ARCADIS Design & Consultancy for natural and built assets

# Moorebank Precinct West (MPW) – Stage 2 Proposal

## Aboriginal Heritage Impact Assessment

SIMTA

SYDNEY INTERMODAL TERMINAL ALLIANCE

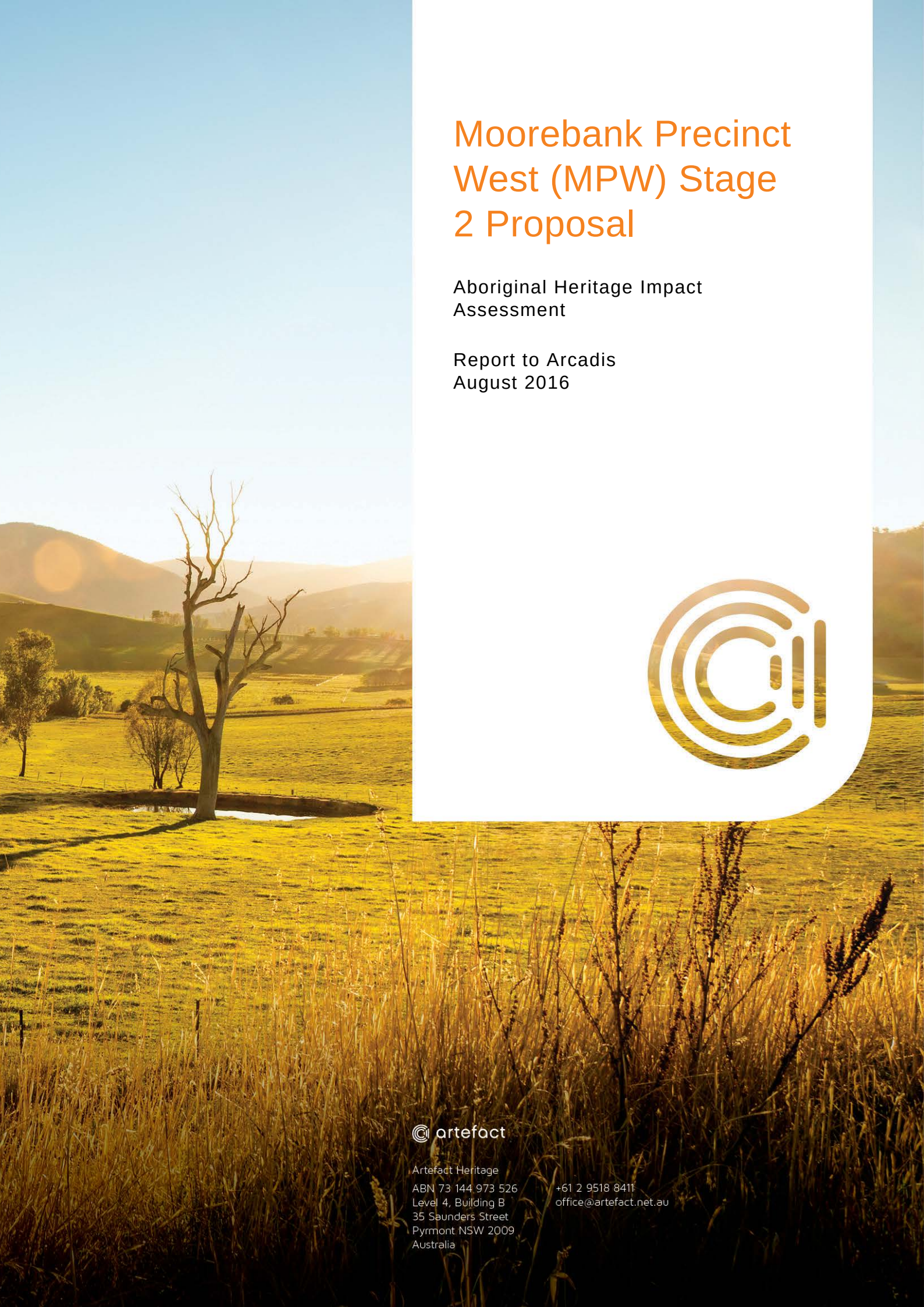
Part 4, Division 4.1, State Significant Development

October 2016

# Moorebank Precinct West (MPW) Stage 2 Proposal

Aboriginal Heritage Impact Assessment

Report to Arcadis
August 2016



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# EXECUTIVE SUMMARY

On the 3 June 2016 Concept Plan Approval (SSD 5066) was granted, under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop the Moorebank Precinct West Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the MPW site).

The MPW Project involves the development of intermodal freight terminal facilities (IMT), linked to Port Botany, the interstate and intrastate freight rail network. The MPW Project includes associated commercial infrastructure (i.e. warehousing), a rail link connecting the MPW site to the Southern Sydney Freight Line (SSFL), and a road entry and exit point from Moorebank Avenue.

Under the Concept Plan Approval, the MPW Project is to be developed in four phases, the first of which is Early Works (MPW Stage 1) and is already underway This Aboriginal heritage assessment is for MPW Stage 2, which involves the construction and operation of an Intermodal terminal (IMT) facility and associated warehousing (the Proposal).

## Overview of findings

It was found that there are five outstanding mitigation measures which require management as part of the Proposal:

- Management of scar trees MA6 and MA7
- Staged salvage excavation of MPW Stage 2 Terrace PAD
- Staged salvage excavation of the tertiary terrace (between MA10 and MA14)
- Salvage excavation of MA10
- Salvage excavation of MA14

These findings are based on the assumption that all other mitigation measures identified in the MPW Concept Plan Environmental Impact Statement (EIS), the Aboriginal Heritage Technical Paper prepared for MPW Concept Plan EIS, additional heritage reporting prepared for the Early Works Approval, the Revised Environmental Mitigation Measures (REMMS) and Ministers Conditions of Approval (MCoA) have been conducted as Early Works. Where any of those tasks have not been completed during Early Works they will need to be addressed as part of Early Works, prior to construction works commencing.

It is recommended that:

- The scar portions of MA6 and MA7 should be removed by a qualified arborist and relocated to the Tharawal Local Aboriginal Land Council (TLALC) property at Thirlmere. The trees should be mounted and housed in a weather protected structure. All costs associated with the removal, relocation and housing of the trees should be covered by the Proponent. Consultation with TLALC regarding the logistics of this mitigation measure are ongoing.

- Staged salvage excavation should be conducted as part of the Proposal, in consultation with Registered Aboriginal Parties (RAPs). Stage 1 excavation would involve dispersed pits placed along transects within MPW Stage 2 Terrace PAD and the tertiary terrace (between MA10 and

MA14). Stage 2 would involve open area salvage excavation, targeting the artefact concentrations identified by NOHC at MA10 and MA14, as well as any additional artefact concentrations identified during Stage 1.

- Where changes are made to the Proposal and areas not assessed by this report or previous reports (NOHC 2014, NOHC Sept 2014, AHMS 2015) are to be impacted, further Aboriginal heritage investigation and consultation should take place.
- An Aboriginal Cultural Heritage Assessment Report (ACHAR) should be prepared as a condition of the Proposal approvals. That document would outline ongoing management/ mitigation measures relating to MA6 and MA7, and any other mitigation measures not conducted during Early Works.
- An unexpected finds procedure should be included in the ACHAR and in place for the construction phase of the Proposal.
- If suspected human remains are located during any stage of the construction works, work should stop immediately and the NSW Police and the Coroner's Office should be notified. The Office of Environment and Heritage, RAPs and an archaeologist should be contacted if the remains are found to be Aboriginal.

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# 1.0 INTRODUCTION AND BACKGROUND

## 1.1 Introduction

On the 3 June 2016 Concept Plan Approval (SSD 5066) was granted, under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to develop the Moorebank Precinct West Project (MPW Project) on the western side of Moorebank Avenue, Moorebank, in south-western Sydney (the MPW site).

The MPW Project involves the development of intermodal freight terminal facilities (IMT), linked to Port Botany, the interstate and intrastate freight rail network. The MPW Project includes associated commercial infrastructure (i.e. warehousing), a rail link connecting the MPW site to the Southern Sydney Freight Line (SSFL), and a road entry and exit point from Moorebank Avenue.

Under the Concept Plan Approval, the MPW Project is to be developed in four phases, being:

- Early Works development phase, comprising:
  - The demolition of existing buildings and structures
  - Service utility terminations and diversion/relocation
  - Removal of existing hardstand/roads/pavements and infrastructure associated with existing buildings
  - Rehabilitation of the excavation/earthmoving training area (i.e. 'dust bowl')
  - Remediation of contaminated land and hotspots, including areas known to contain asbestos, and the removal of:
    - Underground storage tanks (USTs)
    - Unexploded ordnance (UXO) and explosive ordnance waste (EOW) if found
    - Asbestos contaminated buildings
  - Archaeological salvage of Aboriginal and European sites
  - Establishment of a conservation area along the Georges River
  - Establishment of construction facilities (which may include a construction laydown area, site offices, hygiene units, kitchen facilities, wheel wash and staff parking) and access, including site security
  - Vegetation removal, including the relocation of hollow-bearing trees, as required for remediation and demolition purposes
- Development of the intermodal terminal (IMT) facility and initial warehousing facilities,
- 'Ramp up' of the IMT capacity and warehousing,
- Development of further warehousing.

Approval for the Early Works phase (MPW Concept Plan Approval) was granted as the first stage of the MPW Project within the Concept Plan Approval. Works, approved as part of this stage are anticipated to commence in the third quarter of 2016.

Commonwealth Approval (No. 2011/6086), under the *Environmental Protection Biodiversity Conservation Act 1999* (EPBC Act), was also granted in mid-2016 (soon after the Concept Plan Approval) for the MPW Project. In addition to this, the Planning Proposal (PP_2012_LPOOL_004_00)

which provided a rezoning of part of the MPW site, and surrounds, was gazetted on 24 June 2016 into the *Liverpool Local Environmental Plan 2008* (Amendment No. 62).

On 5 December 2014, Moorebank Intermodal Terminal Company (MIC) and SIMTA announced their in-principle agreement to develop the Moorebank IMT Precinct on a whole of precinct basis. This agreement is subject to satisfying several conditions which both parties are currently working towards. SIMTA is therefore seeking approval to build and operate the IMT facility and warehousing under the MPW Project Concept Approval, known as the MPW Stage 2 Proposal (the Proposal).

## 1.2 Report purpose

This report has been prepared to support the Environmental Impact Statement (EIS) for approval of the Proposal. A summary of the works included in the Proposal is provided below.

This report has been prepared as part of a State Significant Development (SSD) Application for which approval is sought under Part 4, Division 4.1 of the EP&A Act. This report has been prepared in accordance with the Secretary's Environmental Assessment Requirements (SEARs) (ref: SSD 16-7709 and dated 14 July 2016) and Revised Environmental Mitigation Measures (REMMs) identified in the MPW Concept Plan Approval (SSD_5066). Table 1 provides a summary of the SEARs and the REMMs from the MPW Concept Plan Approval, which are relevant to this report and the section where they have been addressed in this report.

**Table 1 Assessment requirements**

| Section / number | SEAR / REMM | Where addressed in this report |
|---|---|---|
| Stage 2 SEARS 9 | Aboriginal Heritage including but not limited to:<br>An assessment of the heritage impacts of the proposal.<br>The assessment shall:<br>a) consider impacts to Aboriginal heritage (including cultural and archaeological significance), in particular impacts to Aboriginal heritage sites identified within or near the project should be assessed. The identification of cultural heritage values should be guided by the Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW (DECCW 2000). Where impacts are identified, the assessment shall demonstrate effective consultation with Aboriginal communities in determining and assessing impacts and developing and selecting options and mitigation measures (including the final proposed measures) in accordance with the Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW); and<br>b) describe attempts to avoid impacts to cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH. | Section 3.0: Consultation Process<br>Section 7.0: Impact Assessment<br>Section 8.0: Management and Mitigation Measures |
| REMMS 12a | Where reasonable and feasible, options would be explored to conserve moderate to high significance sites in situ. | Section 8.0: Management and Mitigation Measures |
| REMMS 12b | An Aboriginal heritage interpretation strategy for the Project would be developed in close consultation with the registered Aboriginal parties. | Completed as part of Early Works |

| Section / number | SEAR / REMM | Where addressed in this report |
|---|---|---|
| REMMS 12c | Options for management MA6 and MA7 would be explored during the detailed design phase in consultation with registered Aboriginal parties (RAPs). If the scars are considered to be of Aboriginal origin, possible management options include:<br>• Conservation of the tree(s) in situ. This would involve designing the project to ensure that the tree(s) would not be impacted.<br>• Salvage and conservation of the tree(s), or the scar portion of the tree's trunk, at a location outside the project area.<br>In the event that there is not a consensus of views among all of the RAPs it is recommended that a precautionary approach be taken. This would involve acting upon statements of the tree(s) holding cultural value, even if only a minority of RAPs view either or both trees as holding cultural value. | Section 3.0: Consultation Process<br>Section 7.0: Impact Assessment<br>Section 8.0: Management and Mitigation Measures |
| REMMS 12d | An archaeological salvage excavation program would be implemented to preserve archaeological deposits of moderate to high archaeological/scientific significance located within the construction footprint (items recorded at MA5 and MA9).<br>Consideration would be given to conserving both sites in situ, within open space reserves, or as an extension of the proposed conservation zone. | Completed as part of Early Works |
| REMMS 12e | A surface salvage program would be carried out to conserve surface artefacts located within the construction footprint (items recorded at MA1, MA2, MA3 and MA4). Salvage of surface artefacts would be undertaken before any impacts in these areas. | Completed as part of Early Works |
| REMMS 12f | The Unanticipated Discoveries Protocol described in Appendix 10 of Technical Paper 10 – Aboriginal Heritage Impact Assessment in Volume 7 of the EIS, would be followed in the event that historical items or relics or suspected burials are encountered during construction works. | Section 8 Mitigation and Management Measures |
| REMMS 12g | Consultation would be ongoing with the registered Aboriginal parties during construction of the Project and would include:<br>• Consultation on the future care and management of Aboriginal objects<br>• Methodologies for any future investigations<br>Finalisation of management and mitigation strategies subject to detailed design | Section 3 Consultation |

The objective of this report is to provide an updated Aboriginal heritage impact assessment, in accordance with the Office of Environment and Heritage (OEH) 'Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales' (2010) and 'Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation' (2005). Projects approved as SSD are not subject to section 90 permits and approval (see Section 2.0). The aforementioned guides are used for this assessment as best practice standards. This report builds upon investigations conducted as part of the MPW Concept Plan EIS and includes a cumulative impact assessment. This assessment addresses all Aboriginal sites or areas of archaeological potential which may be impacted by the Proposal.

