7. Assessment of key issues

7.5 Aboriginal heritage

This section describes the potential Aboriginal heritage impacts that may be generated by construction and operation of the project and presents a proposed approach to the management of these impacts. **Table 7-76** outlines the SEARs that relate to Aboriginal heritage and identifies where they were addressed in this EIS. The full assessment of Aboriginal heritage impacts is provided in **Appendix I**.

Table 7-76 SEARs (Aboriginal heritage)

Secretary's requirement	Where addressed in this EIS
10. Heritage	
1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance 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;	Impacts on Aboriginal heritage are discussed in **Section 7.5.1** and **Section 7.5.3** to **Section 7.5.6**
b. Aboriginal places of heritage significance, as defined in the Standard Instrument – Principal Local Environmental Plan;	No Aboriginal Places or sites of Aboriginal heritage significance are gazetted in the detailed investigation area in the Fairfield LEP 2013, Liverpool LEP 2008 and Penrith LEP 2010 Aboriginal places of heritage significance are identified in **Section 7.5.3**, with impacts assessed in **Section 7.5.4**
c. environmental heritage, as defined under the *Heritage Act 1977*; and	Non-Aboriginal environmental heritage is discussed in **Section 7.6.3** to **Section 7.6.5**
d. items listed on the National and World Heritage lists.	Results of desktop searches are provided in **Section 7.5.3**
2. Where impacts on State or locally significant heritage items are identified, the assessment must a. include a significance assessment and statement of heritage impact for all heritage items including the Fleurs Radio Telescope Site and the McGarvie-Smith Farm Site (including significance assessment);	Results of desktop searches are provided in **Section 7.5.3**. Impacts on the Fleurs Radio Telescope Site and the McGarvie-Smith Farm Site are assessed in **Section 7.6.4**
b. consider impacts on the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant)	Impacts on Aboriginal items of significance are presented in **Sections 7.5.4** to **Section 7.5.5** Impacts on non-Aboriginal items of significance are presented in **Section 7.6.4**
c. outline measures to avoid and minimise those impacts in accordance with the current guidelines; and	Measures to avoid and minimise Aboriginal heritage impacts are discussed in **Section 7.5.4** to **Section 7.5.6**, with environmental management measures presented in **Section 7.5.6** Measures to avoid and minimise non-Aboriginal heritage impacts are discussed in **Section 7.6.7**

Secretary's requirement	Where addressed in this EIS
3. Where archaeological investigations of Aboriginal objects are proposed these must be conducted by a suitably qualified archaeologist, in accordance with section 1.6 of the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010c).	Archaeological investigations have been conducted by a suitably qualified and experience archaeologist (as per Section 1.6 of the Code of Practice) Further details regarding archaeological investigations and qualification of personnel are presented in Annexure C of **Appendix I**
4. Where impacts on Aboriginal objects and/or places are proposed, consultation must be carried out with Aboriginal people in accordance with the current guidelines.	Consultation with Aboriginal people is discussed in **Sections 7.5.2** and **Section 7.5.3**

7.5.1Policy and planning setting

The Aboriginal cultural heritage assessment was prepared to assess the impacts of the project in accordance with the following relevant legislation, policies and guidelines:

- *National Parks and Wildlife Act 1974* (NPW Act)
- *Native Title Act 1994* (NSW Native Title Act)
- *Heritage Act 1977* (Heritage Act)
- *Aboriginal Land Rights Act 1983*
- Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH, 2011a)
- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales 2010 (DECCW 2010d)
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a)
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW 2010c)
- *PACHCI (*Roads and Maritime, 2011a*)*
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
- EPBC Act
- *Native Title Act 1993*
- Australia International Council on Monuments and Sites (ICOMOS) Charter for Places of Cultural Significance 2013 (Burra Charter) (Australia ICOMOS 2013).

Further detail on the above legislation, policies and guidelines and how they apply to project is provided in **Chapter 2** of **Appendix I**.

7.5.2Assessment methodology

Overview

The assessment of Aboriginal cultural heritage was conducted by a suitably qualified heritage consultant in accordance with the guidance documents listed in **Section 7.5.1**. The Aboriginal cultural heritage assessment involved:

- A desktop assessment of the study area including various online databases and available reports to develop a predictive model
- Review of relevant landscape characteristics associated with patterning, preservation and discovery of Aboriginal sites, carried out in August 2017
- Predictive modelling to determine the archaeological sensitivity of particular landforms, and ultimately the location, extent and sampling strategy for the test excavation methodology and program. It was predicted that stone artefact sites would be the primary material evidence for past Aboriginal occupation, and moreover that most of the cultural materials would be contained in the buried soil profile rather than exposed on the ground surface.
- Archaeological survey of the detailed investigation area (defined below) conducted between July and September 2017 with representatives from the Deerubbin and Gandangara Local Aboriginal Land Councils
- Consultation with the Aboriginal community representatives in accordance with ACHCRP, carried out between October 2017 and February 2019
- Archaeological assessment including field inspection and test excavations within the detailed investigation area in accordance with the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW (DECCW 2010c) carried out between February and June 2018. Existing data on the archaeological characteristics of the Cumberland Plain suggest that the distribution of surface exposed sites is poorly correlated with the distribution of Aboriginal objects in sub-surface deposits. For this reason, an essential component of the archaeological assessment was a program of sub-surface testing to reveal relationships between landforms soils and site distributions.
- Identification of Aboriginal cultural values through consultation and desktop reviews
- Significance assessments in accordance with:
  - The Australia ICOMOS Burra Charter (Australia ICOMOS, 2013)
  - The Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH, 2011a)
- Assessment of impacts on items/areas identified in the desktop assessment and verified through surveys and test excavations and of management measures to minimise impacts in accordance with the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH, 2011a)
- Development of management measures in accordance with relevant legislation and guidelines to assess impacts on Aboriginal cultural heritage, primarily to seek to avoid impacts and/or secondarily to mitigate them.

The PACHCI procedure outlines a four-stage process for investigating potential impacts on Aboriginal cultural heritage on Roads and Maritime projects. The four stages of the PACHCI are designed to ensure compliance with statutory requirements and EESG policies, including the ACHCRP. The four stages are as follows:

- Stage 1 – Initial Roads and Maritime assessment
- Stage 2 – Further assessment and site survey with Aboriginal stakeholders
- Stage 3 – Formal consultation with Registered Aboriginal Parties and preparation of a cultural heritage assessment report
- Stage 4 – Implementation of project mitigation measures.

Each of the four stages of the PACHCI were carried out for this project. Further details relating to consultation as part of the Aboriginal cultural heritage assessment is provided in the 'Consultation' section below.

Study area

The Aboriginal heritage assessment has primarily investigated potential Aboriginal cultural heritage values that have the potential to be impacted by the project. The following areas were therefore identified for the purpose of the assessment (see **Figure 7-55**):

- Construction footprint – Defined as the zone in which construction activities would take place. The boundaries of this area shifted slightly during the assessment period, to the extent that some sections of the footprint are shown outside of the detailed investigation area as defined in this report. While outside the defined detailed investigation area, these sections of the construction footprint were considered in the impact assessment.
- Detailed investigation area – This refers to the area where detailed investigations were carried out as part of the archaeological assessment which covered an area that may be subject to ground disturbance. This area was set before confirmation of the EIS construction footprint and explains why the construction footprint extends beyond the detailed investigation area in some locations.
- Broader study area – This area surrounds the detailed investigation area (and includes the detailed investigation area) and was investigated as part of the desktop assessment. It is, hereafter, referred to as the 'study area'. This area was selected to include comparable archaeological situations in similar environmental settings along the greater South Creek catchment and the Mulgoa Creek headwaters.

Some of the desktop investigations included regional studies which are not shown in **Figure 7-55**.

Consultation

Engagement with Aboriginal stakeholders was carried out to address the requirements of the PACHCI which provides an opportunity for Aboriginal people to participate in decision making about the management of their cultural heritage. The consultation activities carried out in association with each stage of the PACHCI is detailed in **Table 7-77**.

Table 7-77 Consultation activities carried out during each of the PACHCI stages

PACHCI stage	Required actions	Activities and outcomes
Stage 1	An initial assessment to determine whether the project is likely to harm Aboriginal cultural heritage.	Based on existing information about the distribution of Aboriginal cultural sites in, and near the detailed investigation area it was determined that the project is likely to impact on Aboriginal cultural heritage. This result therefore triggered the subsequent actions under Stage 2 of the PACHCI.

PACHCI stage	Required actions	Activities and outcomes
Stage 2	Further assessment and site survey with key Aboriginal stakeholder involvement and a qualified archaeologist to assess the project's potential to harm Aboriginal cultural heritage	The following consultation activities were carried out as part of PACHCI Stage 2: • The National Native Title Tribunal was contacted on 16 October 2017 to identify any registered native title claimants or native title holders for the assessment area. The response indicated that there were no current native title claimants or native title holders for the detailed investigation area. • A search of the Register of Aboriginal Owners (*Aboriginal Land Rights Act 1983*) was requested on 18 October 2017. There were no Registered Aboriginal Owners in the detailed investigation area. • Site officers from the Deerubbin and Gandangara LALCs were engaged to participate in the archaeological survey (July to September 2017) and consulted regarding the assessment process. The archaeological survey further indicated that the project is likely to harm Aboriginal cultural heritage. This therefore triggered the subsequent actions under Stage 3 of the PACHCI.
Stage 3	Formal consultation and preparation of the ACHAR	The following consultation activities were carried out as part of PACHCI Stage 3: • Letters were sent to the following organisations on October 2017 requesting details of Aboriginal people who may have an interest in, and cultural knowledge of, the detailed investigation area – EESG – Gandangara LALC – Deerubbin LALC – The Registrar appointed under the *Aboriginal Land Rights Act 1983* – The National Native Title Tribunal – The Native Title Services Corporation Limited – Fairfield City Council, Penrith City Council and Liverpool City Council • Based on the responses, a list of 20 Aboriginal groups and individuals were identified, and correspondence sent inviting them to register interest in the project • Advertisements inviting Aboriginal groups or people to register their interest in the project were placed in two local newspapers on 10 October 2017 • A Register of Aboriginal Parties was compiled based on the responses to letters and advertisements. Fifteen Registered Aboriginal Parties (RAPs) were registered for the project. The list of RAPs was forwarded to EESG, Deerubbin LALC and Gandangara LALC in November 2017. • The draft archaeological methodology was sent to the RAPS and EESG on 21 December 2017, allowing for a 28-day review as required under the Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW 2010a) • Aboriginal site officers participated in test excavations between 21 February and 27 June 2018

PACHCI stage	Required actions	Activities and outcomes
		• Balarinji conducted a process to prepare conceptual design directions underpinned by the locally endorsed Aboriginal narrative. These design directions were gathered through an inclusive consultation process with artists and Elders who originate from or live and work in the Aboriginal community through which the project would run • The draft ACHAR was sent to the RAPS and EESG in February 2019, allowing for a 28-day review as required under the relevant guidelines. • A total of three Aboriginal Focus Group (AFG) meetings were held for the project: – First AFG was held on 17 January 2018 to discuss the project overview, results of the archaeological survey and proposed archaeological methodology for test excavation – Second AFG was held on 7 August 2018 to discuss preliminary results of test excavation program and advise on mitigation and management measures for potentially impacted sites – Third AFG was held on 27 February 2019 to discuss draft ACHAR and AAR, salvage program, the Aboriginal cultural heritage design process, and proposed management measures for potentially impacted sites • Any additional comments received during ongoing consultation would be included in the submissions report following EIS exhibition. During future stages of the project, RAPs would be consulted about significant design or construction changes in a manner consistent with the relevant guidelines.
Stage 4	Implementation of project mitigation measures based on recommendations in Stage 3 and to obtain an AHIP, if required	The PACHCI Stage 4 would involve: • Implementation of the ACHAR recommendations (such as salvage) in accordance with any heritage construction management sub-plans and any other planning approval conditions • Finalisation of the excavation report. Note: Under Division 5.2 Section 5.23 of the EP&A Act, an AHIP is not required for the project as it is designated as SSI.

