Review of Environmental Factors

QUEENS WHARF RESERVE ACTIVE TRANSPORT PROJECT CITY OF PARRAMATTA

OCTOBER 2024

Quality Assurance	
PROJECT:	Review of Environmental Factors -
ADDRESS:	198 George Street, Parramatta 2A Noller Parade, Parramatta
Lot/DP:	Lot A DP 959111, Lot A DP 444716, Lot 1 DP 126881, Lot 1 DP 909045, Lot 1 DP 128847, Lot 1 DP 1151643, Lot 2 DP 1151643, Lot 3 DP 1151643 and Lot 1 DP224186
COUNCIL:	City of Parramatta
AUTHOR:	Think Planners Pty Ltd

Document Management			
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BC	BC	Final	15/10/2024

DECLARATION

This Review of Environmental Factors (REF) has been prepared for the City of Parramatta. It assesses the potential environmental impacts of the Queens Wharf Reserve Active Transport Link at 198 George Street, Parramatta and 2A Noller Parade, Parramatta.

This REF has been prepared following the relevant provisions of the *Environmental Planning and Assessment Act 1979* (EPA Act), the *Environmental Planning and Assessment Regulation 2021* (EPA Regulation) and *State Environmental Planning Policy (Transport and Infrastructure) 2021* (Transport and Infrastructure SEPP).

This REF provides an accurate and fair review of the activity concerning its likely environmental impact. It addresses, to the fullest extent possible, all the factors listed in the Guidelines approved under Section 170 of the EP&A Regulation (Guidelines for Division 5.1 Assessments (June 2022) and the *Commonwealth Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Based on the information presented in this REF, it is concluded that by adopting the recommended mitigation measures, there are unlikely to be any significant environmental impacts associated with the activity. Consequently, an Environmental Impact Statement (EIS) is not required.

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Company:	Think Planners Pty Ltd
Date:	15 October 224

Reviewing officer	
I certify that I have reviewed and endorsed the contents of this REF document and, to the best of my knowledge, it is in accordance with the EP&A Act, the EP&A Regulation and the Guidelines approved under clause 170 of the EP&A Regulation, and the information it contains is neither false nor misleading	
Signature	Troy Holbrook
Full name	Troy Holbrook
Position	Senior Open Space & Natural Area Planner
Date	29 November 2024

Determination	
I accept this REF on behalf of the City of Parramatta, as the determining authority, and determine that the Proposal can proceed subject to the assessment carried out within this document.	
Signature	
Full name of Delegated Officer	Terry Johnson
Position	Group Manager Parks and Open Space
Date	9 December 2024

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ABBREVIATIONS

Abbreviation	Description
AEC	Area of Environmental Concern
AHD	Australian Height Datum
AHIP	Aboriginal Heritage Impact Permit
AHIMs	Aboriginal Heritage Information Management System
AIA	Arboricultural Impact Assessment
AMG	Australian Map Grid
BC Act 2016	Biodiversity Conservation Act 2016
BC Regulation	Biodiversity Conservation Regulation 2017
BAM	Biodiversity Assessment Method
CA	Certifying Authority
CM Act	Coastal Management Act 2016
CoP	City of Parramatta
CRA	Conservation Risk Assessment
CLMA	Crown Land Management Act 2016
DPE	Department of Planning and Environment
ESD	Ecologically Sustainable Development
EIS	Environmental Impact Statement
ECMP	Environmental Construction Management Plan
EES	Environment, Energy and Science
EPA	Environment Protection Authority
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2021
EPBC Act (Commonwealth legislation)	Environment Protection and Biodiversity Conservation Act 1999
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence

FM Act	Fisheries Management Act 1994
PLEP 2023	Parramatta Local Environmental Plan 2023
LEP	Local Environmental Plan
LGA	Local Government Area
MNES	Matters of National Environmental Significance
NPW Act	National Parks and Wildlife Act 1974
NPW Regulation	National Parks and Wildlife Regulation 2019
NPWS	National Parks and Wildlife Service (part of EES)
NT Act (Commonwealth legislation)	Commonwealth Native Title Act 1993
OEH	(Former) Office of Environment and Heritage
PECMP	Preliminary Construction Management Plan
Planning Systems SEPP	State Environmental Planning Policy (Planning Systems) 2021
POEO Act	Protection of the Environment Operations Act 1997
Proponent	City of Parramatta
REF	Review of Environmental Factors
RF Act	Rural Fires Act 1997
RFS	Rural Fire Service
BC SEPP	State Environmental Planning Policy (Biodiversity and Conservation) 2021
RH SEPP	State Environmental Planning Policy (Resilience and Hazards) 2021
SEPP	State Environmental Planning Policy
SIS	Species Impact Statement
SRZ	Structural Root Zone
TI SEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
TPP	Tree Protection Plan
WM Act	Water Management Act 2000
WM Regulation	Water Management (General) Regulation 2018

EXECUTIVE SUMMARY

The proposal

Think Planners was commissioned by the City of Parramatta (CoP) to prepare a Review of Environmental Factors (REF) for the proposed upgrading of Queens Wharf Reserve, located along the Parramatta River Foreshore and between the Gas Works Bridge (Harris Street) and Alfred Street. The Park has a frontage to both the Parramatta River, Noller Parade and George Street and is more generally known as 198 George Street, Parramatta and 2A Noller Parade, Parramatta.

The following works are proposed in Queens Wharf Reserve:

- Creation of separated pedestrian and cyclist paths;
- Improved path connections and DDA compliance;
- New tree planting;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works;
- Reconstructed retaining walls; and
- Improved electrical works.

This REF assesses the potential environmental impacts associated with the construction, operation and maintenance of the proposed project at Queens Wharf Reserve. The significance of the impact has been determined, and appropriate mitigation measures have been recommended.

Need for the proposal

In 2016 a REF was prepared for the upgrading of Queen Wharf Reserve; however, the landscape and active transport design has evolved further since this time. This necessitates a new REF to assess the impacts of the updated design and, where necessary, provide mitigation measures.

Proposal objectives

The following key objectives underpin the proposal:

- The creation of separated pedestrian and cyclist paths;

- Improved path connections and compliance with the *Disability Discrimination Act 1992*;
- Enhance biodiversity and tree canopy cover through new tree planting;
- Improved lighting for increased safety of park users;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works;
- Reconstructed retaining walls; and
- Improved electrical works.

The proposed works meet the objectives of the project.

Options considered

The following options were considered:

- **Option 1:** Provision of separated pedestrian and cycle paths and associated works. This option would include the following minor works in addition to the separate pedestrian and cycle paths:
  - New tree planting;
  - Improved lighting for increased safety;
  - Minor landscape and garden bed improvements;
  - Minor civil infrastructure works;
  - Reconstructed retaining walls; and
  - Improved electrical works.
- Option 2 – **do nothing.** This approach is unacceptable as it does not align with the desire to upgrade pedestrian and cycle infrastructure to enhance local and district connectivity or improve park safety and accessibility for all.

  The preferred option (Option 1) would contribute to achieving the proposal objectives.

Site details

The subject site is 198 George Street, Parramatta and 2A Noller Parade, Parramatta. The land subject to this REF is legally described in Table 1 below:

Table 1 Legal address of the site

Address	Lot and DP
198 George Street, Parramatta	Lot A DP 959111, Lot A DP 444716, Lot 1 DP 126881, Lot 1 DP 909045, Lot 1 DP 128847, Lot 1 DP 1151643, Lot 2 DP 1151643, and Lot 3 DP 1151643
2A Noller Parade, Parramatta	Lot 1 DP224186

The subject site is in the City of Parramatta Local Government Area (LGA).

Planning approval pathway

The proposed activity is considered 'development without consent' as the works are consistent with Cl.2.73 (3) of *State Environmental Planning Policy (Transport and Infrastructure) 2021* (TI SEPP).

The works become an 'activity' for Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act) and are subject to an environmental assessment (Review of Environmental Factors).

Statutory consultation

Part 2.2 Division 1 of the TI SEPP identifies when consultation with Council and other public authorities is required. The proposal does not trigger the TI SEPP's consultation requirements under Part 2.2 Division 1.

Environmental impacts

As part of its obligations under Section 5.5 of the EP&A Act, the CoP must consider all matters likely to affect the environment to the fullest extent possible.

Accordingly, this REF has considered a wide range of potential environmental impacts. Where necessary, mitigation measures are proposed to ensure that the impacts of the proposed works are no more than minor.

Justification and Conclusion

The environmental impacts associated with the proposed activity are not likely to be significant. Therefore an Environmental Impact Statement does not need to be prepared or approval to be sought for the proposed activity from the Minister for Planning and Public Spaces under Part 5.1 of the EPA Act.

The project is expected to result in long-term benefits to the Parramatta LGA. It is consistent with the relevant planning strategies developed by State and Local Governments.

Construction activities are expected to result in temporary minor disruption and nuisances to the nearby residents and road users of George Street and Noller Parade and other local roads within the vicinity of the subject site during the construction phase.

However, the proposal will likely provide an overall benefit to the user of Queens Wharf Park and Parramatta River by providing separated pedestrian and cyclist networks to the Parramatta CBD and surrounding area. In addition, the proposed landscaping will improve the amenity of the reserve, increasing its desirability for use and enhancing the safety of a key riverfront area of public space. Furthermore, the work will ensure that the CoP provides an access network that meets the community's needs, particularly those with a disability.

This REF has outlined several processes and mitigation measures that will be implemented to ensure that the scope of works does not result in adverse environmental impacts on the community and the environment. If adverse impacts arise, the measures outlined in the REF will be used to contain and mitigate any significant impacts.

Accordingly, this REF concludes that the proposal is consistent with the Strategic and Statutory planning objectives, the environmental characteristics of the site, the surrounding context and the principles of Ecologically Sustainable Development (ESD)

On this basis, it is recommended that the CoP approve the proposed activity under Part 5 of the EPA Act. It is subject to the adoption and implementation of matters outlined in Chapter 8 of this REF.

1. INTRODUCTION

PROPOSAL IDENTIFICATION

The City of Parramatta (CoP) proposes undertaking the George Street East Active Transport Project within Queens Wharf Reserve, Parramatta. The proposed works are permitted without consent under Division 12 Parks and other Public Reserves, Cl.2.73 of the State Environmental Planning Policy (Transport and Infrastructure) 2021 (TI SEPP).

The proposed works will provide improved active transport links through Queens Wharf Reserve. This is expected to deliver long-term positive benefits to all users of the subject site. In addition, the proposed landscaping will improve the amenity of the reserve, increasing its desirability for use and enhancing the safety of a key riverfront area of public space. Furthermore, the work will ensure that the CoP provides a network that meets the community's needs, particularly those with a disability.

Think Planners Pty Ltd has prepared this Review of Environmental Factors (REF) on behalf of CoP to determine the environmental impacts of the proposed works. For these works, COP is the proponent and the determining authority under Part 5 of the Environmental Planning and Assessment Act 1979 (EP&A Act).

The purpose of this REF is to describe the proposal, document the likely impacts of the proposal on the environment and detail protective measures to be implemented to mitigate impacts.

The description of the proposed works and associated environmental impacts have been undertaken in the context of section 171(1) of the Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) and the Australian Government's Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The assessment contained within the REF has been prepared to have regard to the following:

- Whether the proposed activity is likely to have a significant impact on the environment and, therefore, the necessity for an EIS to be prepared and approval to be sought from the Minister for Planning under Part 5.1 of the EP&A Act; and

- Whether the activity is likely to significantly affect threatened species, populations, ecological communities or their habitats, and therefore requires an SIS and/or BDAR.

- The potential for the proposal to significantly impact Matters of National Environmental Significance (MNES) on Commonwealth land. This could require a referral to the Australian Government Department of Environment and

Energy for a decision by the Commonwealth Minister for the Environment on whether assessment and approval are required under the EPBC Act.

The REF helps fulfil section 5.5 of the EP&A Act, which requires that the CoP examine and consider to the fullest extent possible, all matters affecting, or likely to affect, the environment because of the proposed activity.

This REF has been prepared under the Department of Planning and Environment's (DPE) Guidelines for Division 5.1 Assessments (June 2022).

PROPOSAL IDENTIFICATION, NEED + ALTERNATIVES

The scope of works associated with this REF includes constructing new active transport pathways and landscaping. The scope of the works related to this REF includes but is not limited to the following:

- Creation of separated pedestrian and cyclist paths;
- Improved path connections and DDA compliance;
- New tree planting;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works;
- Reconstructed retaining walls; and
- Improved electrical works.

An overview of the alternatives, and an identification of the preferred alternative, for the Proposal are provided in the table below.

Table 2 Overview of options

Alternative description	Strengths + Weaknesses	Preferred Option
Do Nothing	A do-nothing scenario would involve no changes or upgrades to the existing pathways and associated infrastructure in Queens Wharf Reserve. This approach is unacceptable as it does not align with the desire to upgrade pedestrian and cycle infrastructure to enhance local and district connectivity.	
George Street East Active Transport Project	Provision of separated pedestrian and cycle paths and associated works. This option would include the following minor works in addition to the separate pedestrian and cycle paths: - New tree planting; - Improved lighting for increased safety; - Minor landscape and garden bed improvements; - Minor civil infrastructure works; - Reconstructed retaining walls; and	✓

- Improved electrical works.

The preferred option takes into consideration the principles of ESD by:

- The proposed activity will be undertaken with the precautionary principle to ensure that serious or irreversible environmental damage is avoided.
- Providing inter-generational equity by protecting the environment's health, diversity and productivity.
- There is no negative impact on the broader environment's biological diversity or ecological integrity.
- The proposed activity will encourage the use of public spaces, enhancing the safety and quality of these spaces.
- The proposed activity will contribute to increased canopy cover within the LGA.
- The proposed activity will encourage active transport modes through an upgraded and connected network, offering a choice other than private vehicles.

2. SITE ANALYSIS + DESCRIPTION

THE SITE

The project is located in the Queens Wharf Reserve. The Parramatta River bounds the site to the north, Alfred Street to the east, George Street and Noller Parade to the south, and the Gasworks Bridge to the west (Figure 1). The Parramatta Light Rail runs along the George Street frontage of Queens Wharf Reserve.

Aerial maps (Figures 1 and 2) illustrate the development site and its immediate and broader local context below.

Figure 1: Aerial Map of Subject Site (Source: Spatial Viewer 2023)[1]

Set on the southern bank of the picturesque Parramatta River, the subject site provides a range of active and passive recreational opportunities. It includes diverse public infrastructure, Aboriginal art sculptures and war memorials. The park is historically significant, being part of the Parramatta Heritage Walk. The park has an open canopy structure with stands of mature trees within a grassed parkland setting. Dispersed

[1] The scope of works includes an on-road cycleway on Noller Parade, along with a pedestrian crossing and cycle crossing at River Road West. The project brief dated 9 December 2021 notes the following regarding works in the Noller Parade road reserve*: "The proposed on-road portion of the works can therefore be undertaken as 'exempt development and no REF is required".*

stands of mangrove trees are evident along the riverbank, along with historical disturbance to form sandstone walls. Trees within the park provide good canopy cover and shade for people using the pathways and other facilities of the park. It is noted that CoP records indicate that mature trees within the park were planted around the 1960s, indicating an ongoing management and beautification process of this area.

The site is located to the east of the Parramatta CBD and within close proximity to major roads, including Hassall Street (south), James Ruse Drive (east), Victoria Road (to the north) and O'Connell Street to the west. Improved active transport linkages will provide a safe and efficient journey into the Parramatta CBD or other areas of local interest, including Parramatta Park and Parramatta Stadium. Outside the immediate vicinity of Parramatta, improved linkages ultimately provide active transport connections to Sydney, Olympic Park and beyond.

The site is described in the table below.

Table 3 Site details

Site description	
Address	198 George Street, Parramatta and 2A Noller Parade, Parramatta
Legal Description	Lot A DP 959111, Lot A DP 444716, Lot 1 DP 126881, Lot 1 DP 909045[2], Lot 1 DP 128847, Lot 1 DP 1151643, Lot 2 DP 1151643, and Lot 3 DP 1151643 and Lot 1 DP224186
Owner/s	City of Parramatta
Heritage (PLEP 2023 reference numbers)	I011 Wetlands, Parramatta River, Local Significance I546 Gasworks Bridge, Local Significance I547 HMAS Parramatta shipwreck and memorials, State Significance I548 Queen's Wharf Reserve and stone wall and potential archaeological site, Local Significance

[2] Lot 1 DP 909045 is Crown land reserved for 'public recreation' with the CoP the manager

Figure 2: The indicative location of the site is identified in blue outline (Source: Think Planners)

Figure 3: Representative character of the subject site (Source: CoP)

Figure 4: Representative character of the subject site (Source: Extent Heritage)

Figure 5: Representative character of the subject site, with Gasworks bridge (left) and HMAS Parramatta memorial (right). (Source: Extent Heritage)

Figure 6: Representative character of the subject site, showing paths, Aboriginal Art, seating and landscape character (Source: Google Streetview)

SITE CONSIDERATIONS + CONSTRAINTS

Section 10.7 Planning Certificate No. 2023/4098 dated 21 June 2023 and Planning Certificate No. 2023/4094 dated 21 June 2023 (Appendix H) identifies that the site is located within the RE1 Public Recreation Zone under the Parramatta LEP 2023. The relationship between the proposal and PLEP 2023 is discussed in Chapter 4 of this REF. Tables 4 and 5 summarise the key considerations of the 10.7 Planning Certificate for the site.

Table 4 10.7 Certificate 2023/4098, 198 George Street, Parramatta

Affectation	Yes	No
Critical habitat		✓
Conservation area		✓
Item of environmental heritage	✓	
Proclaimed to be in a mine subsidence district		✓
Affected by a road widening or road realignment		✓
Affected by a planning agreement		✓
Affected by a policy that restricts development of land due to the likelihood of landslip		✓
Affected by bushfire, tidal inundation, subsidence, acid sulphate or any other risk	✓ **Note 1**	
Affected by any acquisition of land provision		✓
Biodiversity certified land or subject to any bio-banking agreement or property vegetation plan		✓
Significantly contaminated		✓
Subject to flood related development controls	✓ **Note 2**	
Aboriginal Heritage – High Sensitivity	✓ **Note 3**	
Coastal Wetlands	✓ **Note 4**	

Note 1: The Planning Certificate notes that the lot is identified as Class 4 on the Acid Sulfate Soils Map
Note 2: The land is affected by a 100 year Average Recurrence Interval flood as indicated by Council's current flooding information.
Note 3: The Planning Certificate notes the potential to contain items of Aboriginal heritage.
Note 4: Mapping associated with Chapter 2 Coastal management of State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 identifies the land as containing Coastal Wetlands and/or is within a Proximity Area for Coastal Wetlands.

Table 5 10.7 Certificate 2023/4094, 2A Noller Parade, Parramatta

Affectation	Yes	No
Critical habitat		✓
Conservation area		✓
Item of environmental heritage	✓	
Proclaimed to be in a mine subsidence district		✓
Affected by a road widening or road realignment		✓
Affected by a planning agreement		✓
Affected by a policy that restricts development of land due to the likelihood of landslip		✓
Affected by bushfire, tidal inundation, subsidence, acid sulphate or any other risk	✓ **Note 1**	
Affected by any acquisition of land provision		✓
Biodiversity certified land or subject to any bio-banking agreement or property vegetation plan		✓
Significantly contaminated		✓
Subject to flood related development controls	✓ **Note 2**	
Aboriginal Heritage – High Sensitivity	✓ **Note 3**	
Coastal Wetlands	✓ **Note 4**	

Note 1: The Planning Certificate notes that the lot is identified as Class 4 on the Acid Sulfate Soils Map
Note 2: The land is affected by a 100 year Average Recurrence Interval flood as indicated by Council's current flooding information.
Note 3: The Planning Certificate notes the potential to contain items of Aboriginal heritage.
Note 4: Mapping associated with Chapter 2 Coastal management of State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 identifies the land as containing Coastal Wetlands and/or is within a Proximity Area for Coastal Wetlands.

3. PROPOSED ACTIVITY

OVERVIEW

This REF aims to assess all matters affecting or likely to affect the environment through the proposed works at Queens Wharf Reserve under Part 5 of the EP&A Act. The works being considered under this REF are primarily illustrated on the concept plans prepared by the CoP and attached to this REF. The plans identify the following works:

- Creation of separated pedestrian and cyclist paths;
- Improved path connections;
- Removal of trees and replacement with new tree planting;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works;
- Reconstructed retaining walls; and
- Improved electrical works.

The proposal will provide a separate pedestrian and cycle connection uninterrupted from Alfred Street to Harris Street along the river foreshore. This will enhance access to the Parramatta River, City Centre and local and regional destinations. The concept plans prepared by the CoP are included in Appendix A, with the design shown in Figure 7.

Figure 7: Concept Design (Source: City of Parramatta)

CONSTRUCTION ACTIVITIES

The works are considered short-term, with less than one year of construction. The table below provides a summary of the construction activities that are anticipated to facilitate the proposal.

Table 6 Anticipated construction activities

Construction activity	Description
Commencement date	1st quarter 2025
End date	3rd quarter 2025
Work hours and Duration/ construction	The following standard hours of operation related to the construction works will apply: - Monday to Friday: 7:00am to 6:00pm - Saturday: 8:00am to 1:00pm - Sunday and Public Holidays: No work
Ancillary facilities	As per the Construction Management Plan in place
Plant equipment	As per the Construction Management Plan in place. The following equipment is anticipated (but is not exhaustive): - Handheld jack hammer - Concrete saw - Power hand tools - Hand tools - Elevated Work Platforms (Scissors and Booms) - Forklifts/telehandlers - Delivery trucks (concrete, asphalt, building materials) - Dump truck - Heavy Roller if required - Excavator if required
Work method	At this stage the detail of the work method is limited and will be informed during the construction planning phase. We expect, however the construction methodology to address the following items: - Site establishment basic amenities/ facilities for workers; - Erosion and sediment control measures; - Tree protection fencing and exclusion zones; - Traffic control measures; - Placement and concentration of pavement materials;

	- Stockpile sites that consider the distance from waterways, heritage and other sensitive areas; - Provision of utility adjustments; and - Removal, treatment and disposal of contaminated materials, including acid sulfate soils, within the work area.
Source and quantity of materials	The Principal Contractor will prepare a detailed Construction Waste Management Plan (CWMP) before the commencement of works to ensure maximising the sorting and recycling of waste materials associated with works. The CWMP is to be approved by the CoP before works commence.
Traffic management and access	Appointed contractor to define control measures in a Construction Traffic Management Plan prepared in accordance with Councils and TfNSW requirements. Signs advising of the proposed works and changes to traffic conditions, as well as areas under construction, should be visibly placed around the area of works.
Stormwater management	As per the Construction Management Plan and Stormwater Management Plan.

