



Transport for NSW

Beaches Link and Gore Hill Freeway Connection

Chapter 14

Non-Aboriginal heritage

14 Non-Aboriginal heritage

This chapter describes the potential non-Aboriginal heritage impacts associated with the project and identifies measures which address these impacts. Detailed non-Aboriginal heritage assessments have been carried out for the project and are included in Appendix J (Technical working paper: Non-Aboriginal heritage) and Appendix K (Technical working paper: Maritime heritage).

The Secretary’s environmental assessment requirements as they relate to non-Aboriginal heritage, and where in the environmental impact statement these have been addressed, are detailed in Table 14-1 (Secretary’s environmental assessment requirements checklist).

Avoiding or minimising impacts has been a key consideration throughout the design and development process for the Beaches Link and Gore Hill Freeway Connection project. A conservative approach has generally been used in the assessments, with potential impacts presented before implementation of environmental management measures.

The proposed environmental management measures relevant to non-Aboriginal heritage are included in Section 14.5.

Table 14-1 Secretary’s environmental assessment requirements – Non-Aboriginal heritage

Secretary’s requirement	Where addressed in EIS
<p>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:</p> <ul style="list-style-type: none"> c. environmental heritage, as defined under the <i>Heritage Act 1977</i> (including potential items of heritage value, conservation areas, open space heritage landscapes, built heritage landscapes and archaeology); d. items listed on the State, National and World Heritage lists; e. heritage items and conservation areas identified in local regional planning environmental instruments covering the project area; and f. marine items of potential heritage significance within Middle Harbour, such as any shipwrecks. 	<p>A summary of listed heritage items within the study area is presented in Section 14.3.</p> <p>Consideration of direct and/or indirect impacts (including potential item of heritage value, conservation areas, open space heritage landscapes, built heritage landscapes and archaeology) to the heritage significance of listed (and nominated) heritage items are presented in Section 14.4.2. Further details are provided in Appendix J (Technical working paper: Non-Aboriginal heritage).</p> <p>Section 14.4.3 includes assessment of maritime items of potential heritage significance within Middle Harbour. Further details are provided in Appendix K (Technical working paper: Maritime heritage).</p>
<p>2. Where impacts to State or locally significant heritage items or archaeology are identified, the assessment must:</p> <ul style="list-style-type: none"> a. Include a significance assessment and statement of heritage impact for all heritage items (including any unlisted places that are assessed of heritage value); b. Provide a discussion of alternative locations and design options that have 	<p>Significance assessment and statements of heritage impact are presented in Section 14.4, and Section 4 of Appendix J (Technical working paper: Non-Aboriginal heritage).</p> <p>A discussion of alternative locations and design options are outlined in Section 14.4.1, and Section 5.1, Section 5.2 and Section 5.4 of Appendix J (Technical working paper: Non-Aboriginal heritage) and Section 4.4 and</p>

Secretary's requirement	Where addressed in EIS
<p>been considered to reduce heritage impacts;</p> <p>c. in areas identified as having potential archaeological significance, undertake 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;</p> <p>d. 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);</p> <p>e. provide a comparative analysis to inform the rarity and representative value of any heritage places proposed for demolition;</p> <p>f. outline mitigation measures to avoid and minimise identified impacts in accordance with the current guidelines; and</p> <p>g. be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).</p>	<p>Section 4.5 of Chapter 4 (Project development and alternatives).</p> <p>Mitigation measures are presented in Section 14.5 which includes consideration of areas identified as having potential archaeological significance.</p> <p>Discussion of impacts 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 14.4 and Section 5.2 to Section 5.4 of Appendix J (Technical working paper: Non-Aboriginal heritage). A comparative analysis is not required for the reasons stated in Appendix J (Technical working paper: Non-Aboriginal heritage). This is summarised in Section 14.4.2.</p> <p>Environmental management measures are presented in Section 14.5.</p> <p>Section 14.2 and Section 1.4 of Appendix J (Technical working paper: Non-Aboriginal heritage) provides details of qualification held by heritage consultants.</p>

14.1 Legislative and policy framework

The *Heritage Act 1977* (the Heritage Act) is the primary piece of State legislation affording protection to all items of environmental heritage (natural and cultural) in NSW. Under the Heritage Act, "items of environmental heritage" include places, buildings, works, relics, moveable objects and precincts identified as having heritage significance based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Items of identified heritage at a level of State significance are listed on the NSW State Heritage Register and are afforded automatic protection against any activities that may damage an item or affect its heritage significance under the Heritage Act.

The Heritage Act also provides protection for ‘relics’, which includes archaeological material or deposits. Sections 139 to 145 of the Heritage Act prevent the excavation or disturbance of land known or likely to contain relics, unless under an excavation permit. However, the project is subject to Division 5.2 (State significant infrastructure) provisions of the *Environmental Planning and Assessment Act 1979*, and therefore excavation or exception permits would not be required.

For the purposes of the Heritage Act, the State of NSW also includes the bed of the harbour and the water column up to three nautical miles from the coast. Shipwrecks currently under the jurisdiction of the Heritage Act are identified in the Historic Shipwrecks Register, maintained by the NSW Heritage Council. Part 3C of the Heritage Act also contains specific provisions for the protection of shipwrecks more than 75 years old. This section is included in the Act to provide a link to and consistency with the *Historic Shipwrecks Act 1976* (Commonwealth).

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Commonwealth) applies to those items which are of World, Commonwealth or National heritage significance. Significant impact to World or National heritage items constitute a matter of national environmental significance and require a referral to the Minister for Environment and Energy.

The *Environmental Planning and Assessment Act 1979* establishes the framework for cultural heritage values to be formally assessed in the land use planning and development consent process. The *Environmental Planning and Assessment Act 1979* requires that environmental impacts are considered before land development; this includes impacts on cultural heritage items and places as well as archaeological sites and deposits.

The requirement to consider potential impacts on Non-Aboriginal heritage is given effect through the following guidelines:

- United Nations Educational, Scientific and Cultural Organisation Convention on the Protection of the Underwater Cultural Heritage (UNESCO, 2001)
- Australia International Council on Monuments and Sites *Charter for Places of Cultural Significance (Burra Charter)* (Australia ICOMOS, 2013)
- *NSW Heritage Manual* (NSW Heritage Office and Department of Urban Affairs and Planning, 1996) including the following sections:
 - *Investigating History* – used in carrying out research into historical context and history of individual heritage items
 - *Investigating Fabric* – used in surveying and recording individual heritage items
- *Assessing Heritage Significance* (NSW Heritage Office, 2001) – updated section of 1996 *NSW Heritage Manual* used to review existing significance assessment and carry out significance assessment for new heritage items
- *Investigating Heritage Significance* (draft guideline) (NSW Heritage Office, 2004) – updated section of *NSW Heritage Manual* used to carry out significance assessment for new heritage items
- *Statements of Heritage Impact* (NSW Heritage Office, 2002) – used in preparation of Statements of Heritage Impact
- *Guidelines for the Management of Australia’s Shipwrecks* (Australian Institute for Maritime Archaeology Inc. and the Australian Cultural Development Office, 1994)
- *Criteria for the Assessment of Excavation Directors* (NSW Heritage Council, 2011)
- *Cultural Heritage Guidelines* (Roads and Maritime Services, 2015a).

14.2 Assessment methodology

Impacts on heritage are defined as either:

- Direct impacts, resulting in a planned and intentional physical change to a heritage item from project activities within the heritage item boundary
- Potential direct impacts, resulting from incidental physical impacts occurring as a result of activities adjacent to or within the heritage item boundary
- Indirect impacts, resulting in changes to the heritage item or its surroundings from project activities outside of the heritage boundary, such as vibration, settlement, visual impacts, social impacts, impacts to landscapes and vistas, changes to ongoing use, changed associations, or change to access.

The level of impact on the heritage significance of each heritage item in the study area has been assessed as major, moderate, minor or negligible based on the definitions and framework for assessing severity of impacts from the *EPBC Act Significant Impact Guidelines 1.2* (Department of Sustainability Environment Water Population and Communities, 2013). Where the heritage significance of an item is unknown, such as for potential maritime heritage items identified during field surveys and investigations, items have been assigned a heritage sensitivity level which combines heritage potential of the item with its potential significance.

A Statement of Heritage Impact has been prepared for each State or locally significant terrestrial heritage item impacted by the project in accordance with the *Statements of Heritage Impact guidelines* (NSW Heritage Office, 2002). Where relevant, the impact assessment has incorporated Commonwealth heritage guidelines including *Matters of National Environmental Significance Significant Impact Guidelines 1.1* (Commonwealth of Australia Department of the Environment, 2013).