It is understood that mitigation measures approved as part of MPW Stage 1 (Early Works) and subject to Stage 1 approvals would be conducted as part of Early Works.

### 1.2.1 Background to this assessment

Several archaeological investigations have previously been undertaken within the Proposal site, the most relevant of which include:

- An Aboriginal Cultural Heritage Assessment (ACHAR) conducted by Archaeological and Heritage Management Solutions (AHMS) in 2012 of the SIMTA site, which partially overlaps with the Proposal site
- Test excavations were conducted by AHMS in (2015) in the MPE Site, including portions that overlap with the Proposal site
- A desktop review of the MPW site conducted by NOHC in 2011
- An Aboriginal heritage assessment conducted by NOHC in 2014 as part of compilation of the MPW Concept Plan EIS
- An Aboriginal heritage assessment addendum – Archaeological subsurface testing of MRSA2 (now MA14) conducted by NOHC in September 2014
- An Aboriginal heritage assessment addendum – Scar Tree Assessment (MA6 and MA7) conducted by NOHC in 2015.

**Minister's Conditions of Approval (MCoA) for Early Works**

The MCoA define Early Works as involving: the demolition of buildings, including services termination and diversion; rehabilitation of the excavation / earthmoving training area; remediation of contaminated land; removal of underground storage tanks; heritage impact remediation works; and the establishment of construction facilities and access, including site security.

The MCoA state (under B6 and B7) that prior to construction:

- The Applicant shall not harm, modify or otherwise impact any heritage items outside the subject site
- Prior to the commencement of Early Works affecting Aboriginal sites MA1, MA2, MA3, MA4, MA5 and MA9, the Applicant shall:
  - Develop a detailed salvage strategy, prepared in consultation with the OEH (Aboriginal heritage) and the Aboriginal stakeholders. The investigation program shall be prepared to the satisfaction of the Secretary
  - Undertake any further archaeological excavation works recommended by the results of the Aboriginal investigation program.

Within twelve months of completing the above work, unless otherwise agreed by the Secretary, the applicant shall submit a report containing the finding of the excavations, including artefact analysis and Aboriginal Site Impact Recording Forms (ASIR) and the identification of final storage location for all Aboriginal objects recovered (testing and salvage), prepared in consultation with the Aboriginal stakeholders, the OEH (Aboriginal heritage) and to the satisfaction of the Secretary.

Note that where archaeological testing has occurred as part of the Environmental Assessment and the results are included in the documents listed as Condition 4 the sites tested must still form part of the final report under B7.

The MCoA also details the requirements for a Construction Heritage Management Plan (CHMP) for Early Works.

E19 of the MCoA states that all future development relevant to MA6 and MA7 (scar trees) shall include a consideration of the Aboriginal cultural value of the trees and options for avoiding impacts and ongoing conservation measures, including evidence of consultation with Aboriginal community representatives. As such, sites MA6 and MA7 form part of the current assessment for the Proposal.

E20 of the MCoA further details that all future Development Applications shall assess heritage impacts of the proposal, in line with State and Federal heritage legislation.

## 1.3 Proposal overview

The Proposal involves the construction and operation of an Intermodal terminal (IMT) facility and associated warehousing.

The IMT facility would have the necessary infrastructure to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum. Specifically, the IMT facility within the Proposal site would include the following key components:

- Truck processing, holding and loading areas – with entrance and exit from Moorebank Avenue via an upgraded intersection and a round-about to distribute traffic between the warehousing precinct and the IMT
- Rail loading and container storage areas – installation of nine rail sidings, with an adjacent container storage area serviced by manual handling equipment
- Administration facility – office building with associated car parking and light vehicle access from Moorebank Avenue
- The Rail link connection – rail sidings within the IMT facility, which would be linked (to the south) to the Rail link (constructed as part of the MPE Project (SSD 14-6766)).

Also included within the Proposal are the following key components:

- Warehousing area – construction and operation of approximately 215,000 $m^2$ GFA of warehousing, with warehouses ranging in size from 4,000 $m^2$ to 71,000 $m^2$. Included within the warehousing area would be ancillary offices, truck and light vehicle parking, associated warehouse access roads.
- Freight village – construction and operation of approximately 800 $m^2$ of retail premises, with access from the internal road.
- Upgraded intersection on Moorebank Avenue and internal road – including works to Moorebank Avenue, Anzac Road to accommodate the proposed site entrance to Moorebank Avenue, and construction of an internal road.
- Ancillary works – including vegetation clearing, earth works, drainage and on-site detention, utilities installation/connection, signage and landscaping.

## 1.4 Proposal components and key terms

Table 2 provides a summary of the key terms included within this report. Figure 2 also provides an indication of the site areas and proposed works discussed in Table 2.

### Table 2: EIS key terms

| Term | Definition |
|---|---|
| Moorebank Precinct West (MPW) Concept Plan Approval<br><br>(Concept approval and Early Works) | MPW Concept Plan and Stage 1 Approval (SSD 5066) granted on 3 June 2016 for the development of the MPW Intermodal terminal facility at Moorebank and the undertaking of the Early Works. Granted under Part 4, Division 4.1 of the *Environmental Planning and Assessment Act 1979*. This reference also includes associated Conditions of Approval and Revised Environmental Management Measures, which form part of the documentation for the approval.<br><br>N.B. Previously the MIC Concept Plan Approval |
| Moorebank Precinct West (MPW) EPBC Proposal | Commonwealth Approval (No. 2011/6086), anticipated to be granted in late 2016, for the impact of the MPW Project on listed threatened species and communities and impacts on the environment by a Commonwealth agency. Anticipated to be granted under the *Environmental Biodiversity Protection Conservation Act 1999*. |
| Moorebank Precinct West (MPW) Concept Plan EIS | The Environmental Impact Statement prepared to support the application for approval of the MPW Concept Plan and Early Works (Stage 1) under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Environmental Planning and Assessment Act 1979*.<br><br>N.B. Previously the MIC Concept Plan EIS |
| Revised Environmental Management Measures (REMMs) | The environmental management measures for the MPW Concept Plan Approval as presented within the MIC Supplementary Response to Submissions (SRtS) (PB, 2015) and approved under the MPW Concept Plan Approval. |
| Moorebank Precinct West (MPW) Planning Proposal | Planning Proposal (PP_2012_LPOOL_004_00) to rezone the MPW site from 'SP2- Defence to 'IN1- Light Industrial' and 'E3- Management', as part of an amendment to the *Liverpool Local Environmental Plan 2008* (as amended). It is anticipated to be gazetted in late 2016. |
| Moorebank Precinct West (MPW) Project | The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval and the anticipated MPW EPBC Proposal.<br><br>N.B. Previously the MIC Project. |
| Moorebank Precinct West (MPW) site | The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Proposal and MPW Planning Proposal (comprising Lot 1 DP1197707 and Lots 100, 101 DP1049508 and Lot 2 DP 1197707). The MPW site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.<br><br>N.B. Previously the MIC site. |
| Early Works | Works approved under Stage 1 of the MPW Concept Plan Approval (SSD 5066), within the MPW site, including: establishment of construction compounds, building demolition, remediation, heritage impact mitigation works and establishment of the conservation area. |
| Early Works Approval | Approval for the Early Works (Stage 1) component of the MPW Project under the MPW Concept Plan Approval (SSD 5066) and the (yet to be granted) MPW EPBC Approval. Largely contained in Schedule 3 of the MPW Concept Plan Approval. |
| Early Works area | Includes the area of the MPW site subject to the Early works approved under the MPW Concept Plan Approval (SSD 5066). |

| Term | Definition |
|---|---|
| Proposal | MPW Stage 2 Proposal (the subject of this EIS), namely Stage 2 of the MPW Concept Plan Approval (SSD 5066) including construction and operation of an IMT facility, warehouses, a Rail link connection and Moorebank Avenue/Anzac Road intersection works. |
| Proposal site | The subject of this EIS, the part of the MPW site which includes all areas to be disturbed by the MPW Stage 2 Proposal (including the operational area and construction area). |
| IMT facility | The Intermodal terminal facility on the MPW site, including truck processing, holding and loading areas, rail loading and container storage areas, nine rail sidings, loco shifter and an administration facility and workshop. |
| internal road | Main internal road through the MPW site which generally travels along the western perimeter of the site. Provides access between Moorebank Avenue and the IMT and warehouses. |
| Rail link connection | Rail connection located within the MPW Stage 2 site which connects to the Rail link included in the MPE Stage 1 Proposal (SSD 14-6766). |
| Proposal operational rail line | The section of the Rail link connection and Rail link between the SSFL and the Rail link connection (included in the MPE Stage 1 Proposal) to be utilised for the operation of the Proposal. |
| construction area | Extent of construction works, namely areas to be disturbed during the construction of the Proposal. |
| operational area | Extent of operational activities for the operation of the Proposal. |
| Moorebank conservation area/conservation area | Vegetated area to remain to the west of the Georges River, to be subject to biodiversity offset, as part of the MPW Project. |
| Moorebank Precinct (MP) | Refers to the whole Moorebank intermodal precinct, i.e. the MPE site and the MPW site. |
| Moorebank Precinct East (MPE) Project | The Intermodal terminal facility on the MPE site as approved by the MPE Concept Plan Approval (MP 10_0913) and including the MPE Stage 1 Proposal (14-6766).<br>N.B. Previously the SIMTA Concept Plan Approval |
| Moorebank Precinct East (MPE) site | The site which is the subject of the MPE Concept Plan Approval, and includes the site which is the subject of the MPE Stage 1 Approval.<br>N.B. Previously the SIMTA site |
| Moorebank Precinct East (MPE) Stage 1 Proposal | MPE Stage 1 Proposal (14-6766) for the development of the Intermodal terminal facility at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.<br>N.B. Previously the SIMTA Stage 1 Proposal |
| Rail link | Part of the MPE Stage 1 Proposal (14-6766), connecting the MPE site to the SSFL. The Rail link (as discussed above) is to be utilised for the operation of the Proposal. |

## 1.5 Site description

The Proposal site is generally bounded by the Georges River to the west, Moorebank Avenue to the east, the East Hills Railway Line to the south and the M5 Motorway to the north. It is located on Moorebank Avenue, Moorebank and forms Lot 1 in Deposited Plan (DP) 1197707. The Proposal site

also contains Lots 100 and 101 DP1049508, which are located north of Bapaume Road and west of Moorebank Avenue. The Proposal site is located wholly within Commonwealth Land.

The Proposal would also require works to upgrade the intersection of the MPW site with Moorebank Avenue and would therefore be undertaken on the following parcels of land:

- Moorebank Avenue, owned by the Commonwealth Government, south of Anzac Road Lot 2, DP 1197707 (formerly part of Lot 3001, DP 1125930)
- Moorebank Avenue, owned by Roads and Maritime Services, north of Anzac Road
- A portion of Bapaume Road, a public road that is the responsibility of Liverpool City Council
- A portion of Anzac Road, owned by Liverpool City Council, to the east of Moorebank Avenue

The key existing features of the site are:

- Relatively flat topography, with the western edge flowing down towards the Georges River, which forms the western boundary to the MPW site
- A number of linked ponds in the south-west corner of the Proposal site, within the existing golf course, that link to Anzac Creek, which is an ephemeral tributary of the Georges River
- An existing stormwater system comprising pits, pipes and open channels
- Direct frontage to Moorebank Avenue, which is a publicly used private road, south of Anzac Road and a publicly owned and used road north of Anzac Road
- The majority of the site has been developed and comprises low-rise buildings (including warehouses, administrative offices, operative buildings and residential buildings), access roads, open areas and landscaped fields for the former School of Military Engineering (SME) and the Royal Australian Engineers (RAE) Golf Course and Club. Defence has since vacated and all buildings on the site are currently unoccupied and will be removed during the Early Works
- Native and exotic vegetation is scattered across the Proposal site
- The riparian area of the Georges River lies to the west of the Proposal site and contains a substantial corridor of native and introduced vegetation. The riparian vegetation corridor provides a wildlife corridor and a buffer for the protection of soil stability, water quality and aquatic habitats. This area has been defined as a conservation area as part of the MPW Concept Plan Approval
- As stated above, the majority of the Proposal site has been developed, however heritage and biodiversity values still remain on the site
- A strip of land (up to approximately 250 metres wide) along the western edge of the MPW site lies below the 1% annual exceedance probability (AEP) flood level
- The site is privately owned by the Commonwealth and leased by SIMTA.
- A number of residential suburbs are located in proximity to the Proposal site, including:
- Wattle Grove, located approximately 1,000 m from the Proposal site and 1,000 m from the Rail link connection to the east. The Rail link, which will be used during operation of the Proposal is 1,260 m to the west of Wattle Grove at its closest point

- Moorebank, located approximately 630 m from the Proposal site and more than 1,400 m from the Rail link connection to the north. The Rail link is 2,500 m to the south of Moorebank at its closest point
- Casula, located approximately 330 m from the Proposal site and 1,200 m from the Rail link connection to the west. The Rail link is approximately 290 m to the east of Casula at the closest point
- Glenfield, located approximately 820 metres from the Proposal site and 1,100 metres from the Rail link connection to the south-west. The Rail link is approximately 750 m to the east of Glenfield at its closest point.

## 1.6 Construction overview

Subject to planning approval, construction of the Proposal is planned to commence in the third quarter of 2017. The total period of construction works for the Proposal is anticipated to be approximately 36 months. The indicative construction programme is included as Appendix 1.

### 1.6.1 Construction program and activities

The construction works have been divided into seven ‘works periods’ which are interrelated and also may potentially overlap. Subject to confirmation of construction staging, the order of these construction works periods may shift slightly.