ONGOING OPERATIONS

Once the activities are completed, Queens Wharf Reserve will continue to operate in its existing manner.

ANCILLARY FACILITIES

Not applicable.

4. STATUTORY FRAMEWORK

ACTIVITY DESCRIPTION UNDER TI SEPP

Section 4.1 of the EP&A Act states that if an EPI provides that development may be carried out without the need for development consent, a person may carry out the development, under the EPI, on land to which the provision applies. However, an environmental assessment of the development is required under Part 5 of the Act.

The TI SEPP seeks to facilitate effective infrastructure delivery across the State. Part 2.3, Division 12 of TI SEPP, outlines the approval requirements for parks and other public reserves.

A ***public reserve*** *has the same meaning as it has in the Local Government Act 1993, but does not include a Crown reserve that is dedicated or reserved for a public cemetery.*

The proposed activity is without consent being consistent with CL.2.73 of TI SEPP. It is accordingly able to be carried out by the CoP.

Under Part 5 of the EP&A Act, the proposed works are identified as an 'activity'. They are accordingly subject to an environmental assessment (REF). The proposal is considered an 'activity' per Cl.5.1 of the EPA&Act because the 'carrying out of a work' is explicitly referenced under the definition of 'activity' in clause 5.1(d).

Under provisions of the TI SEPP, Table 5.1 identifies the activity proposed to be undertaken on the subject site.

Table 7 TI SEPP description of works

Division and Section within TI SEPP	Description of Works
Part 2.3 General Division 12 Parks and other public reserves Cl.2.72 Definitions	***public reserve*** *has the same meaning as it has in the Local Government Act 1993, but does not include a Crown reserve that is dedicated or reserved for a public cemetery.* Queens Wharf Reserve is a public reserve within the meaning of the LGA 1993.
Part 2.3 General Division 12 Parks and other public reserves Cl.2.73 Development permitted without consent	*3) Any of the following development may be carried out by or on behalf of a public authority without consent on land owned or controlled by the public authority—* *a) development for any of the following purposes—* *i) roads, pedestrian pathways, cycleways, single storey car parks, ticketing facilities, viewing platforms and pedestrian bridges,*

ii) recreation areas and recreation facilities (outdoor), but not including grandstands,

iii) visitor information centres, information boards and other information facilities,

iv) lighting, if light spill and artificial sky glow is minimised in accordance with the Lighting for Roads and Public Spaces Standard,

v) landscaping, including landscape structures or features (such as art work) and irrigation systems,

vi) amenities for people using the reserve, including toilets and change rooms,

vii) food preparation and related facilities for people using the reserve,

viii) maintenance depots,

ix) portable lifeguard towers,

b) environmental management works,

c) demolition of buildings (other than any building that is, or is part of, a State or local heritage item or is within a heritage conservation area).

Note—
The term building is defined in the Environmental Planning and Assessment Act 1979 as including any structure.

The proposed works are consistent with Cl.2.73 (3) (a) (i) and (v) and accordingly are 'permitted without consent' under the TI SEPP.

TISEPP consultation is discussed within section 6 of this REF.

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

The provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) do not affect the proposal as it is not a development that takes place on or affects Commonwealth land or waters. Further, it is not a development carried out by a Commonwealth agency, nor does the proposed development affect any matters of national environmental significance. An assessment against the EPBC Act checklist is provided in the table below.

Table 8 EPBC Act 1999 checklist

Consideration	Yes/ No
The activity will not have any significant impact on a declared World Heritage Property?	No
The activity will not have any significant impact on a National Heritage place?	No
The activity will not have any significant impact on a declared Ramsar wetland?	No
The activity will not have any significant impact on Commonwealth listed threatened species or endangered community?	No
The activity will not have any significant impact on listed migratory species?	No
The activity does not involve nuclear actions?	No
The activity will not have any significant impact on Commonwealth marine areas?	No
The activity will not have any significant impact on Commonwealth land?	No
The activity does not relate to a water resource, a coal seam gas development or large coal mining development?	No

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

Duty to Consider Environmental Impact

Part 5 of the EP&A Act applies to activities permissible without consent and generally carried out by a public authority. Activities under Part 5 of the EP&A Act are assessed and determined by a public authority, referred to as the determining authority. The CoP is the proponent and determining authority for the proposed works.

To satisfy the objects of the EP&A Act relating to the protection and enhancement of the environment, a determining authority, in its consideration of activity, shall, notwithstanding any other provisions of the Act or the requirements of any other Act or any instrument made under the EP&A Act or any other Act, examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment because of that activity (refer to sub-section 1 of section 5.5 of the EP&A Act).

Section 171 of the EP&A Regulation defines the factors which must be considered when assessing the likely impact of an activity on the environment under Part 5 of the EP&A Act. This is set out in the Department of Planning and Environment's Guidelines for Division 5.1 assessments – June 2022[3], which references factors to be considered under section 171(2) of the EP&A Regulation.

The table below demonstrates the effect of the proposed development activity on the matters listed for consideration in sub-section 3 of section 5.5 of the EP&A Act.

Table 9 Activity effect on any wilderness area

Consideration	Yes/ No
Sub-section 3: Without limiting subsection 1, a determining authority shall consider the effect of any activity on any wilderness area within the meaning of the Wilderness Act 1987) in the locality in which the activity is intended to be carried on.	No
Note: If a biobanking statement has been issued regarding a development under Part 7A of the Threatened Species Conservation Act 1995, the determining authority is not required to consider the impact of the activity on biodiversity values.	

ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 2021

As stated above, Section 170 of the EP&A Regulation defines the factors which must be considered when assessing the likely impact of an activity on the environment under Part 5 of the EP&A Act. This is set out in the Department of Planning and

[3] Where necessary the DPE Guideline has been updated to reflect EPA+A Regulation amendments.

Environment's Guidelines for Division 5.1 assessments – June 2022, which references factors to be considered under section 171(2) of the EP&A Regulation. These requirements are considered in Chapter 6 of this REF.

OTHER NSW LEGISLATION

The following table lists any additional legislation that must be considered if it applies to the proposed activity.

Table 10 Assessment against additional NSW Legislation

Additional legislation		
State Legislation	**Assessment comment**	**Relevant**
Rural Fires Act 1997	*Is the site identified on the Bushfire Prone Land Map?* Not identified on the Bushfire Prone Land Map	**N/A**
Biodiversity Conservation Act 2016	*Does the site contain any critical habitat, threatened species, ecological population, or community?* Part 7 of the Biodiversity Conservation Act 2016 (BC Act) sets out the requirements for biodiversity assessment and approvals under the EP&A Act. For Part 5 of the EP&A Act, an activity is to be regarded as likely to significantly affect the environment if it is expected to affect threatened species significantly. A desktop study (2016) has revealed that no threatened species, population or ecological communities or their habitats are located within the subject area. A review of the SEED Catalogue (2023) has not identified threatened species on the subject site. Mangroves located outside the work area and along the banks of the Parramatta River do provide potential habitat. However, these are located outside of the proposed work area. The subject site is within a proximity area for coastal wetlands (Figure 15). A management strategy can be prepared to mitigate any potential impacts of construction works on mangrove habitat.	**Yes** Refer to Chapters 6 + 7
Water Management Act 2000	*Are the works within 40 metres of a watercourse?* The works are within 40 m of the Parramatta River. The proposal does not trigger the	Yes

	requirements of the Water Management Act 2000. A public authority is exempt from the requirements to obtain a controlled activity approval under Cl.41 of the Water Management (General) Regulation 2018.	Refer to Chapters 6 + 7
Contaminated Land Management Act 1997	*Is the site listed on the register of contaminated sites?* A search of the Contaminated Land Record Notices on the EPA website does not identify the subject site as contaminated. Likewise, 10.7 Planning Certificates do not identify records on land contamination. Environmental Investigation Services have assessed the potential for contamination on the site. The preliminary assessment identified the potential for contamination, and the underlying soil conditions should be tested. This is to ensure that any soil disposed can be classified as virgin excavated natural material. Measures to address contamination, including unexpected finds can be included as a mitigation measure associated with this REF.	**Yes** Refer to Chapters 6, 7 + 8
Heritage Act 1977	*Any impacts on local or State or national heritage? If any assessment provided, note where.* Queens Wharf Reserve comprises Archaeological Management Unit 2895. This AMU is identified to be of state significance with exceptional archaeological significance related to an early river landing c. 1790 and the Australian Gas Light Company c. 1870s. The reserve also contains the HMAS Parramatta Shipwreck and Memorials, being listed on the State Heritage Register.	Yes Refer to Chapters 6, 7 + 8
Roads Act 1993	*Any works to a public road, or pumping of water onto a public road, or involve the connection of a road to a classified road?* The site contains unformed portions of road within Queens Wharf Reserve. New works within this area, including the removal of trees, will require approval under the Roads Act 1993	Yes Refer to Chapters 6, 7
Protection of the Environmental Operations Act 1997	The POEO Act aims to protect, restore and enhance the quality of the environment in NSW. Under Section 48 of the POEO Act, the carrying out of scheduled activities requires a	**N/A**

	licence, with Schedule 1 identifying the scheduled uses. The proposed works are not a scheduled activity under Schedule 1, and accordingly, a licence is not required.	
Waste Avoidance and Resource Recovery Act 2001	This legislation seeks to encourage the most efficient use of resources and to reduce environmental harm following the principles of ecologically sustainable development and to ensure that resource management options are considered against the following hierarchy (1) avoidance of resource consumption where it is unnecessary, (2) resource recovery and reuse, (3) and disposal. The proposal will include a waste management strategy to address this legislation.	**Yes** Refer to Chapters 6, 7 + 8
Local Government Act 1993.	The reserve is categorised as Community Land (Park) under this Act. *The core objectives for management of community land categorised as a park are —* *a) to encourage, promote and facilitate recreational, cultural, social and educational pastimes and activities, and* *b) to provide for passive recreational activities or pastimes and for the casual playing of games, and* c) *c) to improve the land in such a way as to promote and facilitate its use to achieve the other core objectives for its management* The proposed activity is consistent with the core objectives for managing community land described above.	**Yes**
Disability Discrimination Act 1992	The reserve upgrade will include accessible pathways, which is a key objective of the project. Further, the separation of cyclists and pedestrians will improve the safety of the pathway network, along with offering pathways that better meet the needs of all users.	**Yes** Refer to Chapters 6, 7

Crown Land Management Act 2016	The Crown Land Management Act 2016 (CLMA) provides a framework for the ongoing care and management of Crown Reserves in NSW. It applies to the NSW Government, local councils and members of the community, with the following objectives relevant: - *provide for the ownership, use and management of Crown land of NSW* - *provide clarity concerning the law applicable to Crown land* - *provide for the management of Crown land having regard to the principles of Crown land management* - *provide for the consistent, efficient, fair and transparent management of Crown land for the benefit of the people of NSW* - *require environmental, social, cultural heritage and economic considerations to be taken into account in decision-making about Crown land* - *facilitate the use of Crown land by the Aboriginal people of NSW because of the spiritual, social, cultural and economic importance of land to Aboriginal people and, where appropriate, to enable the co-management of dedicated or reserved Crown land.* Queens Wharf Reserve contains a small parcel of Crown land (Lot 1 DP 909045) and includes a small portion of the existing pathway. The land is reserved for 'public recreation' with the CoP responsible for its management. The proposed works are consistent with Councils obligations under the CLMA.	**Yes**
National Parks and Wildlife Act 1974	Amongst other matters, an important element of the NPW Act 1974 is the legislative protection for Aboriginal heritage in NSW. The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Aboriginal Archaeological Test Excavation Report, prepared by Extent People Centred Heritage, dated April 2024 are to be implemented.	**Yes** Refer to Chapters 6, 7 + 8
Biosecurity Act 2015	The DPI biosecurity risk weed declarations for the City of Parramatta list numerous weed species. The Arboricultural Impact Assessment did not identify any noxious trees within the subject site. However, if any noxious weeds are discovered, these must be removed and	**N/A**

	disposed of by Council representatives appropriately.	
Coastal Management Act 2016	The Coastal Management Act 2016 seeks to improve how hazards are identified, assessed and resolved within coastal development. In doing so, it aims to protect the coastal and marine environments, ensuring they can continue to be enjoyed by future generations. The Coastal Management Act 2016 applies to the subject site as it is identified within the BC SEPP 2021 maps.	**Yes** Refer to Chapters 6 + 7
Fisheries Management Act 1994	The FM Act aims to conserve fish stock and habitat and conserve threatened ecological communities of fish and marine vegetation. In doing so, the FM Act seeks to apply the principles of ecologically sustainable development to conserve the biological diversity of marine environments. The proposed works are located near the Parramatta River, which contains mangrove habitat, an important vegetation community and a habitat for fish and other marine life. The proposed works will not have any impacts on either the Parramatta River or fish habitat. Mitigation measures associated with sedimentation and stormwater management will appropriately protect the waterway and associated habitat during construction works.	**Yes**
State Environmental Planning Policies	Assessment Comment	
State Environmental Planning Policy (Biodiversity and Conservation) 2021	The Biodiversity and Conservation SEPP provide the framework for protecting and managing the natural environment. In doing so, the SEPP aims to protect health, wellbeing, cultural identity and long term economic security. <u>Chapter 2 Vegetation in non-rural areas</u> This chapter seeks to protect the biodiversity values of trees and other vegetation in non-rural areas of the State and to preserve the amenity of the State through the appropriate preservation of trees and other vegetation. An arboricultural impact assessment report has been prepared and is included as	**Yes** Refer to Chapters 6, 7 + 8

	Appendix D of this REF. Of the 74 trees potentially impacted by the proposed activity, the Arboricultural Impact Assessment identified 64 trees that could be impacted through works encroaching within the tree protection zone. Along with mitigation measures, this is discussed in Chapters 6, 7 and 8. Chapter 6 Water catchments The subject site is identified as within the Foreshores and Waterways Area. The proposed works are not identified on the Foreshores and Waterways Area – Zone Map.	
State Environmental Planning Policy (Resilience and Hazards) 2021	Chapter 2 Coastal management Chapter 2 supports the CM Act by facilitating a coordinated approach to planning within the coastal area. This is achieved through managing development within the coastal zone, protecting environmental assets, creating a framework to guide decision making and mapping the four coastal management areas. The subject site is identified on the Coastal Wetlands and Littoral Rainforest Area Map (Figure 15). This map describes it as a within a proximity area for coastal wetlands. The proposed works within Queens Wharf Reserve will not significantly impact the matters identified in Cl.2.8 of the CH SEPP, with mitigation measures during construction ensuring that the mangrove habitat is suitability protected from sedimentation or water runoff from the construction site. It is noted that the proposed activity is permitted without consent under the TI SEPP. The proposed activity is on land identified on the Coastal Environment Area Map. The proposed activity is consistent with the requirements outlined in Cl.2.10 of the RH SEPP, noting that the proposed activity is permitted without consent under the TI SEPP. In addition to mitigation measures to ensure that the environmental assets within the subject site and nearby are appropriately managed, the REF has undertaken archaeological investigations for Aboriginal Cultural Heritage. This process ensures that the proposal will have no detrimental impact	**Yes** Refer to Chapters 6, 7 + 8

		on land identified on the Coastal Environment Area map. The subject site is located in the Coastal Use Area. The proposal is consistent with the requirements of Cl.2.11, noting that the proposed activity is permitted without consent under the TI SEPP. <u>Chapter 4 Remediation of land</u> Chapter 4 provides a state-wide planning approach for the remediation of land and aims to promote the remediation of contaminated land to reduce the risk of harm to human health or the environment. Chapter 4 requires the determining authority to consider the possibility of contamination and the suitability of proposed land uses on contaminated land. The potential for contamination on the site has been assessed by Environmental Investigation Services (Appendix E). The preliminary assessment identified the potential for contamination, and the underlying soil conditions should be tested. This is to ensure that any soil disposed of the site can be classified as virgin excavated natural material. Measures to address contamination, including unexpected finds, can be included as a mitigation measure associated with this REF.	
State Environmental Planning Policy (Transport and Infrastructure) 2021		Chapter 2 of the TI SEPP aims to facilitate the effective delivery of infrastructure across NSW and streamline the delivery of necessary services and infrastructure to communities through establishing alternate planning mechanisms and approval pathways. Several divisions of the TISEPP are aimed at streamlining the delivery of infrastructure carried out by, or on behalf of, a public authority. In this instance, the CoP is this REF's proponent and determining authority. The proposed works may be carried out without development consent under Cl.2.73 of the TI SEPP (as discussed in Table 6) and therefore is an 'activity' under Part 5 of the EPA Act.	Yes

	Consultation requirements under the TI SEPP are discussed in Chapter 5.	
Parramatta Local Environmental Plan 2023	**Assessment Comment**	**Compliant**
Cl.2.1 Land use Zone	Under the Parramatta Local Environmental Plan 2023 (PLEP 2023), the site is zoned Public Recreation (RE1). The TI SEPP removes the requirement to seek consent under the provisions of the PLEP 2023; however, a brief analysis is below.	Yes
CL.2.3 Zone objectives	The site use remains the same, and the proposal is accordingly consistent with the relevant objectives of the zone.	Yes
Cl.4.3 Height of Buildings	No building height applies	N/A
Cl.4.4 Floor Space Ratio	No FSR applies	N/A
Cl.5.10 Heritage	The following heritage items are located on site: - **I011**: Wetlands, Parramatta River, Local Significance - **I546:** Gasworks Bridge, Local Significance - **I547:** HMAS Parramatta shipwreck and memorials, State Significance - **I548:** Queen's Wharf Reserve and stone wall and potential archaeological site, Local Significance The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Historical Archaeological Post Excavation Report, prepared by Extent People Centred Heritage, dated April 2024 are to be implemented. In addition to the above, the site is also located on the site is identified as "High Sensitivity" on the Aboriginal Sensitivity Map within Appendix 11 of Parramatta DCP 2011 The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Aboriginal Archaeological Test Excavation Report, prepared by Extent People Centred Heritage, dated May 2024 are to be implemented.	Yes Refer to Chapters 6, 7 + 8

	Further discussed in Chapters 6, 7 and 8.	
Cl.5.21 Flood planning	The site is identified on the 10.7 Planning Certificate as affected by a 100-year Average Recurrence Interval flood. However, the upgrades to the path network, in addition to the landscape works, are unlikely to significantly impact drainage patterns or flood hazards and the health or safety of people within the area.	Yes
6.1 Acid sulfate soils	The site is identified as Class 4 on the Acid Sulfate Soils Map. The proposal will not impact acid sulfate soils or lower the water table. Excavation works on site must implement measures that address acid sulfate soil risk. To apply the precautionary principle, the following procedures are recommended: - All areas containing acid sulphate soils identified and either appropriately disposed offsite or remain undisturbed - The site must be managed following the general requirements of WorkCover NSW and strategies outlined in the relevant codes, standards, and guidelines. However, an assessment of acid sulfate soils by Environmental Investigation Services has noted that Acid Sulfate Soils Management Plan is not required.	Yes
6.2 Earthworks	The earthworks are minor and restricted to landscaping and active transport network implementation. An S.140 excavation permit of the Heritage Act and S.90 AHIP of the NPW Act will facilitate testing in key locations to ensure that earthworks will not impact archaeological sites or places with heritage value.	Yes
6.3 Biodiversity	The proposal will result in removing some trees to facilitate the upgraded pedestrian and cycle paths. However, these trees are mature landscape plantings and do not provide significant wildlife habitat. New trees and gardens will be planted to offset any loss. Therefore, there will be no impact on local biodiversity values. It is noted that the site is near the Mangrove habitat along the Parramatta River; however,	Yes

site mitigation measures will ensure that this area is not impacted.

It is also noted that the subject area provides a foraging resource for highly mobile threatened species, such as the grey-headed flying fox and potentially threatened microbat species. However, the proposal will not impact the foraging activities of these species if present.