Archaeological survey

An archaeological survey was conducted between July and September 2017 with representatives from the Deerubbin and Gandangara Local Aboriginal Land Councils (LALC). The archaeological survey provided an opportunity to conduct targeted surveys of the areas identified by the predictive model, to confirm the landscape and landforms, the presence of relatively intact soil profiles, potential alignments for test pit transects and site access arrangements.

The survey method involved all survey team members walking at a maximum of 20 metre separation, allowing inspection of all grounds within each property accessed.

An effective area of 153 hectares was surveyed on foot across the construction footprint, representing 0.02 per cent effective coverage of the total area that would be impacted by the project. It is noted that a much larger area than the construction footprint was surveyed. The effective coverage for a survey takes the limitations imposed by ground surface exposure and exposure type into account.

For certain areas, such as the Western Sydney Parklands in the east, heavy bushland hindered access to any area other than formed trails, bicycle tracks and vehicle tracks.

Archaeological test excavations

The purpose of the test excavations was to confirm whether Aboriginal objects were present in the sub-surface soils in an identified PAD, and if so to provide information about the type, extent and density of cultural materials.

Test pits were excavated along transects (lines) at each PAD at intervals between 20 metres to 200 metres, depending on the size of the PAD. Transects were positioned to ensure that each PAD was adequately sampled, including potential differences in soils and cultural contents associated with varying distance from watercourses. Between three and 27 test pits were excavated in each PAD.

A total of 166 test pits (one metre by one metre) were hand excavated, along with 25 larger geotechnical test pits (which were either two or three square metres, this was required as part of the wider project).

Full details on the selection, location and physical attributes of every test excavation and geotechnical pit are provided in the Archaeological Assessment Report (Annexure C of **Appendix I**).

Aboriginal cultural values

A cultural values assessment was also carried out as part of the ACHAR, which included the collection of cultural information during consultation, field survey and during the test excavation program. The Aboriginal cultural values assessment was carried out by the project archaeologists and the Balarinji strategic design team (Balarinji 2018b).

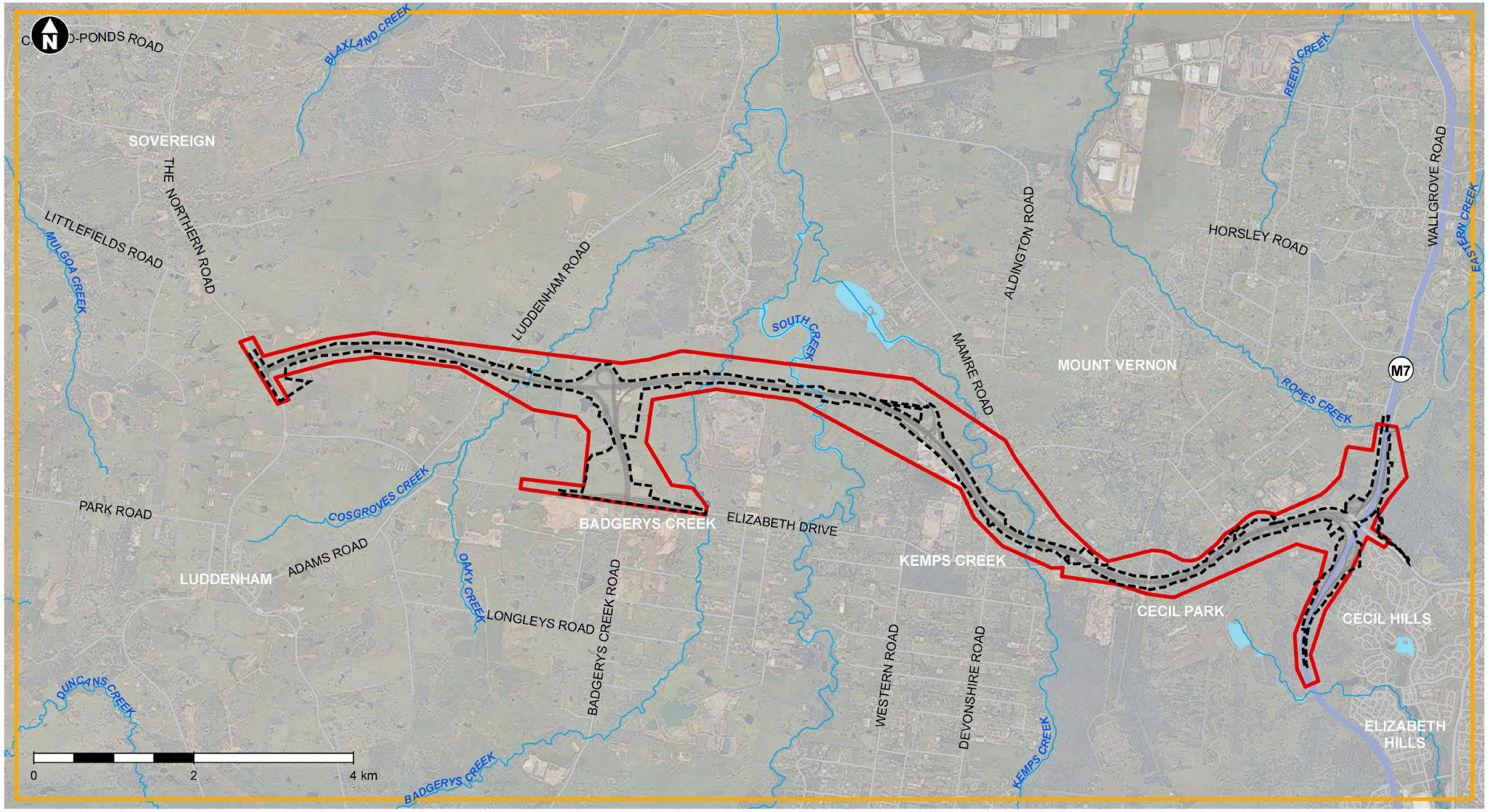

Figure 7-55 Location of construction footprint, detailed investigation area and study area for Aboriginal cultural heritage assessment

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The assessment involved several methods of consultation with knowledge holders as identified by the RAPs for the project. The cultural values assessment was based on:

- Reviewing archaeological fieldwork and consultation previously conducted for the concept design (Aurecon 2016a)
- Reviewing literature relevant to the project and the surrounding landscape
- Consultation with knowledge holders for the region during AFG meetings
- Consultation with knowledge holders at arranged meetings
- Consultation with Aboriginal site officers during field work regarding Aboriginal objects and cultural values.

The information provided has contributed to an understanding of the cultural value of the broader landscape within which the project would be located. Knowledge holders have provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of European occupation and land management practices on their traditional land, and subsequently their culture. The cultural values assessment identified locations of Aboriginal cultural value relevant to the project. The results of the cultural values assessment are provided in **Section 7.5.3**.

Significance assessment

Significance assessments generally use a series of standard criteria to define why a site is important. The criteria used for the significance assessment are described in the Australia ICOMOS Burra Charter (Australia ICOMOS 2013). These criteria include for:

- Social value
- Historical value
- Scientific value
- Aesthetic value
- Spiritual value.

With the exception of spiritual value, the individual criteria were applied to each of the Aboriginal sites that were identified in the construction footprint. The level of spiritual significance for individual sites and places is cultural information that is not generally disclosed to persons who are not traditional knowledge holders. For this reason, a significance level was not assigned for spiritual values in the significance assessments that follow.

An overall significance rating is assigned to a site based on an average across the criteria. While this may oversimplify the significance of particular sites or their attributes to particular stakeholders, it provides a consistent basis for comparing the relative significance of sites.

Results of the significance assessments carried out for the project are provided in **Section 7.5.3.**

Impact assessment methodology

The impacts of the project on Aboriginal heritage, during both construction and operation, was assessed in accordance with the terminology in EESG guidelines and the Australia ICOMOS Burra Charter (Australia ICOMOS 2013).

The use of the term ‘harm’ in relation to Aboriginal objects and sites in this document reflects the terminology in the current EESG AHIP application form. It is noted that these terms are not defined in EESG guidelines however a reasonable interpretation based on common usage is provided below.

Types of harm are categorised as:

- Would not be harmed – no movement or other alteration of any Aboriginal object from, or within, a site
- Movement (collection) only – meaning surface artefacts may be moved within, but not moved from, a site
- Excavation – Aboriginal objects may be removed from a site by archaeological excavation
- Community collection – Aboriginal objects may be removed by members of the local Aboriginal community
- Directly harmed – Aboriginal objects may be removed or destroyed.

The degree of harm is categorised as:

- Total – the entire site would be harmed
- Partial – part of the site would be harmed
- None – there would be no movement of any Aboriginal object from a site or within a site, including covering sites by burial or inundation.

The consequence of harm makes reference to the loss of heritage value and is defined here as the loss of cultural significance taking into account the five heritage values under the Australia ICOMOS Burra Charter (Australia ICOMOS, 2013). Loss is categorised as:

- Total loss of value – the site is destroyed, and its embodiment of heritage value is irretrievably lost
- Partial loss of value – the site is harmed, there is incomplete representation of its original fabric, some potential remains for the site to be appreciated by present and future generation
- No loss of value – the site retains its full potential and value to present and future generations.