For the purpose of the heritage assessments, all areas within 50 metres of the project construction footprint have been considered (the study area). The maritime heritage assessment is limited to the immersed tube tunnel alignment between Northbridge and Seaforth, the area around the Middle Harbour south and Middle Harbour north cofferdams (BL7 and BL8), the area around the Spit West Reserve construction support site (BL9) and the temporary mooring facility east of Clive Park in Middle Harbour (refer to Chapter 6 (Construction work)).

The terrestrial and maritime heritage assessments have been informed by searches of NSW and Commonwealth heritage registers and supplemented by a literature review of previous assessments and heritage studies. Heritage items and areas of archaeological potential not already identified on registers are also identified as part of the assessment. Field surveys were carried out in May, June, September and December 2017, August 2018, and March 2020 by qualified heritage specialists to inspect items of known heritage value and areas of potential heritage value.

Further detail on the assessment methodology is provided in Appendix J (Technical working paper: Non-Aboriginal heritage) and Appendix K (Technical working paper: Maritime heritage).

14.3 Existing environment

14.3.1 Historical context of the project area

North Sydney to Cammeray

At the time of European arrival, the North Shore area of Sydney was inhabited by the *Cammeraygal* (also known as *Gamaraigal* and *Kameragal*) with groups camped at Milsons Point, Manly and Lane Cove (Morris, 1986). The first record of contact with Aboriginal people in this area was on the Lane Cove River in 1788 and later in Middle Harbour.

Between the 1790s and 1831, thousands of hectares of land were granted to politicians, merchants, ex-convicts, and settlers (North Sydney Council, n.d.-a). The Township of St Leonards (now North Sydney) was gazetted in 1838, and its town centre was established in the same year. By the mid-1880s, the township had a commercial and civic centre, a tramline, and a ferry wharf at Milsons Point, which boosted development. A tramline extension was added along Falcon Street

from North Sydney to Crows Nest in 1893, which was replaced by an electric tramline in 1898, attracting a larger population to the area (Godden Mackay, 1994).

The opening of the Sydney Harbour Bridge in 1932 transformed the township into a large commercial area and a popular shopping destination, and saw a marked increase in land values (City of Sydney, 2016a; Warne, 2005). By the 1960s, many townhouses and apartments were built in an effort to house the population. During the 1970s and 1980s, commercial growth accompanied residential development, and the 1990s and 2000s saw a substantial increase in population (City of Sydney, 2016a).

The Cammeray area was slow to develop due to its steep topography and remote location, with little growth in the area until the early 1900s when the tramline was extended along Miller Street (North Sydney Council, 2012a; 2012b; n.d.-b). In 1886, the mayor of St Leonards dedicated a portion of land as a reserve, comprising present-day Cammeray Park, Cammeray Golf Course, Green Park, and ANZAC Park (North Sydney Council, 2016).

Cammeray and Artarmon to Northbridge

The first land grant in Artarmon was made in 1810, with new settlers establishing farms, market gardens, and orchards in the area during the 1850s. Brick making began in the area in 1828 and laid the foundation for the 1950s establishment of the Artarmon Industrial Area (City of Sydney, 2016b; Fallowfield, 2008).

The Municipality of North Willoughby was formally proclaimed in October 1865 and by the 1880s, several tanneries and brickworks had been established in the area (LandArc Pty Limited, 2002; Willoughby District Historical Society Inc, 2011a). Land near Naremburn was one of the first areas settled from 1853, followed by land on the Northbridge Peninsula in the vicinity of Sailors Bay Road in 1855 and 1856 (Willoughby District Historical Society Inc, 2011c).

In the late 19th century and early 20th century, subdivision and development took off first around Artarmon, predominantly driven by the opening of the North Shore Railway (City of Sydney, 2016b; Willoughby District Historical Society Inc, 2011b). Development around Naremburn, Northbridge and Willoughby during the 1920s was driven by the prospective opening of the Sydney Harbour Bridge (Willoughby District Historical Society Inc, 2011c; Willoughby Leisure, n.d.).

More intensive development in the area occurred from the 1960s, and in response, the Willoughby Council initiated the West Artarmon Residential Area Redevelopment Plan to open the way for medium and high density buildings, including high-rise residential towers and public housing developments (City of Sydney, 2016b; Willoughby District Historical Society Inc, 2011b). The opening of the Gore Hill Freeway in 1992 separated Artarmon's industrial area in the south from its residential area in the north (Willoughby City Library Services, 2013).

Middle Harbour

The first recorded European visitation of Middle Harbour occurred soon after the arrival of the First Fleet, however settlement in the surrounding area was slow to develop as it was not attractive for agricultural activities (Godden Mackay, 1991).

The waterway gradually became a thoroughfare and crossing point for people travelling between Sydney and settlements in the Manly area in the 19th century, and for the transportation of goods such as timber logs and harvested oysters (Technical working paper: Maritime heritage (2020); Godden Mackay, 1991). The first ferry service across Middle Harbour from The Spit to Clontarf was established in 1849 and was taken over by the Government in the late 1880s (Sturrock, 1982). The first Spit Bridge was constructed in 1924 and was later replaced with the present bridge in 1958 as development on the northern side of Middle Harbour increased.

Modest commercial maritime activities in Middle Harbour developed through the second half of the 19th century but slowly declined as rail and road networks diverted trade away from small jetties and landings along the foreshore. At this time, the upper areas of Middle Harbour around Bantry Bay were largely undeveloped and were used by the Government as an explosives storage area. From the early 20th century until the mid-1970s, explosives were regularly towed in lighters or

barques to and from a storage facility at Bantry Bay to a specially dedicated wharf at The Spit (Godden Mackay, 1991).

In the early 20th century, Middle Harbour became popular for recreational purposes, with a corresponding increase in the presence of recreational boats, timber jetties, slips, boatsheds and swimming enclosures (Godden Mackay, 1991).

Seaforth to Balgowlah and Frenchs Forest

Initial land grants were made in the 1810s and were typically used for farming. Settlements had been developed around Manly Cove and North Harbour by the 1820s (City of Sydney, 2016c; Manly and Northern Beaches, 2017). Balgowlah was used for the village of North Harbour as early as 1828, although the population remained minimal until the 1880s (City of Sydney, 2016d; 2016e; MacRitchie, 2008). The first Manly Wharf was built in 1856 with a regular ferry service from 1859. Rapid growth took place in the 1880s, and the area became a popular seaside resort (City of Sydney, 2016d).

Settlement in the Frenchs Forest area first began in the 1850s, driven by major timber and milling operations around Bantry Bay (City of Sydney, 2016f; City of Sydney, 2017; City of Sydney, 2016g). Traces of the 1856 bullock track used to haul logs from the sawmills to the wharf are still extant today along a bushwalking track within the Garigal National Park between Bantry Bay and the Wakehurst Parkway (NSW National Parks and Wildlife Service, 2017).

Land within the Warringah area remained rural until the 1880s when some growth occurred and Warringah Council established in 1906 (Warringah Council, 1998). Growth in this area primarily consisted of subdivision for weekenders and holiday homes for tourism and recreational purposes, which was further driven by the early 1900s extension of the tramline and the construction of the Spit and Roseville bridges in 1924 (City of Sydney, 2016h).

There was population expansion in the 1920s after the opening of the Spit Bridge, and the Balgowlah Golf Course was formed in 1925 (Jobling IF, 1996; Manly Library, n.d). Significant development did not occur in the area until the post-war years of the 1950s, when the remaining dairy farms disappeared as the area urbanised (MacRitchie, 2008).

Many apartments and units were constructed in the 1960s and 1970s, and industrial development centred around Frenchs Forest (City of Sydney, 2016g; 2016h). New buildings were established during the mid-1990s, attracting a larger population, (City of Sydney, 2016i).

14.3.2 Heritage items and conservation areas

Listed terrestrial heritage items and conservation areas

Seventy-three items with heritage listings were identified within the study area. This includes four items listed on the State Heritage Register (North Sydney Sewer Vent and St Leonards Park at North Sydney, Tarella (house) at Cammeray, and the Walter Burley Griffin Incinerator at Willoughby), with the remainder being of local heritage significance. There are no heritage items listed on the World Heritage List, National Heritage List or Commonwealth Heritage List in or adjacent to the study area. Heritage items listed within the study area are shown in Figure 14-1 to Figure 14-3. Further detail on heritage items and heritage listings of each item are provided in Appendix J (Technical working paper: Non-Aboriginal heritage).