A summary of the indicative activities included in each of these works periods, which is relevant to the construction of the IMT facility, the Rail link connection and the warehouses, is provided.in Appendix 1.

### 1.6.2 Ancillary compounds

Temporary construction compounds, a batching plant and communal parking areas would be required to support construction works for the Proposal. The locations of these compounds and facilities are indicative and subject to confirmation by the construction contractor and are shown in Figure 2.

At this stage construction compounds identified for the Proposal include:

- Earthworks Compound
- Interstate Compound
- Rail Compound.

Access to the compound sites would be via existing access points to the Proposal site from Moorebank Avenue. An area would be made available in the northern portion of the Proposal site to provide worker parking, once the Moorebank Avenue/Anzac Road intersection upgrade is complete. In addition, to the above compounds, individual smaller compounds would be established for the construction of each warehouse.

The indicative location of these compounds is shown in Figure 2.

## 1.7 Authorship

This report was written by Alyce Howard (Senior Archaeologist) and reviewed by Josh Symons (Principal Archaeologist). Dr Sandra Wallace (Director) provided management input and final review.

**Figure 1: Proposal overview (source: Arcadis August 2016)**

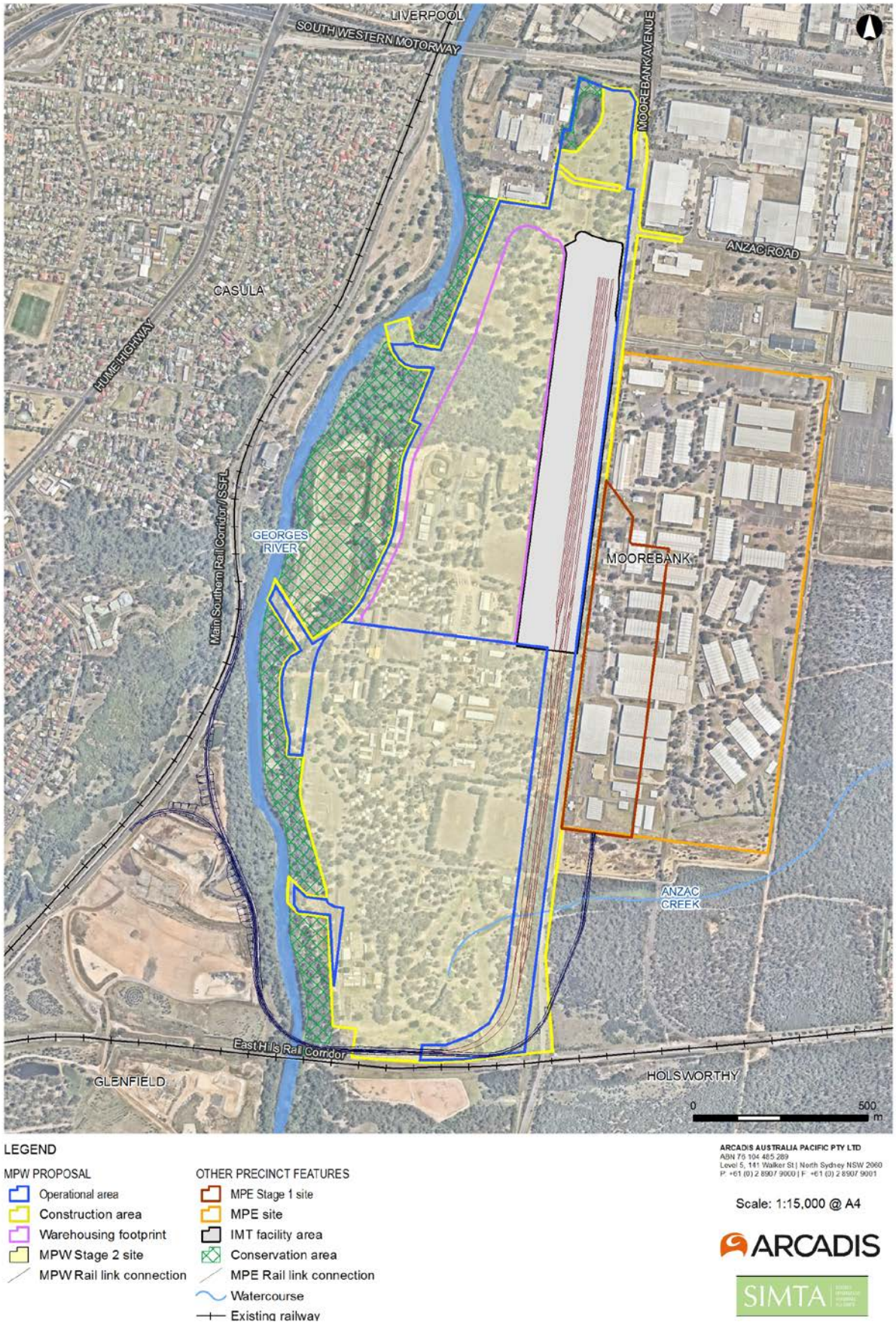
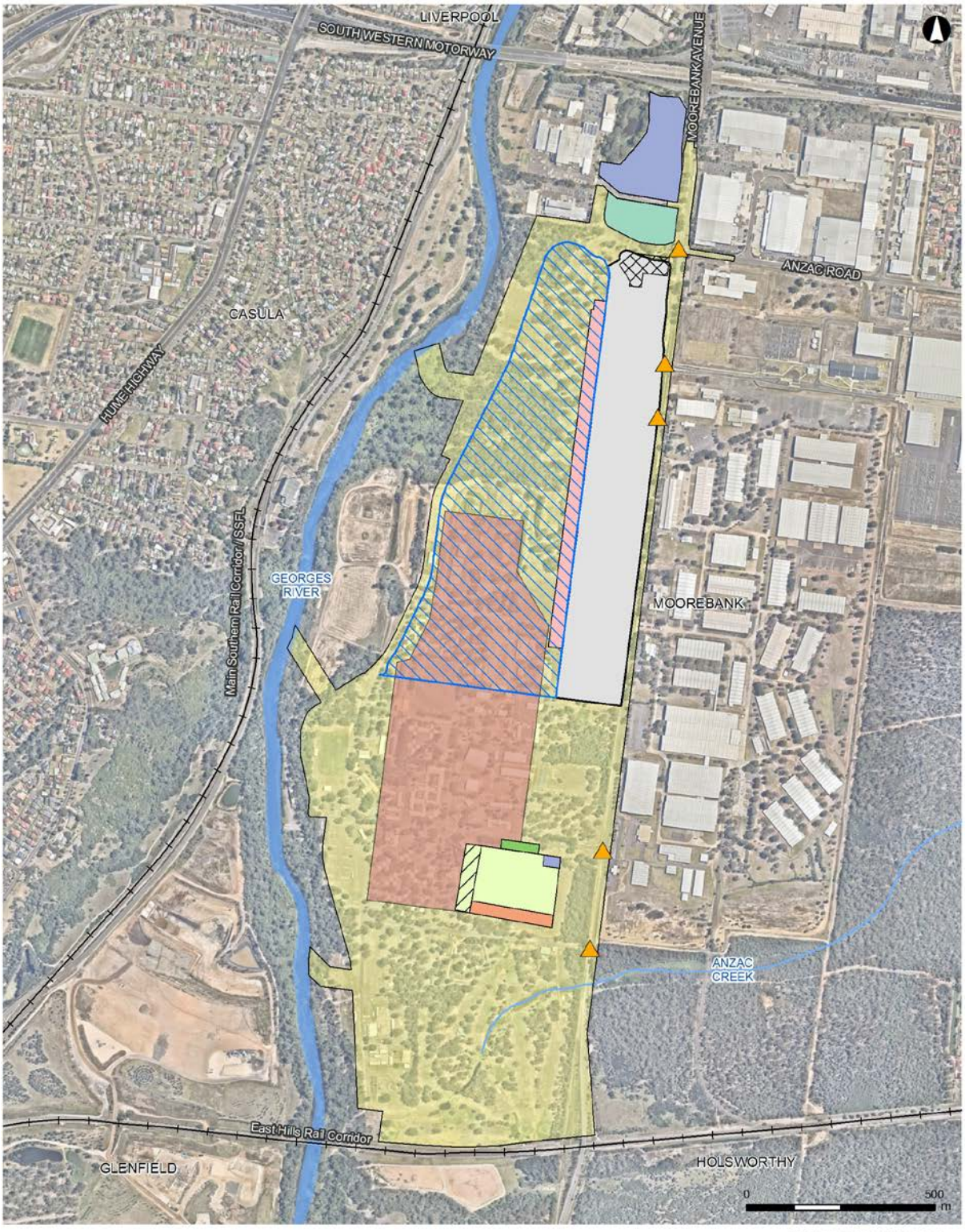


**Figure 2: Proposal construction layout (source: Arcadis August 2016)**



# 2.0 LEGISLATIVE CONTEXT

***National Parks and Wildlife Act* (1974) (NPW Act)**

The NPW Act, administered by the OEH provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under Section 90 of the Act, and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community) under Section 84.

The protection provided to Aboriginal objects applies irrespective of the level of their significance or issues of land tenure. However, areas are only gazetted as Aboriginal Places if the Minister is satisfied that sufficient evidence exists to demonstrate that the location was and/or is, of special significance to Aboriginal culture.

The NPW Act was amended in 2010 and as a result the legislative structure for seeking permission to impact on heritage items has changed. A Section 90 permit is now the only Aboriginal Heritage Impact Permit (AHIP) available and is granted by the OEH. Various factors are considered by OEH in the AHIP application process, such as site significance, Aboriginal consultation requirements, ESD principles, project justification and consideration of alternatives. The penalties and fines for damaging or defacing an Aboriginal object have also increased.

As the Proposal is being assessed under Part 4 Division 4.1 of the EP&A Act 1979 permits issued under the NPW Act 1974 are not required.

**Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW 2010 (Code of Practice)**

The Code of Practice was introduced in October 2010 by the OEH (formerly the Department of Environment, Climate Change and Water). The aim of the guidelines is to establish the requirements for undertaking test excavation as a part of archaeological investigation without an AHIP and to establish the requirements that must be followed when carrying out archaeological investigation in NSW where an application for an AHIP is likely to be made.

OEH recommends that the requirements of the Code of Practice also be followed where a proponent may be uncertain about whether or not their proposed activity may have the potential to harm Aboriginal objects or declared Aboriginal places and the proponent is required to undertake further investigation to understand and establish the potential harm their proposal may have on Aboriginal cultural heritage, and the further investigation involves archaeological assessment

As the Proposal is being assessed under Part 4, Division 4.1 of the EP&A Act, it is not required to use the Code of Practice. However, the Code of Practice has been used in the context of best practice to inform and structure the current study.

***Environmental Planning & Assessment Act* (1979) (EP&A Act)**

The EP&A Act is administered by the Department of the Premier and Cabinet and provides planning controls and requirements for environmental assessment in the development approval process. This Act has three main parts of direct relevance to Aboriginal cultural heritage. Namely, Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment process for local government (consent) authorities and Part 5 which relates to activity approvals by governing (determining) authorities.

Planning decisions within Local Government Areas (LGAs) are guided by Local Environmental Plans (LEPs). Each LGA is required to develop and maintain an LEP that includes Aboriginal and historical heritage items which are protected under the EP&A Act 1979 and the *Heritage Act 1977.*

The study area is within the Liverpool City Council LGA.

The Liverpool LEP 2008 (Part 5, Clause 5.10) makes standard provision for the protection of Aboriginal objects and Aboriginal places of heritage significance. There are no Aboriginal items within the study area that are listed in the Liverpool LEP 2008.

The Proposal will be assessed under Part 4.1 of the EP&A Act, which establishes an assessment and approval regime for SSD. Part 4, Division 4.1 applies to development that is declared to be SSD by a State Environmental Planning Policy (SEPP). Section 89J of the EP&A Act specifies that approvals or permits under section 90 of the NPW Act are not required for approved SSD projects.

***Aboriginal Land Rights Act* (1983)**

The *Aboriginal Land Rights Act 1983* is administered by the NSW Department of Human Services - Aboriginal Affairs. This Act established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the Act to; (a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and (b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

***Native Title Act* (1994)**

The *Native Title Act 1994* was introduced to work in conjunction with the Commonwealth Native Title Act. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

There are no active Native title claims within the Proposal site.

# 3.0 CONSULTATION PROCESS

Aboriginal community consultation has been conducted by NOHC and MIC throughout the Early Works approval process.

Nine RAPs are registered for the MPW Proposal:

- Tharawal Local Aboriginal Land Council (TLALC)
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (CBNTCAC)
- Darug Land Observations (DLO)
- Darug Custodian Aboriginal Corporation (DCAC)
- Darug Aboriginal Cultural Heritage Assessments (DACHA)
- Darug Aboriginal Landcare Incorporated (DALI)
- Banyadjaminga
- Gandangara Local Aboriginal Land Council (GLALC)
- Tocomwall Pty Ltd

Aboriginal representatives from RAPs participated in the field survey of the Proposal site as well as the subsurface testing program as part of the MPW Concept Plan approval process.

Appendix 5 of Technical Paper 10 – Aboriginal Heritage Assessment in Volume 7 of the MPW Concept Plan EIS details consultation that has taken place to date with RAPs. This includes dates of communication through letters, emails and telephone calls, as well as participation in field survey and subsurface testing programs.

As testing and salvage of all identified Aboriginal heritage artefact sites and identified potential archaeological deposits (PADs) is being undertaken as part of Early Works, Artefact Heritage has undertaken consultation with RAPs only with regard to the scar trees (MA6, MA7 and MA8) and areas of additional impact to the tertiary terrace within the conservation area.

It is understood that the proposed works would not impact MA8. However, MA6 and MA7 are within the Proposal construction area. A site visit was conducted on 8 June 2016 with all RAPs in order to gain updated recommendations regarding the management of the trees. See Sections 5.0, 5.2 and 7.2 for details of the site visit and predicted impacts.