7.5.3 Existing environment

Overview

Aboriginal historical context

This section provides a summary of the cultural context of the study area. For a detailed outline of the cultural context of the study area see Section 5.2 of **Appendix I**.

Archaeological evidence suggests that the early Holocene occupation of the Cumberland Plain was sporadic with a relatively low population base. In comparison with coastal parts of Sydney, there is little information on the early historic accounts about the lifestyle of Aboriginal people on the Cumberland Plain. There are no known historic references to Aboriginal people that specifically relate to the study area.

The information below draws upon the broader Sydney region, as described by anthropologists, historians and archaeologists such as Matthews (1901), Kohen (1986), Attenbrow (2010), Goodall and Cadzow (2009) and Irish (2017). Information was predominately derived from personal oral histories of Darug descendants and their long-term residents and the journals, diaries and official reports of the European people.

The major reason for the lack of historic accounts is likely the scale and speed of mortality as a result of the health epidemics that swept through the Aboriginal population of the Cumberland Plain, following their first encounters with the Europeans. At least two waves of smallpox are recorded, the first in 1789 and another in the late 1820s. It is estimated that half of the Aboriginal population of the Sydney region was lost in the first epidemic (Turbet, 1989).

The social disruption that must have accompanied this extraordinary loss of life was followed by the rapid dispossession of traditional lands across the Cumberland Plain. The first excursion of the Europeans as far west as Parramatta took place in 1788. A party led by Watkin Tench had ventured as far west as the Nepean River by 1789. The agricultural potential of the fertile soils on the Wianamatta shales was immediately apparent and the Cumberland Plain was quickly divided into a series of land grants. Early land holdings in the immediate vicinity of the study area included the 1806 grant of 640 acres to James Badgery on the southern side of Elizabeth Drive, and the 1813 grant to John Blaxland of 6710 acres between Badgerys Creek and the Nepean River. Within the investigation area, land use activities included logging, clearing native vegetation for agricultural purposes, quarrying for clay shale extraction, roads, and excavations for farm dams.

During the initial phase of exploration there was minimal interaction between the European people and Aboriginal groups, however as more settlers entered the regions beyond the established settlements of Sydney camps interactions became increasingly frequent and adversarial. Conflicts intensified between 1812 and 1816 and military expeditions were sent throughout the Sydney area (Attenbrow, 2010; Australian Museum Consulting, 2014; GML, 2007).

These land grants and the development of European occupation led to Aboriginal people being pushed off their land and resulted in an increase in conflicts. One such conflict was the Appin Massacre on 17 April 1816. The massacre resulted the death of at least 14 Aboriginal people and occurred due to a military reprisal raid ordered by Governor Lachlan Macquarie (Karskens, 2015).

The scale of impacts on the Aboriginal occupants of the Cumberland Plain means that almost all recorded observations were of a society adjusting to rapid and severe change. Furthermore, the observers carried their own inherent biases and limited understanding of what they were observing. For these reasons the ethno-historic picture of Aboriginal life that can be extracted from the ethno-historic data is limited and cannot represent the complexity or richness of social, spiritual or economic activities that took place in the study area.

Historical observations suggest that Darug (coastal and hinterland dialect), Gundungurra, and Tharawal peoples inhabited the Cumberland Plain (Kohen, 1986). Attenbrow (2010) suggests that the study area falls within the traditional lands of the Darug language group. Following the major epidemics and conflicts in the late 18th and early 19th centuries, the remnant Darug clans responded to the loss of life by consolidating into a single South Creek group, referred to at the time as the South Creek Tribe.

Darug descendants continued to live and practice cultural activities on several properties in the South Creek catchment. Three such properties, Exeter Farm on Badgerys Creek (AHIMS site card 45-5-215), Mamre Farm at Orchard Hills (Martin, 1988) and the Macarthur farm at Mulgoa (Keating, 1996) are located within 15 kilometres of the study area.

Following European arrival, the local landscape became used primarily for agriculture. Activities included stock grazing, cropping, orcharding, and dairying. As populations increased and land use intensified, lands were subdivided into small holdings and agricultural plots resulting in even more disturbance and modification of the environment. Within the investigation area, land use activities included logging, clearing native vegetation for agricultural purposes, quarrying for clay shale extraction, roads, and excavations for farm dams.

High levels of ground disturbance begun in 1956 as a result of excavation and quarrying activities, as well as the associated development of these facilities. The Luddenham portion of the detailed investigation area was subject to intensive clearing and farming over the last 80 years. The area was used for a myriad of activities over this time, including dairy farming, horse yards and stables, excavation for dam development and disposal of demolition rubbish (Dean-Jones, 1991). There is widespread evidence of illegal historic land uses including the unapproved disposal of construction and industrial wastes.

The section north of Elizabeth Drive between Luddenham Road and Mamre Road was subject to clearing and ripping of the topsoil to facilitate grazing and related farming activities.

Social organisation and language

Though ethnographic (relating to the scientific description of peoples and cultures with their customs, habits, and mutual differences) observations and accounts were not systematically recorded within the region, the accounts that exist provide a glimpse into the social and cultural life of the Aboriginal people at that time. European observations often used the generic term ‘tribe’ when referring to Aboriginal people in the Sydney region. However, the societal organisation of Aboriginal people in the Sydney area was far more complex than tribal affiliation and based upon kinship systems.

The first level in the social hierarchy of Aboriginal groups of south-eastern Australia was the individual families who occupy and move throughout their traditional lands. Related families form bands who regularly come together for social, ceremonial and economic activities. Clans are likewise defined by descent and shared language, cultural practices and land. The languages spoken by clan members would generally share common elements with those of adjacent clans. Language groups or tribes form the highest level of related structure.

The proximity of Darug country to early Sydney meant that they were one of the first cultural groups to be impacted by European arrival (Tindale, 1974). Many of the European observations related to Darug, Gundungurra and Tharawal groups see hunting, fishing, cooking and conflict. These are all issues of shared interest to the European observers.

For the Darug people, the connection to the Cumberland Plain was an integral component of Country and to the formation of a cultural identity, all of which was extremely damaged and with some knowledge lost due to European occupation and subsequent dispossession of land occupied by the Darug people.

Shelter, tools, weapons and natural resources

The overhangs and rock shelters that provided shelter during inclement weather in the sandstone country are almost entirely absent from the Cumberland Plain. However, dwellings were constructed with timber and bark from trees of the area. Examining ethnographic accounts by Trench (1789) and Collins (1798) allow a glimpse into the type of shelter that may were used. They describe rock shelters, huts which would were big enough to fit up to eight people, and bark ‘ovens’ which were constructed to allow one person to lie down inside for shelter. Within the study area, there is a reference to, but not a description of, the presence of huts by Caley (1801, p47), as well as a mention of ‘Good Land, Native Huts’ by William Dawes (Dawes, 1792).

The typical tool kit on the Cumberland Plain consisted of stone flakes, ground stone axes, hatchets, spears, clubs, bowls and canoes (Tench, 1961). Ground stone axes were essential for the climbing techniques recorded on the Cumberland Plain as well as for a variety of other woodworking and hunting tasks. Potential sources for the igneous rock types favoured for ground edge axes include the deep gravel beds along the Nepean River as well as more distant igneous rock quarries near Tamworth and Oberon. Raw materials for flaked stone artefacts are widely distributed across the region. The most commonly used material for stone artefact production was the silcrete gravels associated with the St Marys Formation, which is available at multiple sites including the junction of Cosgroves and South Creeks to the north of the study area.

The diversity and abundance of native vegetation in the detailed investigation area was diminished through agricultural land use practices. Wide scale clearing of native vegetation was ongoing since the arrival of European settlers. Limited areas of native vegetation remain within the detailed investigation area.

A wide range of natural resources would were utilised by Aboriginal people on the Cumberland Plain, providing edible flora and fauna, wood and bark for the construction of tools and shelter, stone for the production of flaked and ground edge artefacts and ochres for ceremonial purposes.

The presence of creeks and waterways was important for both subsistence and as landmarks. The Nepean River, not far from the operational footprint, is a known focal point, and a possible weather refuge area for Aboriginal people at the time of European arrival. The key creek within the detailed investigation area is South Creek which flows for 70 kilometres, and which was dual named as Wianamatta meaning 'mother place' in the Darug language. Additionally, there is Kemps Creek which flows for over 17 kilometres, and Badgerys Creek which is 16 kilometres long. All these watercourses provided water, food sources, and cultural significance for Aboriginal groups (Balarinji, 2018b).

Landscape context

The project is located on the Cumberland Plain, a relatively flat, low lying subregion of the Sydney Basin. For the purpose of investigating the Aboriginal cultural heritage values four major landforms were identified within the detailed investigation area, these are:

- Luddenham rolling hills
- Cecil Hills
- Creek flats
- Gentle slopes.

Further to this, based on a review of the 1:100,000 scale Soil Landscape Map for Penrith, there are also four main soil landscapes in the detailed investigation area that are closely related to surface landform and topography, these are:

- South Creek soil landscape – fluvial deposits which are located along and adjacent to all four creek channels
- Blacktown soil landscape – residual soils located in the flat to gently undulating terrain between creek channels and adjacent floodplains
- Luddenham soil landscape – residual soils located on the low rolling hills at both ends of the project
- Picton soil landscape – residual and colluvial soils located at the eastern end of the project.

A small patch is also mapped as Disturbed Terrain. These soil landscapes are shown in **Section 8.1.3** and in **Figure 8-3**.

Two geo-physical characteristics are of importance to potential Aboriginal heritage values within the detailed investigation area; the presence of Quaternary alluvium and small outcrops of Minchinbury sandstone. Quaternary Alluvium is located along all four major creek channels and is typically comprised of fine-grained sand, slit, and clay fluvial deposits. This alluvium has the potential to preserve discrete archaeological deposits. Isolated outcrops of Minchinbury Sandstone located within the construction footprint may be suitable for sharpening stone axes.