Additional potential terrestrial heritage items

Four additional items of potential heritage significance were identified during the field investigations. These were ANZAC Park at Cammeray, Henry Lawson's Cave within Flat Rock Gully, Balgowlah Golf Course and Burnie (House) at Balgowlah. ANZAC Park was assessed as being of social value due to the location of the war memorial within the park, and its association with the former North Sydney Tramway Depot and its personnel who served during World Wars I and II. Henry Lawson's Cave was assessed as being of historical and social value due to its association with Henry Lawson and as an amphitheatre for recreational community use. Balgowlah Golf Course was assessed as being of historical value as an example of Sydney's post-World War

I suburban expansion and community desire for recreational activities, and its association with one of its founders, James Sydney Wallace Eve, an Olympic swimmer and Australian sports administrator. The impact of the project on these items is assessed in Section 14.4.2. Burnie (House) did not meet the thresholds for heritage significance for local or state listing.

No additional areas of archaeological potential were identified during the field surveys.

Listed maritime heritage items

Two of the listed heritage items identified within the study area have a maritime heritage component. These are Clive Park Tidal Pool, listed on the Willoughby Local Environment Plan 2013, and Harbour foreshores (Seaforth), listed on the Manly Local Environment Plan 2012.

Further detail on heritage items and heritage listings of each item are provided in Appendix K (Technical working paper: Maritime heritage).

Additional potential maritime heritage items

Three unidentified shipwrecks of potential heritage significance were identified during field surveys at Clive Park, Pearl Bay and Middle Harbour (refer to Figure 14-3). These are considered to be of local heritage significance for their rarity and research potential. As such, the impact of the project on these items has been assessed in Section 14.4.3.

Seven unverified anomalies were identified between Northbridge and Seaforth through review of remote sensing data from field surveys and from review of existing sources (refer to Figure 14-3). These are considered to have low to medium potential heritage sensitivity. As the heritage significance cannot be verified, the impact of the project on these items has been assessed in Section 14.4.3 for completeness.

There is potential within the project construction footprint for archaeological remains to occur, associated with maritime infrastructure, shipwrecks and vessel activity that were not identified during the field surveys due to the limitations of visual and remote sensing investigations. A summary of maritime archaeological potential is provided in Table 14-2.

Table 14-2 Maritime archaeological potential within the study area

Potential archaeological site type	Location		
	Middle Harbour between Northbridge and Seaforth	Middle Harbour and Pearl Bay, west of The Spit	Middle Harbour between Northbridge and Beauty Point
Maritime infrastructure	Certain	Certain	Very unlikely
Shipwrecks	Certain	Certain	Unlikely
Discard	Certain	Certain	Very likely

14.4 Assessment of potential impacts

14.4.1 Impact avoidance and minimisation

As detailed in Chapter 4 (Project development and alternatives), the project has avoided or minimised impacts to heritage in the following ways:

- The majority of the project would be constructed and located underground, avoiding impacts through the subsurface tunneling of the project

- At Cammeray, the construction and permanent footprint for the program of works has been designed to utilise as much as possible the existing Warringah Freeway corridor and to enable the remaining land to continue to function as a recreational area (golf course). Residual land (ie outside operational requirements) would be returned to enable incorporation into the golf course at the completion of construction. At Middle Harbour, the construction methodology for the project has been selected to avoid direct impacts on foreshore areas, such as Clive Park. Specifically, the use of cofferdams has minimised temporary and permanent impacts to the shoreline and avoids direct impacts to the park
- At the Wakehurst Parkway, project work has been contained within the existing road reserve to avoid direct impact to Bantry Bluff, which is listed on the Manly Local Environmental Plan 2013 as locally significant, and Upper Middle Harbour Area and the Narrabeen Catchment Lagoon, which are listed on the Register of the National Estate for landscape values
- The Wakehurst Parkway east construction support site (BL13) has been designed to avoid direct impacts to key heritage elements of the Bantry Bay Water Pumping Station and the Bantry Bay Reservoir
- Permanent direct impacts to the Manly Dam and surrounds have been avoided. Less than one per cent of the heritage item would be impacted during a short period of the construction phase to reconnect the upgrade works to an existing fire trail / high voltage powerline maintenance access track.

14.4.2 Potential terrestrial heritage impacts

Of the 76 heritage items identified within the study area, 48 items have been identified as not being impacted by the project. These items are located within 50 metres of surface works for the project along the Warringah Freeway corridor and Balgowlah connections in proximity to minor works within the existing road reserve. Impacts on these 48 items would be limited to temporary noise, vibration and/or visual impacts during construction, and managed through the implementation of minimum working distances for vibration intensive construction activities and other standard construction management measures. As such, impacts to these heritage items have not been carried forward for further detailed assessment.

Of the 28 heritage items that would be potentially impacted:

- Three heritage items (Henry Lawson's Cave, Commercial building, and Grant's Wharf (remains)) would be in the vicinity of low impact work and impact to these items from settlement and vibration would be negligible. There would be no impact to one item in the vicinity of low impact work. Temporary and permanent visual impact is also unlikely as the distance to permanent infrastructure and the retained mature vegetation provides a visual barrier to the majority of the project-related infrastructure
- Three heritage items (Bantry Bluff, The Upper Middle Harbour Area, and The Narrabeen Catchment Lagoon) within the study area, that are listed for landscape and natural values, have been identified as subject to negligible impact by the construction or operation of the project. In each case, the work is outside, or just within the curtilage of the item and work would be contained within previously disturbed areas. Mature vegetation would be retained between the construction footprint and heritage curtilage and any impact on the heritage items and their significance would be negligible.

As such, impact to these heritage items has not been carried forward for further detailed assessment.

A heritage assessment for the remaining 22 heritage items and conservation areas that would be potentially impacted is included in Table 14-3, with items shown in Figure 14-1. Heritage items situated above the tunnel alignment or adjacent to surface works have been assessed as groups of heritage items due to their proximity to each other, the similarity of impacts and similarity of mitigation measures.

Two terrestrial heritage items considered in Table 14-3 have maritime heritage elements. These items include:

- Clive Park Tidal Pool
- Harbour foreshores (Seaforth).

These items have been considered in their entirety in Table 14-3, and do not appear in the maritime heritage assessment in Section 14.4.3.

It is noted that as no whole heritage places are proposed for demolition, no comparative analysis was carried out.

Table 14-3 Potential impacts on terrestrial heritage items

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
1	ANZAC Park, Cammeray	Unlisted	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Planned physical impacts to the heritage item due to the construction of permanent operational infrastructure within the heritage boundary as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project and Beaches Link and Gore Hill Freeway Upgrade program of works. <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage item due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary vibration impacts due to construction activities within the heritage boundary Temporary and permanent visual impacts due to the construction of permanent operational infrastructure within and adjacent to the heritage boundary. 	<p>Negligible</p> <p>All work within the heritage boundary would be contained within previously disturbed areas associated with the Western Harbour Tunnel and Warringah Freeway Upgrade project, and would be minor in nature. Views of permanent operational infrastructure would be partially filtered by vegetation and would not affect the visual setting around the war memorial within the park. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
2	Cammeray Park (including Golf Course), Cammeray	North Sydney Local Environmental Plan 2013	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Planned physical impacts to the heritage item due to the construction of permanent operational infrastructure within the heritage boundary. <p>Potentially direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage items due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the construction of permanent operational infrastructure within the heritage boundary Permanent social impacts due to the repurposing of a large section of the heritage item for permanent operational infrastructure Temporary vibration impacts due to construction activities within the heritage boundary Slight permanent settlement and ground movement impacts to the heritage item caused by tunnel excavation. 	<p>Moderate</p> <p>Direct impacts of the project would be contained within areas previously disturbed by the Western Harbour Tunnel and Warringah Freeway Upgrade project. The proposed works would be of small-medium scale and of moderate intensity, with the changes to the heritage item being permanent and irreversible. The heritage item would lose a large portion of its significance as a relatively intact open space.</p> <p>The implementation of the management measures described in Section 14.5 would provide landscape treatments to screen views to operational infrastructure, however the level of impact would still be moderate.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
3	Cammeray Conservation Area, Cammeray	<ul style="list-style-type: none"> North Sydney Local Environmental Plan 2013 Register of the National Estate. 	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Planned physical impacts to the heritage item due to the construction of permanent road infrastructure within and adjacent to the heritage boundary. <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage item due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the construction of permanent operational infrastructure within and adjacent to the heritage boundary Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary Very slight permanent settlement and ground movement impacts to the heritage item caused by tunnel excavation. 	<p>Minor</p> <p>Direct impacts of the project to the heritage item would be minor and would be contained within areas previously disturbed by the Western Harbour Tunnel and Warringah Freeway Upgrade project. However, temporary and permanent visual impacts along the boundary of the conservation area would be moderate to high due to landscape impacts at Cammeray Golf Course and the presence of project-related infrastructure. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
4	Tarella, Cammeray	<ul style="list-style-type: none"> State Heritage Register North Sydney Local Environmental Plan 2013 Register of the National Estate National Trust of Australia (NSW) Register. 	State	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impact due to the implementation of architectural noise treatments for the heritage item. <p>No potential direct impacts</p> <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the construction of permanent operational infrastructure within and adjacent to the heritage boundary Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary Very slight permanent settlement and ground movement impacts to the heritage item caused by tunnel excavation. 	<p>Negligible</p> <p>Eligibility for architectural noise treatment for the heritage item would be confirmed during further design development and in consultation with the landowner. Should architectural noise treatment be required, this would be done in such a way to minimise heritage impacts, while preserving owner amenity and heritage values of the item.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
5	St Thomas Rest Park, Crows Nest	<ul style="list-style-type: none"> North Sydney Local Environmental Plan 2013 National Trust of Australia (NSW). 	Local	No direct impacts	<p>Negligible</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible, as the proposed works would remain outside the heritage boundary.</p>
				No potential direct impacts	
				Indirect impacts: <ul style="list-style-type: none"> Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary Very slight permanent settlement and ground movement impacts to the heritage item caused by tunnel excavation. 	
6	Holtermann Estate A Conservation Area, Crows Nest	<ul style="list-style-type: none"> North Sydney Local Environmental Plan 2013 Register of the National Estate. 	Local	Direct impacts: <ul style="list-style-type: none"> Physical impact due to the implementation of architectural noise treatments for a number of residences within the conservation area. 	<p>Negligible</p> <p>Eligibility for architectural noise treatment at a number of residences within the conservation area would be confirmed during further design development and in consultation with the landowner. Should architectural noise treatment be required, this would be done in such a way to minimise heritage impacts, while preserving owner amenity and heritage values of the conservation area.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.</p>
				No potential direct impacts	
				Indirect impacts: <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the construction of permanent operational infrastructure in proximity to the conservation area Very slight to slight permanent settlement and ground movement impacts to heritage item within the conservation area caused by tunnel excavation. 	