An additional site visit was conducted on 1 July 2016 in order to discuss future management of the scar trees MA6 and MA7. Representatives of the following organisations were on site:

- TLALC
- GLALC
- CBNTCAC
- DCAC
- DACHA

The proponent's justification for needing to impact the trees was presented to the stakeholders on site. The proponent outlined that the MPW site was to be raised by approximately two metres for purposes of stormwater management and to avoid contaminants and unfavourable ground conditions. Retaining the trees would not be an option in the current concept designs. CBNTCAC noted that this outcome had been expected for some time. It was recommended by TLALC that an option for future

management of the trees would be to have an arborist move them to the TLALC property near Thirlmere. The trees would be maintained at the TLALC property, mounted and housed in weather resistant structure, provided all costs of relocation and construction of the housing is covered by the proponent.

All stakeholders on site agreed that relocation of the scar portions of MA6 and MA7 to the TLALC property would be an acceptable management measure for conservation of the trees.

TLALC and GLALC noted that relocation of the trees to the Moorebank conservation area (on the western bank of the Georges River) would not be an acceptable management strategy, as access to the trees would be limited, there is the potential for flood risks and the trees would not be adequately maintained.

All stakeholders were contacted by phone on 5 August 2016 in order to finalise recommendations regarding ongoing management of the scar trees MA6 and MA7. CBNTCAC, TLALC and DALI were unavailable for comment. However, in addition to recommendations presented at the site meeting on the 1 July 2016, DCAC, DLO and DACHA agree that relocation of the scar portions of both trees to the TLALC property would be an acceptable solution. DLO added that all costs should be covered by the proponent, and if this is not the case then no impact should occur and the trees should remain *in situ*. Tocomwall noted that items such as scar trees are designed to stay in place for perpetuity and any removal is considered destructive, however, if the trees are to be relocated to the TLALC property they have nothing to add to existing stakeholder recommendations. DLO also added that removal of the scar portions of both trees and relocation should occur with minimal damage to the scar portion.

# 4.0 SUMMARY AND ANALYSIS OF BACKGROUND INFORMATION

A comprehensive presentation of background context information for the MPW Project was presented in the MPW Concept Plan EIS (NOHC 2014). A synthesised presentation and analysis of that background information is outlined below.

## 4.1 Environmental context

The Proposal site is situated along the upper Georges River, in a transitionary area between Wianamatta Shale and Hawkesbury Sandstone zones. Wianamatta Shale terrain is typical of the Cumberland Plain Woodland located to the west of the Proposal site. Hawkesbury Sandstone terrain extends from the upper Georges River to the east (NOHC 2014).

The majority of the Proposal site is capped by Tertiary alluvial clayey quartz sands, salty sands and clays and forms part of the Berkshire Park Soils Group (Hazleton and Bannerman 1990). This soil landscape unit generally overlies alluvium, often on elevated terraces, and comprises shallow clayey sand soils, with frequent ironstone pisoliths (Hazleton and Bannerman 1990 *in* NOHC 2014). The Berkshire Park Soils landscape is mapped on the Penrith sheet as being developed on the Tertiary terraces of the Hawkesbury/Nepean River System. Landforms on the east side of the Georges River are lower in altitude than on the west, so flooding incidence is much higher (NOHC 2014). The banks of the Georges River and Maxwells Creek are characterised by the South Creek soil landscape. The soil profiles of the South Creek soil landscape generally comprise an A1 horizon of brown sandy loam with an A2 horizon of more compact bleached clay loam with gravels. This is underlain by a yellow to brown clay B horizon with high gravel content. The fluvial soils would have been subject to frequent flood events, possibly resulting in a deep, homogenous deposit susceptible to mixing (OEH 2014, Artefact 2016). The modern geomorphology, hydrology and wetland habitats of the Georges River reflect disturbance throughout the catchment which has occurred since European settlement (NOHC 2014).

## 4.2 Aboriginal ethno-historic context

Aboriginal people traditionally lived in small family or clan groups that were associated with particular territories or places. The language groups occupying the region surrounding the Proposal site are thought to have been the Dharawal, the Darug and the Gundungurra (Attenbrow 2010:221, 222). Laila Haglund has suggested that the Campbelltown area may have represented the intersection between the boundaries for these language groups, and that the Narellan Valley may have been part of a ‘travel corridor’ facilitating movement between the northern Cumberland Plain and the Illawarra (JMcDCHM 2007:21 after Haglund 1989).

The Dharawal language group was largely coastal and is thought to have extended from the Shoalhaven River, north to Botany Bay and then inland to Camden (Attenbrow 2002:34). Historical records show that the Gundungurra were located to the west and southwest of the Dharawal and into the southern Blue Mountains. It is not known whether this represented recent displacement patterns as a result of European colonisation or was part of a longer term interaction with the Dharawal (Karskens 2010:496). The Darug language group occupied much of the Cumberland Plain between the Blue Mountains and the coast, with the language being divided into coastal and hinterland dialects (Attenbrow 2002:34).

British colonisation had a profound effect on the Aboriginal population of the Sydney region. In the early days of the colony Aboriginal people were disenfranchised from their land as the British claimed

areas for settlement and agriculture. The colonists, often at the expense of the local Aboriginal groups, also claimed resources such as pasture, timber, fishing grounds and water sources.

Some Aboriginal people of southwestern Sydney may have seen cattle before being first confronted by the colonists. Two bulls and four cows escaped from the Sydney colony in 1788 and were not recovered. In 1790 a group of cows were observed grazing near Camden in what became known as the 'Cowpastures'. The herd expanded and by 1801 were thought to number in the hundreds and efforts were made to recapture them (Turbet 2011: 88, Kayandel 2010:23).

In the early 1800s relationships between the Aboriginal people of the area and the European settlers were generally amicable. Grace Karskens notes several examples of close relationships between land owners and local Aboriginal people, including Charles Throsby who gave the Dharawal protection on his Glenfield Estate during later not so peaceful times (Karskens 2010).

Relations between Aboriginal people and colonists did not remain amicable. A sustained drought during 1814 and 1815, and continued disenfranchisement lead to tensions between farmers and Aboriginal people who remained to the southwest of Sydney. The Aboriginal people were accused of stealing corn and potatoes and spearing cattle. A number of farmers were killed on their properties. In a dispatch Governor Macquarie wrote that '*The Native Blacks of this country…have lately broken out in open hostility against the British Settlers residing on the banks of the River Nepean near the Cow Pastures*'. Aboriginal people were targeted and it was ordered that Aboriginal men be strung from trees when they were killed as an example (Turbet 2011:234).

In 1816 the tensions culminated in the Appin massacre when Aboriginal people where pursued by a detachment led by Captain James Wallis. Fourteen Aboriginal people of the Dharawal nation were shot or driven over a cliff to their deaths by the soldiers. The bodies of two of the Aboriginal men were strung up at the site (Turbet 2011).

Although the numbers of Aboriginal people in the area decreased as settlers and farmers moved into the locality, communities remained living at Camden Park and along the Georges River near Liverpool (Liston 1988).

## 4.3 Historical land use context

European expansion throughout the Cumberland Plain displaced Aboriginal people from their traditional land and effectively cut off access to many resources. The first European activity in the area was exploratory shortly followed by settlement. The first land parcels in the Liverpool area were granted in 1798.

Liverpool was founded in 1810 by Governor Macquarie who named the area after the Earl of Liverpool. Following the completion of the road between Sydney and Liverpool in 1813 settlement expanded rapidly. The rich soils on the floodplain of the Georges River provided for a growing agricultural industry. In the 1860s many small farmers moved away from the river after a particularly large inundation and the area became open to larger scale agriculture such as dairy farming. Up until the mid-twentieth century agriculture co-existed with suburban areas in the Liverpool region.

**The following site specific information has been taken from Chapter 21 - *European Heritage* of the EIS document prepared by Parsons Brinkerhoff and NOHC (2014) for the MPW Concept Plan EIS.**

> *"At the turn of the 19th century, the* [MIC] *Proposal site was part of the Moorebank Estate, which comprised small rural landholdings and farms first established by Thomas Moore.*

*The Project site was first used for military purposes in the late 19th century, when it was established as a military training camp that quickly expanded during World War I. Other uses on the site have included sandmining on the eastern bank of the Georges River, and the construction of a light railway to service the operation, during the 1930s.The School of Military Engineering (SME) is the largest of the Defence units on the Project site and was established during World War II, in what is now called the Steele Barracks Army Base. The SME is home to the Royal Australian Engineers (RAE), whose role is to provide geospatial, combat and force support engineering capabilities. The buildings and facilities at the SME have undergone major change and redevelopment since the 1940s. Most of the buildings dating from that period have since been demolished and replaced with new structures. Various training facilities and schools have been established at the SME including the School of Signals, Central Training Depot, specialist dog training, explosive ordnance disposal and the nuclear, biological and chemical warfare wing.*

*The land west of the Georges River was a largely undeveloped rural landscape prior to the 20th century. Later, this area was developed as a golf course. The Southern Sydney Freight Line (SSFL), parallel and immediately adjacent to the Main South Railway Line (passenger line), has resulted in substantial disturbance to all of the remaining locally elevated ground and a proportion of the river flats on this land. This was due to the use of this land as construction depots and ancillary areas for the SSFL construction."*[1]

## 4.4 Aboriginal material culture

The archaeological understanding of the early Aboriginal settlement of the Sydney Basin and surrounds is constantly expanding and developing. At present, the earliest occupation known is associated with deposits on the Parramatta and Nepean Rivers, which have been dated to c.25-30,000 yBP and 36 000 yBP (years before present) (JMcD CHM Oct 2005; AHMS Feb 2013). Two coastal sites south of Wollongong at Bass Point and Burrill Lake in the Shoalhaven have both been dated to around 20,000 yBP (Lampert 1971 and Nanson et al 1987). Evidence of Aboriginal occupation at Lake Mungo has been dated to 50-60,000 yBP (Bowler et al 2003). Excavations conducted by AHMS within PAD2 in the southern portion of the Proposal site retrieved a date of 18,000 yBP in association with artefact bearing deposits (AHMS 2015).

The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts. Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000 yBP in the Sydney region (Attenbrow 2010:102). It is argued that these changes in material culture were an indication of changes in social organisation and behaviour.

The Eastern Regional Sequence was first developed by McCarthy in 1948 to explain the typological differences he was seeing in stone tool technology in different stratigraphic levels during excavations such as those at Lapstone Creek near the foot of the Blue Mountains (McCarthy 1948). The sequence had three phases that corresponded to different technologies and tool types (the Capertian, Bondaian and Eloueran). The categories have been refined through the interpretation of further

[1] Moorebank Intermodal Terminal Project Environmental Impact Statement (2014) Chapter 21 pp 6

excavation data and radiocarbon dates (Hiscock & Attenbrow 2005, JMcDCHM 2005). It is now thought that prior to 8,500 yBP tool technology remained fairly static with a preference for silicified tuff, quartz and some unheated silcrete. Bipolar flaking was rare with unifacial flaking predominant. No backed artefacts have been found of this antiquity. After 8,500 yBP silcrete was more dominant as a raw material, and bifacial flaking became the most common technique for tool manufacture. From about 4,000 yBP to 1,000 yBP backed artefacts appear more frequently. Tool manufacture techniques become more complex and bipolar flaking increases (JMcDCHM 2006). It has been argued that from 1,400 to 1,000 years before contact there is evidence of a decline in tool manufacture. This reduction may be the result of decreased tool making, an increase in the use of organic materials, changes in the way tools were made, or changes in what types of tools were preferred (Attenbrow 2010:102). The reduction in evidence for stone tool manufacture coincides with the reduction in frequency of backed blades as a percentage of the assemblage.

After European colonisation Aboriginal people of the Sydney Basin often continued to manufacture tools, sometimes with new materials such as bottle glass or ceramics. There are a number of sites in Western Sydney where flaked glass has been recorded, for example at Prospect (Ngara Consulting 2003) and Oran Park (JMcDCHM 2007).

**The following information has been taken from Chapter 22 - *Aboriginal Heritage* of the EIS document prepared by Parsons Brinkerhoff and NOHC (2014) for the MPW Concept Plan EIS.**

> *"Previous studies have been conducted in the vicinity of the* [MIC] *Project site and near the Georges River. Koettig and Hughes (1983) and Haglund (1984) conducted surveys along the proposed route of the East Hills−Glenfield Railway and at Glenfield. No Aboriginal sites were recorded in these areas; however, factors such as poor surface visibility may have contributed to the lack of identified sites. Boot (1990; 1992; 1993; 1994a, 1994b) carried out a series of archaeological investigations at Wattle Grove, along Anzac Creek and north of the East Hills Railway Line. Several scatters were identified along low ridgelines next to drainage lines or swampy areas.*
>
> *The sandstone dominated terrain within the Holsworthy Military Area also contains a number of Aboriginal sites including rock shelters, pigment art sites, rock engravings and grinding groove complexes, which have been documented in a number of surveys and site investigations (Officer 1984, Sharp 1994, Sefton 1994, Axis Environmental/Australian Museum Business Services Consulting 1995 and McCotter 1995)."*[2]

[2] Moorebank Intermodal Terminal Project Environmental Impact Statement (2014) Chapter 22 pp 8

## 4.5 Registered Aboriginal archaeological sites in the local area- AHIMS search results

An extensive AHIMS search of the area surrounding the Proposal site was undertaken on the 29 January 2016 with the following parameters:

| | |
|---|---|
| GDA 1994 MGA 56 | 306360E – 309043E |
| | 6239515N – 6242887N |
| Buffer | 200 m |
| Number of sites | 16 |
| AHIMS Search ID | 209348 |

A total of 16 Aboriginal sites were identified. Figure 6 illustrates the distribution of Aboriginal sites within and adjacent to the Proposal site. Table 3 details the frequency of each site type.

**Table 3: Frequency of site types from AHIMS extensive search data**

| Site type | Frequency | Percentage of total sites (%) |
|---|---|---|
| Artefact | 5 | 31 |
| Artefact with PAD | 5 | 31 |
| Modified tree (carved or scar) | 4 | 25 |
| PAD | 2 | 13 |
| **Total** | **16** | **100** |

The most common site types in the search area are artefact sites (n=5) and artefact sites with associated areas of PAD (n=5). Modified trees are also common in the search area (n=4), however, previous studies have indicated that these trees have not been confirmed as culturally modified (NOHC 2014 and AHMS 2012). This issue is addressed in Section 5.1 and Section 7. The least common site type in the search area was areas of PAD (n=2).