Desktop assessment and previous archaeological investigations

Database search results

The desktop assessment identified the following:

- A search of the Commonwealth's lists of National and World Heritage sites carried out in June 2017 identified no sites in or near the detailed investigation area
- A search of the Register of Native Titles Claims carried out in June 2017 indicated there are currently no native title claims identified within the detailed investigation area or the broader study area
- A search of the Aboriginal Land Claims carried out in June 2017 indicated there are currently no registered Aboriginal land claims in the detailed investigation area
- A search of the State Heritage Register carried out in June 2017 indicated there are currently no items of Aboriginal heritage significance or subject to an IHO within the detailed investigation area

- The search of the Fairfield LEP 2013, Liverpool LEP 2008 and Penrith LEP 2010 carried out in June 2017 indicated that no Aboriginal Places or sites of Aboriginal heritage significance are gazetted in the detailed investigation area
- A search of registered sites on AHIMS carried out on 14 June 2017 identified 24 registered sites of which 15 were within the detailed investigation area, and eight of these are in the construction footprint. This is discussed further below
- A search of previous archaeological investigations in or near the detailed investigation area identified 25 previous studies. This is discussed further below
- A search of Native Titles Claims and Aboriginal Land Claims was re-run on the 22 July 2019. No native title or land claims within the detailed investigation area or broader study area were identified.

Registered AHIMS sites

The AHIMS database, managed by the EESG, contains information about gazetted Aboriginal Places and recorded Aboriginal sites and objects. Following interrogation of the AHIMS site cards by a qualified archaeologist, 15 registered AHIMS sites, comprising 14 stone artefact sites and a PAD were identified within the detailed investigation area. Eight of the 15 registered sites were located within the construction footprint.

Table 7-78 describes the eight registered sites within the construction footprint and **Table 7-79** describes the seven registered sites that are outside the construction footprint but within the detailed investigation area.

Table 7-78 Registered AHIMS sites within the construction footprint

AHIMS number	Site description
45-5-2308	Eleven flaked stone artefacts recorded along an eroded fire trail on a narrow ridge top within what is now the Western Sydney Parklands at Cecil Hills.
45-5-3804	A single silcrete flaked piece recorded on an interfluve between two first order drainage lines in a paddock near Luddenham. The artefact was exposed by an erosion scar at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4747	Three stone artefacts recorded in a vehicle track exposure on an elevated ridge on the western side of Badgerys Creek. The artefacts were re-located in 2017.
45-5-4748	A single silcrete flake recorded on the Badgerys Creek eastern alluvial floodplain at the base of a tree. The artefact could not be found during an inspection in 2017.
45-5-4786	A single silcrete flake recorded on a ridge in a paddock near Luddenham. The artefact was exposed by a 25 m^2 area of sheet erosion. The artefact could not be found during an inspection in 2017.
45-5-4007/ 45-5-4937	Three silcrete flaked stone artefacts recorded along a first order drainage depression next to Range Road at Kemps Creek as part of the present M12 assessment. On review of the AHIMS records it was discovered that the site had been previously recorded with incorrect coordinates.
45-5-0496/ 45-5-4749	A small number of stone artefacts recorded in 1985 by Professor Richard Wright from the University of Sydney near the concrete bridge over South Creek on the University of Sydney land. The site was inadvertently re-recorded by archaeologists surveying for M12 route options.
45-5-0528/ 45-5-4750	At the time of the assessment, more than 50 artefacts were recorded around a dam/soak waterbody serving as a farm water body with eroding gully walls. The waterbody appears to be located on a natural spring. The site was originally recorded in 1985 by Professor Richard Wright from the University of Sydney, and then inadvertently re-recorded by archaeologists surveying for M12 route options. This natural spring has now been in-filled.

Table 7-79 AHIMS sites outside the construction footprint but inside the detailed investigation area

AHIMS number	Site description
45-5-2307	Seven artefacts recorded along 100 metres of unsealed track in the road reserve on the southern side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-4374, however this would require testing of the intervening sub-surface deposits.
45-5-4374	Seventeen artefacts recorded along 45 metres of unsealed track in the road reserve on the southern side of Elizabeth Drive at Cecil Hills. The site may be continuous with 45-5-2307.
45-5-2310	Five flaked stone artefacts along 80 metres of power line maintenance track within road reserve on the southern side of Elizabeth Drive. The artefacts could not be found during an inspection in 2017.
45-5-2563	A single broken silcrete flake on a track near a drainage line at Cecil Park near the eastern end of the detailed investigation area, north of Elizabeth Drive. The artefact could not be found during an inspection in 2017.
45-5-2721	Thirty-four artefacts recovered from 95 auger pits dug on the headwaters of Ropes Creek as part of The M7 Motorway investigation at the very eastern end of the detailed investigation area. A previous testing program carried out established a low density sub-surface distribution of Aboriginal cultural material across the three landforms that were sampled: the banks of a creek, the associated floodplain and a nearby hillcrest.
45-5-2723	One hundred and forty artefacts recovered from 38 auger pits and twenty-seven recovered from the open area excavation. A previous testing program carried out established a low density sub-surface distribution of Aboriginal cultural material across the elevated terrace on the northern side of Hinchinbrook Creek.
45-5-4767	A single silcrete flake recorded in a cutting next to a greenhouse in a highly disturbed context on the eastern side of Kemps Creek. The artefact could not be found during an inspection in 2017.

Previous archaeological studies

More than 25 previous studies were conducted within five kilometres of the detailed investigation area. Almost all of the previous studies resulted in the discovery of Aboriginal cultural material. The review of past archaeological work has supported the development of a predictive model for the detailed investigation area. Trends that emerge from the previous studies include:

- There is a strong correlation between the density, size and complexity of sites and the presence of reliable freshwater
- A low density of artefactual material persists in areas beyond about 150 metres from watercourses
- Elevated rises above areas subject to periodic inundation, such as creeks, were found to contain artefacts and sites
- The presence or absence of artefacts on the exposed ground surface is a poor predictor of the density of sub-surface artefactual material
- In contrast to the northern part of the Cumberland Plain, there is limited evidence that access to high quality stone is playing a major role in the distribution of sites. This may reflect the apparent lack of extensive outcrops of silcrete in the southern half of the Cumberland Plain
- Opportunities for grinding grooves and scarred trees are limited by the rarity of sandstone outcrops and old growth trees on the Cumberland Plain.

Potential archaeological deposits

Based on the predictive model 14 PADs were initially identified within the detailed investigation area. A list of the 14 PADs is provided in **Table 7-80**.

Table 7-80 PADs based on the predictive model

PAD	Assessment area	Landform	Soil landscape
The Northern Road (TNR)	Luddenham	Gentle Slopes	Blacktown
Cosgroves Creek West (CCW)	Luddenham	Gentle Slopes	South Creek
Cosgroves Creek East (CCE)	Luddenham	Gentle Slopes	Blacktown
Badgerys West B (BWB)	Badgerys Creek	Creek Flats	Blacktown/South Creek
Badgerys Creek West (BCW)	Badgerys Creek	Luddenham Rolling Hills	Blacktown
Badgerys Creek East (BCE)	South Creek	Creek Flats	South Creek
South Creek West (SCW)	South Creek	Creek Flats	Blacktown/ South Creek
South Creek East (SCE)	South Creek	Creek Flats	South Creek
Kemps North West (KNW)	Kemps Creek	Luddenham Rolling Hills	Blacktown
Kemps Creek West (KCW)	Kemps Creek	Creek flats	South Creek
Kemps Creek East (KCE)	Kemps Creek	Creek flats	South Creek/Blacktown
Range Road (RR)	Cecil Flats	Creek flats	Luddenham
PCP8 (PCP8)	Cecil Hills	Gentle Slopes	Luddenham
Cecil Hills Ridge PAD (CHRP)	Cecil Hills	Gentle Slopes	Picton/ Luddenham

Archaeological survey findings

During the archaeological survey four additional Aboriginal archaeological sites were identified within the detailed investigation area however after further investigation only one site, located within the construction footprint, was considered to have potential archaeological value; M12-AS-03 (AHIMS 45-5-4935). This increased the number of registered stone artefact sites in the construction footprint from eight to nine.

The location of the 15 registered AHIMS sites, 14 PADs and one new Aboriginal site is shown in **Figure 7-68**. Some of the site views showing the landscape character of the PADs are also provided in **Figure 7-56** to **Figure 7-67**.

Figure 7-56 TNR PAD, view north

Figure 7-57 CCW PAD, view north

Figure 7-58 CCE T2 PAD, view east

Figure 7-59 BWB PAD, view east

Figure 7-60 BCW PAD, view north

Figure 7-61 BCE PAD, view south

Figure 7-62 SCE PAD, view east

Figure 7-63 SCW PAD, view east toward South Creek East PAD

Figure 7-64 KNW PAD, view east

Figure 7-65 KCW PAD, view west

Figure 7-66 PCP8 PAD, view south

Figure 7-67 CHRP PAD, view north

Figure 7-68 Location of identified Aboriginal sites and PADs prior to test excavations Page 1 of 3

Figure 7-68 Location of identified Aboriginal sites and PADs prior to test excavations Page 2 of 3

Figure 7-68 Location of identified Aboriginal sites and PADs prior to test excavations Page 3 of 3

Test excavation findings

Based on the predictive model, 14 PADs were initially identified within the detailed investigation area however based on differences in landform, soils and archaeological characteristics noted during test excavations, two of the 14 PADs (Cosgroves Creek East and South Creek West) were later sub-divided into three and two separate PADs respectively. Therefore, a total of 17 PAD were considered within the detailed investigation area and investigation as part of the test excavations. **Table 7-81** lists the names and descriptions of the final 17 PADs that were targeted during test excavations.

Table 7-81 PADs within the detailed investigation area

PAD name	Registered AHIMS site	Landforms	Description
The Northern Road (TNR)	45-5-3804	Luddenham Rolling Hills	Excavation area crossing a first order drainage line near ephemeral ponds exploring whether deposit is associated with the single surface artefact originally recorded as site 45-5-3804.
Cosgroves Creek West (CCW)	TBC	Creek Flats	PAD on the western side of Cosgroves Creek in the vicinity of trotting tracks with exposed artefacts.
Cosgroves Creek East T1 (CCE T1)	TBC	Creek Flats; Gentle Slopes	PAD on a low dividing ridge east of Cosgroves Creek. Continuous with Cosgroves Creek East T2.
Cosgroves Creek East T2 (CCE T2)	TBC	Gentle Slopes	PAD on a low rise over a second-order tributary. Continuous with Cosgroves Creek East T1 and T3.
Cosgroves Creek East T3 (CCE T3)	TBC	Gentle Slopes	PAD on high ground distant from watercourses. Continuous with Cosgroves Creek East T2.
Badgerys West B (BWB)	TBC	Gentle Slopes	PAD on a prominent hillock and low ridge overlooking South Creek. Incorporates 45-5-4747
Badgerys Creek West (BCW)	TBC	Creek Flats; Gentle Slopes	PAD on floodplain and gentle slopes of Badgerys Creek adjacent to Elizabeth Drive
Badgerys Creek East (BCE)	45-5-0528; 45-5-4750; 45-5-4748	Creek Flats	PAD on floodplain of South Creek. Continuous with South Creek West T1.
South Creek West T2 SCW T2)	TBC	Gentle Slopes	PAD on a low rise running north–south and parallel to South Creek. Continuous with Badgerys Creek East and South Creek West T1.
South Creek West T1 (SCW T1)	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	Creek Flats	PAD on floodplain on the western edge of South Creek. Continuous with South Creek West T2 and South Creek East.
South Creek East (SCE)	TBC	Creek Flats	PAD on floodplain on the eastern side of South Creek. Continuous with South Creek West T1.
Kemps North West (KNW)	TBC	Gentle Slopes	Gentle slopes on the western side of Kemps Creek.
Kemps Creek West (KCW)	TBC	Creek Flats	Creek flats on the western side of Kemps Creek. Continuous with Kemps Creek East

PAD name	Registered AHIMS site	Landforms	Description
Kemps Creek East (KCE)	TBC	Creek Flats; Gentle Slopes	Creek flats on the eastern side of Kemps Creek. Continuous with Kemps Creek West.
Range Road (RR)	45-5-4007/45-5-4937	Gentle Slopes	Excavation area across site on gentle slopes along a first order drainage line.
PCP8	45-5-2308	Cecil Hills	Excavation area across site on ridgeline and hillslopes exposed by a fire trail.
Cecil Hills Ridge PAD (CHRP)	45-5-4935	Cecil Hills	Excavation area across site on high hillslope and ridgetop above the M7 Motorway. Incorporates 45-5-4935.