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
7	Artarmon heritage conservation area, Artarmon	Willoughby Local Environmental Plan 2012	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts to the conservation area due to the construction of permanent infrastructure within the heritage boundary. <p>No potential direct impacts</p> <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the construction of permanent operational infrastructure within and adjacent to the heritage boundary Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary Settlement and ground movement impacts to the heritage item caused by tunnel excavation. 	<p>Negligible</p> <p>Temporary and permanent works within the heritage conservation area would be limited to minor pavement and drainage works and be restricted to previously disturbed areas. Areas impacted by vibration and settlement would be vegetated open space (Artarmon Reserve), with no structures relevant to the heritage listing present.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
8	Clive Park and Tidal Pool, Northbridge	Willoughby Local Environmental Plan 2012	Local	<p>No direct impacts</p> <p>Potential direct impacts</p> <ul style="list-style-type: none"> Potential physical impact to the heritage item from anchoring of project maritime vessels on or around the item. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary visual impacts due to the construction infrastructure in Middle Harbour in proximity to the heritage item, including cofferdams, cranes and maritime construction vessels Temporary vibration impacts due to construction activities (eg piling) adjacent to the heritage boundary Slight permanent settlement and ground movement impacts to heritage item within the conservation area caused by tunnel excavation. 	<p>Minor</p> <p>The construction methodology for the project has been selected to avoid direct impacts on Clive Park and its immediate foreshore. There is potential for the site to be physically impacted from anchoring by construction related vessels, however this is highly improbable as the area would be marked as a restricted zone. Indirect impacts would occur due to vibration, settlement and temporary changes to the visual setting of the item. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
9	Harbour foreshores	Manly Local Environmental Plan 2012	Local	<p>No direct impacts</p> <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impact to the heritage item from anchoring of project marine vessels on or around the item. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary visual impacts due to the construction infrastructure in Middle Harbour in proximity to the heritage item, including cofferdams, cranes and marine construction vessels Temporary vibration impacts due to construction activities (eg piling) adjacent to the heritage boundary Slight permanent settlement and ground movement impacts to heritage item within the conservation area caused by tunnel excavation. 	<p>Minor</p> <p>The construction methodology for the project has been selected to avoid direct impacts on the heritage item. There is potential, for the site to be physically impacted from anchoring by construction related vessels, however this is highly improbable as the harbour foreshores would be marked as restricted zones. Indirect impacts would occur due to vibration, settlement and temporary changes to the visual setting of the item. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
10	Balgowlah Golf Course, Balgowlah	Unlisted	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts to significant portions of the heritage item due to the temporary establishment and operation of the Balgowlah Golf Course construction support site (BL10) and the construction of permanent road infrastructure and operational facilities and new and improved open space and recreation facilities. <p>No potential direct impacts</p> <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the location of the Balgowlah Golf Course construction support site (BL10) and the location of permanent operational facilities within the heritage boundary Permanent social impacts due to repurposing of the heritage item for construction and operational use, and for use as new and improved open space and recreation facilities. 	<p>Major</p> <p>The proposed works would be of large scale and major intensity, with portions of the golf course being modified through the construction of the permanent access road, operational infrastructure and new and improved open space and recreation facilities. Changes to the heritage item would be permanent and irreversible as the heritage item would potentially no longer demonstrate its original character as an interwar period golf course.</p> <p>It is noted that for the purposes of the non-Aboriginal heritage impact assessment (see Appendix J (Technical working paper: Non-Aboriginal heritage)), a worst-case scenario approach of demolition has been assumed for the Golf Course club house building. However, further opportunities to retain and repurpose the club house would be investigated through the dedicated consultation process jointly led by Transport for NSW and Northern Beaches Council during further design development which would give the community the opportunity to provide input on the final layout of the new and improved open space and recreation facilities at Balgowlah.</p> <p>The implementation of the management measures described in Section 14.5 would ensure information about the physical nature of the heritage item is recorded, however the level of impact would still be major.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
11	Frenchs Bullock Track, Killarney Heights	Warringah Local Environmental Plan 2011	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts to part of the heritage item due to the construction of permanent road infrastructure within the heritage boundary. <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage item due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual and aesthetic impacts to the heritage item due to roadworks within and in proximity to the heritage boundary Vibration impacts to the heritage item due to construction activities within the heritage boundary. 	<p>Minor</p> <p>The proposed works would be of small and localised scale, and low intensity, with a small section of the Frenchs Bullock Track potentially being permanently modified by a slope associated with roadworks extending into the curtilage of the item.</p> <p>If required, works could result in a permanent and irreversible change of up to 20 per cent of the track, the changes would not detrimentally impact the historical and aesthetic significance of the heritage item as the greater majority of the track remains in-situ and would continue to display its historical and aesthetic significance.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor. During detailed design and construction planning, the impacts would be re-assessed with a view to redesign shared path connections to the track, thereby minimising the level of impact.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
12	Bantry Bay Water Pumping Station (WPS 122), Killarney Heights	<ul style="list-style-type: none"> Warringah Local Environmental Plan 2011 Sydney Water Section 170 Heritage and Conservation Register 	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts within the heritage boundary due to site establishment works and operation of the Wakehurst Parkway east construction support site (BL13). <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage item due to operation of construction vehicles and equipment within proximity to the pumping station building. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary visual impacts due to the location of the Wakehurst Parkway east construction support site (BL13). 	<p>Minor</p> <p>The proposed works would be restricted to avoid direct impact to the historic pumping station building.</p> <p>Within the heritage boundary the proposed works would be restricted to small to medium scale low-intensity temporary and reversible activities.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
13	Bantry Bay Reservoir (WS 0008), Killarney Heights	<ul style="list-style-type: none"> Warringah Local Environmental Plan 2011 Sydney Water Section 170 Heritage and Conservation Register 	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts within the heritage boundary due to site establishment works and operation the Wakehurst Parkway east construction support site (BL13). <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage item due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>No indirect impacts</p>	<p>Minor</p> <p>The proposed works would be restricted to avoid direct impact to the significant concrete reservoir which is the key heritage element of the heritage item.</p> <p>Within the heritage boundary, the proposed works would be of small-medium scale of low intensity, with the majority of the area being subject to works which are temporary and reversible.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be minor.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
14	Manly Dam and Surrounds, Allambie Heights	<ul style="list-style-type: none"> Warringah Local Environmental Plan 2011 Register of the National Estate. 	Local	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts within the heritage boundary due to the construction of permanent road infrastructure within and adjacent to the heritage boundary. <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts within the heritage boundary due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to the location of the Wakehurst Parkway South construction support site (BL13) and the location of permanent operational facilities adjacent to the heritage boundary Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary Slight permanent settlement and ground movement impacts within the heritage boundary caused by tunnel excavation. 	<p>Negligible</p> <p>The vast majority of the heritage item would not be impacted by the project, beyond the single small section of the boundary along the Wakehurst Parkway. Additionally, none of the significant built heritage elements are within close proximity to the Wakehurst Parkway east construction support site (BL13) and are not predicted to experience vibration impacts.</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible, as there would be little or no physical impact to the heritage item.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
n/a	Three heritage items situated above the tunnel alignment with potential settlement impacts – Naremburn Central Township (Conservation Area), Walter Burley Griffin Incinerator, street trees along Alan Avenue within Seaforth	Various	State (Walter Burley Griffin Incinerator) / Local (all other items)	<p>No direct impacts</p> <p>No potential direct impacts</p> <p>Indirect impacts:</p> <ul style="list-style-type: none"> • Temporary vibration impacts due to construction activities within and adjacent to the heritage boundaries • Slight permanent settlement and ground movement impacts to heritage items caused by tunnel excavation. 	<p>Negligible</p> <p>With the implementation of the management measures described in Section 14.5, the level of impact on the heritage items would be negligible.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating
n/a	Five heritage items situated immediately adjacent to surface works – five houses on Ernest Street in Neutral Bay	Various	Local	<p>No direct impacts</p> <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Potential physical impacts to the heritage items due to operation of construction vehicles and equipment within and in proximity to the heritage boundary. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary and permanent visual impacts due to changes in land use and the construction of permanent operational infrastructure in the vicinity of the heritage items Temporary vibration impacts due to construction activities within and adjacent to the heritage boundary. 	<p>Negligible</p> <p>Temporary and permanent visual impacts along the boundary of the conservation area would be moderate to high due to landscape impacts at Cammeray Golf Course and the presence of project-related infrastructure. Permanent impacts would likely reduce over time as replacement landscape planting matures.</p> <p>It is noted there may be direct impacts to the heritage items due to the implementation of architectural noise treatments however, these would be carried out as part of the Western Harbour Tunnel and Warringah Freeway Upgrade project. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage items would be negligible.</p>