## 4.6 Previous archaeological investigations in the local area

A detailed assessment of previous archaeological research in the region can be found in NOHC (2014) and AHMS (2012). NOHC and AHMS have conducted archaeological investigations, including test excavations, within the Proposal site. The findings of these investigations are summarised below. The PADs and Aboriginal sites that have been subject to archaeological test excavations are illustrated in Figure 3.

### 4.6.1 NOHC 2014 MPW Concept Design Aboriginal Heritage Assessment

The field survey identified five artefact sites (MA1-5), three scar trees (MA6-7) and three potential archaeological deposits (MAPAD1, MAPAD2 and PAD2) as well as sampling three representative landforms according to the predictive statements made for the area (MRSA1-3).

A test excavation program was conducted in 2012 by NOHC. A total of 59 test pits were excavated across the MAPAD1, MAPAD2, PAD2, MRSA1, MRSA2 and MRSA3 with 264 artefacts recovered

from 26 pits. There were no artefacts recovered from MRSA3 or PAD2. Further excavations were conducted along the western side of the Georges River in 2013 within MAPAD2. A total of 45 test pits were excavated with 14 artefacts recovered from nine test pits.

Sample site MRSA2 was not excavated due to safety concerns. The assessment recommended that this site as well as the western extent of MA10 and areas along the Georges River required further subsurface testing.

Following the test excavations, the areas of PADs and representative landforms were given the following site names:

**Table 4: Updated site names following 2014 test excavations**

| PAD/MRSA | Site Name |
|---|---|
| MAPAD1 | MA9 |
| MAPAD2 | MA11, MA12 and MA13 |
| MRSA1 | MA10 |

The excavation programs concluded that where intact deposits occur, Aboriginal occupation appears to be focussed upon the tertiary terrace edge. The upper catchment of Anzac Creek does not appear to have been a focus of Aboriginal occupation. Riverside margins of elevated flats in close proximity to higher order drainage, i.e. the Georges River, were favoured locations for repeated and/or longer term encampments. The confluence of resources at site MA9 appears to have been a target of Aboriginal activity. The excavation results from this site were found to indicate a relatively continuous, moderate to high density distribution of artefacts with a diverse range of artefact and material types present.

The excavations along the western side of the Georges River found that the extent of fluvial deposition of sands inhibited the testing of the lower pre-1836 floodplain deposits. It was considered that sandy deposits at or below 10 metres Australian Height Datum (AHD) within the Casula-Moorebank section of the Georges River Riparian Corridor are likely to be the result of sedimentation processes caused by the construction of the Liverpool Weir (c. 1836).

### 4.6.2 NOHC Sept 2014 MPW Aboriginal Heritage Assessment Addendum, Archaeological Subsurface Testing – MRSA2

NOHC conducted subsurface testing of MRSA2 in September 2014. The excavations recovered 34 artefacts from three test excavation units. The excavations were found to support the model of archaeological sensitivity presented by NOHC in 2012. Following the excavations, the boundaries of MRSA2 were refined to reflect the concentration of artefacts and the site was designated MA14. The site was recommended for salvage prior to any impacts occurring.

### 4.6.3 NOHC 2015 MPW Aboriginal Heritage Assessment – Addendum, Scar Tree Assessment (MA6 – MA7)

NOHC collected core samples and detailed recording of the scar trees located within the Proposal site (MA6 and MA7) to be analysed by a specialist dendrologist in 2015. The aim of the analysis was to determine an approximate age estimate for each scar.

Core samples were taken from both trees at locations adjacent to and distant from the scars. Detailed recording collected for the trees included scar size and location, diameter of each tree and depth of each scar. The age of the scar was estimated by calculating the difference in the tree diameter between the scar surface and the current outer surface of the tree. This was achieved by measuring the rate at which the post-scar growth has occurred by measuring the width of tree rings evident in the core samples and calculating the amount of growth per year.

There were two usable core samples obtained from MA7 and one from MA6, NOHC did not consider these data limitations to impede the analysis.

The estimated age range for MA6 was calculated to be between 265 and 219 years old. This places the creation of the scar either in the pre-contact period or shortly after European contact. This indicates that it is likely that MA6 is a culturally modified tree, although this cannot be conclusively determined.

The estimated age for MA7 was calculated to be 86 years old. This places the creation of the scar during 1928, after the area came under military control. This younger age indicates that it is less likely that MA7 is a culturally modified tree. However, it cannot be conclusively established whether Aboriginal people living in the area would have been prevented from accessing the Proposal site during the post-World War 1 period and practicing cultural activities.

NOHC recommended that the management of these sites should be in line with their assessed cultural significance as determined by RAPs involved with the project.

Note that additional assessment regarding MA6 and MA7 has been undertaken as part of this assessment for the Proposal, the results of which are detailed in Sections 3.0, 5.0 and 5.2.

### 4.6.4 AHMS 2015 MPE Stage 1 Proposal Aboriginal Heritage Impact Assessment

AHMS completed an Aboriginal heritage impact assessment as part of concept approval of the MPE Stage 1 Proposal, located next to the Proposal site and overlapping with the southern boundary of the Proposal site. As part of the approval process for the MPE Stage 1 Proposal, the SEARS required further investigation of PADs delineated in the original survey report completed by AHMS in 2012. A test excavation program was conducted within the MPE site to further determine the nature and extent of the Aboriginal heritage resource of PAD2 and PAD3. PAD2 extends west of Moorebank Avenue and PAD3 extends to the east of Moorebank Avenue.

The northern extent of PAD2 had previously been tested by NOHC in 2014. The testing program conducted by AHMS was focussed around the southern extent and the area adjacent to Georges River.

A total of 13 test pits were excavated as part of the program. These were divided as seven test pits within PAD2 and six test pits on either side of Anzac Creek within PAD3. The program avoided placing excavation units within the modern floodplain closest to Georges River. Test pits were placed 50 metres from Georges River along upper slope and elevated terraces and 30 to 40 metres from Anzac Creek.

The test excavations recovered 28 artefacts from PAD2. The majority of artefacts were from those test pits located closest to the Georges River. This area was designated as MA14 by AHMS. Optical Stimulated Luminescence (OSL) dates obtained for this site indicate that the underlying sand sheet began forming around 60 000 years ago. OSL samples taken in association with the upper assemblage returned dates between 3-4 000 yBP and samples in associated with the lower assemblage returned dates between 18 000 yBP.

Consultation with RAPs for the MPE Project identified an area of cultural heritage value on the western side of Georges River (Figure 4). This area was considered to be a southern extension of MAPAD2 identified by NOHC (2014).

Note: An area of cultural heritage value was identified by AHMS (2015) along the margins of the Georges River. The margins of the Georges River were also identified as sensitive landforms and part of a tertiary terrace in the MPW Concept Plan EIS (NOHC 2014). This landform was only partially investigated by NOHC (2014) (Figure 5). As such, further investigation of this area would be required. Further investigation would entail test excavation, in consultation with RAPs, and salvage excavation where artefact concentrations or intact Aboriginal archaeological deposits are identified.

### 4.6.5 Names for previously recorded sites within the Proposal site

The review of these documents for the Proposal and the adjacent MPE site have revealed discrepancies in the names assigned to sites by NOHC, AHMS and on the AHIMS register. These discrepancies are summarised in the table below. Where the site is registered the AHIMS name has been used in this report to limit confusion. Where the sites are not registered the naming convention established by NOHC for Aboriginal sites has been followed.

**Table 5: Site names used in this report**

| AHIMS # | AHIMS name | NOHC name | AHMS name | Name used in this report |
|---|---|---|---|---|
| 45-5-4281 | MAPAD2 | MA13 | - | MAPAD2 |
| 45-5-4427 | MA13 | - | - | MA13 |
| - | - | MRSA2/MA14 | - | MA14 |
| - | - | PAD2 | PAD2/MA14 | PAD2 |

**Figure 3: Archaeological test excavations conducted for MPW Concept Design and MPE Stage 1 Proposal approvals**

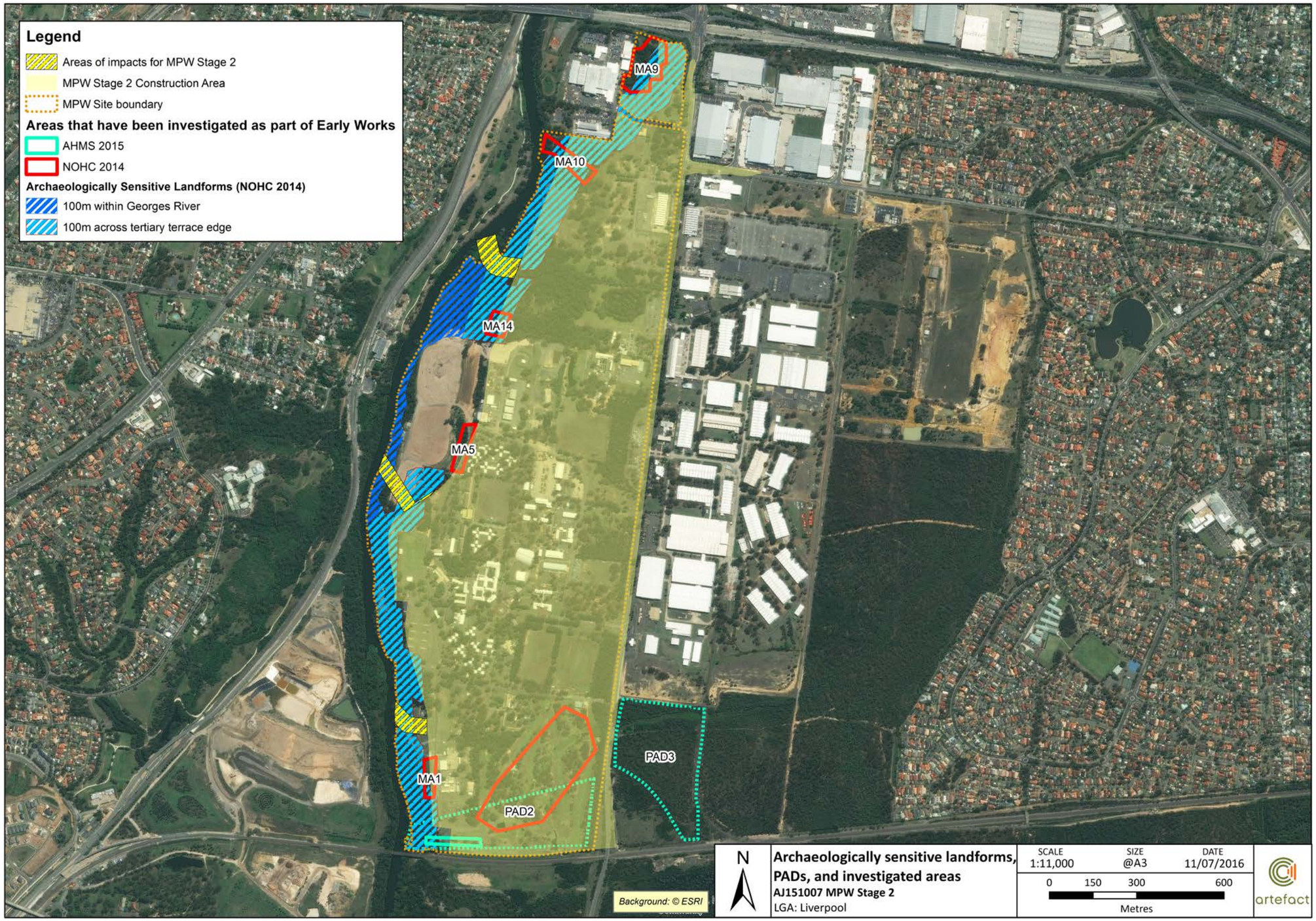


**Figure 4: Area of Aboriginal cultural heritage value indicated by pink polygon (AHMS 2015)**




*Figure 10. Map of Aboriginal objects/sites within the SIMTA site based on recent studies and the works within this assessment. Within the Stage 1 site, the key site identified was MA14, part of the original PAD 2, which has been shown to have the potential to contain significant cultural material. Other sites in close proximity to the Stage 1 rail line are also presented. Areas not highlighted are considered to have low risk of impacting significant Aboriginal objects/sites.*

## 4.7 Predicted Aboriginal archaeological sensitivity and potential

Based on AHIMS data and previous archaeological assessments, NOHC (2014) made the following predictive statements about the surviving archaeological resources of the Proposal site and surrounding region.

**The following information has been taken from Chapter 22 - *Aboriginal Heritage* of the EIS document prepared by Parsons Brinkerhoff and NOHC (2014) for Early Works approval.**

Site types are likely to include:

- Site types likely to occur are scar trees, open artefact scatters, isolated finds and PADs,
- Open artefact scatters are likely to be under-represented in surface surveys conducted in uncleared land.

Site location criteria and trends include:

- Major watershed ridgelines may contain higher site densities and/or greater occupation evidence due to their use as access routes,
- Open artefact scatters are unlikely to have survived in areas that have been quarried for gravel or heavily impacted by vehicles,
- Open artefact scatters and isolated finds are likely to occur on relatively well drained ground on the crests of major ridgelines and spur lines, and in valley floor contexts adjacent to water sources,
- Larger sites are most likely to be associated with permanent water sources,
- Aboriginal scar trees may occur where old growth trees survive.

Areas of Potential Archaeological Deposit (PAD):

- Open sites containing artefacts are unlikely to be detected by surface survey due to the absence of or poor quality (i.e. highly disturbed) ground exposure, or subsequent burial by later sediments (especially during flooding and after fires),
- Open sites containing in situ subsurface material are most likely to occur in well drained, sedimentary aggrading landforms adjacent to streamlines.

An Aboriginal archaeological sensitivity predictive map was developed and further refined following test excavations by NOHC for MPW Concept Plan approval (Figure 5).

This map shows the predicted Aboriginal archaeological sensitivity across the Proposal site. These areas were identified by plotting predicted archaeological potential based on landform variables, but did not include disturbed land surfaces (NOHC 2011). These zones were based on a generalised model of Aboriginal site location, which indicated that the majority of sites are situated on locally elevated, well drained and low gradient ground, close to a fresh or estuarine water source (with the majority of sites within 100 metres of water sources).