Aboriginal occupation

Test excavation demonstrated the presence of stone artefacts in all but one PAD (TNR PAD) where sub-surface deposit was predicted and a wide distribution of Aboriginal occupation across creek valleys. This was taken to reflect a low level of Aboriginal activity in the Luddenham Hills and a focus of Aboriginal settlement in the major creek valleys and primarily along South Creek and associated vantage points. It is unlikely farming activities have removed all archaeology form the Luddenham Hills. The more plausible factor is proximity to permanent water sources. This reflection is also based on The Northern Road results and other archaeological project comparisons

Evidence was found of Aboriginal settlement in the South Creek valley, camping along Cosgroves, Badgerys and Kemps Creeks, activities along minor watercourses and occupation at the eastern margin of the construction footprint on an atypical hilltop location overlooking Darug-Tharawal boundary country. Archaeological evidence is near-absent in the Luddenham hills at the western end of the detailed investigation area, aside from rare single-artefact surface sites.

The South Creek valley demonstrated evidence of stone extraction, primary flaking, stone tool production, artefact use and repeated camping activity in strategic locations, such as close to the creek channel, along a central low spur within the Badgerys-South creeks confluence and adjacent hills at the valley floor edge. Further afield from vantage points, a consistent low density artefact signature reflects resource extraction activity. Present evidence does not suggest cultural stratification of archaeological deposit in deep Quaternary Alluvium valley fill. There is no bimodal distribution of artefacts within alluvium suggesting lower Pleistocene and upper Holocene phases, as suggested in deep sand deposits at Pitt Town. The age of the deeper alluvial topsoil is at present unknown. Obtaining an age for the deep alluvial topsoil is a research question worth pursuing to address Aboriginal assemblage age.

Cosgroves Creek is associated with a broad, low density distribution that extends for more than 400 metres from its banks, including low density deposit along minor tributaries and occasional artefacts along the high ground between Cosgroves and Badgerys creeks.

Kemps Creek is associated with varying densities along the creek within the Quaternary Alluvium on the western side. Very low numbers of artefacts were found on the residual soils on the eastern side of Kemps Creek.

Outcomes of predictive model

The predictive model was tested through the field component of this assessment and supports the significance assessment for Aboriginal cultural heritage that may be impacted by the project **Table 7-82** documents the archaeological predictions that were tested during the survey and test excavation program, and the outcomes.

Table 7-82 Predictive model

Archaeological prediction	Outcome
Stone artefact deposits would occur within the topsoil in Creek Flats areas within at least 300 metres of the major creeks concentrated at the near margins and diminishing in density with increased distance from water	Confirmed by artefact distribution and abundance data
Stone artefact deposits would occur within the topsoil in prominently elevated landforms near, and with good outlook over, the major South Creek complex of creeks, diminishing rapidly in density with increased distance and obstructed outlook over the creek valleys	Confirmed by artefact distribution and abundance data
Stone artefacts are not anticipated to consistently occur in the Luddenham Rolling Hills other than as isolated random finds	Partial confirmation. This landscape unit contains a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts are not anticipated to occur in the Gentle Slopes rising from the creek valleys more than 300 metres from the major creeks other than as isolated random finds	Partial confirmation. These landscapes contain a low but extensive distribution of low density sub-surface stone artefacts
Stone artefacts may occur in an unknown density and unknown extent on the highest of the Cecil Hills adjacent the M7 Motorway, but this may be limited to areas of suitable outlook over adjacent country	Confirmed. The distribution of sub-surface artefacts appears strongly focused at the crest of the main southeast facing ridge at Cecil Hills
Stone artefacts are not anticipated to consistently occur through the Cecil Hills steeply sloping landscape other than on the eastern high outlook area	Confirmed. Testing in the Cecil Hills landform demonstrated a highly discontinuous distribution of stone artefacts
Grinding grooves may occur on suitable outcrops of Minchinbury Sandstone	Confirmed outside the construction footprint. No sandstone outcrops identified during the survey
Scarred trees may occur sporadically across the wider landscape, although these sites are rare in the Cumberland Plain and many naturally scarred trees are misidentified by some site recorders	Confirmed outside the construction footprint. No scarred trees identified during the survey

Aboriginal sites

As discussed, test excavation demonstrated the presence of stone artefacts in all but one PAD (TNR PAD) where sub-surface deposit was predicted and a wide distribution of Aboriginal occupation across creek valleys.

The recorded Aboriginal sites and PADs identified within the detailed investigation area as part of the desktop assessment, predictive model and archaeological survey were consolidated, corrected or changed to better reflect the findings of the test excavations. A final number of 19 Aboriginal sites are located within the construction footprint, including:

- CCW
- CCE T1
- CCE T2
- CCE T3
- BWB
- BCW
- BCE
- SCW 1

- SCW 2
- SCE
- KNW
- KCW
- KCE
- RR
- PCP8
- CHRP
- 45-5- 4747 (M12A1)
- 45-5- 3804 (Isolated artefact 4)
- 45-5- 4786 (TNR AFT-14).

An additional seven Aboriginal sites are located outside of the construction footprint but within the detailed investigation area, including:

- CP AS1
- P-CP9
- PAD-OS-7
- PAD-OS-5
- DLC 2
- M12A5
- KC/ED2.

A detailed description of how recorded Aboriginal sites and PADs have changed, been corrected or absorbed following results of the field surveys and test excavations into the 'final sites' is shaded in **Table 7-83** and **Table 7-84**. The location of the final sites is shown in **Figure 7-68**.

Table 7-83 AHIMS/recorded site and PAD nomenclature changes

Registered AHIMS sites	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Sites within construction footprint				
45-5- 2308	-	-	Part of PCP8	Site is located within PCP8 and was incorporated into that site.
45-5- 3804	-	-	45-5- 3804 (Isolated artefact 4)	-
45-5- 4747	-	-	45-5- 4747 (M12A1)	-
45-5- 4748	-	-	Part of BCE	Site is located within BCE and was incorporated into that larger site.
45-5- 4786	-	-	45-5- 4786 (TNR-AFT-14)	Single stone artefact, not be relocated during project fieldwork. Site is located within TNR PAD. No other artefacts were discovered in the PAD; therefore, site remains as a single stone artefact

Registered AHIMS sites	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
45-5-4007/4937	-	-	Part of CHRP	Site was recorded twice with duplicate entry in AHIMS. Site is located within CHRP and was incorporated into that larger site.
45-5-0496/4749	-	-	Part of SCE	Site was recorded twice with duplicate entry in AHIMS. Site is located within SCE and was incorporated into that larger site.
45-5-0528/4750	-	-	Part of BCE	Site was recorded twice with duplicate entry in AHIMS.Site is located within BCE and was incorporated into that larger site.
45-5-4935 (M12-AS-03)	-	-	Part of CHRP	Identified during project surveys June-Sept 2017. Site is located within CHRP and was incorporated into that site.
-	TNR PAD	TNR PAD	Not a site	No artefacts were discovered in test excavations in the PAD. As a result the PAD is not considered a site.
-	CCW PAD	CCW PAD	CCW	-
-	CCE PAD	CCE T1 PAD	CCE T1	The original CCE PAD was divided into 3 separate PADs based on field observations of soils and landforms
-		CCE T2 PAD	CCE T2	-
-		CCE T3 PAD	CCE T3	-
-	BWB PAD	BWB PAD	BWB	-
-	BCW PAD	BCW PAD	BCW	-
-	BCE PAD	BCE PAD	BCE	Incorporates 45-5- 0528/4750 and 45-5-4748
-	SCW PAD	SCW T1 PAD	SCW 1	The original SCW PAD was divided into 2 separate PADs based on field observations of soils and landforms
-		SCW T2 PAD	SCW 2	-
-	SCE PAD	SCE PAD	SCE	Incorporates 45-5- 0496/4749
-	KNW PAD	KNW PAD	KNW	-
-	KCW PAD	KCW PAD	KCW	-
-	KCE PAD	KCE PAD	KCE	-
-	RR PAD	RR PAD	RR	-
-	PCP8 PAD	PCP8 PAD	PCP8	Incorporates 45-5-2308
-	CHRP PAD	CHRP PAD	CHRP	Incorporates 45-5- 4007/4937

Registered AHIMS sites	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
TOTAL				
9 Registered Sites	**14 PADS**	**17 PADS**	**19 Final Sites (within construction footprint)**	

Table 7-84 AHIMS/recorded site and PAD nomenclature changes throughout the assessment process within detailed investigation area (outside the construction footprint)

AHIMS sites pre- test excavations	PAD as defined by desktop assessment	PAD as refined during excavations	Final sites (shaded)	Comments
Aboriginal sites inside detailed investigation area (outside the construction footprint)				
45-5-4374			CP AS1	Stone artefact site
45-5-2307			P-CP9	Stone artefact site
45-5-2721			PAD-OS-7	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2723			PAD-OS-5	Stone artefact site: initially a PAD with artefacts discovered in test excavation
45-5-2563			DLC 2	Stone artefact site
45-5-4767			M12A5	Stone artefact site
45-5-2310			KC/ED2	Stone artefact site
TOTAL				
7 Registered Sites			**7 final sites (within detailed investigation area but outside the construction footprint)**	

Identified Aboriginal cultural heritage values

Knowledge holders, identified during consultation with RAPs, have provided information about the traditional presence of Aboriginal people in the landscape, ceremonial sites and the impact of European land management practices on their traditional land, and subsequently their culture.