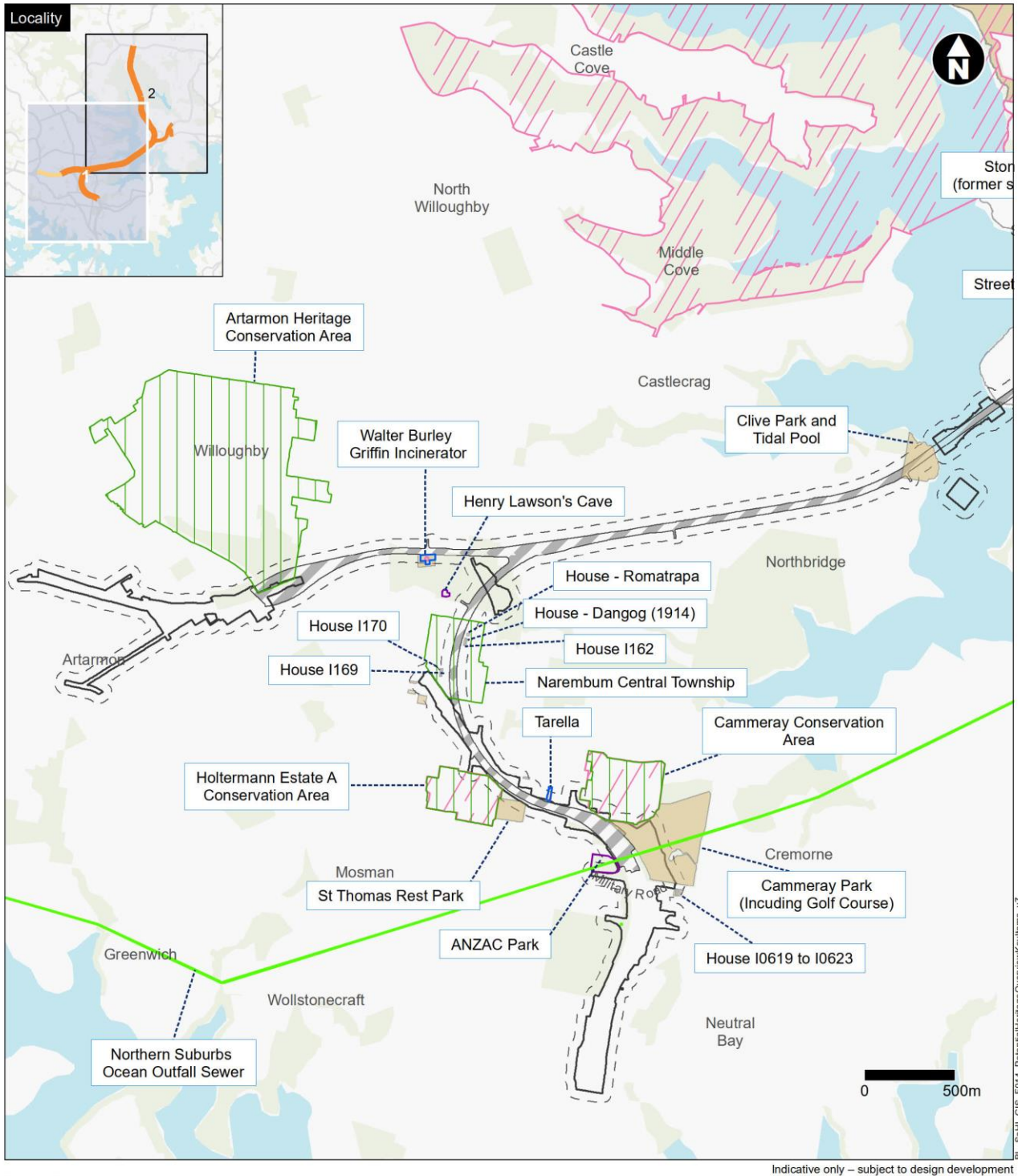
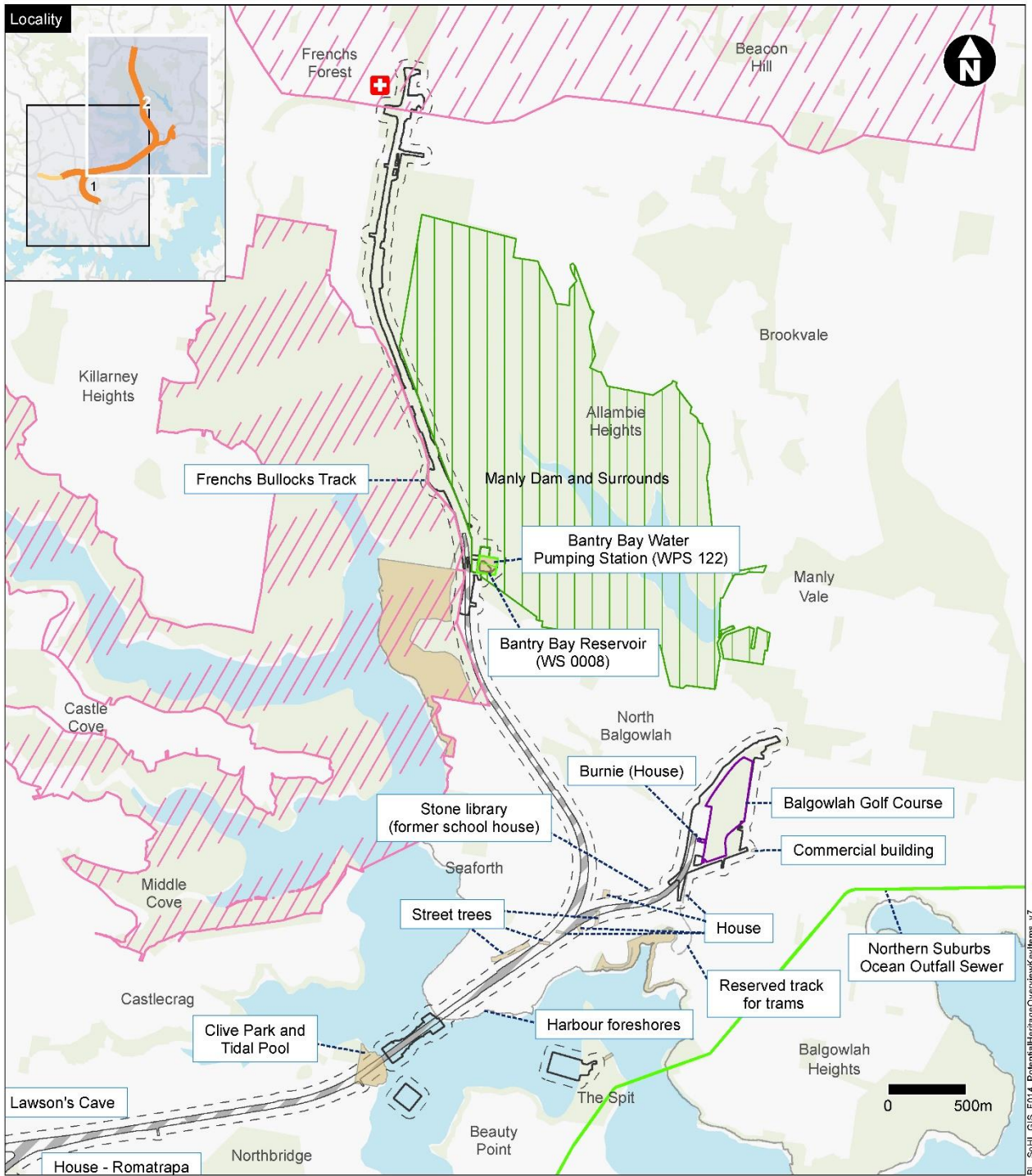