Figure 10: RE1 Public Recreation Zone under PLEP 2023 (Source: Map Viewer)

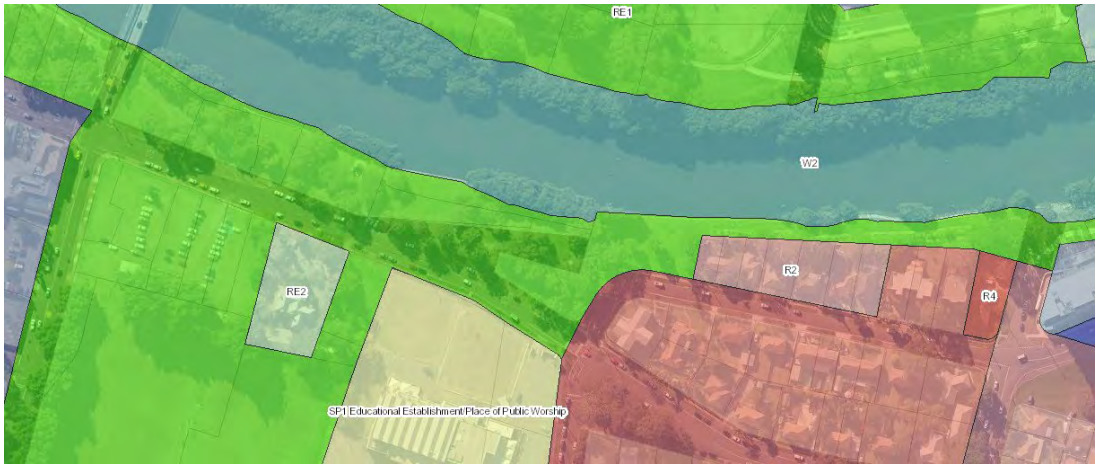
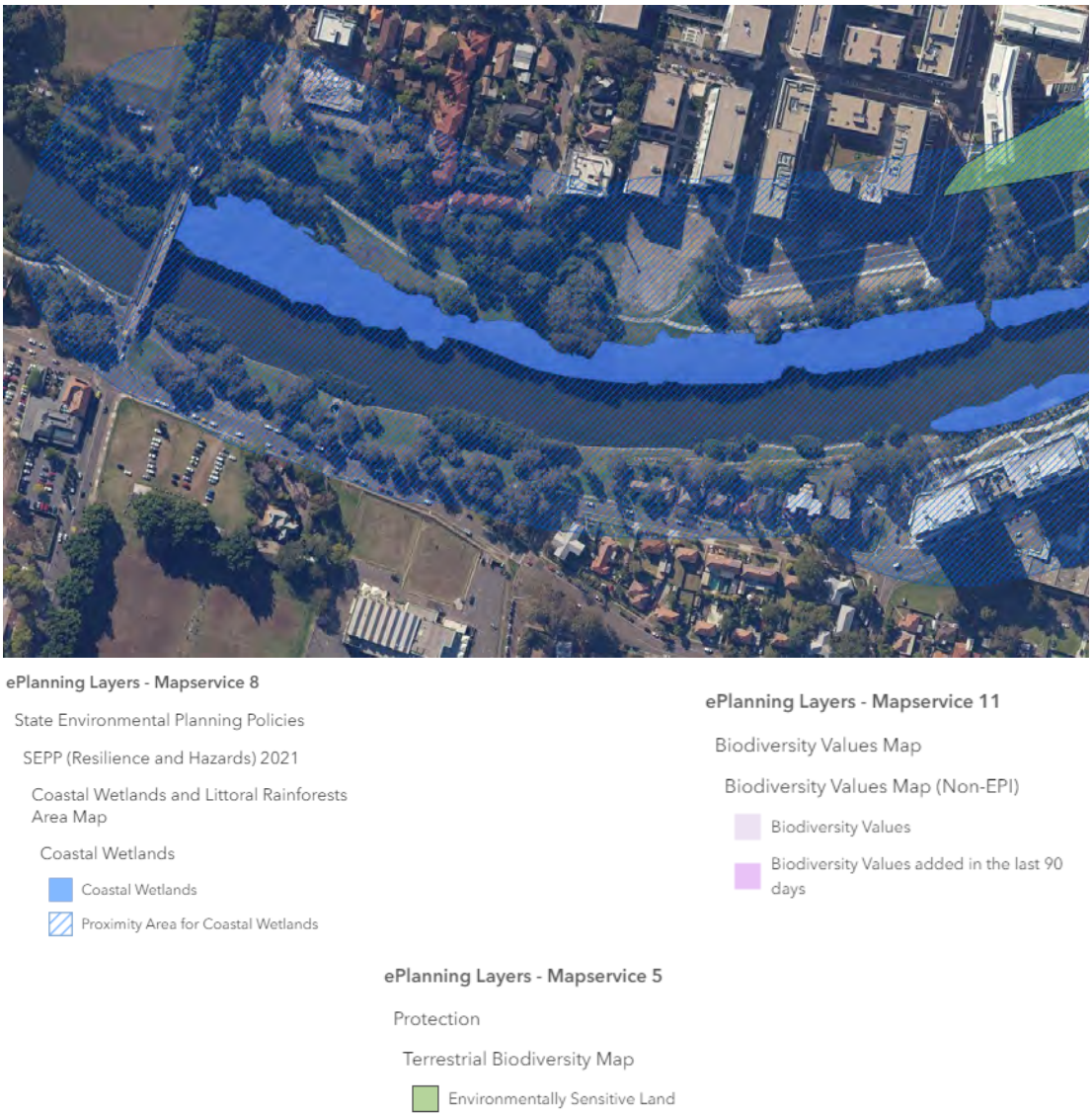


Figure **11**: Heritage map extract under PLEP 2023 (Source: Map viewer)

Figure 12: State Heritage map extract (Source: Spatial viewer)

Figure 13: Aboriginal Sensitivity Map under Parramatta DCP 2011 (Source: Map viewer)

Figure 14: Composite map of environmental values. Note the subject site is within a proximity area for coastal wetlands (Source: Map viewer)



5. CONSULTATION

GOVERNMENT AGENCIES AND OTHER STAKEHOLDER CONSULTATION

Table 11 Consultation requirements

Consultation with Council – Section 2.10, Council related infrastructure or services	**Yes**	**No**
Will the activity:		
a. Have a substantial impact on stormwater management services provided by the Council?		✓
b. Be likely to generate traffic that will strain the capacity of the road system in the LGA?		✓
c. Involve connection to, and have a substantial impact on, the capacity of any part of a sewerage system owned by Council		✓
d. Involve connection to and use a substantial volume of water from any part of a water supply system owned by Council?		✓
e. Involve the installation of a temporary structure on, or enclosing of, a public place that is under the Council's management or control that is likely to cause a disruption to pedestrian or vehicular traffic that is not minor or inconsequential?		✓
f. Involve the excavation that is not minor or inconsequential of the surface of, or a footpath adjacent to, a road for which the Council is the roads authority under the *Roads Act 1993* (if the public authority that is carrying out the development, or on whose behalf it is being carried out, is not responsible for the maintenance of the road or footpath).		✓
Consultation with Council – Section 2.11, local heritage	**Yes**	**No**
Is it likely that the activity will have an impact, that is not minor or inconsequential, on a local heritage item (other than a local heritage item that is also a State heritage item) or a heritage conservation area?		✓
Consultation with Council – Section 2.12, flood liable land	**Yes**	**No**
Will the works be located on flood liable land, and will they alter flooding patterns more than to a minor extent?		✓
Consultation with State Emergency Service— Section 2.13 development with impacts on flood liable land	**Yes**	**No**
Is the activity located on flood liable land and greater than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance		✓

Consultation with councils—Section 2.14 development with impacts on certain land within the coastal zone	Yes	No
Is the activity on land that is within a coastal vulnerability area and is inconsistent with a certified coastal management program that applies to that land?		✓

Consultation with public authorities other than councils –Section 2.15	Yes	No
Will the activity be located:		
a. on or adjacent to land reserved under the National Parks and Wildlife Act 1974?		✓
b. adjacent to a marine park declared under the Marine Parks Act 1997?		✓
c. adjacent to an aquatic reserve declared under the Marine Estate Management Act 2014?		✓
d. in the foreshore area within the meaning of the Sydney Harbour Foreshore Authority Act 1998?		✓
e. In association with development comprising a fixed or floating structure in or over navigable waters?		✓
f. In association with development for the purposes of a health services facility – in an area that is bush fire prone land (as defined by the Act)?		✓
g. In association with development that may increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map—the Director of the Observatory, Note. The dark sky region is land within 200 kilometres of the Siding Spring Observatory.		✓
h. development on defence communications facility buffer land within the meaning of clause 5.15 of the Standard Instrument—the Secretary of the Commonwealth Department of Defence, Note. Defence communications facility buffer land is located around the defence communications facility near Morundah. See the Defence Communications Facility Buffer Map referred to in clause 5.15 of *Lockhart Local Environmental Plan 2012, Narrandera Local Environmental Plan 2013* and *Urana Local Environmental Plan 2011*		✓
i. development on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961—the Mine Subsidence Board*.		✓

ABORIGINAL COMMUNITY CONSULTATION

Consultation has been undertaken under procedures set out in the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. Extent Heritage is conducting this consultation.

In accordance with Step 4.1.3 of the Consultation Requirements, an advertisement was placed in the dailytelegraph.com.au on 27 July 2022, inviting Aboriginal individuals or organisations to register an interest in the project by 10 August 2022. In addition, correspondence was sent to all Aboriginal individuals and organisations identified through the completion of Step 4.1.2 on 28 July 2022, inviting them to register an interest in the project by 12 August 2022. The registration date was extended to 19 August 2022 following feedback from one stakeholder that COVID, the high number of ACHAR consultations being undertaken in Parramatta, and consultation fatigue may cause stakeholders to miss an opportunity to participate in the project.

The draft ACHAR and associated excavation methodology were sent to the RAPs on 18 November 2022 for review for the mandated twenty-eight-day review period. The RAPs were also asked to provide any information regarding cultural values or places of importance to the Aboriginal community within the study area for inconclusion in this ACHAR. Responses were received by 19 December 2022 As a result, Requirement 15a of the Code of Practice will have been satisfied and the methodology was developed in consultation with the RAPs. Consistent with AHIP no.5105 which was issued on 16 June 2023, RAPs were provided a copy of the AHIP on 7 August 2023, with RAP groups also invited to participate in field work. RAPS who participated in test excavations are identified in the attached Q*ueens Wharf Reserve and Noller Parade Active Transport Link—George Street East Test Excavations: Aboriginal Archaeological Test Excavation Report*.

Appendix C contains a complete summary of the consultation, including a summary of the findings. The Aboriginal Cultural Heritage Assessment Report is included in Appendix C, with the Aboriginal Archaeological Test Excavation Report at Appendix D.

HERITAGE NSW CONSULTATION

The CoP has consulted with Heritage NSW, who, on 19 April 2023, issued a S.140 permit for the proposed works.

COMMUNITY CONSULTATION

October 2021

The CoP during 2021 provided surrounding landowners the opportunity to comment on the proposed work. On 5 October 2021, residents and visitors were invited to make a submission on the proposal within 28 days. The consultation area is shown in Figure 15. On 12 October 2021, the proposal was also advertised in the local newspaper

under the Roads Act 1993 and on the CoP Participate Parramatta engagement platform[4]. “Phone a planner” sessions and remote meetings were also offered.

A total of 13 responses were received from the community, with 10 supporting, three supporting to an extent and none against the proposal. These responses are provided in detail in Appendix I.

All responses, bar one, were from within the CoP Local Government Area. The social media campaign reached just over 20,000 engagements, with 504 clicking through to the website, with the project attracting 18 likes, one love, and three comments, only one of which was generally negative (Refer to Appendix I for details).

Figure 15: Consultation area for the proposed works (Source: City of Parramatta)

Table 12 summarises the key points of feedback.

Table 12 Summary of Community Feedback

Feedback	How addressed by CoP
Separated walking and cycling paths are needed/supported.	Noted

[4] https://participate.cityofparramatta.nsw.gov.au/george-street-east-paths

Please install lighting and CCTV.	Lighting is included in the project and CCTV, with Council Officers also forwarding this request to the City Safe Team.
Acquire property in the area and move power poles.	Property acquisition and moving power poles are beyond the scope and budget of this project.
Provide more bike paths and remove parking.	The proposed facilities provide a shared path on the foreshore for the less-confidant riders and on road shared and separated bike paths in Noller Parade for more confidant riders. These facilities are considered adequate to cater the current demand. However, if the demand increases in the future, consideration will be given to upgrade the facility.

September - November 2023: Exhibition of Review of Environmental Factors

In September and October 2023, Council placed a Review of Environmental Factors (REF) for George Street East Pedestrian and Cyclist Paths on public exhibition. This exhibition was promoted to local residents and visitors to Queens Wharf Reserve, on Council's Participate Parramatta website and via Council's Participate Parramatta newsletter.

Four hundred and sixty people visited the Participate Parramatta page and **10 submissions** were received and reviewed by Council staff.

The REF document was **downloaded 265 times**, indicating the project is relevant and of interest to the local community.

- Eight of ten submissions indicated support for Review of Environmental Factors (REF).
- Feedback emphasised minimising disturbance of native species, removing exotics and weeds and increasing the tree canopy.
- Feedback also included concerns regarding lighting of the paths, preservation of trees and traffic in neighbouring streets.

A summary of how Council has responded to concerns is provided in Table 13 below, with the design of the Concept Plan considered appropriate.

Table 13 Summary of Community Feedback and response

Issue	Response
Impact of Lighting Concern for over illumination, light pollution and compliance with guidelines.	Improved lighting has been included in the scope of the project to ensure the street and foreshore are safe for walking and cycling, and respond to a common request from the community for the River paths For this project, the lighting will be installed to comply with Australian Standard 1158.3.1:2020. The foreshore path and Noller Parade paths to PP2 category for pathways, the travel lane in Noller Parade the PR5 category for Local Roads. Council has engaged lighting engineers to ensure the lighting will comply with these standards and does not cause undue nuisance to private property. As the lighting on Noller Parade is supplied by Endeavour Energy, the selection of luminaires is limited to their public lighting list. In this instance the lowest wattage fitting with an aero screen visor (flat glass) has been selected that meets the lighting category. The flat glass reduces spill lighting to the surroundings. The colour of the light is 4000K, as Endeavour does not have a 3000K version of this fitting.
Impact to Trees Concern for the future of Tree 52 and 53, and suggestion for redesign to ensure survival.	The siting and design of the path has sought to retain as many high value trees as possible in the reserve (particularly the Paperbarks).In relation to tree 52 and 53, both trees will be retained as the path avoids them. There are a number of measures the project has incorporated at the recommendation of the arborist to mitigate the impact of works within the root zone to ensure their survival. Given the amount of time between the arborist report and the project being constructed, the project is reviewing all the trees in close proximity to the path for any change in status, and this will be included in the final REF.
Traffic & access impacts Concerns for: • Removal of a vehicular traffic lane, • Difficulty existing and entering driveway,	Council is not proposing to remove any travel lanes or parking lanes on Noller Parade. Parking is being switched to the southern side of Noller Parade, and a contra-flow bike lane installed on the northern edge by narrowing the existing travel lane (within guidelines).

• Sightlines impacted by parked cars • The interaction with vehicles travelling illegally in the wrong direction.	Switching the parking from the north means that residents entering or exiting driveways on the north that need to cross the contraflow bike lane will no longer have parked cars on their frontage. Vehicles entering or exiting driveways to the south will need to continue to look to oncoming traffic from the east only. The plans were considered by Parramatta Traffic Committee (PTC) at its meeting 23 March 2022. The subsequent 100% detail design was reviewed and approved by TfNSW. PTC includes representatives from TfNSW, Council and the Police and is primarily a technical review committee that is required to advise the Council on traffic related matters referred to it by Council. The minutes of PTC which were subsequently approved by Council 26 April 2022. The full papers are available here: https://businesspapers.parracity.nsw.gov.au/Open/2022/04/OC_26042022_AGN_724_AT.PDF Item 13.4 (p321).
Context and Cumulative Impact Concern in the context of significant change (Parramatta Light Rail, Alfred Street Bridge) already occurring in the precinct.	There are on average 300 car movements per day along Noller Parade in the last year with most crossing the eastern end at 10km/h. This compare to 5,000 per day on River Road West and Alfred Street. Since your original letter on the REF, Transport for New South Wales installed additional signage and line marking at the George Street end and the Traffic team have not received any recent complaints, however a small number of vehicles still appear to be travelling east on Noller Parade. The project will install a number of westbound arrows in the carriageway to further educate users and make enforcement simpler for Police. Should anyone mistakenly travel east on Noller Parade, there will be gaps in the parking lane on the south at driveways to allow passing. With the increase in the number of pedestrians and cyclists using both the northern and southern foreshore of the Parramatta River, Council is increasing the capacity of the path where space

allows to give each user group their own space as they move at different speeds.

The intersection of Noller Parade and Alfred Street is at the intersection of four regional walking and riding routes and therefore it is anticipated to have greater numbers of users.

Between Alfred Street and Purchase Street the foreshore is very narrow and the widest feasible path is only 3.5m. Therefore, the facility on Noller Parade will allow for a safe and direct alternative for more confident riders away from pedestrians, and reduce conflict on the foreshore path.

The project will encourage pedestrians and cyclists for recreation and commuting so anticipates there will be increased walking and cycling activity. However, it is unlikely to have any effect on the number of motor vehicles using the area.

There may continue to be minor delays for traffic giving way to pedestrians and cyclists crossing, however there is room for northbound vehicles to store out of the vehicle lane, and this facility ensures pedestrians and cyclists, as a vulnerable road users, have improved protection and safety.

6. ENVIRONMENTAL ASSESSMENT

ENVIRONMENTAL PLANNING AND ASSESSMENT REGULATION 2021 – ASSESSMENT CONSIDERATIONS

The relevant assessment considerations under section 170 of the EP&A Regulation 2021 (though the application of the Department of Planning and Environment's Guidelines for Division 5.1 assessments – June 2022, provide reference to factors to be considered under section 171(2) of the EP&A Regulation.

These are provided below.

Table 14 Assessment considerations for environmental assessment

Consideration	Assessment response	Impact	
a. the environmental impact on a community	The proposal will have a low, temporary impact on the surrounding residential and business community regarding traffic and access, noise, air quality, and waste generation impacts.	- ve	
		Nil	
		+ve	**X**
b. The transformation of a locality	The proposal will not significantly change the nature of the locality.	**- ve**	
		Nil	**X**
		+ve	
c. the environmental impact on the ecosystem of the locality	N/A	- ve	
		Nil	X
		+ve	
d. Reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality.	The proposal will have a low, temporary impact as access to Queens Wharf Reserve will be limited during construction. This will temporarily impact recreation use.	- ve	
		Nil	X
		+ve	
e. The effects on any locality, place or building that has aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific, or social significance or other special value for present or future generations.	The recommendations of the Aboriginal Archaeological Test Excavation Report (May 2024), prepared by Extent Heritage Advisors are to be implemented to ensure that any potential impact is temporary and is appropriately mitigated. Likewise, the recommendations of the Historical Archaeological Post-Exhibition Report are to be implemented. The implementation of the above as mitigation measures will be included to ensure that	- ve	
		Nil	X
		+ve	

		Aboriginal and European heritage is appropriately protected if discovered during site works.		
f.	The impact on the habitat of protected fauna (within the meaning of the Biodiversity Conservation Act 2016)	N/A The grey-headed flying fox and potentially threatened microbat species may use the subject area for foraging. There is unlikely to be any impact on foraging resources because of the proposed activity.	- ve Nil +ve	 X
g.	the endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air	N/A The works will not involve any significant tree or other habitat removal. Whilst mangrove habitat is located along the Parramatta River foreshore, mitigation measures associated with the proposed works will ensure no sedimentation or other detrimental impact due to construction activities. Impacts on trees within the reserve have been mitigated by refining the concept plan for the proposed works. Further mitigation of potential impacts are addressed within the TPP, which includes requirements including qualified arborist supervision and sensitive construction methodologies (within SRZ where cannot be avoided). Structural Root Zones are shown in the Plan within Appendix A. Importantly, mitigation measures will include fencing and exclusion zones per AS4970 (Protection of Trees on Development Sites). Further mitigation measures include a vegetation offset strategy with two replacement trees per tree removed. Replacement trees should also be locally endemic to the Parramatta LGA.	- ve Nil +ve	 X
h.	Long term impacts on the environment	N/A	- ve Nil +ve	 X
i.	Degradation of the quality of the environment	Temporary. There is potential minor environmental impacts from ground disturbance during excavation works for the proposed activity. Mitigation measures are included to manage the potential short-term impacts.	- ve Nil +ve	 X

j.	Risk of safety of the environment	Temporary Hoarding and safety fencing will be utilised to delineate the interaction of pedestrians and construction works. This will assist in preventing unauthorised access to the construction works zone.	- ve Nil +ve	 X
k.	Reduction in the range of beneficial uses of the environment	N/A	- ve Nil +ve	 X
l.	Pollution of the environment	Temporary Construction works associated with the proposed activity are likely to generate construction noise pollution for a short period of time. The proposed works will likely be carried out during and outside of normal working hours and may generate some visual impact associated with construction lighting. A Soil and Water Management Plan will be implemented as part of the Construction Management Plan to minimise the impacts of rainwater and run-off and to minimise the risk of increased erosion and sediment deposition on the local environment.	- ve Nil +ve	 X
m.	Environmental problems associated with the disposal of waste	The proposed activity will generate waste associated with the proposed construction activities.	- ve Nil +ve	Temporary
n.	Increased demanded on resources (natural or otherwise) that are, or are likely to become, in short supply	N/A	- ve Nil +ve	 X
o.	The cumulative environmental effects with other existing or likely future activities	Temporary Cumulative impacts associated with construction works are temporary. These impacts include those associated with the Parramatta Light Rail and Alfred Street Bridge works. A ECMP will be prepared to demonstrate how impacts associated with the proposed construction activities on the subject site can be minimised.	- ve Nil +ve	 X

p.	The impact on coastal processes and coastal hazards, including those under projected climate change conditions.	N/A	- ve Nil +ve	X
q.	Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	Refer to Appendix G; however, the proposal does not raise any inconsistency with either the: - Greater Sydney Regional Plan – A Metropolis of Three Cities - Central City District Plan - Parramatta Local Strategic Planning Statement	- ve Nil +ve	X
r.	Relevant environmental factors	N/A		

Note:

-ve = negative impact

Nil = nil impact

+ve = positive impact

7. DISCUSSION OF IMPACTS

Any likely impacts relating to the proposed activity have been considered and are discussed in the table below. All issues relating to the project are mainly minor and will not cause a significant impact as a result of the proposed activity.

All mitigation measures relating to the project are provided in Chapter 8

Table 15 Discussion of impacts and whether mitigation is required

Issue	Discussion	Mitigation Required
Soil and geology	The proposed development consists of active transport paths for cyclists and pedestrians. Other activities include tree removal, new tree planting, upgraded park lighting, landscaping and minor civil infrastructure works. Potential ground impacts include: - Footings associated with path lights are 1.2 m x 1.2m in width and with a depth of 650mm - Excavations to a depth of 250mm to form up the proposed pathways - Excavations for tree removal and landscaping, including planting trees and replacing park benches and existing garden beds. Potential impacts to the soil and local geology are minor, being able to be adequately mitigated through a ECMP.	Low impact with temporary mitigation measures during construction
Hazardous Material and Contamination	The proposed works will not result in the generation of hazardous materials or future land contamination. Environmental Investigation Services have assessed the potential for contamination on the site. The preliminary assessment identified potential for contamination, and the underlying soil conditions should be tested to ensure that it can be classified as virgin excavated natural material. Potential impacts can ben managed with additional site investigations to ensure that the soil can be classified as virgin excavated natural material, along with an unexpected finds protocol included during construction works.	Low risk Detailed Site Investigation to test if the natural soil condition can be classified as virgin excavated natural material. Contaminated lands protocol required.
Hydrology, Flooding and Water Quality	During rain events, there is the potential for sedimentation runoff. This, however can be mitigated through the ECMP, Sedimentation and Erosion Plan and Stormwater Management Plan.	Low impact with temporary mitigation measures during construction

	There is also the potential that overall water quality could be impacted during flood events due to the close proximity of the Parramatta River. Consideration should be given to supply on demand rather than stockpiling materials on-site to mitigate potential impacts.	The ECMP is to provide a detailed plan on how materials will be managed to ensure that risks associated with flooding are minimised.
Ecology	Biodiversity The site is near scattered stands of Mangrove habitat along the Parramatta River foreshore. These are; however, located some distance from the work site and site mitigation measures can ensure that this area is not impacted. The subject area may also provide a foraging resource for highly mobile threatened species, such as the grey-headed flying fox and potentially threatened microbat species. However, the proposed works are minor and will not impact on the ability of these species to continue to forage, if present. Mitigation measures associated with this REF can ensure that biodiversity values are appropriately managed. Protection of trees To understand the impacts on trees, if any, Active Green Services (AGS) were engaged by CoP to prepare an Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP). The AIA identified all trees within the work area that the proposed activity may impact. This included an assessment of the vitality and retention value of the trees that are potentially impacted, the impacts of tree retention and management measures for tree protection. The management measures are contained within the TPP. The AIA identified 74 trees that required assessment due to the nature of the proposed works. This assessment identified: - Ten (10) trees have encroachments less than 10% (Minor) - Fifty-four (54) trees have encroachments greater than 10% (Major). Of these 15 are planted trees and young enough to transplant.	Low, temporary impact with mitigation measures identified in Chapter 8. Mitigation measures can include erosion and sedimentation controls, TPP, and replacement tree planting strategy.