Three areas were identified to have high Aboriginal cultural significance and high cultural values next to or within the construction footprint:

- A small knoll immediately to the west of Badgerys Creek (site BCW)
- A large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE)
- A prominent ridgeline overlooking the M7 motorway (site CHRP).

All three of these cultural value areas are located within the construction footprint. They are all associated with Aboriginal archaeological sites identified during the archaeological assessment. These areas are not gazetted Aboriginal Places under s84 of the NPW Act.

Further information on these cultural heritage values is provided in **Appendix I**.

Significance assessment

Following the test excavation program, there are:

- Nineteen Aboriginal sites within the construction footprint
- Seven Aboriginal sites within the detailed investigation area.

The areal extent of artefacts within the topsoil away from major creeks exceeded the standard model of Aboriginal site location (200 metres from creeks) by hundreds of metres. Therefore, the term “Aboriginal site” in conventional use does not adequately describe the scale of the archaeological evidence found across 17 kilometres of creek valley landforms and the term ‘site complexes’ was used instead to describe sites that occur in close proximity and appear to be associated with a specific landform feature, either a creek or a ridgeline. The grouping of individual sites into site complexes enables all of the cultural materials at a location to be assessed in the context of all available information.

Based on the findings of the test excavations, five ‘site complexes’ associated with particular creek systems or ridgetop complexes were identified within the detailed investigation area, including:

- Cosgroves Creek complex
- Badgerys Creek Upstream complex
- South Creek complex
- Kemps Creek complex
- Cecil Hills complex.

For each of the 19 Aboriginal sites identified within the construction footprint (see **Table 7-83**), the significance assessment criteria listed in **Section 7.5.2** was applied. An overall significance rating (low, medium or high) was assigned to each site based on an average across the criteria. Considering the ground disturbance works would be confined to the boundary of the construction footprint, the significance of the seven sites identified outside the construction footprint was not assessed.

A summary of the significance of each of the 19 Aboriginal sites located within the construction footprint is provided in **Table 7-85.** The location of each site complex is provided in **Figure 7-69**.

Further detail on the significance assessment carried out for each of the identified sites is provided in Chapter 7 of **Appendix I**.

Table 7-85 Aboriginal sites identified following test excavation

Site complex	Site name	Registered AHIMS sites incorporated	Location	Site type	Overall significance
Sites located within the construction footprint					
Cosgroves Creek	Cosgroves Creek West (CCW)	None	Cosgroves Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Moderate
Cosgroves Creek	Cosgroves Creek East T1 (CCE T1)	None	Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits	Moderate
Cosgroves Creek	Cosgroves Creek East T2 (CCE T2)	None	Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits	Moderate
Cosgroves Creek	Cosgroves Creek East T3 (CCE T3)	None	Cosgroves Creek	Continuous area with Aboriginal objects in sub-surface deposits	Moderate
Badgerys Creek Upstream	Badgerys West B (BWB)	None	Badgerys Creek Upstream	Continuous area with Aboriginal objects in sub-surface deposits	Moderate
South Creek	Badgerys Creek West (BCW)	None	South Creek	Continuous area with Aboriginal objects in sub-surface deposits	High
South Creek	Badgerys Creek East (BCE)	45-5-0528 (Fleurs 2) 45-5-4750 (M12 A3 45-5-4748 (M12 A2)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	High

Site complex	Site name	Registered AHIMS sites incorporated	Location	Site type	Overall significance
South Creek	South Creek West T1 (SCW T1)	45-5-0496/45-5-4749 45-5-0528/45-5-4750	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	High
South Creek	South Creek West T2 (SCW T2)	None	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	High
South Creek	South Creek East (SCE)	45-5-0496 (Fleurs 1) 45-5-4749 (M12 A4)	South Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	High
Kemps Creek	Kemps North West (KNW)	None	Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Moderate
Kemps Creek	Kemps Creek West (KCW)	None	Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Moderate
Kemps Creek	Kemps Creek East (KCE)	None	Kemps Creek	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Low
Cecil Hills	PCP8	45-5-2308	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Moderate

Site complex	Site name	Registered AHIMS sites incorporated	Location	Site type	Overall significance
Cecil Hills	Cecil Hills Ridge PAD (CHRP)	45-5-4935	Cecil Hills	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	High
NA	Range Road (RR)	45-5-4937 45-5-4007	Cecil Park	Continuous area with Aboriginal objects on the surface and in sub-surface deposits	Low
NA	M12A1	45-5-4747	Badgerys Creek	Surface stone artefact site	Low
NA	Isolated artefact 4	45-5-3804	Luddenham	Stone artefact site (single artefact)	Low
NA	TNR-AFT-14	45-5-4786	Luddenham	Stone artefact site (single artefact)	Low

Figure 7-69 Aboriginal sites and site complexes following test excavations Page 1 of 3

Figure 7-69 Aboriginal sites and site complexes following test excavations

Figure 7-69 Aboriginal sites and site complexes following test excavations

7.5.4 Assessment of potential impacts

Construction impacts

The impact assessment used the terminology defined in **Section 7.5.2** to identify the potential type of harm, degree of harm and consequence of harm to Aboriginal sites that would be caused by project construction.

The heritage assessment evaluated the potential harm of the project on the 19 Aboriginal sites located within the construction footprint and seven additional sites located within the detailed investigation area (outside the construction footprint).

Most of the Aboriginal sites listed below consist of broad distributions of Aboriginal stone artefacts associated with major creeks. These sites are expected to extend well into comparable landscapes outside of the construction footprint. For this reason, the degree of harm to sites whose boundaries likely extend beyond the construction footprint is listed as 'partial'. For sites within the construction footprint that would be destroyed by the project, the degree of harm is considered 'total harm'.

As discussed in **Section 7.5.3**, 19 Aboriginal sites are located within the construction footprint. The impact assessment identified the following for the 19 sites within the construction footprint:

- All 19 sites would be subject to direct harm
- 11 sites would be subjected to partial harm
- Eight sites would be subjected to total harm.

A summary of the impacts on each Aboriginal site located within the construction footprint is provided in **Table 7-86.**

Impacts on Aboriginal cultural heritage values

As discussed in **Section 7.5.3**, three areas associated with recorded sites are designated high Aboriginal cultural heritage significance and were identified by the RAPS during fieldwork, these are:

- A small knoll immediately to the west of Badgerys Creek (site BCW)
- A large area on a rise and floodplain between Badgerys Creek and South Creek (sites BCE, SCW T1, SCW T2 and SCE)
- A prominent ridgeline overlooking the M7 motorway (site CHRP).

All three of these cultural values areas are located within the project construction footprint and are all associated with Aboriginal archaeological sites identified during the archaeological assessment. All three areas are located within the construction footprint and expected to be impacted by the project.

The three Aboriginal cultural values areas are not gazetted Aboriginal Places under S86(4) of the NPW Act, but values of local significance identified during this cultural values assessment.

Justification of impacts

The impacts of development on the cultural landscape where the project is located range from historic clearing and land use practices to major infrastructure projects such as the M7 Motorway and the impacts from future projects such as the Western Sydney Airport. In this context any further impact on the remaining resource needs careful justification.

Alternative route options were investigated and evaluated in the strategic options assessment however all potential alignments would have an impact on Aboriginal heritage values (further detail on the strategic options selection process is discussed in **Chapter 4**).

Table 7-86 Aboriginal site impact assessment for sites

Site name	AHIMS ID	Registered AHIMS sites	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
Sites within the construction footprint						
CCW	TBC	-	Moderate	Directly harmed (5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for about 1 km
CCE T1	TBC	-	Moderate	Directly harmed (4.5 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for about 1 km
CCE T2	TBC	-	Moderate	Directly harmed (6.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for about 1 km
CCE T3	TBC	-	Moderate	Directly harmed (20 ha)	Partial	Partial loss of value; very diffuse background scatter estimated to extend to the north and south of the construction footprint for about 1 km
BWB	TBC	-	Moderate	Directly harmed (1.7 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint several hundred metres
BCW	TBC	-	High	Directly harmed (1.4 ha)	Total	Total loss of value
BCE	TBC	45-5-0528 (Fleurs 2) 45-5-4750 (M12 A3) 45-5-4748 (M12 A2)	High	Directly harmed (5.8 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for about 0.8 km
SCW T1	TBC	45-5-0496/45-5-4749; 45-5-0528/45-5-4750	High	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the north and south of the construction footprint for several hundred metres
SCW T2	TBC	-	High	Directly harmed (0.9 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for 0.2 km
SCE	TBC	45-5-0496 (Fleurs 1)/45-5-4749 (M12 A4)	High	Directly harmed (5.6 ha)	Partial	Partial loss of value; site estimated to extend to the north of the construction footprint for several hundred metres; loss of silcrete source and associated quarrying evidence

Site name	AHIMS ID	Registered AHIMS sites	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
KNW	TBC	-	Moderate	Directly harmed (11.4 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCW	TBC	-	Moderate	Directly harmed (3.6 ha)	Partial	Partial loss of value; site estimated to extend to the east and north of the construction footprint for several hundred metres
KCE	TBC	-	Low	Directly harmed (1.5 ha)	Total	Total loss of value
PCP8	45-5-2308	45-5-2308	Moderate	Directly harmed (0.1 ha)	Total	Total loss of value
CHRP	45-5-4935	45-5-4935	High	Directly harmed (0.4 ha)	Total	Total loss of value
RR	45-5-4937 45-5-4007	45-5-4937 45-5-4007	Low	Directly harmed (0.5 ha)	Total	Total loss of value
M12A1	45-5-4747	45-5-4747	Low	Directly harmed (0.02 ha)	Total	Total loss of value
Isolated artefact 4	45-5-3804	45-5-3804	Low	Directly harmed	Total	Total loss of value
TNR-AFT-14	45-5-4786	45-5-4786	Low	Directly harmed	Total	Total loss of value
Sites within the detailed investigation area (outside the construction footprint)						
CP AS1	45-5-4374	45-5-4374	(not assessed)	No harm	None	No loss of value as this site is located over 200 metres from the construction footprint
P-CP9	45-5-2307	45-5-2307	(not assessed)	No harm	None	No loss of value as this site is about 140 metres from the construction footprint
PAD-OS-7	45-5-2721	45-5-2721	(not assessed)	No harm	None	No loss of value as this site is about 130 metres from the construction footprint

Site name	AHIMS ID	Registered AHIMS sites	Assessed significance of site	Type of harm	Degree of harm	Consequence of harm
PAD-OS-5	45-5-2723	45-5-2723	(not assessed)	No harm	None	No loss of value as this site is about 200 metres from the construction footprint
DLC 2	45-5-2563	45-5-2563	(not assessed)	No harm	None	No loss of value as this site is about 50 metres from the construction footprint and on private property that won't be impacted.
M12A5	45-5-4767	45-5-4767	(not assessed)	No harm	None	No loss of value as this site is about 200 metres from the construction footprint

The archaeological investigations confirm that there is a continuous but variable distribution of Aboriginal objects across the detailed investigation area and construction footprint. This conclusion is consistent with previous studies in comparable environment contexts on the Cumberland Plain. A key factor driving the ubiquitous distribution of cultural materials may be the close proximity of most of the construction footprint to high quality and reliable sources of freshwater.