Figure 14-1 Location of terrestrial heritage items impacted by the project



Indicative only – subject to design development

Legend

- Study area
- Tunnel
- Construction footprint
- State Heritage Register (DPE 2017)
- s170 area (compiled by Jacobs 2017)
- Register of the National Estate (DOE 2015)
- LEP Heritage Conservation Area - Landscape (DPE 2020)
- LEP Heritage Item (DPE 2020)
- Potential non-Aboriginal heritage item

Figure 14-2 Location of terrestrial heritage items impacted by the project

14.4.3 Potential maritime heritage impacts

Of the 10 maritime heritage items identified within the study area with cultural heritage significance, one item, the Side scan sonar anomaly (18W-003), would not be impacted by the project (refer Figure 14-3).

A heritage assessment for the remaining nine heritage items that would be potentially impacted is included in Table 14-4 and shown in Figure 14-3. Areas of archaeological potential have also been assessed (Items 10, 11 and 12).

Note that Clyde Park Tidal Pool and Harbour foreshores (Seaforth) have been assessed as terrestrial items in Section 14.4.2.

Table 14-4 Potential impacts on maritime heritage sites

Item	Item name	Listing	Heritage	Impact type	Impact rating (with mitigation)
Heritage items					
1	Clive Park Unidentified Shipwreck No. 1	Unlisted	Local	No direct impacts	Minor The proposed works may result in loss of site integrity and reduction in heritage values. Potential direct and indirect impacts to the heritage item would be minimised with the implementation of the management measures described in Section 14.5 to collect archaeological information from the site before construction.
				Potential direct impacts: <ul style="list-style-type: none"> Physical impact to the heritage item from anchoring of project vessels on or around the item Physical impact to the heritage item by propeller jet turbulence of project vessels. 	
				Indirect impacts: <ul style="list-style-type: none"> Temporary vibration impacts to the heritage item due to the construction of the Middle Harbour south cofferdam (BL7). 	
2	Middle Harbour Unidentified Shipwreck No. 1	Unlisted	Local	No direct impacts	Negligible With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.
				No potential direct impacts	
				Indirect impacts: <ul style="list-style-type: none"> Temporary vibration impacts to the heritage item due to the construction of the Middle Harbour south cofferdams (BL7). 	

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating (with mitigation)
3	Pearl Bay Unidentified No. 1 Shipwreck (18W-01)	Unlisted	Local	Direct impacts: <ul style="list-style-type: none"> Physical impact to the heritage item from piling activities associated with the construction of the Spit West Reserve construction support site (BL9). 	Minor The proposed works may result in loss of site integrity and reduction in heritage values. Potential direct and indirect impacts to the heritage item would be minimised with the implementation of the management measures described in Section 14.5 to collect archaeological information from the site before construction and to establish a restricted zone before construction to avoid potential direct impacts.
				Potential direct impacts <ul style="list-style-type: none"> Physical impact to the heritage item from anchoring of project vessels on or around the item. 	
				No indirect impacts	
Unverified anomalies – potential heritage items					
4	'Barge'	Unlisted	Unknown – low heritage sensitivity	No direct impacts	Negligible It is expected there would be no discernible change to the existing natural and human impacts to this site. With the implementation of the management measures described in Section 14.5, the level of impact on the heritage item would be negligible.
				No potential direct impacts	
				Indirect impacts: <ul style="list-style-type: none"> Temporary vibration impacts to the heritage item due to the construction of the Middle Harbour south cofferdam (BL7). 	
5	Side scan sonar anomaly 16W-06	Unlisted	Unknown – low heritage sensitivity	Direct impacts: <ul style="list-style-type: none"> Planned physical impacts to the entire item due to dredging for the immersed tube tunnels. 	Minor The proposed dredging works for the immersed tube tunnels would result in loss of site integrity and reduction in heritage values. As the expected heritage sensitivity of the site is low, the implementation of the pre-dredge management measures described in Section 14.5 would result in a minor impact.
				No potential direct impacts	
				No indirect impacts	

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating (with mitigation)
6	Magnetic anomaly 1	Unlisted	Unknown – low heritage sensitivity	Direct impacts: <ul style="list-style-type: none"> Physical impacts to the entire item due to dredging for the immersed tube tunnels. 	Minor The proposed dredging works for the immersed tube tunnels would result in loss of site integrity and reduction in heritage values. As the expected heritage sensitivity of the site is low, the implementation of the pre-dredge management measures described in Section 14.5 would result in a minor impact.
				No potential direct impacts	
				No indirect impacts	
7	Magnetic anomaly 2	Unlisted	Unknown – low heritage sensitivity	Direct impacts: <ul style="list-style-type: none"> Physical impacts to the entire item due to dredging for the immersed tube tunnels. 	Minor The proposed dredging works for the immersed tube tunnels would result in loss of site integrity and reduction in heritage values. As the expected heritage sensitivity of the site is low, the implementation of the pre-dredge management measures described in Section 14.5 would result in a minor impact.
				No potential direct impacts	
				No indirect impacts	
8	Magnetic anomaly 3	Unlisted	Unknown – medium heritage sensitivity	No direct impacts	Minor The proposed works may result in loss of site integrity and reduction in heritage values, which is suspected to be associated with the Clive Park Unidentified Shipwreck No 1. Potential direct and indirect impacts to the heritage item would be minimised with the implementation of the management measures described in Section 14.5 to collect archaeological information from the site before construction.
				Potential direct impacts: <ul style="list-style-type: none"> Physical impact to the heritage item from anchoring of project vessels on or around the item Physical impact to the heritage item by propeller jet turbulence of project vessels. 	
				Indirect impacts: <ul style="list-style-type: none"> Temporary vibration impacts to the heritage item due to the construction of the Middle Harbour south and Middle Harbour north cofferdams (BL7 and BL8). 	

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating (with mitigation)
9	Side scan sonar anomaly 18W-002	Unlisted	Unknown – low heritage sensitivity	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impact to the heritage item from piling activities associated with the construction of the Spit West Reserve construction support site (BL9). <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Physical impact to the heritage item from anchoring of project vessels on or around the item Physical impact to the heritage item by propeller jet turbulence of project vessels. <p>No indirect impacts</p>	<p>Minor</p> <p>The proposed works may result in loss of site integrity and reduction in heritage values. Potential direct and indirect impacts to the heritage item would be minimised with the implementation of the management measures described in Section 14.5.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating (with mitigation)
Potential archaeological sites					
10	Potential archaeological sites in Middle Harbour between Northbridge and Seaforth	Unlisted	Unknown – low heritage sensitivity	<p>Direct impacts:</p> <ul style="list-style-type: none"> Physical impacts to the bed of the harbour in this area due to dredging for the immersed tube tunnels and construction of the Middle Harbour south and Middle Harbour north cofferdams (BL7 and BL8). <p>Potential direct impacts:</p> <ul style="list-style-type: none"> Physical impact to the bed of the harbour in this area from anchoring of project vessels on or around the item Physical impact to the bed of the harbour in this area by water turbulence from the operation of project vessels. <p>Indirect impacts:</p> <ul style="list-style-type: none"> Temporary vibration impacts to the bed of the harbour in this area due to the construction of the Middle Harbour south and Middle Harbour north cofferdams (BL7 and BL8). 	<p>Minor</p> <p>The proposed works may result in loss of site integrity and reduction in heritage values of potential archaeological sites. Impacts to potential archaeological sites would be minimised with the implementation of the management measures described in Section 14.5 to identify any further heritage items before construction.</p>