Resultant from the AIA is a TPP that provides the necessary recommendations to mitigate potential impacts to the structural root zone (SRZ) of trees. These will form part of the mitigation measures associated with this REF.

The AIA has resulted in further refinement of the concept plan guiding the works in the subject site. The SRZ is shown as a dashed circle around the existing trees on the concept plan. The updated plans show that the proposed paths are:

- aligned outside of the trees SRZ; or
- replaced like for like with existing paths. The paths will be constructed above existing tree roots to mitigate any potential impacts from construction activities.

Likewise, the updated plans show that there is no new furniture (e.g. benches) or lighting within the SRZs.

These refinements reduce the impacts of the proposed works on trees identified in the AIA. It is also noted that since the completion of the AIA and TPP, several tree plantings associated with the Parramatta Light Rail have been cut and do not require removal. Trees 59-64,66,67,69-71 are the young Lophestmons planted by Parramatta Light Rail. It is recommended that these trees are considered for transplanting." Accordingly, the following trees identified in the AIA now require removal, with the reference number referring to the AIA report:

- Trees 13,15 & 74 will not remain viable under the current design due to significant encroachment. Therefore, these trees will need to be removed and compensatory replanting adopted" to align with the arborist report (page 24).
- Tree #20, as it is a dead stump.

Impacts on trees within the reserve have been mitigated by refining the concept plan for the proposed works. The proposed pathway network now potentially impacts the structural root zone of ten trees.

Further mitigation of potential impacts are addressed within the TPP, which includes requirements including qualified arborist supervision and sensitive construction methodologies (within SRZ where cannot be avoided). Structural Root Zones are shown in the Plan within Appendix A.

	The CoP Arborist is to review and make specific advice on the sensitive construction methodology to be used within Queens Wharf Reserve. Importantly, mitigation measures will include fencing and exclusion zones per AS4970 (Protection of Trees on Development Sites). Further mitigation measures include a vegetation offset strategy that will replace any tree removed with two trees locally endemic to the Parramatta LGA.	
Transport, access and parking	There will be a change to the access and egress to the park whilst the construction activities take place. This may necessitate the temporary park closure in the vicinity of the work site. Other impacts associated with the proposed works include the need for a temporary diversion of pedestrians and cyclists. Other impacts include parking for construction workers during the duration of the works program. There is to be no parking in the reserve by workers, with vehicles restricted to only those that are essential. This is to minimise any potential amenity impacts and also damage to the reserve. Transport impacts are however minor and temporary in nature. A Traffic Management Plan can mitigate any impacts successfully, including the identification of a safe alternative route for pedestrians and cyclists.	Low impact with temporary mitigation measures during construction
Noise and vibration	There is potential for noise associated with the construction works to impact surrounding residential areas and park users. A ECMP should address hours of work as outlined in the mitigation measures, along with a program to minimise noise generation. The noise impact of the use of the park is expected to remain comparable to the existing park use once the works are completed. No formal mitigation measures are considered necessary post construction.	Low impact with temporary mitigation measures during construction
Air quality and energy	Potential airborne particles within the locality are largely restricted to vehicle emissions and minor dust generated by vehicle movements in the broader landscape. The works may temporarily affect air quality through exhaust emissions from machinery and associated transportation. There may also be minor dust generated during earthworks associated with the	Low impact with temporary mitigation measures during construction

	proposed works. There is potential that emissions and dust generated from the works may result in air quality impacts to adjacent sensitive receivers. However, given the temporary duration of the works and nature of the Activity, the level of potential impact is not considered significant and can be managed or minimised through implementation of safeguards and management measures. The works would contribute to greenhouse gas emissions to a minor extent via the emissions from construction equipment and traffic, as well as the consumption of materials requiring carbon emissions and the removal of vegetation that may otherwise act as a carbon sink. Given the relatively minor scale of the proposed works however, the influence on greenhouse gas emissions would be negligible. However, it is appropriate to implement measures that can reduce or minimise such effects.	
Heritage – non Aboriginal	The following heritage items are located on site: - **I011**: Wetlands, Parramatta River, of *Local Significance* - **I546:** Gasworks Bridge, of *Local Significance* - **I547:** HMAS Parramatta shipwreck and memorials, of *State Significance* - **I548:** Queen's Wharf Reserve and stone wall and potential archaeological site, of *Local Significance* The above reference numbers relate to PLEP 2023. Item I547 is also known as SHR Item 01676. The CoP engaged Extent Heritage to prepare a Historical Archaeological Impact Assessment of the subject site. This assessment is necessary given the potential ground impacts to archaeological and heritage features on the site through the following works: - Footings associated with path lights are 1.2 m x 1.2m in width and with a depth of 650mm - Excavations to a depth of 250mm to form up the proposed pathways - Excavations for tree removal and landscaping include planting trees and replacing park benches and existing garden beds. This detailed research identified nine phases of development spanning from 1788 until 2023 and is	Low impact with temporary mitigation measures during construction

	described in the Extent Heritage Report at Appendix C. The historical archaeological test excavation was carried out in accordance with conditions attached to an excavation permit (HMS ID 2487) issued under Section 140 of the Heritage Act 1977 (NSW). The excavation works were guided by the findings of the Historical Archaeological Impact Assessment (HAIA) (Extent Heritage 2023b) and the approved research design and methodology outlined in the Historical Archaeological Research Design (HARD) (Extent Heritage 2023a). The historical archaeological test excavation program was undertaken in conjunction with Aboriginal archaeological test excavation, under AHIP #5105. Recommendations from the Historical Archaeological Post-Exhibition Report (April 2024) are to be implemented.	
Heritage – Aboriginal	The CoP engaged Extent Heritage to prepare an Aboriginal Cultural Heritage Assessment Report. This detailed report is attached, with key elements discussed below. A search of the Aboriginal Heritage Information Management Systems (AHIMS) database was completed on 20 July 2022, with two registered sites identified within the study area: - AHIMS ID 45-6-3312, and - AHIMS ID 45-6-3131. The study area is located on the Parramatta Sand Sheet, and as a result, the project boundary is considered a Potential Archaeological Deposit, having the potential to contain Aboriginal objects dating to the Pleistocene, Holocene, and contact period. These objects may hold high scientific potential and social/cultural value. Accordingly, Extent Heritage has recommended implementing an excavation program to understand the nature of potential subsurface archaeological remains within the study area. As the study area has the potential for contact period archaeology, an Aboriginal AHIP is required to authorise the excavations. On 16 June 2023, the DPE approved an application for a AHIP under S.90 of the NPW Act, with site investigations completed between 16 October 2023 and 31 October 2023. Through the completion of background research, database searches, field survey, and test excavations; it is established there are two Aboriginal sites within the study area— QWR PAD	Low impact with temporary mitigation measures during construction

	1 (AHIMS ID 45-6-4094) and River Road West (AHIMS ID 45-6-3131). River Road West (AHIMS ID 45-6-3131) has been assessed as having high archaeological value and the proposed works will not impact this site. Test excavations that investigated portions of QWR PAD 1 (AHIMS ID 45-6-4094) are considered to have moderate scientific significance. Based on design information provided by the proponent, the proposed works will impact a portion of QWR PAD 1 (AHIMS ID 45-6-4094), resulting in a partial loss of value. The recommendations of the Aboriginal Archaeological Test Excavation Report (May 2024) and prepared by Extent Heritage Advisors are to be implemented to ensure that any potential impacts are mitigated.	
Social impacts	There will be a temporary impact during the construction phase of the project as parts of the reserve will be unavailable for recreational use during construction. The proposal will however be progressively constructed which will minimise the extent of the area that is closed for recreational use.	Temporary during construction
Visual amenity	There will be a temporary impact during the construction phase of the project. Visual amenity can be reduced by screening the work site and clean work practices. This can be included as part of the ECMP.	Temporary during construction
Land uses and services	The proposal has the potential to impact service infrastructure within the reserve. A Before You Dig Australia search is to be undertaken before site works, with all service infrastructure accurately identified. This will be included as part of the ECMP.	Temporary during construction
Waste generation	Waste generated during construction would comprise a combination of building materials, packaging waste and general waste associated with construction workers. All waste products will be disposed of in accordance with the relevant waste classification guidelines and either recycled where possible or sent to a licensed facility to receive the materials. Other waste impacts include organic material from tree and vegetation removal. Any excess cleared vegetation and soil not utilised on-site would be deposited at a licensed waste facility or reused as a resource (e.g. mulched) on Council projects	

	wherever possible and as deemed fit/ suitable following NSW waste legislation. Waste has the potential to disperse into the surrounding environment and cause visual impacts and potential harm to terrestrial and aquatic flora and fauna. Waste products may also transport contaminants that may degrade local water quality (e.g. fuels, lead-based paint and oils). Risks associated with waste can be reduced and managed by implementing safeguards. It is accordingly a temporary impact and can be mitigated successfully.	
Cumulative impacts	The project is expected to add to several minor cumulative impacts including resource consumption, vegetation clearing and generation of greenhouse gas emissions (e.g. through operation of vehicles and equipment). However, the mitigation measures stated in this REF and the final methodology for completion of the Activity would aim to minimise the extent to which the proposal contributes to cumulative adverse environmental impacts. Cumulative impacts associated with construction works are temporary. These impacts include those associated with the Parramatta Light Rail works. The ECMP will identify the management strategies to mitigate the cumulative risk of the project, which are to be implemented by the future Contractor.	N/A
Impact on coastal processes and hazards	N/A	N/A
Applicable LSPS, Regional Plans or District Plans	Refer to Appendix G for consideration of relevant plans including: - Greater Sydney Region Plan - Central City District Plan - Parramatta Local Strategic Planning Statement	No
Any other relevant environmental factors	N/A	
Ecologically Sustainable Development	The principles of ecologically sustainable development are outlined in Cl.193 of the EP&A Regulation, in relation to EIS requirements. An EIS is not required for this project; considering these principles is helpful. Precautionary Principle	

Cl.193 (2) and (3) of the EP&A Regulation states that:

2) *The precautionary principle is that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*

3) *In applying the precautionary principle, public and private decisions should be guided by—*

   a) *careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment, and*

   b) *an assessment of the risk-weighted consequences of various options.*

To satisfy the precautionary principle, this REF has thoroughly analysed potential environmental, economic and social concerns. This assessment has identified and examined potential impacts and developed appropriate mitigation measures and safeguards to help avoid and/or minimise any impacts and safeguard the environment.

Considering this assessment's findings, the proposal is unlikely to impose significant and/or long-term adverse impacts on the environment, economy or community. The mitigation measures and safeguards outlined in this REF would be implemented to ensure sound environmental outcomes in all aspects of the proposal.

8. MITIGATION MEASURES

Mitigation measures are to be implemented for the proposal to reduce environmental impacts, as described in the table below.

Table 16 Mitigation measures

Aspect	Mitigation Measure	When
Site induction	• The Contractor will implement a work site induction plan and provide it to the CoP. The plan is to be consistent with relevant WHS requirements to ensure the safety of those on, around and in the vicinity of the site.	a. Ongoing.
Soil and geology	• Erosion and sediment controls must be implemented following the Landcom/Department of Housing Managing Urban Stormwater, Soils and Construction Guidelines (the Blue Book). • Works must only commence once all erosion and sediment controls have been established. The controls must be maintained in place until the works are complete and all exposed erodible materials are stabilised. • All sediment control measures must be checked regularly and repaired or re-installed (if required) if heavy rainfall is forecast.	b. Before work commences. c. Regular ongoing maintenance checks to ensure control measures remain in good condition.
Hazardous Material and Contamination	**Contamination** • A Detailed Site Investigation is to occur before works commencing to confirm no contaminated soil on site. **Unexpected finds** • An Unexpected Finds Protocol (UFP) is to be prepared before work commences. • If unexpected, contaminated land is encountered during the works, they are to stop immediately, and relevant procedures outlined in the (UFP), and CEMP are to be followed. • The EPA and CoP are to be notified immediately in response to incidents causing or threatening actual or potential harm to the environment under section	d. Before, during construction activities and work

	148 of the POEO Act (via EPA Environment Line on 131555). **Spill containment** • A spill containment kit is to be available at all times. All personnel are to: - Be aware of the kit's location and trained in its use. - Manage, transport, and dispose of hazardous materials in a manner consistent with applicable regulations, including WH&S and EPA waste protocols.		
Hydrology, Flooding and Water Quality	• The Stormwater Management Plan, including sediment and erosion notes and conditions, would be implemented in accordance with The Civil Engineering Design Plans, prepared by a suitably qualified person. • The site's erosion and sediment control measures will be implemented during construction. The design of these measures is to be following the Landcom "Blue Book". These will include: - A sediment fence. - Temporary access to site with shaker pad (if required). - An indicative stockpile area with sediment fence around it during construction. - Geotextile inlet pit filters or sandbags to be placed around existing stormwater pits. • Site compounds and material storage areas are to be located outside flood prone areas of the reserve to minimise the potential for migration into the adjacent waterway during significant rainfall events.	e.	Before work commences and ongoing regular maintenance
Ecology	• A vegetation offset strategy is to be prepared by a suitably qualified person and approved by CoP before works commence. The vegetation offset strategy is to ensure that two replacement trees are planted for each tree removed. The replacement trees must be endemic to the Parramatta LGA and contribute to canopy coverage to reduce urban heat.	f.	Before, during construction activities and work

	• All mitigation measures outlined in the Arboricultural Impact Assessment prepared by Active Green Services, are to be implemented, this includes, but is not limited to: - Non-Destructive Root Exploration (Root mapping); - Limit footpath excavations to 200mm maximum depth; - Sensitive construction methods including Directional Drilling/Boring, Screw Piling, Cantilevers, Structural Confinement Cells, or as recommended by the supervising arborist, when works in the structural root zone cannot be avoided. • An updated Tree Protection Plan is to be prepared and approved by CoP arborist prior to works commencing. • Mitigation measures will also include all fencing and exclusion zones in accordance with AS4970 (Protection of Trees on Development Sites). • Prior to works commencing the CoP Arborist is to review the proposed sensitive construction methodology and make any changes if required. No works can commence until the sensitive construction methodology has been approved by the CoP Arborist. • Prior to works commencing, the CoP is to engage a suitably qualified arborist to oversee works within TPZs and SRZs. • The project arborist is to certify satisfactory implementation of tree protection measures and sensitive construction methods during works,		
Transport, access and parking	• A Construction Traffic Management Plan (CTMP) is to be prepared by a suitably qualified person and is to address the construction phase of the development. • This shall appropriately manage internal site traffic, including pedestrian and cycle movements to ensure the safety of workers and public as well as outline required signage and fencing to assist with ensuring safety for all.	g.	Before, during construction activities and work

	• The CTMP also addresses pedestrian and cycle route diversions to ensure that safety is maintained • The CTMP should assess whether licenced traffic controllers are required, and if so, include requirements consistent with relevant standards and technical guidelines. • Appropriate signage will be erected, and details will be confirmed by appropriate Project personnel responsible for site safety during the development.	
Noise and vibration	• **Construction hours** The following construction hours are proposed: - Monday to Friday: 7am to 5pm. - Saturday: 8am to 5pm. - Sundays and Public Holidays: No excavation or construction works. • **Plant and equipment:** - Employ quieter techniques for all high noise activities such as concrete sawing and power and pneumatic tools. - Use quieter plant and equipment based on the optimal power and size to perform the required tasks most efficiently. - Selecting plant and equipment with low vibration generation characteristics. - Operate plant in a quietest and most effective manner. - Where appropriate, limit the operating noise of equipment. - Regularly inspecting and maintain plant and equipment to minimise noise and vibration level increases, to ensure that all noise and vibration reduction devices are operating effectively. • **Consultation, notification and complaints handling:**	h. Before, during construction activities and work

	- Provide information to neighbours before and during construction - Include community information signage with project details, timeframes, and Council project manager contact. This can be incorporated into the temporary fencing. - Maintain good communication between the community and Project staff. - Have a documented complaints process and keep register of any complaints. - Give complaints a fair hearing and provide for a quick response. - Implement all feasible and reasonable measures to address the source of complaint. Implementing all reasonable and feasible mitigation measures for all works will ensure that any adverse noise impacts to surrounding receivers are minimised when noise goals cannot be met due to safety or space constraints.	
Air quality and energy	**Air Quality** • No materials will be burnt on site. • Vehicles transporting waste or other materials that may produce dust will be covered during transportation. • Vehicles, machinery and equipment will be maintained per manufacturer's specifications to meet the Protection of the Environment Operations Act 1997 requirements and associated regulations. • Vehicles and equipment will be switched off when not operating. • Debris and waste will be immediately collected into appropriate storage facilities and removed from the site as soon as practical to ensure light-weight material is not dispersed by wind gusts. • Stockpiles and exposed soils will be covered or dampened to reduce incidence of air dispersal.	i. Before, during construction activities and work

	• Appropriate practices are to be in place to minimise dust that could be dispersed during excavation.		
Heritage – non Aboriginal	• The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Historical Archaeological Impact Assessment, prepared by Extent People Centred Heritage, dated February 2023 are to be implemented. • The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Historical Archaeological Post Excavation Report, prepared by Extent People Centred Heritage, dated April 2024 are to be implemented. • The stop work provisions are to be applied in line with the NSW Heritage Act 1977 requirements if any unexpected archaeological finds are exposed during construction and earthworks. An appropriately qualified heritage professional and an archaeologist should be engaged to assess the finds and advise on their management. • Final designs for the project will make all efforts to ensure that any works including the location and movement of plant and machinery do not impact any identified items. • All workers on-site are to be made aware of their responsibility under the Heritage Act 1977. • The CoP Heritage Officer is to review and provided advice on heritage matters, including approving final plans.	j.	During construction works
Heritage – Aboriginal	• The recommendations of the Queens Wharf to Noller Parade Active Transport Link Aboriginal Cultural Heritage Assessment Report (January 2023), prepared by Extent Heritage are to be implemented. • The recommendations of the Queens Wharf to Noller Parade Active Transport Link Aboriginal Archaeological Excavation Report (May 2024), prepared by Extent Heritage are to be implemented.	k.	Prior to commencement and during construction works

	• All personnel working on site would receive induction on their responsibilities under the NPW Act; and • If Aboriginal cultural material is identified on site, a Stop Work Procedure will be followed, which includes: - Works will cease immediately. - A temporary exclusion zone established. - The CoP project manager and Local Aboriginal Land Council will be contacted immediately. - Advice sought from a suitably qualified archaeologist. • Heritage NSW contacted immediately.		
Visual amenity	• Upon completion of construction, any works areas are to be restored to an acceptable visual state. • The construction worksite would be maintained, kept free of rubbish and cleaned up at the end of each workday.	l.	Prior to commencement and during construction works
Land uses and services	• All service infrastructure (e.g., electricity, water infrastructure, etc) is to be identified. Identified service infrastructure along with any required mitigation measure is to be included in the ECMP.	m.	Before works commence.
Waste generation	• A Waste Management Plan is to be prepared by the Contractor specifying the likely waste generation and how the waste generated will be disposed of. Waste material taken off site will be appropriately classified and managed in accordance with the Waste Classification Guidelines (EPA November 2014). • The WMP is to include resource management hierarchy principles to be followed: - Avoid unnecessary resource consumption as a priority - Avoidance is followed by resource recovery (including reuse of materials, reprocessing, recycling and energy recovery)	n.	Prior to commencement and during construction works

	- Disposal is undertaken as a last resort at a licenced disposal facility. • Waste material is not to be left on site once the works have been completed. • Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	
Environmental Construction Management Plan	During construction, appropriate environmental safeguards shall be implemented. The ECMP for the construction phase will be structured as follows: - **Chapter 1 - Introduction**. A description of the project and the objectives of the ECMP will be provided. **Chapter 2 - Environmental Management Planning.** A summary of the environmental issues and aspects. **Chapter 3 - Management Strategies and Implementation.** The environmental protection measures will be documented, when and how they will be implemented and who is ultimately responsible for undertaking particular actions. This chapter will also address awareness, training and emergency response requirements. **Chapter 4 - Monitoring & Measuring Environmental Impacts.** The process for monitoring the performance and compliance with the ECMP will be documented. The process for reporting and managing breaches of the plan will be specified. **Chapter 5 - Communication Strategy.** The process for addressing public complaints or concerns will be detailed. As may be required occasionally, methods for communicating with interested stakeholders will also be addressed.	o. Before the commencement of construction. p. A copy of the ECMP will be provided to the CoP before works commencing. q. The CoP is to approve the ECMP before works commence.

9. SUMMARY OF IMPACTS

Based on the identification of potential issues, and an assessment of the nature and extent of the impacts of the proposed development, it is determined that:

- The extent and nature of potential impacts are negligible to low and will not have significant adverse effects on the locality, community and environment;
- Potential impacts can be appropriately mitigated or managed to ensure that there is minimal effect on the locality, community; and
- Given the above, it is determined that an EIS is not required for the proposed development activity

10. ENVIRONMENTAL FACTORS CONSIDERED

ENVIRONMENTAL FACTORS CONSIDERED: CLAUSE 171 OF EP&A REGULATION 2021

Table 17 Summary of environmental factors considered in this REF

Has the REF considered the following points?	Yes/No	Comment
Any environmental impact on a community.	Yes	The proposal will have a low, temporary impact on the surrounding residential and business community in regard to traffic and access impacts, noise impacts, air quality impacts and waste generation impacts.
Any transformation of a locality.	Yes	There will be no adverse transformation of the locality.
Any environmental impact on the ecosystems of the locality.	Yes	There will be no undue impact on ecosystems in the area, with mitigation measures ensuring that any potential impacts are prevented.
Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality.	Yes	The proposal will have a low, temporary impact as access to Queens Wharf Reserve will be limited during construction. This will temporarily impact on recreation use
Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations.	Yes	No impact. Discussed further below. The recommendations of the Queen's Wharf Reserve and Noller Parade Active Transport Link: Historical Archaeological Post Excavation Report, prepared by Extent People Centred Heritage, dated April 2024 are to be implemented. The recommendations of the Queens Wharf to Noller Parade Active Transport Link Aboriginal Archaeological Test Excavation Report (May 2924), prepared by Extent Heritage are to be implemented. Mitigation measures will be included to ensure that Aboriginal and European heritage is appropriately protected if discovered during site works.
Any impact on the habitat of protected fauna (within the meaning of the *Biodiversity Conservation Act 2016*)	Yes	No impacts. The grey-headed flying fox and potentially threatened microbat species may use the subject area for foraging. There is unlikely to

		be any impact on foraging resources because of the proposed activity.
Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air.	Yes	No impacts. The works will not involve any significant tree or other habitat removal. Whilst mangrove habitat is located along the Parramatta River foreshore, mitigation measures associated with the proposed works will ensure that there is no sedimentation or other detrimental impact because of construction activities.
Any long-term effects on the environment.	Yes	No impacts.
Any degradation of the quality of the environment.	Yes	There is the potential for minor impacts on the environment from ground disturbance during excavation works for the proposed activity. Mitigation measures are included to manage the potential short term impacts.
Any risk to the safety of the environment.	Yes	Temporary Hoarding and safety fencing will be utilised to delineate the interaction of pedestrians and construction works. This will assist to prevent unauthorised access to the construction works zone.
Any reduction in the range of beneficial uses of the environment.	Yes	The proposal represents a positive benefit through upgrading of park facilities for active transport, improved access for people with a disability and new tree planting and landscaping.
Any pollution of the environment.	Yes	Temporary. The pollution of the environment by the proposed development during construction works phases may be avoided by the employment of suitable mitigation measures, including an ECMP.
Any environmental problems associated with the disposal of waste.	Yes	The proposed development is not anticipated to result in any problems associated with the disposal of waste. A Construction Waste Management Plan is included as a condition of REF approval.
Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply.	Yes	No impacts
Any cumulative environmental effect with other existing or likely future activities.	Yes	Temporary Cumulative impacts associated with construction works are temporary.