The consequence is that, rather than defining discrete areas as Aboriginal sites, it is more appropriate to regard the construction footprint as being divided into a series of adjoining sites described as landform-scale distributions of cultural materials.

This situation suggests that design solutions such as re-routing the project cannot avoid all impacts on Aboriginal heritage. Instead, the focus must be on minimising impacts on the areas of highest Aboriginal heritage significance. In the case of the construction footprint this includes the defined sites on either side of the proposed crossings of Badgerys Creek (BCE and BCW) and South Creek (SCW 1, SCW2 and SCE) and the elevated ridge overlooking the M7 Motorway (CHRP).

The testing of the current construction footprint would suggest that such broad scale and intensive testing across a larger sample of landscape is unlikely to reveal areas where impacts on Aboriginal cultural heritage would be significantly lower. The Aboriginal sites along Badgerys Creek and South Creek appear to extend both upstream and downstream of the selected route. There is no reason to presume that the section of the sites potentially impacted by the route is of greater or lesser significance than comparable areas of creek bank to the north or south. Accordingly, it is concluded that there are no grounds for recommending a different crossing point for either creek.

The other high significance Aboriginal site is CHRP. This ridgetop site occupies a unique location on the highest point in the surrounding landscape, offering unsurpassed views to the east and south. While the feasibility of rerouting the construction footprint to avoid direct impacts on CHRP must consider constructability, existing infrastructure, threatened ecological species and cost, consideration on minimising the impact on this site where practicable should be considered.

The only strategy which would substantially reduce impacts on Aboriginal cultural heritage values would be to position the construction footprint on areas with existing high levels of ground surface disturbance, such as the existing Elizabeth Road corridor or over the operational quarries. This option was not considered operationally feasible in the strategic options assessment due to the unacceptable impacts on existing infrastructure, transport links and commercial operations.

Further details are provided in **Appendix I**.

Operational impacts

All potential impacts on Aboriginal cultural heritage identified within the ACHAR are related to construction activities and associated ground disturbance. No adverse impacts on Aboriginal cultural heritage (either direct or indirect) are therefore anticipated during operation of the project.

7.5.5 Cumulative Impacts

Cumulative Aboriginal heritage impacts may arise from the interaction of construction and operation activities of the project and other approved or proposed projects in the area. When considered in isolation, specific project impacts may be considered minor. These minor impacts may be more substantial however, when the impact of multiple projects on the same receivers is considered.

Since the early 1800s impacts on the land forms surrounding the operational footprint of the M12 Motorway in the Cumberland Plains was primarily agricultural, consisting of varied phases of stock grazing, cropping, orcharding, dairying and market gardening. In more recent times use of the land has intensified and a wide variety of activities have had substantial impacts on the land. The landscape was subdivided into small

holdings and agricultural blocks since WWII, with a wide variety of market gardening and farming uses in the last 50 years. As recently as 2009 a wide range of land use activities (including chicken farming, market gardening, horticulture, and nursery/garden plant production) were being carried out on blocks within the areas surrounding the construction footprint (Balarinji 2018b).

All these activities have had a substantial impact on the Aboriginal archaeological record, especially regarding artefacts in the top soil and the plough zone. Vegetation clearance and repeated ploughing and cropping have removed nearly all trees with the potential for Aboriginal scarring. Artefact occurrences were impacted by soil loss, lateral and vertical soil movement across the land surface, and to a depth of the relevant plough zone.

Prior to the introduction of environmental and heritage legislation in NSW in the 1970s, an unknown but presumably large number of Aboriginal cultural sites were likely to have been lost to development, particularly along transport corridors. In consideration of these historical matters, the design of the project has adopted as narrow a footprint as possible in all areas in order to minimise the impacts on sites. All identified Aboriginal archaeological sites within the study area were considered in relation to the project. Some level of impact is unavoidable in relation to such a large project.

The test excavation program allowed the description of extensive sub-surface distributions of cultural materials in the construction footprint. These large sites compare to most of the sites in AHIMS which were detected through surface exposures, where the size of the site is largely determined by the extent of exposure and erosion. In this situation it is not appropriate to assess cumulative impacts just by the number of Aboriginal sites that were impacted across the region. A more appropriate measure of cumulative impact considers the project in terms of the proportion of archaeologically sensitive soils within the South Creek catchment that would potentially be impacted by the project in consideration of other projects in the wider area.

The construction footprint would cover 331 hectares. The combined area of Aboriginal sites is estimated as 48.6 hectares, or 14.7 per cent of the construction footprint. This figure does not include the highly diffuse and discontinuous background scatter at CCW 3, which extends for another 20 hectares.

The most significant sites from an archaeological perspective occur within the South Creek alluvium along the major creeks in the local area. Development along the South Creek valley is constrained by the flood-prone nature of the land but can be subject to development pressures for playing fields and industrial development on filled land. A total of 40 hectares of artefact-bearing South Creek alluvium across Cosgroves, Badgerys, South and Kemps creeks would be impacted by the project along the construction footprint. There are over 1000 hectares of South Creek alluvium on land north and south of the construction footprint in the South Creek valley alone, not including Cosgroves Creek, Badgerys Creek and Kemps Creek. For example, the property bounded by Elizabeth Drive, South Creek, the Kemps Creek Waste Depot and the construction footprint boundary comprises over 125 hectares of archaeologically sensitive alluvium.

On land at the confluence of Badgerys Creek and South Creek to the north of the construction footprint there are over 135 hectares of archaeologically sensitive alluvium. Between Elizabeth Drive and Catherine Field there are over 1000 hectares of South Creek alluvium, not including tributary valleys. The impact on the potential archaeological resource within this area is accumulating as development continues. In this context the contribution of 40 hectares of South Creek alluvium in the construction footprint is relatively minor.

The cumulative Aboriginal heritage impacts are considered in **Table 7-87** and outlined in further detail in **Appendix I**. Additional details of each of the projects considered is provided in **Table 7-3**.

The projects listed in **Table 7-87** are relevant to the consideration of cumulative Aboriginal heritage impacts as they are or would be located within the vicinity of the project and have an impact on the Aboriginal archaeological record. However for Aboriginal heritage, overlapping construction or operational timeframes of separate projects do not usually add to the overall level of impact as they do for other disciplines, such as traffic or noise. This is because once physical changes are made to an Aboriginal heritage place, regardless of whether they are made at the same time or separately, the impact level does not change.

While projects listed in **Table 7-87** are transformative, such extensive change is likely to generate impacts on Aboriginal heritage values associated with Aboriginal objects, site complexes and cultural landscapes associated with the regional Aboriginal occupation of the region from deep time the European invasion. The contribution of the M12 Motorway project to cumulative impacts on Aboriginal heritage in the area is moderate, considering the impacts would be linear and are being addressed and managed through the implementation of a range of environmental mitigation measures. These measures include training and workshops for Aboriginal site officers, cultural heritage interpretation integrated into the fabric of the motorway design and proposed Western Sydney Airport site.

Through the inclusive consultation carried out by Balarinji and the cultural values interpretation framework and its integration with the project design, the project has mitigated some of the irrevocable impacts on Aboriginal cultural heritage. The inclusion of tangible, visual artistic statements that see past and ongoing Aboriginal cultural connections to the landscape would contribute an often overlooked First People's perspective in transport infrastructure design. Communicating the ancient and rich Aboriginal history of the area to users of the motorway, including those visitors using the Western Sydney Airport is a valuable educational product and an important statement to the large Aboriginal and Torres Strait Islander population living in western Sydney today.

Overall, the project would have moderate cumulative Aboriginal cultural heritage impacts associated with the project and the other ongoing and planned developments in the area.

Table 7-87 Cumulative Aboriginal heritage impacts

Project and status	Cumulative impacts
Western Sydney Airport Approved. Under construction	There would be moderate cumulative Aboriginal cultural heritage impacts associated with the construction of the project and the Western Sydney Airport. However, the full impact on alluvium within the Badgerys Creek valley has not been clearly defined in the Aboriginal heritage reports reviewed for the Western Sydney Airport. A conservative estimate based on the extent of alluvium mapped on the 1:100,000 soil landscape data is that 150 hectares of archaeologically sensitive alluvium would be impacted by the Western Sydney airport. The area of alluvium with the Badgerys Creek valley to be impacted in the detailed investigation area is 6.6 hectares. The cumulative impact of the project on Aboriginal heritage is therefore not considered to be of a degree that represents an unacceptable impact on the Aboriginal cultural heritage of the study area.
Sydney Metro Greater West Not yet approved	Sydney Metro Greater West is currently under strategic development. The magnitude of cumulative construction impacts will be dependent on the specific construction locations, activities and impacts which are yet to be determined for the Sydney Metro Greater West. However, moderate Aboriginal cultural heritage impacts are anticipated as the project will traverse the current project in areas where moderate to high significant sites and landscape features were identified. Depending on the final design outcomes, this project may have a greater impact on Aboriginal heritage, in particular where impacts occur close to the waterway and creek complexes in the Cumberland Plain.