Three zones of predicted Aboriginal archaeological potential are recognised within the Project site:

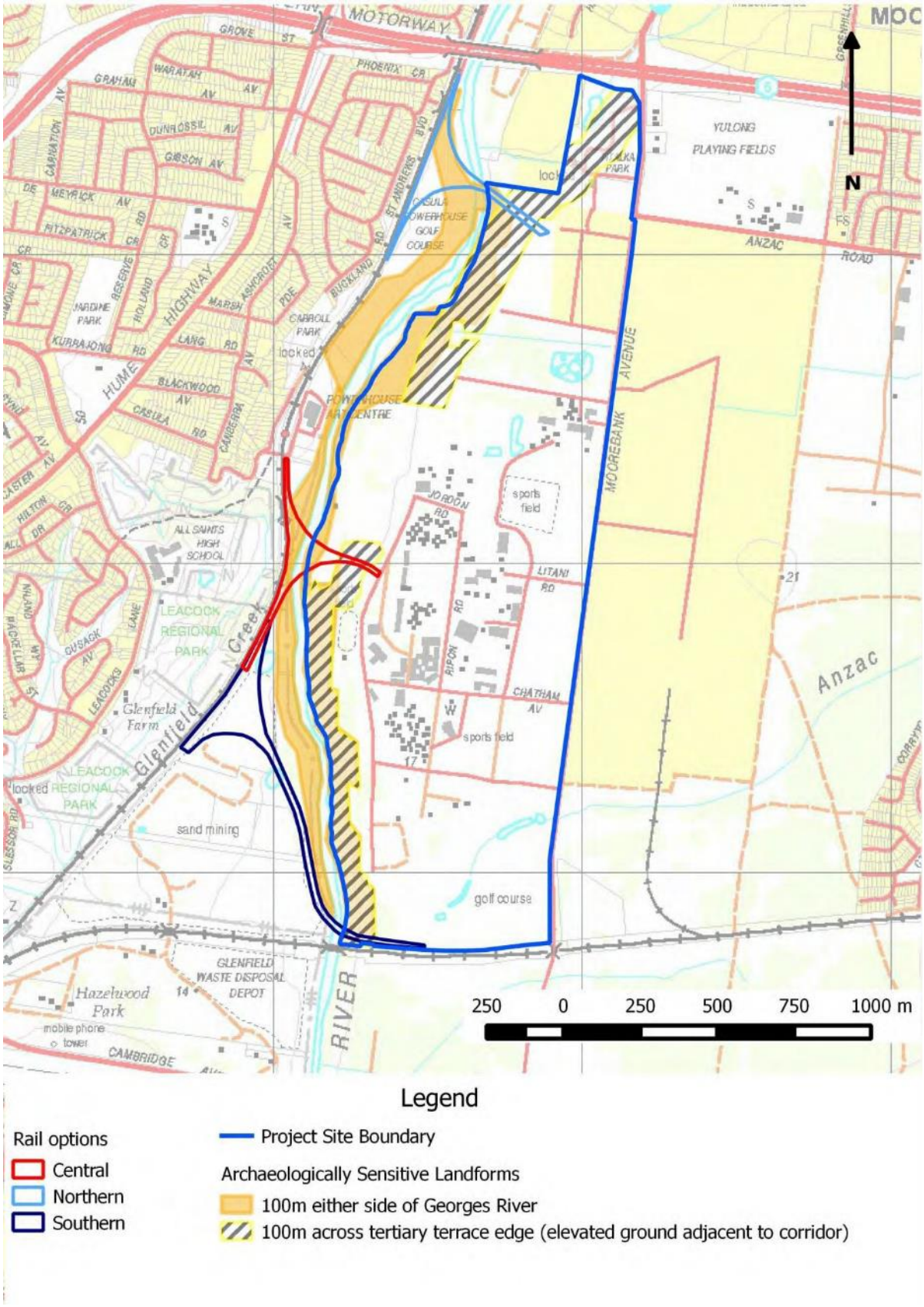
- The Georges River riparian corridor 100 metres either side of the Georges River (inclusive of the 1890s eastern riverbank configuration)

- Minor tributary riparian zones 100 metres either side of the tributary drainage lines (inclusive of the pre- European drainage alignment as best determined from historical mapping and 1943 aerial photography)
- The elevated slopes and riverside margin of a locally elevated Tertiary alluvial terrace edge situated along a 100 metres wide zone on the eastern side of the Georges River.

The likely incidence of Aboriginal sites along Georges River riparian corridor is expected to be relatively high, given its value in prehistory as a source of food, camping locations, raw materials and fresh water.

The depth of deposit along the banks of the Georges River indicates that sandy deposits at or below 10 metres Australian Height Datum (AHD) within the Casula-Moorebank section of the Georges River Riparian Corridor are likely to be the result of sedimentation processes that post-date the Liverpool Weir (1836) and as such the archaeological potential of these deposits is limited.

**Figure 5: Predicted areas of sensitivity for Aboriginal archaeology (source: MPW Concept Design EIS Chapter 22 - *Aboriginal Heritage* - pg 88)**



# 5.0 ADDITIONAL INFORMATION FROM THIS ASSESSMENT

Since the time of preparing the MPW Concept Plan EIS and subsequent addendum reporting (NOHC 2014, NOHC Sept 2014, NOHC 2015) MIC has advised that the construction and operational area has changed (Figure 5).

A site visit was conducted as part of this assessment on the 8 June 2016 in order to assess and inspect the additional areas.

Three scar trees identified during previous investigation were also revisited, in order to discuss cultural heritage values and management with RAPs.

The site visit was attended by Alyce Howard from Artefact heritage and representatives of the following registered Aboriginal stakeholder groups:

- TLALC
- GLALC
- CBNTCAC
- DCAC
- Tocomwall

Impacts to this additional area are discussed in Section 7.2.

Another site visit was conducted on 1 July 2016 in order to discuss future management of the scar trees MA6 and MA7. Representatives of the following organisations were on site:

- TLALC
- GLALC
- CBNTCAC
- DCAC
- DACHA

The results of this site visit are detailed in Section 5.2.

## 5.1 Site visit results regarding additions to construction and operational area

Three additional areas have been added to the construction and operational area. Figure 5 illustrates the areas, which are located on the western margin of the study area and protrude into the conservation area.

### 5.1.1 Southern addition to the construction area

The southern addition to the construction area is located on a flat terrace landform on the east bank of the Georges River. The area is approximately 110 metres long and 70 metres wide. Dense vegetation limited physical access and visibility was nil (Plate 1 and Plate 2). As such, it is estimated that less than 10% of the total area was surveyed. Evidence of significant flooding (high rainfalls were experienced earlier that week) was observed across the area. It is likely that this area experiences regular flooding and erosion/deposition of deposits. It was assessed that this area has low potential to contain intact Aboriginal archaeological deposits.

**Plate 1: Dense vegetation within the southern addition (view SW)**

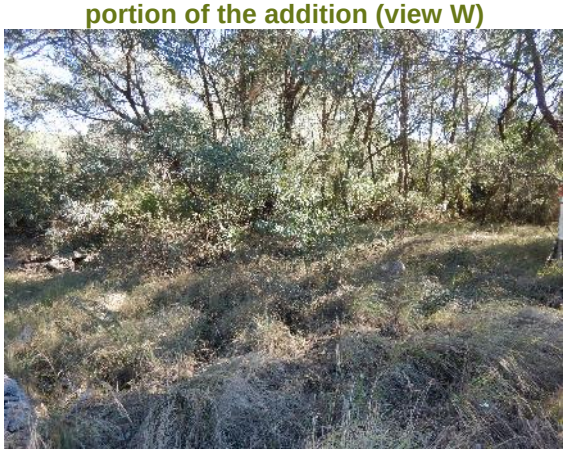
**Plate 2: Dense vegetation within the southern addition (view NW)**

### 5.1.2 Central addition to the construction

The central addition to the construction area is located on a flat terrace landform on the east bank of the Georges River. The area is approximately 180 metres long and 50 metres wide. Vegetation limited physical access in the easternmost extent of the area, and grasses were dense in western portion, resulting in nil visibility (Plate 3 and Plate 4). As such, it is estimated that less than 10% of the total area was surveyed. Evidence of significant flooding (high rainfalls were experienced earlier that week) was observed across the area. It is likely that this area experiences regular flooding and erosion/deposition of deposits. It was assessed that this area has low potential to contain intact Aboriginal archaeological deposits.

**Plate 3: Grasses within the eastern portion of the central addition (view W)**

**Plate 4: Dense vegetation within the western portion of the addition (view W)**



### 5.1.3 Northern addition to the construction area

The northern addition to the construction area is located on a flat terrace landform on the east bank of the Georges River. The area is approximately 170 metres long and 70 metres wide. Dense vegetation limited physical and visibility was close to nil (Plate 3 and Plate 4). The northern addition is located adjacent a cleared area which Glenda Chalker (CBNTCAC) recalls being used for playing fields in the past.

The northern addition is on a comparable elevation to AHIMS site #45-5-4276 and no evidence of flooding was observed in this addition. It is within the area of Tertiary terrace identified by NOHC and was assessed as a sensitive landform (NOHC 2013). Furthermore, this area was not subject to test

excavation during MPW Concept Design investigations. As such, the northern addition to the construction area has been assessed as a PAD, with moderate archaeological potential (Plate 7 and Plate 8).

**Plate 5: Looking at the northern addition from the edge of the cleared area (view W)**

**Plate 6: Dense vegetation within portions of the northern addition (view NW)**

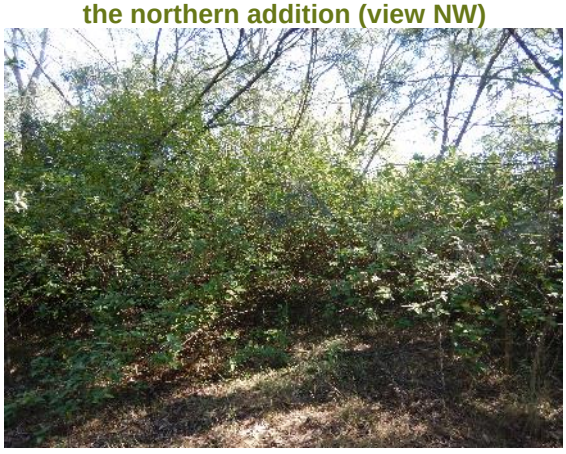


**Plate 7: PAD within the northern addition (view N scale)**

**Plate 8: PAD within the northern addition (view W)**

## 5.2 Results of revisiting scar trees MA6, MA7 and MA8

Potential scar trees MA6, MA7 and MA8 were revisited on 8 June 2016 and 25 July 2016.

### 5.2.1 Results of the 8 June site visit

The survey team was unable to get close to MA8 due to safety reasons. Recent flooding had washed in a large amount of sediment and debris which was unstable and would not support an adult's weight.

MA6 and MA7 were accessible, and found to still be in good condition, as was assessed in NOHC 2015.

There was consensus among stakeholder's recommendations, which state that MA6 and MA7 should be conserved. Scar trees are an increasingly rare cultural resource and are highly significant to the Aboriginal community. It is recommended that a buffer zone, which takes in both the root zone and the canopy of each tree is established. Glenda Chalker (CBNTCAC) noted that old trees naturally drop their limbs from time to time, and she has known this to be used as justification to remove scar trees in the past. As such, a buffer zone wide enough to encompass the trees root zone and keep

people away from falling branches would be necessary, in order to physically protect the tree and also prevent the tree from being a hazard to people.

**Plate 9: MA6 (view E)**

**Plate 10: MA7 (view N)**

### 5.2.2 Results of the 25 July site visit

The proponent's justification for needing to impact the trees was presented to the stakeholders on site. The proponent outlined that the MPW site was to be raised by approximately two metres for purposes of stormwater management and to avoid contaminants and unfavourable ground conditions. Retaining the trees would not be an option in the current concept designs. CBNTCAC noted that this outcome had been expected for some time. It was recommended by TLALC that an option for future management of the trees would be to have an arborist move them to the TLALC property near Thirlmere. The trees would be maintained at the TLALC property, mounted and housed in weather resistant structure, provided all costs of relocation and construction of the housing is covered by the proponent.

All stakeholders on site agreed that relocation of the scar portions of MA6 and MA7 to the TLALC property would be an acceptable management measure for conservation of the trees.

TLALC and GLALC noted that relocation of the trees to the Moorebank conservation area (on the western bank of the Georges River) would not be an acceptable management strategy, as access to the trees would be limited, there is the potential for flood risks and the trees would not be adequately maintained.

All stakeholders were contacted by phone on 5 August 2016 in order to finalise recommendations regarding ongoing management of the scar trees MA6 and MA7. CBNTCAC, TLALC and DALI were unavailable for comment. However, in addition to recommendations presented at the site meeting on the 1 July 2016, DCAC, DLO and DACHA agree that relocation of the scar portions of both trees to the TLALC property would be an acceptable solution. DLO added that all costs should be covered by the proponent, and if this is not the case then no impact should occur and the trees should remain in

situ. Tocomwall noted that items such as scar trees are designed to stay in place for perpetuity and any removal is considered destructive, however, if the trees are to be relocated to the TLALC property they have nothing to add to existing stakeholder recommendations. DLO also added that removal of the scar portions of both trees and relocation should occur with minimal damage to the scar portion.

# 6.0 SIGNIFICANCE SUMMARY

## 6.1 Archaeological significance

Archaeological significance refers to the archaeological or scientific importance of a landscape or area. This is characterised by using criteria such as archaeological research potential, representativeness and rarity of the archaeological resource and potential for educational values. Due to scope constraints of this assessment, archaeological significance is based on the findings of the MPW Early Works approval and subsequent addendum reporting (NOHC 2014, NOHC Sept 2014, NOHC 2015).

Table 6 provides a comprehensive list of all Aboriginal sites and PADs previously recorded in the Proposal site and summarises their archaeological significance.