		These impacts include those associated with the Parramatta Light Rail works. A Construction Management Plan (ECMP) will be prepared to demonstrate how impacts associated with the proposed construction activities on the subject site can be minimised.
any impact on coastal processes and coastal hazards, including those under projected climate change conditions.	Yes	Not relevant
any applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1	Yes	Refer to Chapter 7 and Appendix G
any other relevant environmental factors	Yes	Refer to Chapter 7

ENVRONMENTAL REVIEWS CHECKLIST

Has the REF considered the following points?	Yes/No	Section
Has the Review of Environmental Factors clearly detailed who is proposing to carry out the Activity or development?	Yes	Chapter 1
Has the Review of Environmental Factors detailed the relevant LEP and why development consent is not required from Council?	Yes	Chapter 4
Does the development involve the construction of a Water Storage Dam or Sewage Treatment Work?	No	N/A
Is the development within or in proximity to a coastal wetland?	Yes	Chapters 5,6.7and 8
Is the development within or in proximity to urban bushland?	No	N/A
Is the development within or in proximity to littoral rainforest?	No	N/A
Do acid sulphate soils occur within the development area?	Yes	Chapter 4
Will the development restrict access to a coastal foreshore area?	No	N/A
Will the development require the removal of native vegetation?	No	Chapters 5,6.7and 8
Are there State listed threatened flora or fauna species, populations or ecological communities in the development area?	No	Chapters 5,6.7and 8
Is the development located within 40 metres of a waterway?	Yes	Chapters 5,6.7
Is the development located on land either permanently or intermittently submerged by water?	No	N/A
Is a bore required for de-watering of a construction site?	No	N/A
Will wastewater be discharged from the site?	No	N/A
Is the area likely to contain aboriginal artefacts or items of cultural heritage?	Yes	Chapters 5,6.7and 8
Has the State Heritage Register been reviewed for listings associated with the development site?	Yes	Chapters 5,6.7and 8
Are the works near a railway line or on land owned or administered by a rail corporation	No	N/A
Will the works occur within a road reserve?	Yes	Chapters 6,7
Will the works occur on Crown land?	Yes	Chapter 4
Will the works occur within National Park Estate?	No	N/A
Will chemicals or flammable liquids be stored on the development site?	No	N/A
Are pesticides required to be used as part of the development works?	No	N/A

MATTERS OF NATIONAL ENVIRONMENTAL SIGNIFICANCE CHECKLIST

Matters of National Environment Significance are matters protected under national environmental law (Environment Protection and Biodiversity Conservation Act 1999).

The following checklist provides guidance on whether an action is likely to have an impact on one of these matters, and whether further assessment of significance is required.

Consideration	Yes/ No	Details
The activity will not have any significant impact on a declared World Heritage Property?	No	No world or natural heritage items in works area.
The activity will not have any significant impact on a National Heritage place?	No	No national heritage place is in the area
The activity will not have any significant impact on a declared Ramsar wetland?	No	No RAMSAR wetlands in proximity to works area.
The activity will not have any significant impact on Commonwealth listed threatened species or endangered community?	No	No Commonwealth listed threatened flora or fauna species in the proximity of the works area.
The activity will not have any significant impact on listed migratory species?	No	No migratory species in the works area
The activity does not involve nuclear actions?	No	No impact on nuclear actions
The activity will not have any significant impact on Commonwealth marine areas?	No	N/A
The activity will not have any significant impact on Commonwealth land?	No	No
The activity does not relate to a water resource, a coal seam gas development or large coal mining development?	No	N/A

11. JUSTIFICATION + CONCLUSION

The proposed Queens Wharf Reserve Active Transport works is subject to assessment under Part 5 of the EP&A Act.

The REF has examined and considered all matters affecting, or likely to affect, the environment by reason of the proposed activity to the fullest extent.

As discussed in detail in this report, the proposal will not result in any significant or long-term impact. The potential impacts identified can be reasonably mitigated and where necessary managed through the adoption of suitable site practices and adherence to accepted industry standards.

As outlined in this REF, the proposed activity can be justified on the following grounds:

- Separated pedestrian and cyclist paths will improve the active transport experience and resolve conflicts between pedestrians and cyclists;
- There is improved path connections and DDA compliance;
- The pathway has been designed to retain trees, with those requiring removal having no retention value due to poor health, being dead trees or impacted by the Parramatta Light Rail works.
- local biodiversity and beautification of the area is increased through new tree planting, landscaping and gardens;
- safety is improved through new lighting;
- retaining walls are reconstructed;
- It responds to environmental sustainability initiatives of CoP that encourage other transport modes
- Contributes to a reduction in the urban heat island effect through enhanced tree canopy cover
- Protects European and Aboriginal cultural heritage
- It is consistent with all relevant legislation, plans and policies;
- It has minimal environmental impacts; and
- Adequate mitigation measures have been proposed to address these impacts.

The project will result in long-term positive benefits to the Parramatta LGA and is consistent with both Council and State Government strategic plans. Any impacts from construction activities are expected to be minor disruption and restricted to the vicinity of the subject site during the construction phase. More broadly the completion of the project will provide significant benefits to residents and visitors to the Parramatta LGA, allowing a greater appreciation of Queens Wharf Park and the Parramatta River, in addition to being a key active transport link to the Parramatta CBD and surrounding area.

It has been considered that the benefits associated with the proposed works outweigh the temporary minor adverse impacts. The proposal has assessed likely environmental impacts and provided recommendations for implementing mitigation measures during the construction phase. These are considered as sufficient. The environmental impacts of the proposal are not likely to be significant. Therefore an EIS doesn't need to be prepared.

In addition, the activity is unlikely to significantly affect threatened species, populations, ecological communities or habitats. Therefore a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) is not required.

On this basis, it is recommended that the CoP determine the proposed activity in accordance with Part 5 of the EP&A Act and subject to the adoption and implementation of mitigation measures identified within this report.

APPENDIX A – CONCEPT PLANS

Tree protection zones are shown as dashed circles on the concept plans.

Figure 7: Concept Plan sheet 1 (Source: City of Parramatta)

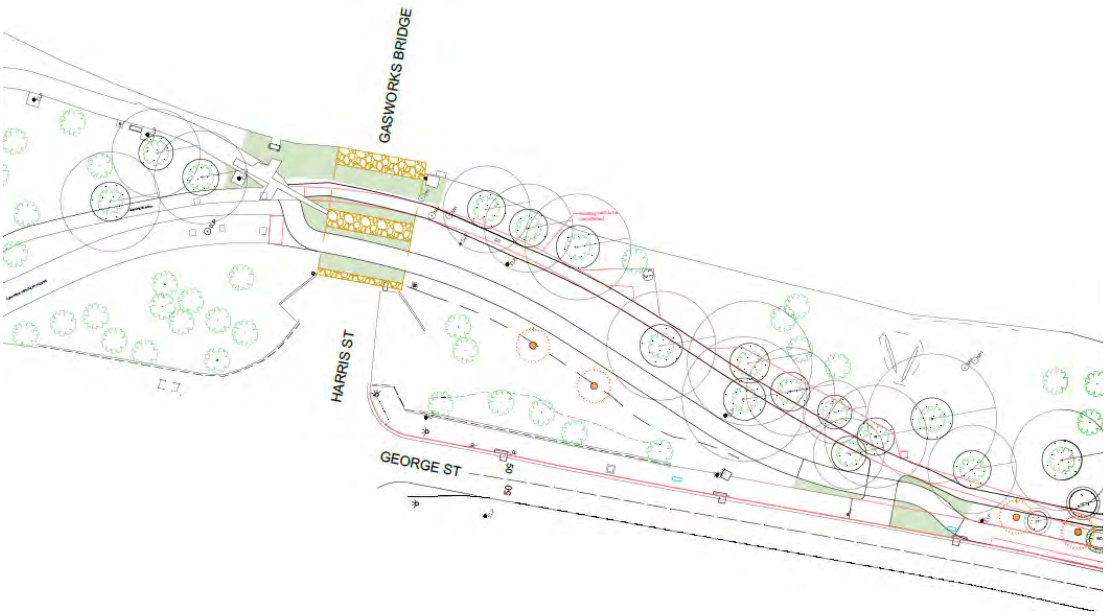
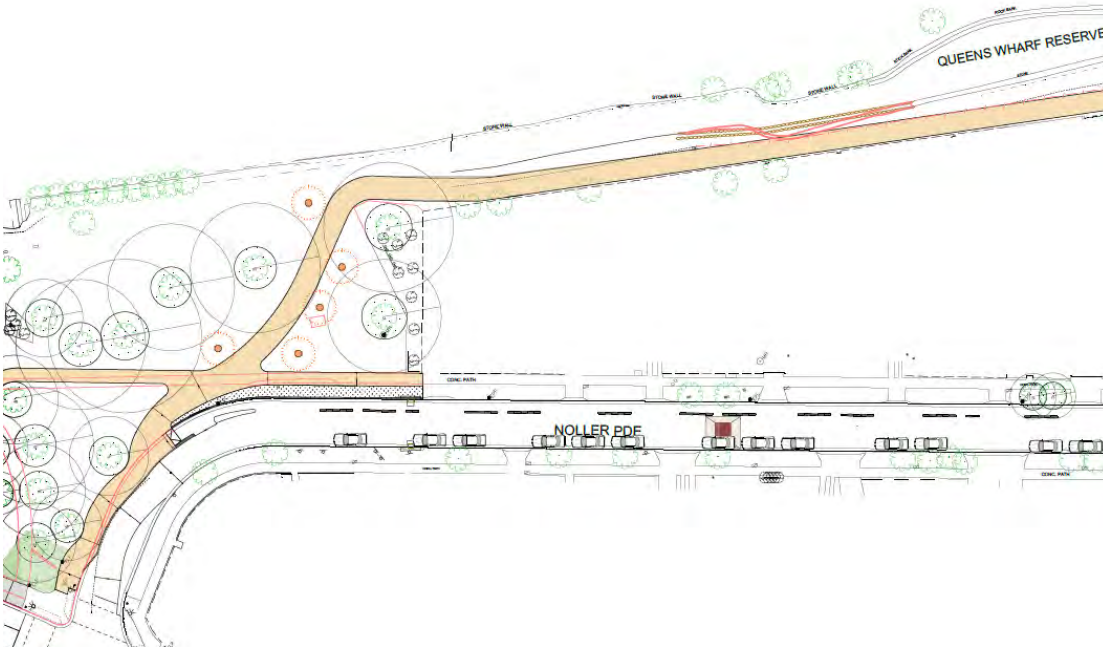


Figure 8: Concept Plan Sheet 2. The left edge of sheet 2 joins with the right edge of sheet 1 above. (Source: City of Parramatta)

Figure 9: Concept Plan Sheet 3. The left edge of sheet 3 joins with the right edge of sheet 2. (Source: City of Parramatta)



APPENDIX B- HISTORICAL ARCHAEOLOGICAL IMPACT ASSESSMENT REPORT

EXTENT
PEOPLE-CENTRED HERITAGE

Queen's Wharf Reserve and Noller Parade Active Transport Link

Historical Archaeological Impact Assessment

Prepared for City of Parramatta Council

February 2023 - FINAL

ECAAS ISO 9001 QUALITY MANAGEMENT CERTIFIED
ECAAS ISO 14001 ENVIRONMENTAL MANAGEMENT CERTIFIED
ECAAS ISO 45001 SAFETY MANAGEMENT CERTIFIED

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Draft 01	Graham Wilson	7/12/2022	technical
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Executive summary

Extent Heritage has been engaged by the City of Parramatta Council to undertake a Historical Archaeological Impact Assessment in advance of proposed development to install a cycleway and pedestrian path network as part of the Queen's Wharf Reserve and Noller Parade Active Transport Link Project. The proposed project area (hereafter referred to as the 'study area') is located in Queen's Wharf Reserve on the southern bank of the Parramatta River, Parramatta. The proposed development consists of a mix of shared paths, comprising of separated (off-road) cycleways and pedestrian paths, and on-street cycleways. Additional design elements include new tree planting, installation of improved lighting, minor landscaping and auxiliary works and minor civil infrastructure.

A search of all available heritage registers and the Heritage Management System (HMS). Items on the State Heritage Register, Parramatta Location Environmental Plan, and the National Trust (NSW) Register were identified. Two items are extant—HMAS Parramatta Shipwreck and Memorials (SHR 01676) and Queen's Wharf Reserve and Stone Wall Potential Archaeological Site (LEP I1489).

A site inspection of the study area was undertaken on 4 August 2022. The site inspection noted some minor ground disturbance from services, existing pathways, and other landscape elements. Some other discrete areas of modern excavation were noted, and reclamation fill toward the Parramatta River was likely to have built up the area substantially.

Queen's Wharf Reserve has a rich history dating from 1788 and is considered a significant archaeological landscape. Research undertaken for this report identified nine phases of development spanning from 1788 until present. These phases included:

- Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s);
- Phase 2: The Commissariat and continued military occupation (1825–c.1870s);
- Phase 3: Early subdivisions and development (c.1820s–c.1860);
- Phase 4: Howell's Mill (1823–1872);
- Phase 5: Steam Packet Inn and the Emu Hotel (1834–c.1911);
- Phase 6: Byrne's Mill (1841–c.1880s);
- Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937);
- Phase 8: Parramatta Gasworks (1872–c.1840s); and
- Phase 9: George Street Tramway and Queen's Wharf Reserve in the current day (1883–present).

Extent Heritage has been engaged by the City of Parramatta Council to prepare a Historical Archaeological Impact Assessment to support archaeological test excavations and application for appropriate permits.

Based on this desktop study and background research, the following recommendations have been made:

- Historical archaeological test excavation to determine the location, integrity, and presence of expected archaeological items; and
- Application for an Excavation Permit under s140 of the Heritage Act 1977 to authorise this testing.

The results of the testing program would determine any need for any additional permits for salvage, monitoring, and/or harm to relics. The results would also determine whether the construction phase of works could be undertaken through a s139(4) excavation exemption permit.

During construction, any excavation within the curtilage for the HMAS Parramatta Shipwreck and Memorials (SHR item 01676, LEP item I01676) should be avoided. If these items would be impacted, the works may be managed under a s140 permit which would be issued for the construction phase of work or through a s60 Fast Track process.

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1. Introduction

1.1 Project initiation

Extent Heritage Pty Ltd (Extent) has been commissioned by the City of Parramatta Council to undertake a Historical Archaeology Impact Assessment (HAIA) in advance of proposed works at Queen's Wharf Reserve. This report assesses the site's potential to contain historical archaeological remains, their significance, and the impacts of the proposed works on these resources and associated relics. This report provides recommendations for mitigation and management of archaeology during works conducted as part of this development.

1.2 Study area location and identification

The study area is located on the southern bank of the Parramatta River in Parramatta. The study area comprises Queen's Wharf Reserve and Noller Parade. The western most point of the study area extends beyond Macquarie Street (Gasworks Bridge) and the eastern most point extends to Alfred Street. The study area is a public parkland with walking paths, public infrastructure, Aboriginal art sculptures, and war memorials. The Reserve also forms part of the Parramatta Heritage Walk route. The study area is outlined below in Figure 1.

The study area lies within the City of Parramatta Council (LGA), county of Cumberland, Parish of St John, and the Cumberland County. The site comprises all or part of the following land parcels:

Lot B DP 433896	Lot 34 DP 1107897
Lot 1 DP 69432	Lot 56 DP 1107686
Lots 1, 2, and 3 DP 1151643	Lot 1 DP 128847
Lot 1 DP 909045	Lot A DP 444716
Lot A DP 959111	Lot 1 DP 126881
Lot 1 DP 224186	Lots 1, 3 to 11, DP 35895
SP 46699	

Figure 1. study area for proposed works at Queen's Wharf Reserve

Following a review of the available heritage databases, four heritage items are located within the study area. These listings are summarised in Table 1 below.

Table 1. Listed items within the study area

Register/listing	Item name	Item number	Archaeological heritage item
Statutory listings			
World Heritage List	-	-	-
National Heritage List	-	-	-
Commonwealth Heritage List	-	-	-
State Heritage Register	HMAS Parramatta shipwreck and memorials	01676	N
Parramatta Local Environmental Plan 2011, Schedule 5	Queen's Wharf Reserve and stone wall and potential archaeological site	I489	Y
	Gasworks Bridge	I487	N
	Wetlands	I1	N
	HMAS Parramatta shipwreck and memorials	I01676	N
Non-statutory listings			
Register of the National Trust (NSW)	Site of Queens Wharf	9741	Y
	HMAS Parramatta Memorials	7917	N
	HMAS Parramatta Memorials	7918	N

Only two of the items listed in Table 1 are considered to be associated with archaeological heritage. The remainder are discussed within the Statement of Heritage Impact (SoHI) prepared by Extent Heritage for the Queen's Wharf Reserve and Noller Parade Active Transport Link works. The sites listed in Table 1 are shown below in Figure 2.

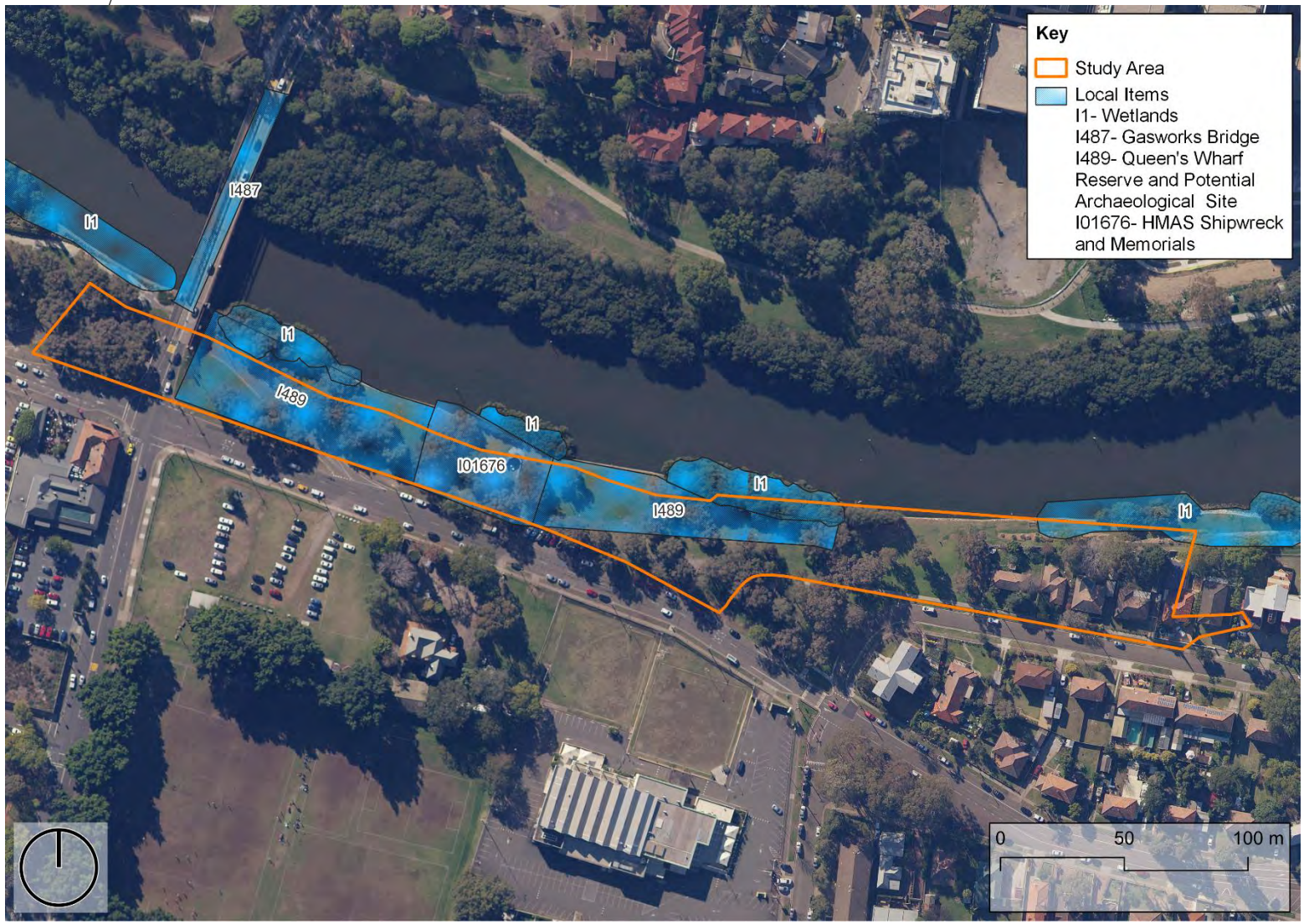

Figure 2. heritage items within the study area

1.3 Project description

City of Parramatta is proposing to install a cycleway and pedestrian path network as part of the Queens Wharf Reserve and Noller Parade Active Transport Link Project. The objectives of the shared path are to:

- establish an uninterrupted shared path along the foreshore to the tip of Camellia at the confluence of Duck and Parramatta River;
- achieve the aim contained in the NSW Governments Sharing Harbour Access Plan 'to improve public access to, and enhance the recreational enjoyment of Sydney and its tributaries for the people of Sydney and visitors to the city'; and
- contribute toward the accomplishment of Council's 'Parramatta Ways' vision by connecting people and places within the LGA. This would be achieved through a high-quality network of shared paths which provide opportunities for commuting and recreational active travel in quiet, attractive surrounds, with quality amenities that will be suitable for any residents from mothers with prams to the elderly.

The proposed development consists of a mix of shared paths, separated (off-road) cycleways and pedestrian paths, and on-street cycleways. Additional design elements include demolition of existing park seating and garden beds, removal of selected trees and new tree planting, installation of improved lighting, minor landscaping works, and minor civil infrastructure.

Excavations associated with the described works are expected to involve significant ground disturbance across the study area, up to a depth of 650mm below ground surface in some locations.