Project and status	Cumulative impacts
The Northern Road upgrade Approved. Construction has begun	Construction activities associated with Stage 5 and Stage 6 may overlap with the project construction. This stage is in the vicinity of the project. The Aboriginal cultural heritage assessment for The Northern Road upgrade identified 28 Aboriginal archaeological sites, all of which would be impacted at least partially by the project. Salvage excavation at 20 archaeological sites was recommended. Only one of these heritage items will be impacted by the current project, the TNR-AFT-14 site (AHIMS ID: 45-5-4786). This site is of low scientific significance and does not have any cultural deposit associated with it.
Other existing road network upgrades and potential road projects, including: • Elizabeth Drive upgrade • Mamre Road upgrade • Outer Sydney Orbital Not yet approved	These projects are currently at varying stages of planning and no design or environmental assessment information is currently publicly available. The timing for construction of the above projects has not yet been announced. However, there is potential for overlaps in construction timing between the project and some of these road upgrade works however as overlapping construction or operational timeframes do not usually add to the overall level of heritage impact. As there has not been environmental assessment carried out for the planned and potential road upgrade projects in the western Sydney area, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and other road projects.
Major land releases, including: • Western Sydney Aerotropolis • South West Growth Area • Western Sydney Employment Area. Future strategic government project	As there has not been environmental assessment carried out for the Growth Areas projects, it is currently unknown whether there would be cumulative Aboriginal heritage impacts associated with the construction of the project and the development associated with the nearby growth areas. However, it can be surmised that this area will undergo substantial changes in the near future. While individual proposals will be subject to assessment for heritage impacts and other environmental assessments, there is likely to be long-term impacts that will change the landscape and the heritage character of this area substantially. Therefore, it is likely that there would be moderate cumulative Aboriginal cultural heritage impacts associated with the construction of the project and the development associated with the nearby growth areas.

Cumulative impacts on cultural values

Following European settlement, the Aboriginal population of NSW went into steep decline, and in less than a century many aspects of traditional Aboriginal life and society could no longer be practiced or were prevented by European policy. The Darug people were one of the first cultural groups to bear the initial impact of Sydney's European settlement due to their lands being situated on the Sydney peninsula and the adjoining hinterlands of the Cumberland Plain. While the coastal Sydney area and its embankments became the residential and commercial focus of the settlement, the fertile lowlands and woodland of the hinterland were developed for agricultural production and the granting of freehold lands.

The Cumberland Plain was an integral component of Darug Country and cultural identity from which they were incrementally excluded and dispossessed by European land use and occupation. Forced movement of people resulted in the loss of many aspects of Aboriginal culture and the emergence of new groups incorporating people from diverse areas and ensuring the preservation of the core cultural practices and knowledge in Aboriginal communities.

The introduction of European land management practices and associated social disruption has had a substantial impact on the Aboriginal cultural values, especially regarding access to traditional lands and cultural practices. Large scale vegetation clearance and agricultural practices have removed nearly all Aboriginal scarred trees in the study area.

The project would have a relatively small impact on this, but by implementing a cultural interpretation strategy and distributing the results of the archaeological investigations to the broader community, some of these cumulative impacts can be offset and ameliorated. Management measures are provided in the **Section 7.5.6**.

7.5.6 Environmental management measures

Impact avoidance

A principle of cultural heritage management is to avoid and minimise impact before applying mitigation. During project development, the following activities were carried out to identify Aboriginal cultural heritage so, where possible, strategies to avoid and minimise impacts could be developed

- Consultation with relevant Aboriginal stakeholders and EESG (see **Chapter 4**)
- Site archaeological survey
- Assessment to identify regionally or nationally significant features.

Design and alignment refinements were made, and the location of ancillary facilities were selected to avoid and minimise impacts on Aboriginal cultural heritage sites where possible, while considering engineering, environmental, social and economic requirements. For example, the design for the project has adopted as narrow a footprint as possible in all areas to minimise various impacts, including those to Aboriginal heritage sites. The design has also placed the alignment as close as practicable to existing development and infrastructure to limit regional fragmentation impacts by consolidating the project corridor with existing development, utilities and road corridors. The ancillary sites in the South Creek area were located and sized to align with existing disturbed areas on farm land and to avoid adjacent undisturbed areas close to creek lines in this landform.

Aboriginal cultural values interpretation

A strategic objective for the project is to create a unique and distinct identity interpreting the rich sense of place, Aboriginal and cultural heritage.

Balarinji, conducted research into the Aboriginal history of the M12 Motorway study area and tested and augmented this narrative through stakeholder consultation to develop an Aboriginal narrative and indicative design concepts for the M12 Motorway. (Balarinji 2018a; 2018b).

Management measures

The environmental management strategies were adopted to minimise the impacts on Aboriginal sites. A description of the strategy and the sites that each strategy would be applied is provided in **Table 7-88.**

Further information regarding the methodology to be adopted for these management strategies is provided in Section 10.2 of **Appendix I**.

Site CHRP is located at a unique point in the landscape and has no alternative representation. Impacts on site CHRP will be minimised where feasible.

The feasibility of retaining portions that are located under elevated structures (bridges) over Badgerys and South Creeks will be investigated as part of the detailed design process, including the following sites:

- BCW
- BCE
- SCW T1
- SCW T2
- SCE.

The objective will be to maximise the retention of intact, cultural deposits in the zone between bridge pylons. This strategy would depend upon the effectiveness of measures to protect the deposits during construction. Potential protective strategies might include fencing and covering the cultural deposits with geotextile fabric and clean fill to reduce the potential for inadvertent damage.

Another active avoidance strategy is to ensure that construction works are closely confined to the minimum possible area required for construction activities. Haulage and other access roads should be designed and located to minimise potential disturbance of soils. Maximising the protection is particularly important in the zone within 100 metres of creeks and may require covering the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.

Table 7-88 Management strategies to be applied to each site

Management strategy	Strategy description	Sites
Active avoidance	Carry out investigations during detailed design to maximise the retention of intact cultural deposits, particularly those within the CHRP and sites located under the elevated structures over Badgerys Creek and South Creek.	CHRP, BCW, BCE, SCW T1, SCW T2, SCE
Passive avoidance	No active protection measures required due to a lack of direct impacts or low archaeological significance.	KCE, CP AS1, P-CP9, PAD-OS-7, PAD-OS-5, DLC2, M12A5, KC/ED2
Active protection	Protection provided in the form of fencing along the edge of the construction footprint closest to the site with signage notifying construction personnel to avoid ground impacts.	CCW, CCE T1, CCE T2, CCE T3, BWB, BCW, BCE, SCW T1, SCW T2, SCE, KNW, KCW, CHRP
Salvage collection	Salvage collection is warranted at those Aboriginal sites in the construction footprint where stone artefacts were recorded on the surface. Salvage collection is to record MGA coordinates of each artefact by GPS and relevant artefact attributes consistent with the broader archaeological salvage analysis. Salvage collection will be carried out by a suitably qualified archaeologist.	BCE, SCW T2, KCW, PCP8, CHRP, RR, M12A1, Isolated Artefact 4, TNR-AFT-14
Salvage excavation	Salvage excavation is warranted at those Aboriginal sites that were assessed as having high scientific and high overall significance. Salvage excavation will be carried out by a suitably qualified archaeologist.	CCW, BWB, BCW, SCW T1, SCW T2, SCE, KCW, CHRP

The environmental management measures that would be implemented to minimise impacts on Aboriginal heritage as a result of the construction and operation of the project, along with the responsibility and timing for those measures, are presented in **Table 7-89**.

Table 7-89 Environmental management measures (Aboriginal heritage)

Impact	Reference	Environmental management measure	Responsibility	Timing
General	AH01	A construction cultural heritage management plan (CCHMP) will be developed for the project in consultation with the project RAPs and EESG. The CCHMP will include: • An unexpected finds procedure for the discovery of Aboriginal ancestral remains, Aboriginal objects or new Aboriginal sites consistent with Roads and Maritime Standard Management Procedure Unexpected Heritage Items (Roads and Maritime, 2015c). This procedure will also outline requirements to manage unexpected human remains finds in accordance with NSW statutory requirements, and relevant guidelines and standards prepared by EESG. The Procedure will outline the process for consulting with the RAPs in the event that previously unidentified Aboriginal heritage is discovered. • Procedures for the management and curation of salvaged Aboriginal objects • Detailed locations and installation procedures for fencing and protective coverings • Details of permissible activities inside protected Aboriginal areas • Procedures for consideration of heritage aspects within site inductions and toolbox talks for construction workers and supervisors.	Contractor	Prior to construction
	AH02	A detailed Aboriginal Cultural Salvage Strategy will be prepared for the project in consultation with project RAPs and EESG to guide the salvage excavation process for Aboriginal sites that will be salvaged. The strategy will address specific questions about each site and will be based on the salvage excavation methodology outlined in the ACHAR and prepared in consultation with EESG and project RAPs. All salvage collections and excavations will be carried out by a suitably qualified and experienced archaeologist. The method and extent of excavation required, and management of artefacts finds will be determined in consultation with project RAPs and EESG. Following completion of all salvage works associated with Aboriginal heritage sites, an Aboriginal Cultural Heritage Report will be prepared in accordance with relevant guidelines and in consultation with project RAPs and EESG. The Aboriginal Cultural Heritage Report will document all results of the salvage activities including analysis of artefacts from collections and excavations and management of all artefact finds.	Roads and Maritime / Contractor	Detailed design

Impact	Reference	Environmental management measure	Responsibility	Timing
Impacts on Aboriginal heritage during construction	AH03	A work method statement will be prepared for the works within identified Aboriginal sites in consultation with a suitably qualified and experienced archaeologist. The method statement will be prepared to minimise impacts on Aboriginal sites where feasible, including input into detailed design. Measures will include (but not be limited to): • Designing and locating bridges (including bridge pylons), haulage routes and other access roads to minimise potential disturbance of soils where feasible • Focusing protection measures on the zone within 100 metres of creeks including consideration of opportunities to cover the original cultural deposits in temporary protective barriers such as geotextile fabric and a layer of clean fill.	Contractor	Detailed design, prior to construction and during construction
Impacts on identified cultural deposits	AH04	An investigation will be carried out during detailed design to minimise impacts on the CHRP site where feasible.	Contractor	Detailed design
	AH05	Investigations will be carried out during detailed design to determine the feasibility of retaining cultural deposits between the pylons of bridges or elevated structures at the following sites: • BCW • BCE • SCW T1 • SCW T2 • SCE This will include covering the original cultural deposits beneath temporary protective barriers such as geotextile fabric and a layer of clean fill material.	Contractor	Detailed design
	AH06	Salvage collection of surface artefacts will be carried out at the following sites: • BCE • SCW T2 • KCW • PCP8 • CHRP • RR • M12A1 • Isolated artefact 4 • TNR-AFT-14.	Contractor / Roads and Maritime	Prior to construction

Impact	Reference	Environmental management measure	Responsibility	Timing
	AH07	Salvage excavation will be carried out at the following sites: • CCW • BWB • BCW • SCW T1 • SCW T2 • SCE • KCW • CHRP. The methodology and extent of excavations required for the above sites will be in accordance with site specific requirements outlined in the ACHAR prepared for the project.	Contractor / Roads and Maritime	Prior to construction