Item No.	Item name	Listing	Heritage significance	Impact type	Impact rating (with mitigation)
11	Potential archaeological sites in Middle Harbour and Pearl Bay, west of The Spit	Unlisted	Unknown – low to medium heritage sensitivity	Direct impacts: <ul style="list-style-type: none"> Physical impact to the bed of the harbour in this area from piling activities associated with the construction of the Spit West Reserve construction support site (BL9). 	Minor The proposed works may result in loss of site integrity and reduction in heritage values of potential archaeological sites. Impacts to potential archaeological sites would be minimised with the implementation of the management measures described in Section 14.5 to identify any further heritage items before construction.
				Potential direct impacts: <ul style="list-style-type: none"> Physical impact to the bed of the harbour in this area from anchoring of project vessels on or around the item Physical impact to the bed of the harbour in this area by water turbulence from the operation of project vessels. 	
				No indirect impacts	
12	Potential archaeological sites in Middle Harbour between Northbridge and Beauty Point	Unlisted	Unknown – low heritage sensitivity	No direct impacts	Minor The proposed works may result in loss of site integrity and reduction in heritage values of potential archaeological sites. Impacts to potential archaeological sites would be minimised with the implementation of the management measures described in Section 14.5 to identify any further heritage items before construction.
				Potential direct impacts: <ul style="list-style-type: none"> Physical impact to the bed of the harbour in this area from anchoring of project vessels on or around the item. 	
				No indirect impacts	

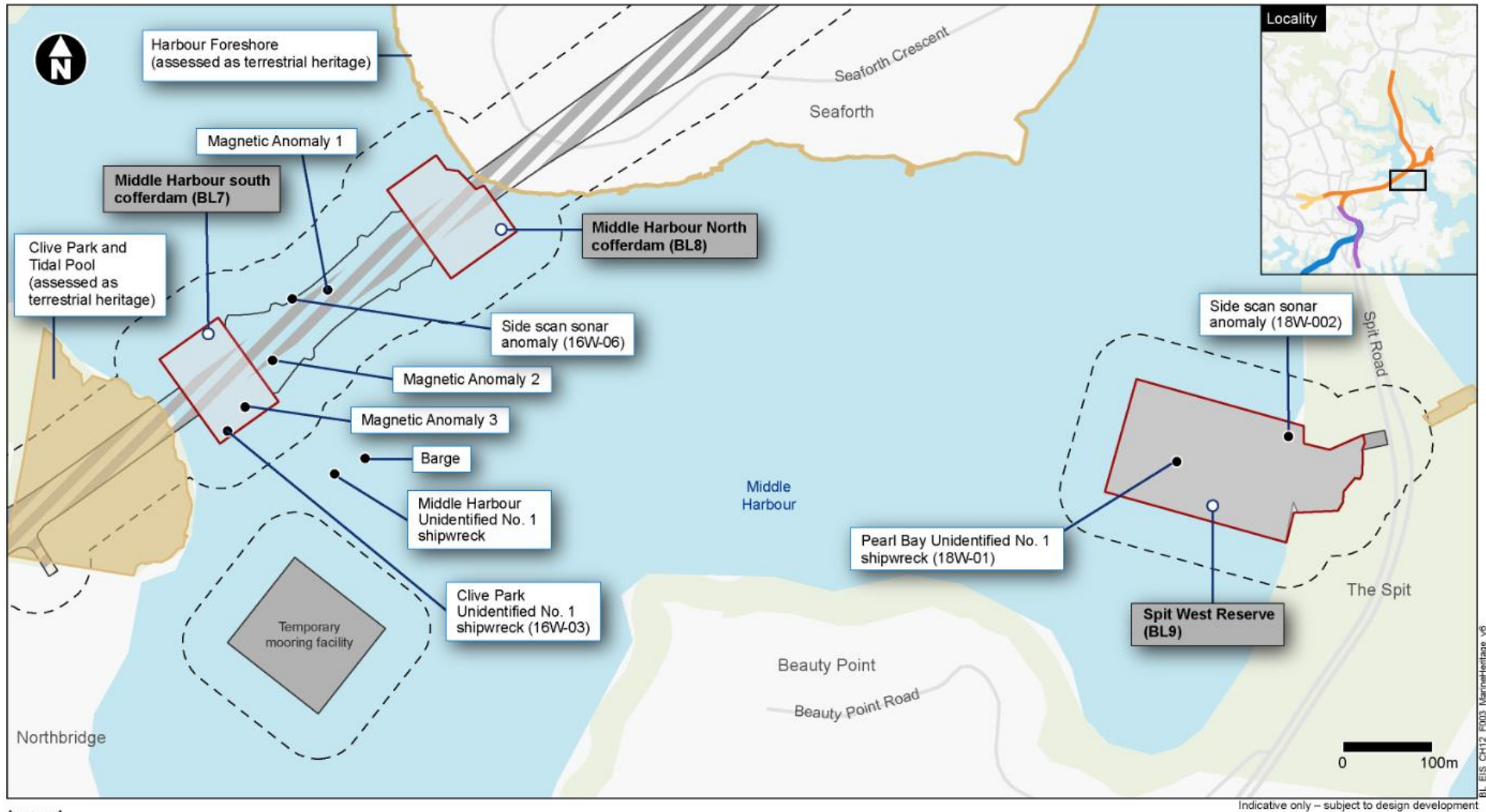


Figure 14-3 Location of maritime heritage items impacted by the project

14.5 Environmental management measures

Environmental management measures relating to non-Aboriginal heritage for the project are outlined in Table 14-5.

Table 14-5 Environmental management measures – Non-Aboriginal heritage

Ref	Phase	Impact	Environmental management measure	Location
NAH1	Design	Ongoing non-Aboriginal heritage impacts	Appropriate heritage interpretation will be incorporated into the urban design for the project in accordance with the <i>NSW Heritage Manual</i> (NSW Heritage Office and Department of Urban Affairs and Planning, 1996), <i>Interpreting Heritage Places and Items: Guidelines</i> (NSW Heritage Office, 2005), and the <i>Heritage Interpretation Policy</i> (NSW Heritage Council, 2005).	BL/GHF
NAH2	Pre-construction	Impacts on specific non-Aboriginal heritage items	Archival recording will be carried out in accordance with the <i>Photographic Recording of Heritage Items Using Film or Digital Capture</i> guideline for areas/items subject to change within the following items, in accordance with Appendix J (Technical working paper: Non-Aboriginal heritage): <ul style="list-style-type: none"> Item 10: Balgowlah Golf Course, Balgowlah Item 11: Frenchs Bullock Track, Killarney Heights (pending further detailed survey and detailed design development confirming direct impact). Archival recording will be completed prior to any works that have the potential to impact upon the items and deposited with appropriate stakeholders as determined during further design development (eg local councils).	BL/GHF
NAH3	Pre-construction	Maritime non-Aboriginal heritage impacts	A Maritime Heritage Management Plan that details the objectives and methodologies to conserve maritime heritage and mitigate impacts will be prepared in consultation with a qualified and experienced maritime archaeologist. The Maritime	BL

Ref	Phase	Impact	Environmental management measure	Location
			<p>Heritage Management Plan will specify:</p> <ol style="list-style-type: none"> Unexpected finds protocols relevant to each type of activity such as dredging or piling Artefact management procedures, including identification of approved submerged reburial locations Relevant work method requirements and maritime heritage inductions tailored for each type of work activity such as dredging or piling Restricted zone, archival, baseline and periodic monitoring protocols including before and during construction, and final site inspections within three months of completion of works for the following maritime heritage sites: <ul style="list-style-type: none"> Clive Park Tidal Pool Clive Park Unidentified No. 1 Pearl Bay Unidentified No. 1. An archaeological research design to guide the investigation of Clive Park Unidentified No 1. 	
NAH4	Pre-construction	Maritime non-Aboriginal heritage impacts	Any pre-dredge bed of the harbour clearance by divers in Middle Harbour will be carried out in the presence of a maritime archaeologist, who will identify any additional inspection or documentation that should be carried out during the clearance dive. This may include inspecting the locations of known or potential submerged maritime heritage sites and items, either recording in situ or recovery and/or relocation.	Middle Harbour
NAH5	Pre-construction	Maritime archival recording	An archival recording of Clive Park Unidentified No. 1 will be carried out to mitigate the likely loss of information resulting from a breakdown of site integrity. The archival recording will have the	Clive Park Unidentified No. 1