1.4 Statutory context

In relation to historical archaeology, the site is subject to the following statutory and non-statutory controls:

- Environmental Planning and Assessment Act 1979;
- Heritage Act 1977 (NSW);
- Paramatta Local Environmental Plan 2011;
- Paramatta Development Control Plan 2011; and
- Parramatta Historical Archaeological Landscaping Management Study 2000 (PHALMS).

1.4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (EP&A Act) requires that environmental and heritage impacts are considered by consent authorities prior to granting development approvals. The relevant sections of the EP&A Act are:

Part 4: Development that requires consent under consideration of environmental planning instruments.

Part 5: An assessment process for activities undertaken by Public Authorities and for developments that do not require development consent but an approval under another mechanism.

Where Project Approval is to be determined under Part 4 (Division 4.1) of the Act, further approvals under the *Heritage Act 1977* (NSW) (the Heritage Act) are not required. In those instances, management of historical heritage follows the applicable the Heritage Council of NSW guidelines (the Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation, July 2005) and any relevant statement of commitments included in the Development Approval.

1.4.2 Heritage Act 1977 (NSW)

The *Heritage Act 1977* (NSW) (the Heritage Act) is designed to conserve the environmental heritage of New South Wales and regulate development impacts on the State's heritage assets. Significant historical archaeological features are afforded automatic statutory protection by the 'relics' provisions of the Act. A 'relic' is defined as:

> *any deposit, artefact, object or material evidence that:*
>
> *a) relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
>
> 1) *is of State or local heritage significance.*

In accordance with Section 139(1), it is an offence to disturb or excavate land, where this may affect a relic, without the approval/excavation permit of the Heritage Council of NSW, unless an endorsed 'Exemption' or 'Exception' to disturb or expose and destroy a 'relic' applies. Sites which may contain archaeological relics are usually addressed under Sections 140 and 141 of the Heritage Act. Sites containing archaeological relics listed on the State Heritage Register (SHR) are addressed under Sections 60 and 63 of the Heritage Act.

Environmental planning instruments made under the *Environmental Planning and Assessment Act 1979* (EPA Act) include State Environment Planning Policies (SEPPs), which address matters of State or regional environmental planning significance, and Local Environmental Plans (LEPs), which guide planning decisions for local government areas. The subject area falls within Parramatta Local Government Area (LGA).

The objectives of Parramatta Local Environmental Plan 2011 (Parramatta LEP 2011) in relation to environment and heritage are provided in the following clauses:

5.10 Heritage conservation

(1) Objectives

The objectives of this clause are as follows:

(a) to conserve the environmental heritage of the City of Sydney,

(b) to conserve the heritage significance of heritage items and heritage conservation areas, including associated fabric, settings and views,

I to conserve archaeological sites,

(d) to conserve Aboriginal objects and Aboriginal places of heritage significance.

(2) Requirement for consent

Development consent is required for any of the following:

(a) demolishing or moving any of the following or altering the exterior of any of the following (including, in the case of a building, making changes to its detail, fabric, finish or appearance):

(i) a heritage item,

(ii) an Aboriginal object,

(iii) a building, work, relic or tree within a heritage conservation area,

(b) altering a heritage item that is a building by making structural changes to its interior or by making changes to anything inside the item that is specified in Schedule 5 in relation to the item

(c) disturbing or excavating an archaeological site while knowing, or having reasonable cause to suspect, that the disturbance or excavation will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed,

(d) disturbing or excavating an Aboriginal place of heritage significance,

(e) erecting a building on land:

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance,

(f) subdividing land:

(i) on which a heritage item is located or that is within a heritage conservation area, or

(ii) on which an Aboriginal object is located or that is within an Aboriginal place of heritage significance.

(7) Archaeological sites

The consent authority must, before granting consent under this clause to the carrying out of development on an archaeological site (other than land listed on the State Heritage Register or to which an interim heritage order under the Heritage Act 1977 applies):

(a) notify the Heritage Council of its intention to grant consent, and

(b) take into consideration any response received from the Heritage Council within 28 days after the notice is sent.

1.4.3 Heritage Listings

Following a search of all available registers, the following items were identified within the study area:

Table 2. Statutory heritage listings within the study area

Item Name	Item Number	Item Type
Queen's Wharf Reserve stone wall and potential archaeological site	Parramatta LEP I1489	Historical archaeological site and built heritage feature
HMAS Parramatta Shipwreck and memorials	State Heritage Register (01676) Parramatta LEP	Built heritage memorial structure
Gasworks Bridge	Parramatta LEP I1487	Built heritage structure
Wetlands	Parramatta LEP I735	Landscape

1.4.4 Non-statutory listings

1.4.4.1 Parramatta Historical Archaeological Landscaping Management Study (PHALMS)

Parramatta LGA is covered by Parramatta Historical Archaeological Landscape Management Study (PHALMS) is a planning document designed to inform Council planners and landowners of potential historical archaeological sites within areas of Parramatta. The Parramatta LGA is divided into Archaeological Management Units (AMU) based on current cadastral boundaries. The listing in each AMU identifies the general history of the area, archaeological potential, research significance, as well as provides management recommendations. Identification in PHALMS of a site having archaeological potential may require further assessment prior to development. Similarly, management recommendations associated with PHALMS listings do not take into consideration changes made to the *Heritage Act* in 2009 and 2013.

The AMU that encompasses the study area is AMU 3031, located on the eastern half of the study area along Noller Parade. The remainder of the study area, within Queen's Wharf Reserve, was not allocated an AMU number.

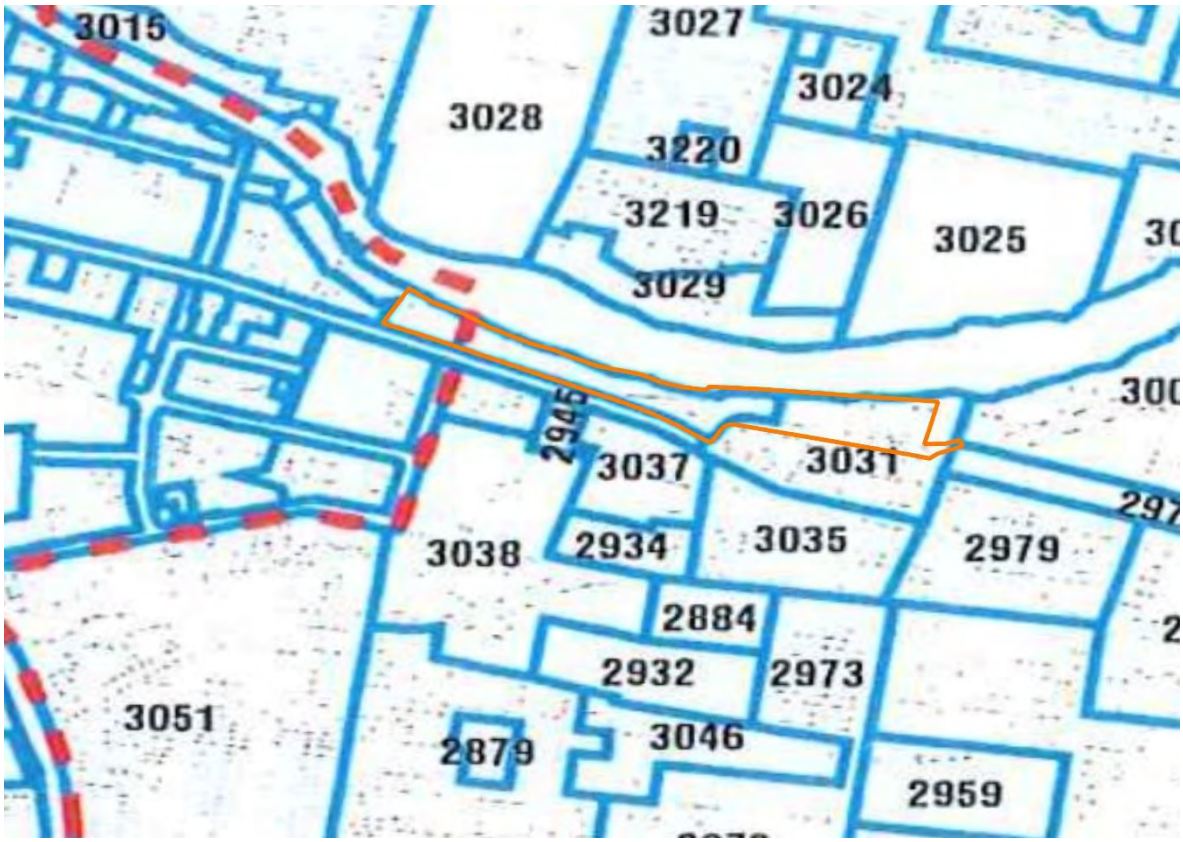

Figure 3 PHALMS listing of Queen's Wharf Reserve (GML, vol. 3 2000, 9)

1.5 Previous reports and investigations

The study area has been subject to several heritage reports including:

- Extent Heritage, 2020. Alfred Street Pedestrian Bridge Development, *Historical Archaeological Assessment* prepared for City of Parramatta;
- Artefact Heritage, 2017. Parramatta Light Rail, *Non-Aboriginal Archaeological Assessment* prepared for WSP/Jacobs;
- Stedinger Associates, 2016. Borehole Logs from the Soldiers' Precinct Queen's Wharf Reserve, Parramatta, *Geotechnical Report* prepared for Parramatta City Council; and
- Varman, R.V.J. 1996. Queen's Wharf Reserve Parramatta, *Archaeological Assessment* prepared for Parramatta City Council.

1.6 Approach and methodology

This report was prepared in accordance with the principles and procedures established by the following documents:

- *The Australia ICOMOS Charter for Places of Cultural Significance, 2013* (the *Burra Charter*) (Australia ICOMOS 2013);

- *Archaeological Assessment Guidelines* (Heritage Office and Department of Urban Affairs and Planning 1996);
- *Assessing Significance for Historical Archaeological Sites and 'Relics',* (Heritage Branch, Department of Planning 2009); and
- '*Historical Archaeology Code of Practice*' (Heritage Office, Department of Planning 2006).

1.7 Limitations

This report does not review the Indigenous cultural heritage values of the subject area.

1.8 Author identification

This report was prepared by Anastasia Klasen (Heritage Advisor, Extent Heritage).

This report was reviewed by Graham Wilson (Principal Heritage Advisor, Extent Heritage) and Hannah Morris (Senior Heritage Advisor, Extent Heritage).

2. Historic context

2.1 Historic Overview

2.1.1 Colonisation of Parramatta

The traditional owners of the Parramatta area are the Aboriginal clans of the Darug language group. For further historical information about the Darug please refer to the Aboriginal Cultural Heritage Assessment Report (ACHAR) for Queen's Wharf Reserve and Noller Parade Active Transport Link (Extent Heritage, 2022).

In 1788, the search for tenable farming land led the British up the Parramatta River from Port Jackson. Upon spotting fresh water and noting the presence of good soils, Governor Phillip established an agricultural township in the area. By December the same year, land clearing had been extensively undertaken, and convicts and marines occupied the land by the river. Government Farm was established on the northern side of the river and recorded its first successful harvest in December 1789 (Higginbotham and Johnson 1991, 4).

British colonisation of the area had swift and devastating effects on the Aboriginal population of the Sydney Basin (NPWS 2003, 189). In the Parramatta area there are many stories of resistance and co-existence with the British, but the impact of disease, violence, and the loss of land and resources was so rapid that many records and stories of the Darug communities were impacted by the early years of colonisation (NPWS 2003, 189).

Darug culture, and Aboriginal culture in Australia more generally, is living, dynamic, and contemporary. Aboriginal peoples have maintained a continued connections with the Parramatta area today. The Darug have considerable knowledge about the use of traditional lands before British colonisation and after colonisation, and the landscape continues to hold important cultural values to the local Aboriginal community.

By 1790, a town plan for the Parramatta settlement had been established by Governor Phillip and surveyor Augustus Alt. This plan laid streets on a grid with High Street (later George Street) running between the proposed location of Government House and the Landing Place at the eastern end of the township.

Figure 4. The landing place at Parramatta, Port Jackson c.1809, Evans, G W, SLNSW PXD 388 vol 3 no 5

Figure 5. A view in Parramatta NSW looking East,1825 – 1828, Earle, Augustus SLNSW PXD 265

2.1.2 The first landing place and early development

The first landing area within the study area comprised a natural stone formation where the river narrowed, located just east of the current Gasworks Bridge. The formation divided the fresh or brackish water from the tidal saltwater. The adjacent beach made the location an ideal landing place and was used to access the Parramatta settlement from the point of its colonisation in 1788 (Varman 1996,8).

The first public wharf was constructed c.1790 and was likely of timber construction (Figure 11). It was located downstream of the natural stone formation that was used as a casual landing place (Varman 1996, 8). The wharf formed the eastern extent of George Street and was an important access point for the river, providing access to Sydney downstream. The wharf was also central for the colony of Parramatta, with government structures that were soon built in the area-including Government Stores and Government Barracks located on the southern side of what is now George Street. These buildings were located outside of the study area, with later associated elements within Queen's Wharf Reserve (Figure 11). The wharf is not marked on eighteenth century maps of the area (Figure 6).

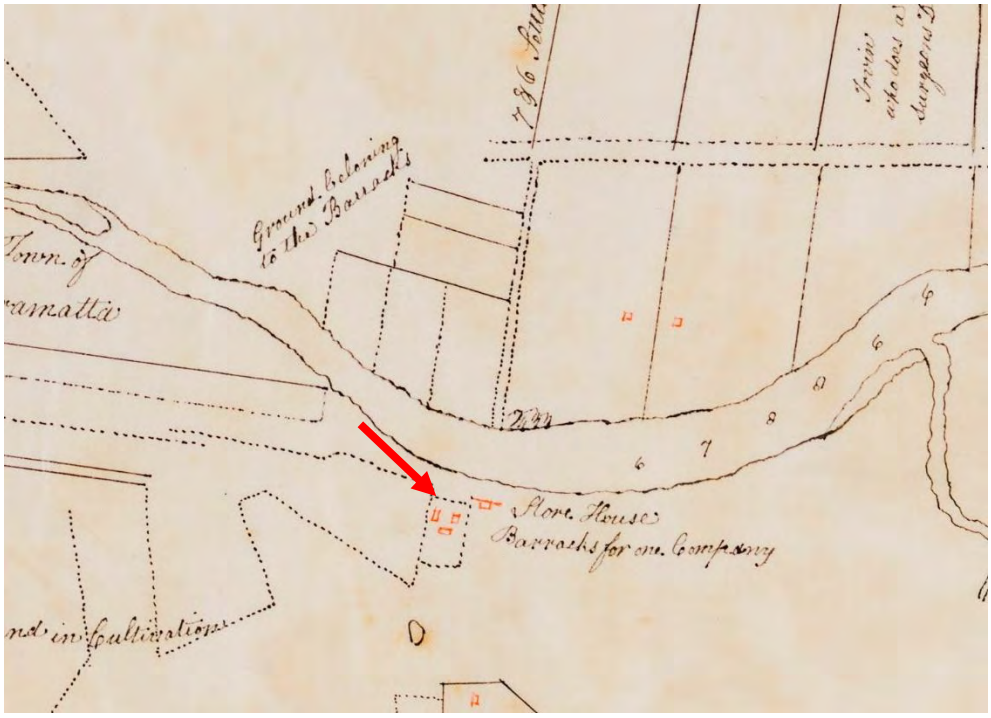

Figure 6. Extract from the Plan of the Settlement of Parramatta, Governor Hunter 1796. The map shows the Government Barracks and Store House, indicated by a red arrow (Source: SLNSW, M BT 36/Series 1/Map 17).

Figure 7. View of Parramatta, 1838, Martens, C SLNSW, DL Pg 15

To facilitate easier landing of larger boats and increased river traffic, a wharf was built in 1808 further east along the river within the study area. The land where the wharf was built had been previously granted to John Macarthur but was withdrawn for the purposes of establishing a public wharf (Varman 1996, 12) (Figure 12). With the growth of Parramatta as a garrison town, a stone wharf, the Lennox Wall or the 'government wharf', was built in c.1834 and was located approximately ten metres east of the 1808 wharf. This stone wharf (Kings Wharf) functioned as the main landing place at Parramatta and was renamed Queen's Wharf in 1837 following Queen Victoria's ascension to the throne (*The Cumberland Argus and Fruit growers Advocate,* 1901).

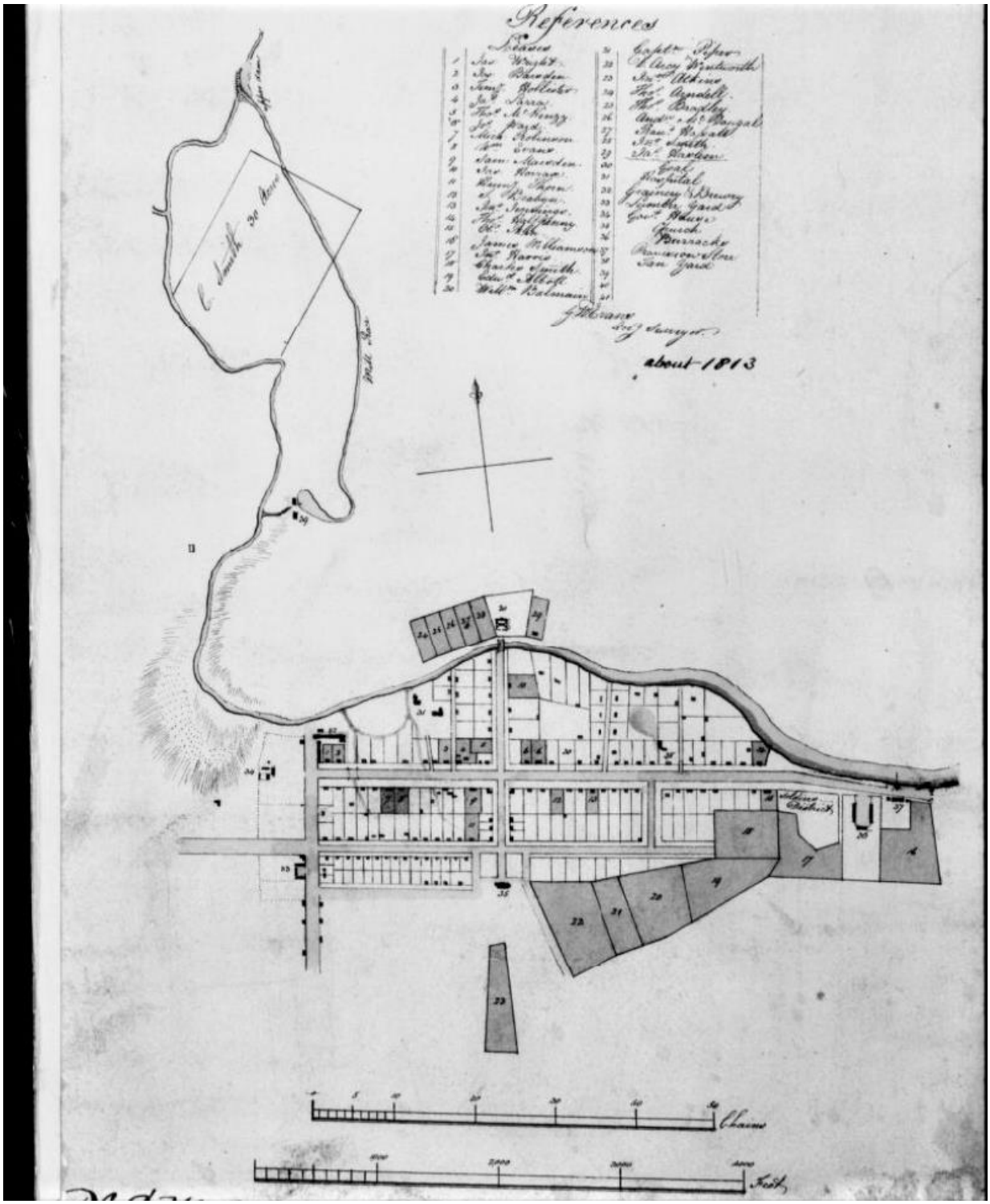

Figure 8. Plan of the Town of Parramatta 1813 (1804), Evans, GW, TNA CO 700 item 22

Figure 9. 1883 Plan of Streets in the Elizabeth Farm Estate and Harris Park Estate. Crown Plan 16-2033

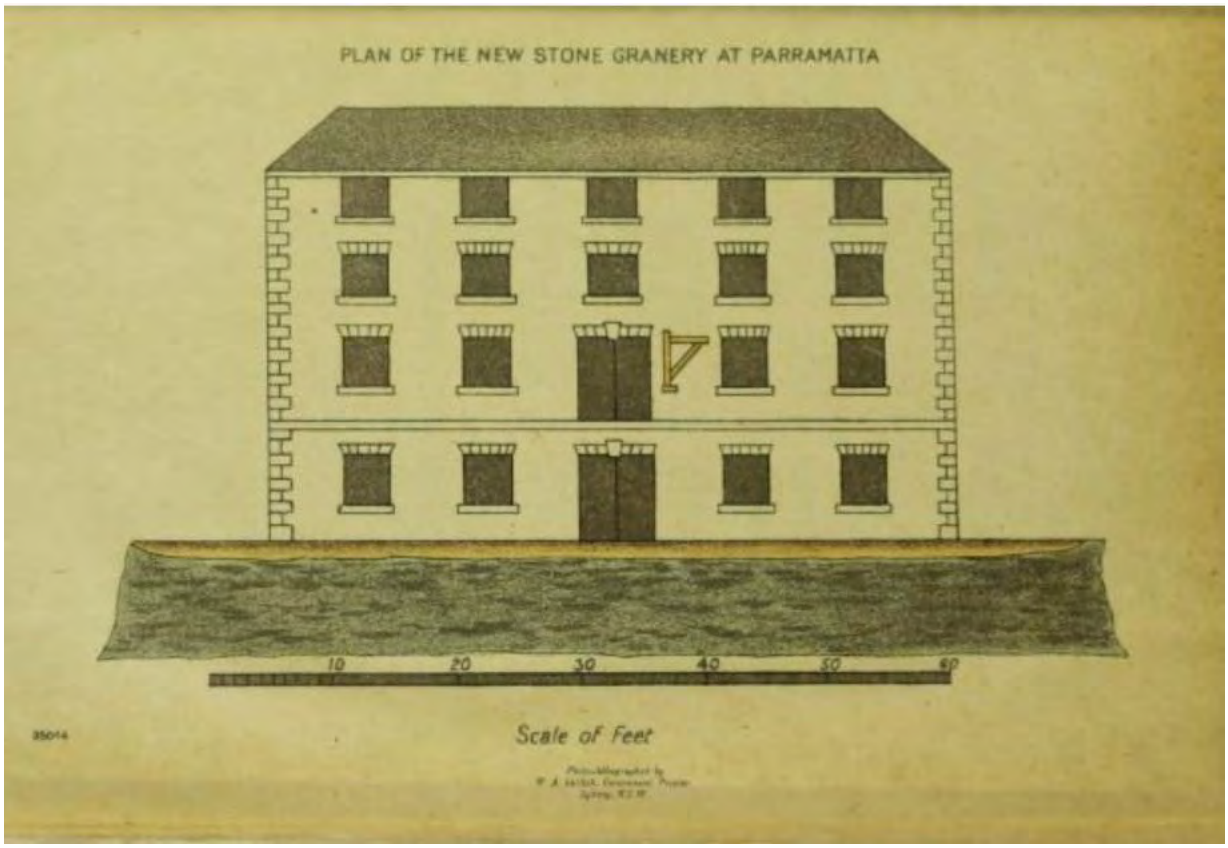

Figure 10. Plan of the New Stone Granary at Parramatta, HRNSW vol 7 opp 40

2.1.3 Subdivisions of the reserve

The land forming Queen's Wharf Reserve was originally divided into two portions, with George Howell owning the western part. Subdivision on the eastern part began as early as 1823 when the existing 14-year leases from 1809 were due to expire (Kass 1996, 113), (Figure 12). The new landowners from west to east include William Sherwin, George Howell, Samuel Wright, J.E. Manning, and James Urquhart with the eastern most lots along Noller Parade reserved for Government and Public buildings (Figure 17).