**Table 6: Summary of archaeological significance**

| Site name | AHIMS number | Site Details | Archaeological significance |
|---|---|---|---|
| **To be salvaged as part of Early Works** | | | |
| MA1 | 45-5-4283 | 3 surface artefacts. Test excavation revealed a low density subsurface artefact scatter and disturbed deposits (NOHC 2014:26) | Low |
| MA2 | 45-5-4273 | Isolated surface artefact in a disturbed context | Low |
| MA3 | 45-5-4274 | Isolated surface artefact in a disturbed context | Low |
| MA4 | 45-5-4275 | 3 surface artefacts in a disturbed context | Low |
| MA5 | 45-5-4276 | 3 surface artefacts, test excavation yielded a moderate density subsurface artefact scatter (NOHC 2014:26). Geomorphological analysis revealed relatively intact deposits (NOHC 2014:2g) | Moderate-high |
| MA9 | 45-5-4280 | Initially identified as a PAD, test excavation yielded a moderate density subsurface artefact scatter. Geomorphological analysis revealed relatively intact deposits (NOHC 2014:26) | Moderate-high |
| **To be salvaged as part of the Proposal** | | | |
| MA6 | 45-5-4279 | Assessed as a culturally modified tree. Identified as part of Early Works approval (NOHC 2014). Subsequent dendrochronological analysis attributed an age of 265-219 years placing the creation of the scar either before or shortly after the arrival of Europeans in Australia (NOCH 2015). | High |
| MA7 | 45-5-4277 | Assessed as a culturally modified tree. Identified as part of MPW Concept Design investigation (NOHC 2014). Subsequent dendrochronological analysis attributed an age of 86 years placing the creation of the scar c. 1928 after the area had been subsumed for military purposed (NOHC 2015). This decreases the likelihood of the scar being of cultural origin. However, RAPs agree that cultural scarring practices continued well into the European occupation period and age does not discount this tree from being culturally modified. | Low (note that cultural significance remains high) |

| Site name | AHIMS number | Site Details | Archaeological significance |
|---|---|---|---|
| MA10 | 45-5-4282 | Initially identified as a PAD, test excavation yielded moderate density subsurface artefact scatter. Geomorphological analysis revealed relatively intact deposits (NOHC 2014:26). Additional excavation in the western portion of the site was undertaken in 2014 (NOHC 2014b). However, the results of additional test excavation have not yet been produced. Furthermore, though this site was addressed in the EIS, it was not included in the MCoA. As such, salvage investigation may be necessary as part of the Proposal. | Low-moderate |
| MA14 | Not registered | Test excavation identified relatively undisturbed artefacts and archaeological deposit within the area of potential. Though this site was addressed in the EIS, it was not included in the MCoA. As such, salvage investigation may be necessary as part of the Proposal. | Moderate to high |
| MPW Stage 2 Terrace PAD | Not registered | Identified during current investigation. Results from excavation of MA10 and MA14 provide enough information to assess significance. | Moderate |
| Tertiary terrace (between MA 10 and MA14) | Not registered | Identified by NOHC. Not fully managed under Early Works as the MPW Concept Plan EIS placed a portion of it within a conservation zone that would not be impacted. | Moderate |
| **Not impacted or managed as part of a separate project** | | | |
| MA8 | 45-5-4278 | Potentially culturally modified tree. Identified as part of MPW Concept Design investigation (NOHC 2014). This tree is located outside of the MPW Stage 2 construction zone and was not assessed further. | Moderate-high |
| MA11 | 45-5-4425 | Surface artefact site and PAD (part of the MAPAD2 complex). Test excavation yielded a low density subsurface artefact scatter in a disturbed context. | Low |
| MA12 | 45-5-4426 | Surface artefact site and PAD (part of the MAPAD2 complex). Test excavation yielded a low density subsurface artefact scatter in a disturbed context. | Low |
| MA13 | 45-5-4427 | PAD site recorded on AHIMS. This site is not discussed in any of the previous reporting by NOHC (2014, 2015) or AHMS (2012, 2015) | Unknown |
| PAD2 | Not registered | Test excavation identified a moderate density subsurface artefact scatter, with intact deposits present beneath an upper layer of fill. The test excavations conducted in the northern area of the PAD did not retrieve any Aboriginal objects (NOHC 2014b).<br><br>AHMS (2015) indicated this site has high research potential. AHMS (2015) excavations targeted the southern margin of the PAD retrieving 28 stone artefacts. OSL Dating retrieved dates of 18, 000 yBP for the lower assemblage and 3-4, 000 yBP for the upper assemblage (AHMS 2015) | High |
| MAPAD2 | 45-5-4281 | Surface artefact site and PAD (part of the MAPAD2 complex). Test excavation yielded a single artefact and relatively intact subsurface deposits. NOHC designated this location as MA13. | Low |

| Site name | AHIMS number | Site Details | Archaeological significance |
|---|---|---|---|
| MRSA3 | N/A | Test excavation did not yield any artefacts (NOHC 2014) – determined not an Aboriginal site | Not a site |
| PAD3 | N/A | Identified as a PAD by AHMS (2012). Test excavation did not yield any artefacts (AHMS 2015) – determined not an Aboriginal site | Not a site |

As test excavation has determined that MRSA3 and PAD3 are not Aboriginal archaeological sites, they will not be listed in further sections of this assessment.

**Sites of low archaeological significance**

The majority of the sites recorded within, or within close proximity to, the Proposal site have been previously assessed to be of low archaeological significance. These sites are MA1, MA2, MA3, MA4, MA11, MA12 and MAPAD2. Following the addendum reporting (NOHC 2015) on the possible age of the scar on MA7 this site has been assessed to be of low archaeological significance.

**Sites of low - moderate archaeological significance**

MA10 has been assessed as having low-moderate archaeological significance.

As discussed in Table 6, though MA10 was addressed in the EIS, it was not included in the MCoA. As such, salvage investigation may be necessary as part of the Proposal.

**Sites of moderate – high and high archaeological significance**

MA5, MA9 and MA14 have been assessed as having moderate - high archaeological significance.

As discussed in Table 6, though MA14 was addressed in the EIS, it was not included in the MCoA. As such, salvage investigation may be necessary as part of the Proposal.

The tertiary terrace formation (including MPW Stage 2 Terrace PAD) has been assessed as being of moderate archaeological significance. Testing completed so far at MA10 and MA14 has shown that archaeological deposits are present and could represent stratified occupation levels, although they are of high density compared to other comparable sites excavated on tertiary terrace landforms (Pitt Town). Enough information has been gathered from testing by NOHC and AHMS to assess the significance of the PAD, therefore additional testing is not required prior to salvage.

**Sites of high archaeological significance**

Ongoing archaeological investigations within the MPW site indicate the potentially high archaeological significance of that site. Further information on the archaeological significance of that site will be available following completion of mitigation measures for the MPW Project.

# 7.0 IMPACT ASSESSMENT

## 7.1 Summary of impacts to identified archaeological sites and PADs

Impacts to identified Aboriginal sites and areas of PAD are detailed in Table 7. This impact assessment is based on the findings of the MPW Concept Plan EIS (Chapter 22 - *Aboriginal Heritage* prepared by Parsons Brinkerhoff and NOHC [2014]) as well as the concept designs and construction zone for the Proposal provided to Artefact Heritage on 28 January and 15 February 2016. These designs are illustrated in Figure 1 and Figure 2.

The Proposal construction area indicates that impacts would occur within the Georges River conservation zone. The Proposal construction area also includes further impacts to the areas of archaeological sensitivity identified by NOHC (2014) associated with the banks of Georges River and associated tertiary terraces (see Figure 5). The impacts to these areas of sensitivity are illustrated in Figure 5.

There are additional impacts associated with the warehouse construction located within the MPW Concept Plan investigation area and the current Proposal site.

**Table 7: Summary of impacts**

| Site name | AHIMS ID | Type of harm | Degree of harm/ staging of impacts | Consequence of harm |
|---|---|---|---|---|
| **To be salvaged as part of Early Works** | | | | |
| MA1 | 45-5-4283 | Direct | Total<br>Early Works | Total loss of value |
| MA2 | 45-5-4273 | Direct | Total<br>Early Works | Total loss of value |
| MA3 | 45-5-4274 | Direct | Total<br>Early Works | Total loss of value |
| MA4 | 45-5-4275 | Direct | Total<br>Early Works | Total loss of value |
| MA5 | 45-5-4276 | Direct | Total<br>Early Works | Total loss of value |
| MA9 | 45-5-4280 | Partial | Partial (portion of extended site boundary within construction area)<br>Early Works | Partial loss of value |
| **To be salvaged as part of the Proposal** | | | | |
| MA6 | 45-5-4279 | Direct | Total<br>MPW Stage 2 Proposal | Total loss of value |
| MA7 | 45-5-4277 | Direct | Total<br>MPW Stage 2 Proposal | Total loss of value |

| Site name | AHIMS ID | Type of harm | Degree of harm/ staging of impacts | Consequence of harm |
|---|---|---|---|---|
| MA10 | 45-5-4282 | Direct | Total<br>MPW Stage 2 Proposal | Total loss of value |
| MA14 | Not registered | Direct | Total<br>MPW Stage 2 Proposal | Total loss of value |
| MPW Stage 2 Terrace PAD | Not registered | Direct | Total<br>MPW Stage 2 Proposal | Total loss of value |
| Tertiary terrace | Not registered | Direct | Partial<br>MPW Stage 2 Proposal | Partial loss of value |
| **Not impacted or managed as part of a separate project** | | | | |
| MA8 | 45-5-4278 | None | None<br>Outside of construction area | No loss of value |
| MA11 | 45-5-4425 | None | None<br>Outside of construction area | No loss of value |
| MA12 | 45-5-4426 | None | None<br>Outside of construction area | No loss of value |
| MA13 | 45-5-4427 | None | None<br>Outside of construction area | No loss of value |
| MAPAD2 | 45-5-4281 | None | None<br>Outside of construction area | No loss of value |
| PAD2 | Not registered | Direct | Total<br>MPE Stage 1 | Total loss of value |

All assessed impacts are associated with the construction phase of the Proposal.

These findings are based on the assumption that all other mitigation measures identified in the MPW Concept Plan EIS, the Aboriginal Heritage Technical Paper prepared for MPW Concept Plan EIS, additional heritage reporting prepared for Early Works Approval, the REMMS and MCoA have been conducted as Early Works. Where any of those tasks have not been completed during Early Works they will need to be addressed prior to construction works commencing.

## 7.2 Additional impacts to identified archaeological sites and PADs

Three additional areas, over and above that assessed for the MPW Concept Plan or Early Works will be impacted by drainage and other related construction works.

It was assessed that the southern and central additions to the construction area have low potential to contain Aboriginal archaeological deposits, and no sites were identified. As such, there are no Aboriginal heritage constraints within the southern and central additions to the Proposal site.

The northern addition to the Proposal site was assessed to have moderate archaeological potential, and was identified as a PAD (MPW Stage 2 Terrace PAD). This PAD will require test excavation in order to determine the nature and extent of potential archaeological deposits.

# 8.0 MANAGEMENT AND MITIGATION MEASURES

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved.

Where unavoidable impacts occur then measures to mitigate and manage impacts are proposed. Mitigation measures primarily concern preserving the heritage values of sites beyond the physical existence of the site. The most common methods of this involve detailed recording of Aboriginal objects, archaeological test and salvage excavations, artefact analysis and, where appropriate, reburial of Aboriginal objects in a location determined by the RAPs.

Mitigation measures vary depending on the assessment of archaeological significance of a particular Aboriginal site and are based on its research potential, rarity, representativeness and educational value. In general, the significance of a site would influence the choice of preferred conservation outcomes and appropriate mitigation measures, usually on the following basis:

- **Low archaeological significance**- Conservation where possible, but usually no mitigation required if impacts are unavoidable.
- **Moderate archaeological significance**- Conservation where possible. If conservation is not practicable, salvage excavations or similar mechanisms determined in consultation with the Aboriginal community may be necessary.
- **High archaeological significance**- conservation as a priority. Only if all practicable alternatives have been exhausted would impacts be considered justified. Comprehensive salvage excavations may be necessary.

## 8.1 Early Works mitigation measures

The findings of this report are based on the assumption that all other mitigation measures identified in the MPW Concept Plan EIS, the Aboriginal Heritage Technical Paper prepared for MPW Concept Plan EIS, additional heritage reporting prepared for Early Works Approval (including the 'Aboriginal Scar Tree Assessment' and the 'Cultural Heritage Report'), the REMMS and MCoA have been conducted during Early Works. Where any of those tasks have not been completed during Early Works they will need to be addressed prior to construction works commencing for the Proposal.

The outstanding mitigation measures which would be addressed by the MPW Stage 2 Proposal are outlined in Section 8.2.

## 8.2 Summary of Proposal management and mitigation measures

Outstanding mitigation measure which would be addressed by the Proposal include:

- Management of scar trees MA6 and MA7
- Staged salvage excavation of MPW Stage 2 Terrace PAD
- Staged salvage excavation of the tertiary terrace (between MA10 and MA14)
- Salvage excavation of MA10
- Salvage excavation of MA14

### 8.2.1 Guiding principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites would be conserved. If conservation is not practical, measures would be taken to mitigate against impacts to Aboriginal sites.

The nature of mitigation measures recommended is primarily based on an assessment of archaeological significance. The recommendations are also informed by cultural significance, which would be discussed with the RAPs.

### 8.2.2 MA6 and MA7

Scar trees are an increasingly rare cultural resource and are significant to the Aboriginal community.

Consultation with stakeholders has reached a consensus that if impacts to the scar trees MA6 and MA7 are unavoidable then the scar portions of both trees should be removed by a qualified arborist and relocated to the TLALC property at Thirlmere. The trees should be mounted and housed in a weather protected structure. All costs associated with the removal, relocation and housing of the trees should be covered by the Proponent.

### 8.2.3 Aboriginal Cultural Heritage Assessment Report (ACHAR)

An ACHAR would be prepared following the Proposal approvals and in accordance with the OEH *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*. The ACHAR would include:

- Details of Aboriginal stakeholder consultation
- An assessment of cultural significance for the project area and identification of any specific areas of cultural significance based on consultation with RAPs (MA6 and MA7)
- A methodology for staged salvage excavation
- Details of mitigation measures relating to MA6 and MA7 (see section 8.2.4 below).