Ref	Phase	Impact	Environmental management measure	Location
			<p>following objectives or research questions:</p> <ul style="list-style-type: none"> Identifying and recording the extent of the site Identifying the type and function of the vessel (which would mean determining its construction) Identifying what the vessel was carrying at the time of loss Re-assessing the cultural heritage significance of the site. <p>The archival recording of the wreck would require limited excavation of the site to recover and examine its contents. This excavation will be carried out in accordance with the research design (refer to NAH3) and any artefacts recovered from the site will be buried, after analysis, in an approved location nearby.</p>	
NAH6	Pre-construction	Maritime archival recording	<p>A detailed archival recording of the following maritime heritage items will be prepared, consistent with relevant NSW Heritage Council approved standards and guidelines:</p> <ul style="list-style-type: none"> Clive Park Tidal Pool Pearl Bay Unidentified No. 1. <p>The archival records will also capture any relevant information needed to serve as a baseline for monitoring during the project, as identified in the Maritime Heritage Management Plan (see NAH3). The final archival record will be updated with any changes identified during monitoring or investigation prior to lodgement.</p>	Clive Park Tidal Pool, Pearl Bay Unidentified No.1
NAH7	Pre-construction	Maritime non-Aboriginal heritage impacts	<p>A side scan sonar survey will be carried out for the following areas, where they are not already covered by existing surveys:</p> <ul style="list-style-type: none"> Project construction footprint between Northbridge and 	Middle Harbour south cofferdam (BL7), Middle Harbour

Ref	Phase	Impact	Environmental management measure	Location
			<p>Seaforth in the vicinity of the immersed tube tunnels and the Middle Harbour cofferdams (BL7 and BL8)</p> <ul style="list-style-type: none"> Project construction footprint in the vicinity of the Spit West Reserve construction support site (BL9). <p>A qualified maritime archaeologist will assess the results of the side scan survey to identify any additional potential heritage items requiring investigation and assessment.</p>	north cofferdam (BL8), Spit West Reserve construction support site (BL9)
NAH8	Pre-construction	Maritime non-Aboriginal heritage impacts	A dive team under the supervision of a maritime archaeologist will inspect the location of each proposed piled mooring to assess the maritime heritage value of any cultural object present and either relocate the object or, if significant, relocate the proposed mooring.	Temporary mooring facility east of Clive Park in Middle Harbour
NAH9	Pre-construction	Non-Aboriginal heritage impacts to Frenchs Bullock Track	<p>The northern section of the Frenchs Bullock Track potentially impacted directly by construction works will be reformed if impacted, as close as possible to the existing alignment.</p> <p>Further detailed survey will be completed to confirm the heritage curtilage of the southern section of Frenchs Bullock Track prior to construction to determine if this section will be directly impacted.</p> <p>Where the heritage curtilage of the Frenchs Bullock Track is within the construction footprint or boundary of proposed permanent infrastructure, impacts to the track will be avoided where possible through further design development.</p>	BL
NAH10	Pre-construction and construction	Vibration impacts to non-Aboriginal heritage	A structural survey will be prepared for all maritime infrastructure within the Seaforth 'Harbour Foreshores' that could be subject to vibrational impact to determine minimum working distances and vibration limits to be observed to prevent cosmetic damage. Vibration	Harbour foreshores (Seaforth)

Ref	Phase	Impact	Environmental management measure	Location
			monitoring will be carried out during works to ensure vibration levels do not exceed appropriate limits. The recommended actions in Appendix G (Technical working paper: Noise and vibration) will be followed.	
NAH11	Construction	Non-Aboriginal heritage impacts during construction	Delineation of restricted zones will be implemented to avoid inadvertent works occurring within the curtilage of heritage items.	BL/GHF
NAH12	Construction	Unexpected discovery of historical heritage materials, features or deposits	If at any time during construction of the project, historical materials, features and/or deposits are encountered, the <i>Standard Management Procedure: Unexpected Heritage Items</i> (Roads and Maritime Services, 2015d) will be followed.	BL/GHF
NAH13	Construction	Unexpected discovery of human remains	In the event that construction of the project reveals possible human skeletal material (remains), <i>Standard Management Procedures – Unexpected Heritage Items</i> (Roads and Maritime Services, 2015d) will be implemented.	BL/GHF
NAH14	Construction	Non-Aboriginal heritage impacts during construction	Non-Aboriginal heritage awareness training will be provided for contractors prior to commencement of construction works to ensure understanding of potential heritage items that may be impacted during the project, and the procedure required to be carried out in the event of discovery of non-Aboriginal heritage materials, features or deposits, or the discovery of human remains. This includes relevant work method requirements and maritime heritage inductions tailored for each type of work activity such as dredging or piling.	BL/GHF

Ref	Phase	Impact	Environmental management measure	Location
NAH15	Construction	Non-Aboriginal heritage impacts	Should at-property noise treatment be required at a premise that is heritage listed, this will be carried out in a manner to minimise heritage impact, and advice of a heritage conservation architect will be sought prior to carrying out the works. Any treatments will be sympathetic to the heritage values of the item, designed with heritage architect input and be reversible where feasible.	BL/GHF

Note: BL = Beaches Link, GHF = Gore Hill Freeway Connection.

Environmental management measures identified in previous sections of this environmental impact statement will also mitigate potential impacts to non-Aboriginal heritage. These are identified in Table 14-6.

Table 14-6 Environmental management measures for non-Aboriginal heritage impacts identified in other sections of the environmental impact statement

Ref	Phase	Impact	Environmental management measure	Location
SG7	Pre-construction, construction	Ground movement impacts	<p>Pre-construction building structure condition surveys will be offered and prepared (where the offer is accepted by the owner) for properties (and heritage assets) within the zone of influence of tunnel settlement where the degree of severity has been assessed as 'slight' or above and within the minimum working distances for cosmetic and structural damage due to vibration. The surveys will be carried out by a suitably qualified person prior to the commencement of the tunnelling and vibration-intensive activities in the vicinity with the potential to affect the building/structure.</p> <p>Within three (3) months of the completion of construction activities that have the potential to cause settlement or vibration-related damage to the subject surface/subsurface structure, all property owners of buildings for which a pre-construction building condition survey was carried out will be offered a second building condition survey. Where an offer is accepted, a post-construction building condition surveys will be carried out by a suitably qualified person. The results of the surveys will be documented in a post-construction building condition survey report for each building surveyed.</p> <p>Copies of building condition survey reports will be provided to the owners of the buildings surveyed within one (1) month of the survey being completed.</p> <p>Any building and/or property damage from settlement caused by the project will be repaired at no cost to the owner. Any repairs to listed heritage items required as a result of the settlement damage, will be carried out under the guidance of a suitably qualified and experienced heritage professional.</p>	BL/GHF

Ref	Phase	Impact	Environmental management measure	Location
CNV7	Construction	Construction vibration impacts	<p>Vibration generating activities will be managed through the establishment of minimum buffer distances to achieve screening levels.</p> <p>Where vibration levels are predicted to exceed the screening levels, a more detailed assessment of the impacted structure will be carried out to assess the susceptibility of the structure to damage from vibration due to the project. Appropriate mitigation and management measures, such as equipment substitution and alternative methods, will be identified and implemented to avoid damage.</p> <p>Attended vibration monitoring will be carried out during vibration intensive activities in the vicinity to ensure vibration levels remain below appropriate limits for that structure.</p> <p>For heritage items, the more detailed assessment will 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> <p>Pre-construction building structure condition surveys will be carried out in accordance with environmental management measure SG7. Any building and/or structure damage from vibration caused by the project would be repaired at no cost to the owner.</p>	BL/GHF

There are environmental management measures that would contribute to the mitigation and management of non-Aboriginal heritage impacts associated with the Western Harbour Tunnel and Beaches Link program of works, which are committed to within the Submissions report for the Western Harbour Tunnel and Warringah Freeway Upgrade project. The implementation of these management measures would also mitigate potential non-Aboriginal heritage impacts associated with this project. These include:

- A thematic heritage study of golf courses in Sydney will be prepared for the region north of the Sydney Harbour. This study will assist in identifying other potential heritage items in the region that demonstrate the same or similar significance as the Cammeray Golf Course (Revised environmental management measure NAH8)
- Archival recording will be carried out in accordance with the *Photographic Recording of Heritage Items Using Film or Digital Capture* guideline for areas/items subject to change within the following items, in accordance with Appendix J (Technical working paper: Non-Aboriginal heritage):
 - f) Cammeray Park (including the Golf Course), Cammeray
 - g) Cammeray Conservation Area, Cammeray (Revised environmental management measure NAH5).