William Sherwin was granted an allotment at Queen's Wharf as early as 1823, however a portion of his grant was exchanged with George Howell to accommodate construction of Howell's Mill. Sherwin constructed a small house in the southwest of his allotment (Figure 26). This house fronted George Street and remained in the Sherwin family until the death of his youngest son, George Sherwin in 1898. Details of Sherwin's use of the land are unclear, however a small house is visible on the 1844 plan of Parramatta (Figure 26).

Figure 11. Plan of the Township of Parramatta, 1823 by G.C. Stewart

Figure 12. 1836 Map of Parramatta compiled from Richard's survey. Shows town allotments, and land leased and granted', L. Johnstone. SRNSW AO 4799.

2.1.3.1 Howell's Mill

George Howell, an ex-convict, was granted allotment 60, Section 21 fronting George Street at Queen's Wharf on June 30, 1823 (Higginbotham 1989, 68). This lot was located immediately west of today's gasworks bridge. By the end of 1827, Howell had purchased part of Sherwin's lot to the east to allow for the construction of a dam that was part of the mill. Howell constructed the wind and watermill with his eldest son, George Howell Jr, who later became the manager of the mill.

Figure 15 and Figure 26 depict the combined wind and watermill iteration of Howell's Mill. The images suggest that the windmill was constructed adjacent to the dam that extended across the river. In addition, the images also show that the mill complex contained several smaller buildings on the property (Figure 14). These structures included a small private wharf, grain stores, work sheds, and a residence (Tatrai 1994).

Howell resided and worked at the mill until 1837 when he moved to another mill he operated near the Female Factory in North Parramatta. However, in 1838 Howell was killed at this mill in an accident and the ownership of the business was taken over by John Hamilton (The Sydney Herald 1838, 3). Hamilton operated the mill in North Parramatta until 1847 when it again changed hands and was renamed 'Knights Mill'. Over the following two decades, between 1850 and 1870, larger steam mills were established across Parramatta and as a result of this competition, Knights Mill was abandoned in 1868. The former lots owned by George Howell were purchased by the Parramatta Gas Company in 1872, after which the mill and all associated structures were removed.

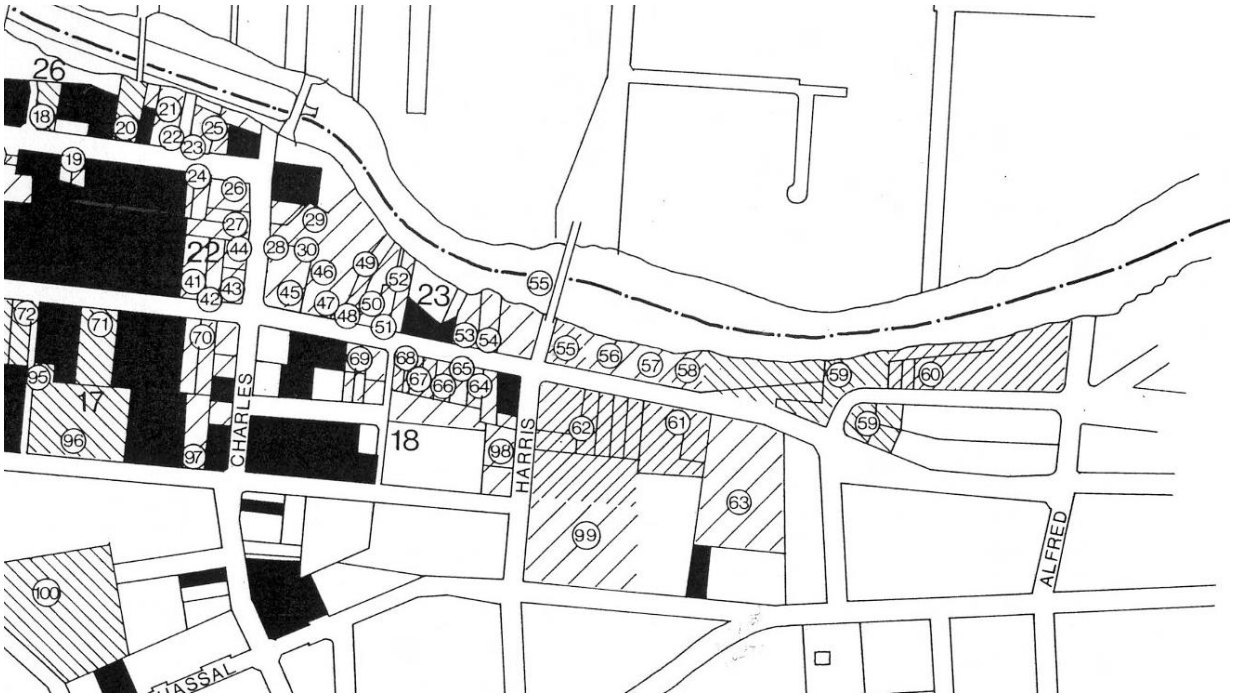

Figure 13 Higginbotham AZP, Parramatta (numbers as mentioned above in text) (source: Higginbotham, 1989)

Figure 14 Watercolour drawing depicting Howell's Mill, c.1850s, by. Miss M.A Williams (Source: SLNSW, reference code 25717).

Figure 15 Howell's Mill Parramatta, 1849 oil painting, by G. Wickham (Source: SLNSW record reference code 404735).

2.1.3.2 Byrne's Mil

Byrne's Mill was established by James and William Byrne in 1844 on two acres of land that they had leased from 1841. James and William Byrne were born in Ireland and came to Australia with their father in 1808 (Jervis 1961, 105). In their early years in the colony, William worked as an apprentice carpenter in the 1830s, his brother James established the first steam ferry to run along the Parramatta River. The brothers operated the ferry together until the 1840s.

In 1841, the brothers built a steam mill on it that operated as a flourmill (Figure 16). Byrne's Mill was established following the lease of the lot along modern day Noller Parade. In 1844, a five-storey extension to the flourmill was constructed and was used as a cloth factory (Kass 1996, 174). Machinery for the factory was imported from England in 1846 and production from the factory commenced in 1847 once the facility was fully established (Jervis 1961, 106).

Byrne's Mill extended west along the Parramatta River and an 1843 plan shows some structures on the former Government land. Figure 18 shows the five–storey factory structure and buildings to the west that would have encroached on the former Government land. This undated photograph indicates that the factory was constructed with stone and brick, and there was a retaining wall along the bank of Parramatta River that was associated with the mill. Figure 16

shows workers cottages to the east of the main mill building, these cottages were likely constructed using brick and timber.

The Byrne's cloth factory was one of several factories producing cloth at this time. However, because of competition within Parramatta, the Byrne's brothers established other ventures. The brothers had bought a store near the Queen's Wharf in 1833, previously owned by Francis Grose, and started the Burton Brewery that they maintained and operated even after the success of their cloth factory and steam mill (Kass 1996, 174).

James Byrne was an influential figure in early Parramatta and was engaged in local politics through his role as markets commissioner, commissioner for the Parramatta Road Trust in 1858, member of Parramatta District Council from 1843, and mayor from 1862 until 1866. James Byrne was also member for Cumberland in the Legislative Assembly between 1856 and 1857, as well as for Parramatta between 1858 and 1861, and 1864 to 1872 (Kass 1996, 149–151).

The mill was highly successful until the boom of the gold rush in the 1850s, when workers left the area. The factory and mill was forced to close in 1857. The cloth mill was reopened in 1862 by James' son, Charles, however it was closed again at sometime in the 1880s. In 1908, the government purchased the old mill for £2,300 and the buildings were used as part of the George Street Asylum for aged men (Figure 9, Figure 12). The buildings were likely demolished in 1937 when the Benevolent Asylum and former Commissariat stores were also demolished.

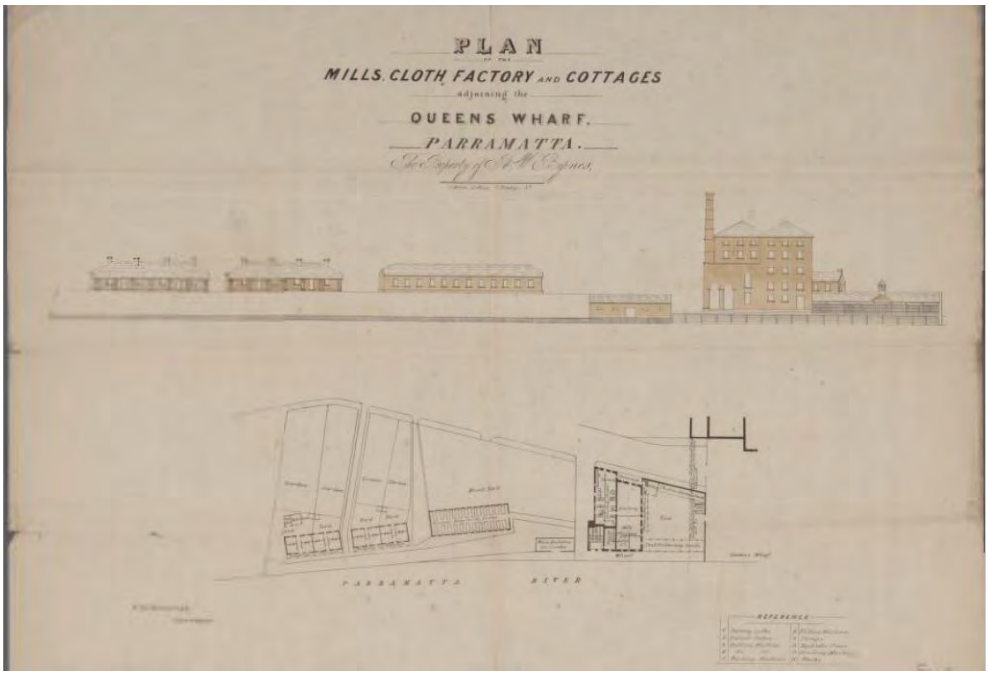

Figure 16 Plan showing Byrnes Mill c.1853 (source: NLA, https://nla.gov.au/nla.obj-229930183/view)

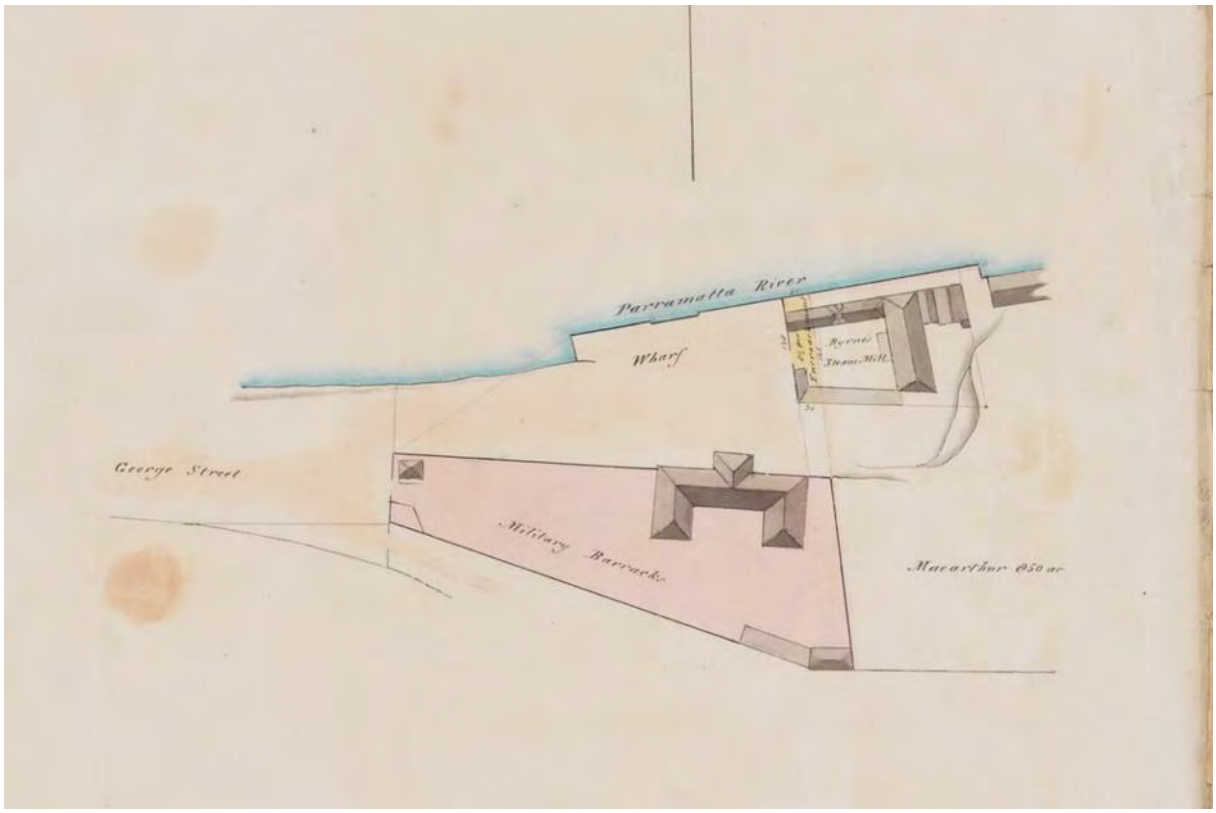

Figure 17 Military Barracks and Byrnes' Steam Mill, plan showing the location of some of the mill on Government land in the northeast (Source: SLNSW, Call No. CA84/21).

Figure 18 View from the northern side of Parramatta, facing south towards the Byrne's Mill (Source: Parramatta Heritage Centre).

Figure 19. Brownrigg's 1844 plan of Parramatta (Source: SLNSW M ZM3 811.1301/1844/1).

Figure 20. Knapp Survey of all of the street in the Town of Parramatta South for the purpose of aligning the same 1855 NSWSA Map 4905

2.1.4 The Commissariat Stores

2.1.4.1 The Commissariat Stores

The Commissariat Store was an essential part of the convict establishment in Parramatta during its early years. The stores supplied necessities including food, clothing, liquor, machinery, building material, and other goods. However, with the gradual withdrawal of the convict population the Commissariat began to lose its function.

The Commissariat Stores at Queen's Wharf were established when river traffic began to peak, and, in 1821, Commissioner JT Bigge noticed the need for stores in Parramatta. The Commissariat was constructed in 1825 as a four-storey stone building (Brown 1995, 91), (Figure 10).

The Parramatta Stores were described by building investigator, Standish Lawrence Harris, who visited Parramatta during the construction of the Commissariat Stores. Harris describes the stores as follows:

> "This Store in appearance, is a well built and spacious Building; the Stone and Brick remarkably good, –the underground story fronting the river is built of large Marble Stone, but for want of a sewer the wet soaks through the Soil at the back and runs through the wall….
>
> The mortar which is composed of a small portion of Lime to the red Earth or Loam is mouldering away– this kind of Mortar has been used throughout the Building, except a little of better kind for Pointing the Brick and Stone.
>
> The Beams used for the purpose of flooring, have been selected with little judgement, being of large dimensions, and the joints cut, and chip-capped to fit not them…parts of the walls have been built this year and a roof is now putting on" (Harris 1824, 93).

The building was used for a short time as a Commissariat when, in 1828, it was converted into a Military Barrack to accommodate the growing military establishment at Parramatta.

2.1.5 The Military Barracks

During the early years of the colony, Parramatta operated as a military outpost with Sydney Cove being headquarters for the military establishment. However, by 1827 the Parramatta garrison required more accommodation (Figure 17). The Commissariat Stores were converted into a Military Barrack and the four-storey stone building became known as the 'Lower Military Barrack'. By the 1830s, an increase in the number of personnel based there required additional infrastructure and buildings were established around Queen's Wharf. This included the construction of a brick privy, a brick drain, and a guard house. In 1836, a brick boundary wall fronting George Street was erected around the perimeter of the barracks.

Plans and illustrations from the 1830s show the original Commissariat Store (at this stage now the Lower Military Barracks), a gate house to the west on George Street and a kitchen building in the southeast near the new perimeter wall (Figure 12). There appears to have been few modifications or developments associated with the Military Barracks after 1836 and the last soldiers housed at the Lower Barracks were vacated by 1848, with a short occupation by the

77th regiment in 1857. Use of this area as a military site had ceased by the end of the 1850s and, in 1862, the building was converted for use as the Parramatta Benevolent Asylum.

Figure 21. *Reuss and Browne's 1859 Map* of the subdivisions of Parramatta and environs [SLNSW: M Z/ M3 811.13gbbd/ 1859/

2.1.6 The Benevolent Asylum

By the 1860s, population within Sydney and surrounding areas began to boom and the existing Benevolent Asylums in Liverpool and Sydney quickly became overpopulated. With the exit of the military, the former Commissariat was converted into the Parramatta Benevolent Asylum for destitute men at the request of the Benevolent Society. By March 1862, staff were dispatched to work and at least 150 men were to be housed there by the end of the month.

With the rapid growth of the Benevolent Asylum, a need for improved infrastructure and facilities to the area were required. These include additional drainage and ventilation outhouses and sheds, tanks, and wells. These upgrades and improved conditions of the buildings allowed accommodations to grow and, by 1870, the asylum housed 250 men.

Historic records and plans from this time indicate that a large tank and two wells had been added to this site to provide water to the asylum. The wells that were added to the property were each forty-one and twenty-five feet deep. Additional services were added to the asylum including a kitchen, lavatories, and some workshops for the patients (The Empire 1870, 3).

Growth of the asylum was gradual over the years following the 1870 upgrades, mostly due to poor funding in the area. In 1884/1885, it was recorded that there were at least 350 patients housed at the Parramatta Benevolent Asylum and it was during this time that the Government acquired land from the former Byrne's Mill. The structures that previously made up the cloth factory and mill were converted into accommodations for staff and wards for patients (Figure 17 and Figure 18). In August 1888, 'a piece of ground of about one acre in extent' was granted as

an exercise ground for the men in the asylum' (Evening News 1888, 6). In 1890, the Superintendent of Government Asylums, Mr Sydney Maxted 'visited Parramatta for the purpose of remedying the overcrowded state of the George Street Asylum'. During that time, the asylum contained at least 960 patients, peaking to 1,100 by the turn of the twentieth century (Evening News 1890, 5; The Daily Telegraph 1900, 5).

A 1898 survey shows the structures associated with the Benevolent Asylum in detail, including the buildings that were previously part of Byrne's Mill (Figure 9 and Figure 22). By the early 1900s, overcrowding within the asylum became a major issue, and the facilities that had been in place since the late 1800s were no longer considered adequate. In response to this, some smaller buildings were constructed around the current buildings (formerly the Commissariat and Byrne's Mill). These buildings were erected along the eastern side of George Street and fronted the Parramatta River. In 1905, it was reported that there were 924 men living in the asylum and a tender was issued for the construction of a new dining room and alterations to the existing buildings.

In 1913, the ownership of the Parramatta Benevolent Asylum was transferred to the Department of Charitable Institutions to Public Health and became known as the 'State Hospital and Asylum for Aged and Infirm Men, George Street, Parramatta'. The asylum did not undergo any significant modifications following this transfer of ownership and the former Byrne's Mill cloth factory building continued to be used as wards for the patients. These buildings from the former Byrnes Mill and factory were fully demolished in 1920.

The George Street Asylum officially closed in 1936 once all inmates were transferred to Lidcombe State Hospital. It is unclear when the buildings were officially demolished, however all structures from the former Commissariat, Byrnes Mill, and George Street Asylum were cleared by 1939.

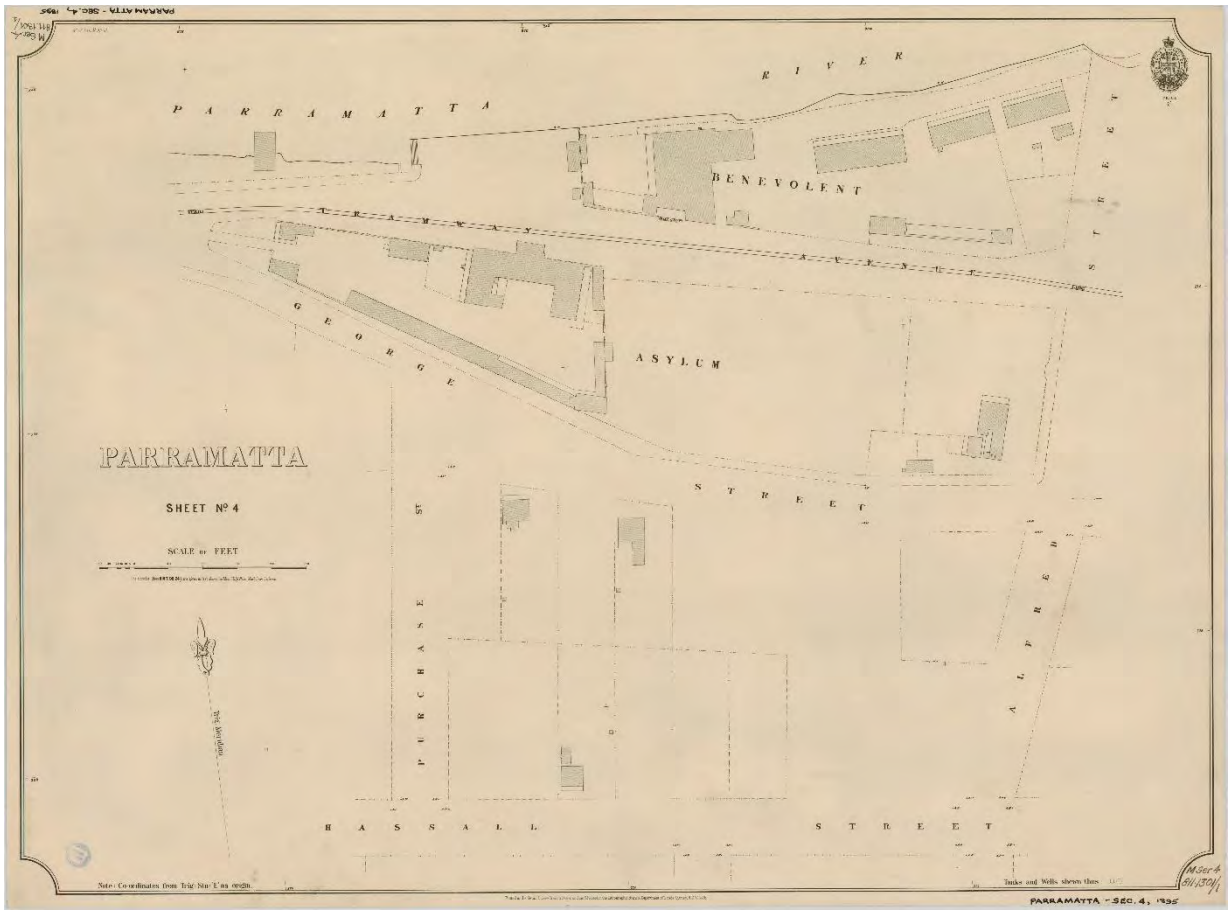

Figure 22. 1895 Parramatta Detail Series, Sheet 9, (Source: SLNSW Metropolitan Detail Series 4 811.1301/1)

Figure 23 Parramatta Benevolent Asylum and gardens (Source: SLNSW, record identifier 1JkoP4rY).