### 8.2.4 Excavation program

Excavation would be required at:

- The newly identified MPW Stage 2 Terrace PAD.
- The un-investigated portion of the tertiary terrace (between MA10 and MA14). As discussed in Section 4.6.4, only small portions of the Tertiary Terrace were investigated as part of NOHC excavation program. The areas tested in Figure 5 are shown as sites in Figure 6. There is a large portion of the tertiary terrace, located between MA14 and MA10, which is inside the construction area yet was not tested by NOHC as part of Early Works investigations.
- MA10. As outlined in Table 6, the NOHC testing program identified a moderate density subsurface artefact scatter and intact deposits.
- MA14. As outline in Table 6, the NOHC testing program identified a moderate density subsurface artefact scatter and intact deposits.

As such, a staged excavation program is recommended. Stage 1 excavation would involve dispersed pits placed along transects within MPW Stage 2 Terrace PAD and the un-investigated portion of the tertiary terrace. Stage 2 would involve open area salvage excavation, targeting the artefact concentrations identified by NOHC at MA10 and MA14, as well as any additional artefact concentrations identified during Stage 1.

Staged salvage excavation would include a procedure for the management of contamination, in case contaminated deposits are identified or suspected during excavation.

A draft excavation methodology should be prepared and forwarded to RAPs for review and comment as part of the ACHAR. The excavation program would commence following review and incorporation of comments from RAPs and finalisation of the methodology. Completion of Stage 1 and Stage 2 excavations would be required following approval and provision of MCoA and prior to construction works commencing.

### 8.2.5 Unexpected finds

The ACHAR would provide a method to manage potential heritage constraints and unexpected finds during construction works. This document would include information on any requirements during construction for:

- Protecting any identified Aboriginal heritage sites in the immediate area during construction activities (such as MA8, MA11 and MA12)
- A procedure to manage reporting and investigation when unexpected finds are encountered.

The Aboriginal cultural heritage assessment report should also incorporate measures and controls to be applied during construction, including but not limited to contractor training in general Aboriginal cultural heritage awareness, and any on-going opportunities for Aboriginal community engagement.

### 8.2.6 Discovery of human remains

If suspected human skeletal remains are uncovered at any time throughout undertaking the proposed works, procedures outlined in the Aboriginal cultural heritage assessment report unexpected finds procedure should be implemented.

### 8.2.7 Changes to the proposed works

This assessment is based upon the most recent information made available to Artefact Heritage as of the date of preparation of this report. Any changes made to the Proposal should be assessed by an archaeologist in consultation with the RAPs. Any changes that may impact on Aboriginal sites not assessed during the current study may warrant further investigation and result in changes to the recommended management and mitigation measures.

### 8.2.8 Ongoing consultation with Aboriginal stakeholder groups

Consultation with RAPs would continue throughout the life of the project, as necessary. Ongoing consultation with RAPs would take place throughout the reburial of retrieved artefacts and in the event of the discovery of any unexpected Aboriginal objects not covered by the project approval.

**Figure 6: Overview of sites salvaged under Early Works and sites requiring consideration during future development stages (source: Arcadis August 2016)**


LEGEND

Requiring consideration during future development stages

- Artefact, PAD
- Modified tree (carved or scarred)
- PAD

Salvaged as part of Early Works

- Artefact
- Artefact, PAD
- PAD
- Managed under MPE project
- Terrace PAD

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Date: 7/09/2016 Path: F:\AA008765\L-GIS\A_Current\B_Maps\EIS\AA008765_EIS_Stage2_Figure16-2_AboriginalHeritageItems_r1v9.mxd
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# 9.0 RECOMMENDATIONS

The following recommendations are based on consideration of:

- Legislative, policy and procedural requirements for the assessment of Aboriginal cultural heritage
- The recommendations of prior investigations, and Aboriginal stakeholder groups as detailed in AHMS (2012) and NOHC (2014)
- The likely impacts of the proposed development.

It was found that there are five outstanding mitigation measures which require management as part of the Proposal:

- Management of scar trees MA6 and MA7
- Staged salvage excavation of MPW Stage 2 Terrace PAD
- Staged salvage excavation of the tertiary terrace (between MA10 and MA14)
- Salvage excavation of MA10
- Salvage excavation of MA14

These findings are based on the assumption that all other mitigation measures identified in the MPW Concept Plan EIS, the Aboriginal Heritage Technical Paper prepared for MPW Concept Plan EIS, additional heritage reporting prepared for Early Works Approval, the REMMS and MCoA have been conducted during Early Works. Where any of those tasks have not been completed during Early Works they will need to be addressed as part of Early Works, prior to construction works commencing.

It is recommended that:

- The scar portions of MA6 and MA7 should be removed by a qualified arborist and relocated to the TLALC property at Thirlmere. The trees should be mounted and housed in a weather protected structure. All costs associated with the removal, relocation and housing of the trees should be covered by the Proponent. Consultation with TLALC regarding the logistics of this mitigation measure are ongoing
- Staged salvage excavation should be conducted as part of the Proposal, in consultation with RAPs. Stage 1 would involve dispersed pits placed along transects within MPW Stage 2 Terrace PAD and the tertiary terrace (between MA10 and MA14). Stage 2 would involve open area salvage excavation, targeting the artefact concentrations identified by NOHC at MA10 and MA14, as well as any additional artefact concentrations identified during Stage 1.
- Where changes are made to the Proposal and areas not assessed by this report or previous reports (NOHC 2014, NOHC Sept 2014, AHMS 2015) are to be impacted, further Aboriginal heritage investigation and consultation should take place.
- An Aboriginal Cultural Heritage Assessment Report (ACHAR) should be prepared as a condition of the Proposal approvals. That document would outline ongoing management/ mitigation measures relating to MA6 and MA7, and any other mitigation measures not conducted during Early Works.
- An unexpected finds procedure should be included in the ACHAR and in place for the construction phase of the Proposal.

- If suspected human remains are located during any stage of the construction works, work should stop immediately and the NSW Police and the Coroner's Office should be notified. The Office of Environment and Heritage, RAPs and an archaeologist should be contacted if the remains are found to be Aboriginal.

# 10.0 APPENDICES

## 10.1 Appendix 1: Work Periods and Activities

| Term | Definition |
|---|---|
| Pre-construction stockpiling | • Establishment of temporary erosion and sediment controls<br>• Minor clearing and grubbing of temporary stockpiling area<br>• Establishment of a temporary stockpiling pad and associated temporary access roads<br>• Installation of temporary construction compound, including amenities and office for bulk earthworks<br>• Importation and stockpiling of approximately 400,000 cubic metres (m3) of clean fill |
| Site preparation activities | • Establishment of construction compound fencing and hoardings<br>• Installation of temporary sediment and erosion control measures<br>• Vegetation clearance<br>• Installation of temporary site offices and amenities<br>• Construction of hardstands for staff parking and laydown areas<br>• Establishment of temporary batch plant sites and installation of batch plant<br>• Construction of access roads, site entry and exit points and security<br>• Set up of construction monitoring equipment |
| Bulk earthworks, drainage and utilities | • Importation, stockpiling and placement of approximately 1,200,000 m3 of imported clean fill (Bulk Earthworks) and raising of the Proposal site to final level<br>• Removal of existing road pavements, as required<br>• Installation of onsite detention basins (OSDs)<br>• Drainage and utilities installation<br>• Establishment of a concrete batching plant |

| Term | Definition |
|---|---|
| Moorebank Avenue intersection works and internal road network | • Relocation, adjustment and/or protection of all affected utilities, services and signage, as required<br>• Establishment of traffic management devices<br>• Installation of erosion and sediment controls<br>• Stripping and stockpiling of topsoil by excavators and trucks<br>• Drainage works<br>• Progressive stabilisation of exposed areas<br>• Compaction of widening areas<br>• Preparation of new lane surfaces<br>• Forming of new kerbs, gutters, medians and other structures<br>• Construction of asphalt and concrete pavement<br>• Landscaping of exposed earthworks areas<br>• New line marking, lighting and sign posting<br>• Removal of construction traffic management and progressive opening of new works to traffic |
| Interstate IMT and Rail link connection construction | • Importation, placement and compaction of engineering fill<br>• Importation and placement of ballast material<br>• Establish formwork and reinforcement for sidings and bridge infrastructure<br>• Placement of concrete, curing and sealing<br>• Installation of permanent ways and rail systems<br>• Installation of permanent access gates, security gatehouse and permanent fencing<br>• Installation of the connection between the Rail link and the IMT sidings<br>• Erection of IMT facility structure – excavation foundation and floor slab construction, structural wall and roof framework, and roofing<br>• Internal fit-out of building with control room, office, workshops, loco-shifter and staff amenities |

| Term | Definition |
|---|---|
| Construction and fit-out of warehousing | • Establishment of construction compound, temporary fencing/ hoardings and temporary sediment and erosion control<br>• Installation of temporary site offices and amenities<br>• Excavation, foundation and floor slab installation<br>• Erection of framework and structural walls<br>• Installation of roof<br>• Internal fit out<br>• Landscaping and surrounds<br>• Preparation of warehouse access road subgrade<br>• Forming of new kerbs, gutters, medians and other structures<br>• Construction of asphalt and concrete pavement<br>• New line marking, lighting and sign posting<br>• Removal of construction traffic management and progressive opening of the internal road and warehouse access roads to traffic |
| Miscellaneous structural construction and finishing works | • Decommissioning/demobilisation of construction sites<br>• Commissioning of operational facilities<br>• Landscaping<br>• Rehabilitation of affected areas<br>• Post-construction condition surveys<br>• Removal of construction environmental controls<br>• Removal of construction ancillary facility related traffic signage |

# 11.0 REFERENCES

AHMS 2012, Aboriginal Cultural Heritage Assessment: SIMTA Moorebank Intermodal Terminal Facility. Report to Hyder Consulting Pty Ltd.

AHMS, 2015. SIMTA Intermodal Terminal Facility – Stage 1: Aboriginal Heritage Impact Assessment, Report to Hyder Consulting Pty Ltd.

Attenbrow, V. 2010. Sydney's Aboriginal Past: Investigating the archaeological and historical records. UNSW Press.

Artefact Heritage. 2016(in draft). PACHCI Stage 2 Cultural Heritage Assessment Report Cambridge Avenue. Report to Roads and Maritime Services.

Bannerman, S. M. & Hazelton, P.A. 1990. Soil Landscapes of Penrith 1:100,000 Sheet. Soil Conservation Service of New South Wales. Sydney.

Boot, P. 1990. Archaeological Survey of Proposed Defence Housing Authority Sub-division at Holsworthy, NSW. Unpublished report to Kinhill Engineers.

Boot, P. 1992. Archaeological Survey of Additions to Defence Housing Authority Subdivision at Wattle Grove Development. Unpublished report to Wattle Grove Development.

Boot, P. 1993. Artefact Scatters at Wattle Grove, NSW. Unpublished report to Wattle Grove Development.

Boot, P. 1994a. Archaeological Survey of Option 3 Land, Defence Housing Authority Subdivision at Wattle Grove, NSW. Unpublished report to Wattle Grove Development.

Boot, P. 1994b. Monitoring of Tree and Topsoil Removal from Artefact Scatters at Wattle Grove, NSW. Unpublished report to Wattle Grove Development.

Bowler, J.M., Johnston, H., Olley, J.M., Prescott, J.R., Roberts, R.G., Shawcross, W., Spooner, N.A. 2003. New Ages for Human Occupation and Climatic Change at Lake Mungo, Australia. Nature. 421: 837-840

Clark, N.R. & Jones, D.C. (eds). 1991. Penrith 1:100,00 Geological Sheet 9030 (New South Wales Geological Survey, Sydney).

Hiscock, P. and Attenbrow, V. 2005. Australia's Eastern Regional Sequence Revisited: Technology and Change at Capertee 3. Oxford: BAR Monograph Series 1397 Archaeopress.

JMcDCHM. 2005. Archaeological salvage excavation of site CG1 (NPWS #45-5-2648), at the corner of Charles and George Streets, Parramatta, NSW. Report for Meriton Apartments Pty Ltd.

JMcDCHM. 2006. Archaeological Salvage Excavation of the Colebee Release Area, Schofields, NSW, Volume 1. Report prepared for Medallist Golf Holdings Pty Ltd.

Karskens, G. 2010. The Colony: A History of Early Sydney. Allen and Unwin, Sydney.

Kayandel Archaeological Services, 2010. The Georges River Estuary, Cultural Heritage Desktop Assessment, Report to SMEC and the Georges River Estuary Management Committee.

Koettig, M and Hughes, P (1983) An Archaeological Survey of the Route of the Proposed Rail Link between East Hills and Glenfield, NSW. Unpublished report to Dames and Moore.

Lampert, R. 1971. Burrill Lake and Currarong: Coastal Sites in Southern New South Wales. Terra Australis 1. Department of Prehistory, ANU: Canberra

Liston, C (1988) The Dharawal and Gandangara in Colonial Campbelltown, New South Wales, 1788-1830. Aboriginal History 12(1): 49-62.

McCarthy, F. D., Brammell, E. and Noone, H. V. V. 1948. The Stone Implements of Australia. Memoirs of the Australian Museum 9: 1-94.

Nanson, G.C., R.W. Young, & E.D. Stockton. 1987. Chronology and Palaeoenvironment of the Cranebrook Terrace (near Sydney) Containing Artefacts More Than 40,000 Years Old. Archaeology in Oceania, 22: 72-78.

Navin Officer Heritage Consultants. June 2014, Moorebank Intermodal Terminal Aboriginal Heritage Assessment. Report prepared for Parsons Brinckerhoff

Navin Officer Heritage Consultants. April 2015, Moorebank Intermodal Terminal Aboriginal Heritage Assessment Addendum-Scar Tree Assessment (MA6 and MA7). Report prepared for Parsons Brinckerhoff

White and McDonald 2010. Lithic Artefact Distribution in the Rouse Hill Development Area, Cumberland Plain, New South Wales. Australian Archaeology. Number 70. June 2010. Pages 29-38.