Figure 24 Parramatta Benevolent Asylum c.1911 (Source: SLNSW, record identifier nX6lijo8Y).

2.1.7 The Steam Packet Inn and the Emu Hotel

2.1.7.1 The Steam Packet Inn

The original opening of the Steam Packet Inn is unknown, however public records from the nineteenth century indicate that the Inn was established and operating on George Street in 1834 (Figure 12). A license was granted to a local man named Charles Macarthur in 1834, who likely owned and operated the Steam Packet Inn until 1837 when the license was transferred to Thomas Whitty. Ownership and licensing of the Inn changed hands several times between 1837 and 1845, and in 1846 the license was transferred to ex-convict John Cadman. The Macarthur family conveyed one rood of land (Lot No 2 in Section 23), where Charles Macarthur retired to and managed the Steam Packet Inn until his death in 1848. The license of the Inn was temporarily transferred to John Fulton between 1853 and 1856, until it was transferred back to Cadman's widow, Elizabeth, in 1856.

The Steam Packet Inn continued to operate until the death of Elizabeth in 1861.

2.1.7.2 The Emu Hotel

In 1861, following the death of Elizabeth Cadman, the license of the inn was transferred to John Kell and his wife. Following the acquisition of the Steam Packet Inn, the Kell family managed the establishment and changed the name to the 'Emu-Hotel'. In 1886, the hotel was advertised

for sale, and after this a clear line of ownership is unknown due to an absence in the historic record. However, it is probable that the Emu-Hotel was managed and operated by various people until 1908 when the property was sold.

Historical records indicate that the Emu-Hotel was a brick building that had a verandah around three sides and had nine rooms that included three attic rooms, a kitchen, pantry, storeroom, laundry, basement, and stables outside (The Cumberland Argus 1908, 9). The building was demolished sometime in the early twentieth century, likely around 1911.

2.1.8 Gasworks

Following the abandonment of Howell's Mill in 1868, the lots that comprised this area were acquired by the Parramatta Gas Company in 1872. Construction of a brick retort house and a retaining wall began in the same year. The pipes for the gasworks were not laid until late 1872 and large gasometer was built. Construction of the gasworks were complete by late 1872, and officially opened in March 1873.

Historical records show that the gasworks consisted of a large factory building along George Street that included a furnace. Along the waterfront of the Parramatta River, there were two iron gasometers and a retaining wall. In the initial years, the gasworks used the buildings from Howell's Mill.

The gasworks was purchased by the Australian Gas Light Company (AGL) in 1890 who undertook significant expansion and development of the area. An 1895 plan of Parramatta shows that by this time the gasworks included a large factory building and furnace, converters, a gasometer, retaining walls (both along Parramatta River and George Street), coal sheds, accommodation, site offices, and other ancillary structures (Figure 25). The Parramatta Gasworks continued to operate on George Street until the mid- to late-1930s.

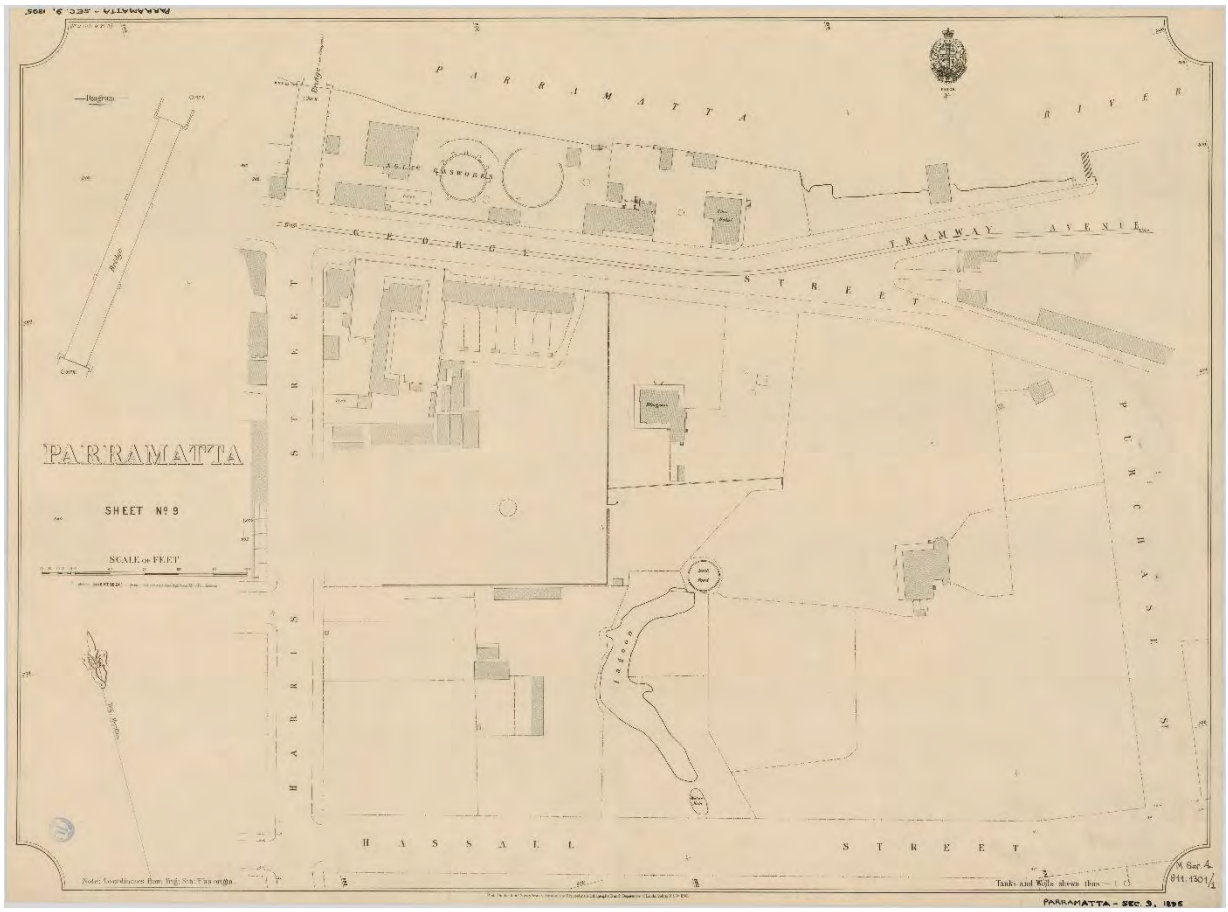

Figure 25. 1895 Parramatta Detail Series, Sheet 4, (Source: SLNSW Metropolitan Detail Series 4 811.1301/1)

2.1.9 George Street Tramway

George Street was established soon after the establishment of the settlement and was the main thoroughfare in Parramatta throughout the nineteenth century. The road serviced the wharves, and both the commercial and residential frontages along the river until the shutdown of the Government wharf sometime in the mid-1880s. Following the closure of the wharves, road and rail became the primary method for accessing and delivering supplies to the town. With increased population and use of George Street, the George Street Tramway was established in 1883. This tramway connected the Parramatta Park to the Redbank Wharf, via Tramway Avenue.

The tramway continued to operate along George Street until March 1943 when it was discontinued. Following the closure of the tram, George Street became a local road.

Figure 26 1844 Brownrigg plan of Parramatta (study area in red).

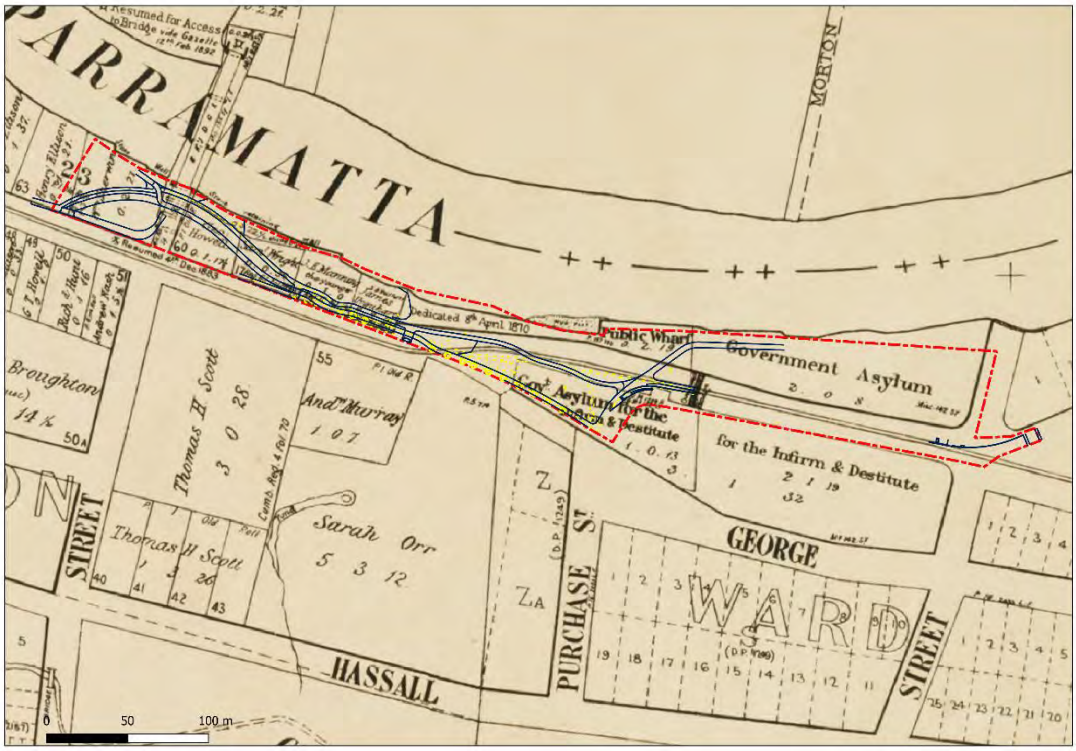

Figure 27 Cupolla and Cahill plan of early Parramatta c.1870 (study area in red).

2.2 Site history timeline

The following timeline of events within the study has been established and are summarised in the table below:

Year	Description
Pre-1788	Indigenous occupation and land use by the Darug people, including the Burramattagal
1788	Settlement of Governor Arthur Phillip and the first colonists to Australia
1789	the first Government Farm in Parramatta is established
1790	the first public wharf is constructed of timber at the first landing place, Queen's Wharf Reserve
1808	a stone wharf is constructed at Queen's Wharf Reserve to accommodate for the increased river traffic in the area
	Parramatta becomes a military centre for the regiment
1809	western half of Queen's Wharf Reserve is divided into two, between Government land and George Howell
1823	Queen's Wharf Reserve is further subdivided between William Sherwin, George Howell, Samuel Wright, J.E Manning and James Urquhart.
	George Howell exchanges land with William Sherwin so Howell can build and Wind and Water Mill
1825	four-storey stone Commissariat building is constructed
1828	Commissariat stores are converted into a Military Barrack
1827	Howell's Wind and Water Mill begins operation
1834	a Government Wharf is constructed to the east of the stone wharf
	the Steam Packet Inn is established and operating
1836	brick boundary wall fronting George Street is erected
1837	the Government Wharf becomes the Queen's Wharf following the coronation of Queen Victoria
1841	the Byrnes brothers, James and William, lease a lot along modern-day Noller Parade and establish a steam and flour mill
1842	steamers and large ships cease using Queen's Wharf due to silting in the river.
1844	Byrne's Mill is established on two acres of land fronting Noller Parade
	Construction of a five-storey extension to the four mill begins
1847	Byrne's steam and cloth mill begins operation
	Howell's Mill ceases operation
1857	Byrnes Mill is forced to close because of lack of workers in the area

Year	Description
1861	the Steam Packet Inn becomes the Emu Hotel
1862	Byrnes cloth mill is reopened
1862	the Commissariat Stores are converted into the Benevolent Asylum
1868	Howell's Mill is completely abandoned
1870	modifications are made to the Benevolent Asylum including the installation of a large tank and wells
1872	the Parramatta Gas Company purchases Howell's Mill and demolishes the mill and associated structures.
1873	Parramatta Gasworks officially opens
c.1911	the Emu Hotel is demolished
1920	buildings from the former Byrnes Mill are fully demolished
1936	George Street Asylum/ Parramatta Benevolent Asylum officially closes
1939	all structures from the former Commissariat, Byrnes Mill, and the asylum are fully cleared
.1940s	all structures associated with the former gasworks are demolished

3. Physical description

3.1 Site Inspection

A site visit was undertaken across the study area on 4 August 2022 by Extent Heritage advisors (Hannah Morris, Senior Heritage Advisor, and Hayley Edmonds, Heritage Advisor). The aim of the visit was to assess the landscape, identify any obvious evidence of disturbance, and identify any visible historical archaeological features. The inspection was undertaken as a visual study only.

This section provides a summary of the results of this survey:

- DEM mapping and available contour data adequately represented the physical form of the landscape. The parkland comprises a gentle slope northward to the riverbank (Figure 28-Figure 29).
- All native vegetation has been previously stripped from the study area.
- Several signs associated with the Harris Park Heritage Walk had been installed along Queens Wharf Reserve, within the study area (Figure 32)
- Sandstone walling along the edge of Parramatta River was located along the entire northern extent of the study area. This wall likely dates to the period following the c.1823 issue of leases (Figure 33).
- Concave inlet along the sandstone wall running along the edge of the Parramatta River. This section was associated with the Wharf. Several other sandstone blocks, flush with the ground surface, were identified within the vicinity (Figure 28 and Figure 29)
- Sandstone flagging beneath the Gasworks Bridge Figure 34 and Figure 35*).*
- Ground disturbance to install the HMAS memorial (Figure 38) and Gasworks Bridge (Figure 39) was noted, especially on the northern side of the feature where the ground level is cut away. The area around the Gasworks Bridge has been identified as having several metres of reclamation fill around it (GML forthcoming).
- Ground disturbance was identified along the banks of the Parramatta River, especially in the western portion of the study area. Two large services, likely water pipes, ran in parallel in an east to west alignment. These were identified by several manholes/inspection pit visible on the ground surface (Figure 40).

The site visit showed that limited evidence of past uses of the site was visible due to modern landscaping of the reserve. Localised areas of disturbance, namely excavation for modern services and infrastructure, were noted. While some historical sandstone features were identified above ground, the extent of subsurface impacts to archaeology and earth build-up was not identifiable.

Figure 28 General landscape of QWR. Facing east.

Figure 29 General landscape of QWR. Facing east.

Figure 30 Representation of existing cycleway and footpath. Eastern portion of site.

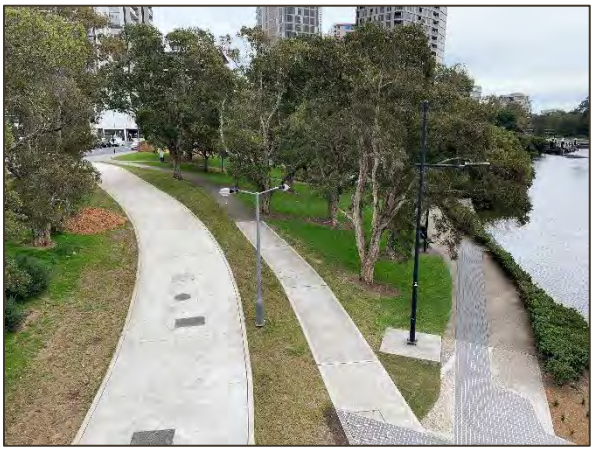

Figure 31 Representation of existing cycleway and footpath. West of Gasworks Bridge.

Figure 32 Example of heritage walk signage.

Figure 33 Example of sandstone wall along the Parramatta River.

Figure 34 Sandstone walling associated with the Wharf. Facing north-west.

Figure 35 Sandstone walling associated with the Wharf. Additional pieces of sandstone marked with red arrows. Facing east.

Figure 36 Sandstone piece underneath Gasworks Bridge. Facing west.

Figure 37 Sandstone flagging underneath Gasworks Bridge. Facing west.

Figure 38 Disturbance associated with HMAS Parramatta memorial.

Figure 39 Disturbance associated with Gasworks Bridge underpass.

Figure 40 Disturbance associated with services. Manholes/inspection pits marked with red allow demonstrating a portion of the feature's extent.

3.2 Geotechnical and environmental investigations

Borehole testing was undertaken in the Queen's Wharf Reserve proposed cycleway area in June 2016. These works consisted of two areas within the precinct. Area A is consisted of three boreholes (numbered one to three) between Harris Street and Purchase Street, along George Street. In Area B there were five boreholes (numbered four to eight) between Purchase Street and Alfred Street. The boreholes, measured 50mm to 100mm in diameter and were carried down to a depth of 3000mm to 6000mm. The findings are summarised in the table below. (Stedinger 2016, p18).

Borehole	Profile Summary	Archaeological Potential
1	Up to 1240mm of fill Thin deposit of potential historic material (brown soil, charcoal, sandstone, hand-made brick)	Potential historical deposit at 1240mm deep (280mm thick) Site of former Gasworks
2	Up to 1240mm of fill Thin deposit of potential historic material (brown soil, charcoal, sandstone, hand brick)	Potential historical deposit at 830mm deep, (80mm thick) Near line of private tramway

3	Small amount of surface soil overlying natural sand (PSB)	Potential Aboriginal Deposit
4	Fill, includes redeposited historic material (brown soil, charcoal, sandstone, hand-made brick)	No horizon, no intact deposit No evidence associated with early Government Store
5	Significant disturbance Foreshore reclamation Soil from local area excavated and redeposited along the shoreline Surfaced with soil and grass in the 20th century	No intact deposit
6	Significant disturbance Modern foreshore reclamation Introduced fill and sandstone boulders	No intact deposit
7	Significant disturbance Foreshore reclamation Soil from local area excavated and redeposited along the shoreline Surfaced with soil and grass in the 20th century	No intact deposit
8	Significant disturbance Modern foreshore reclamation Introduced fill and sandstone boulders	No intact deposit

4. Historical Archaeology Potential

4.1 Archaeology of the Neighbourhood

Extent Heritage, 2020. Alfred Street Pedestrian Bridge Development, *Historical Archaeological Assessment* prepared for City of Parramatta Council

Extent was engaged by the City of Parramatta Council in 2020 to undertake a HAIA in advance of works to be undertaken as part of the Alfred Street Pedestrian Bridge. This report covered the area of Byrne's Mill, which is located parallel to Noller Parade. The HAIA identified a high potential for archaeological resource associated with Byrne's cloth mill and the worker's cottages.

Subsequent archaeological testing undertaken by Extent identified structural remains relating to Byrne's Mill and the cottages. These studies that were undertaken are located within the current study area for the Queen's Wharf Reserve and Noller Parade Active Transport Link development. The HAIA prepared by Extent is a key report to review when undertaking archaeological investigations in this area. The available information through this material

includes the location and depths of archaeological remains, their integrity and the likelihood of survival for remains associated with this phase of occupation within the study area.

Artefact Heritage, 2017. Parramatta Light Rail, *Non-Aboriginal Archaeological Assessment* prepared for WSP/Jacobs

Artefact Heritage was engaged by WSP/Jacobs to prepare a Non-Aboriginal Archaeological Assessment in support of the Environmental Impact Statement for Parramatta Light Rail. This report analysed the potential and significance for archaeological remains along the alignment of the Parramatta Light Rail route.

The report identified key phases of historical development at the site, which partially overlap with the current study area for the Queen's Wharf and Noller Parade development. This report is a central report to review when assessing the archaeological potential and significance within the Queen's Wharf Reserve area. The report identified high potential for both locally and State significant archaeological remains within the Queen's Wharf Reserve boundary.

Stedinger Associates, 2016. Borehole Logs from the Soldiers' Precinct Queen's Wharf Reserve, Parramatta, *Geotechnical Report* prepared for Parramatta City Council

Stedinger Associates were engaged by the City of Parramatta Council in 2016 to undertake geotechnical investigations of Queen's Wharf Reserve. This report identified the locations of the Parramatta Sand Body (PSB), as well as areas across the Reserve that had been subject to significant disturbance.

This report prepared by Stedinger is a valuable resource when assessing the potential depths and locations of historical archaeological remains, as well as identifying any potential areas of historic development.

4.2 Site formation and historical archaeological potential

Based on the historical research undertaken in Part 2 of this report, the following broad historical phases of site development could be identified. Queen's Wharf Reserve has undergone significant development, and several of the historic phases identified in this report overlap. Key phases of development at Queen's Wharf Reserve are summarised below:

Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)

Colonisation and development in Parramatta began in 1788 under the guidance of Governor Arthur Phillip. In these early years, the landscape of Parramatta changed significantly with the subdivision of land and construction of wharves, barracks, and houses across the region. Much of this development happened within the study area at Queen's Wharf Reserve with its significant contribution to early colonisation as a military centre and port.

Between 1790 and c.1820, the centre of the study area operated as the Soldier's District, with the landing place to the north and a grain store in the east (Figure 6, Figure 12,Figure 17). The remaining land within the study area remained largely undeveloped. Evan's 1804 plan of

Parramatta plans show structures that are associated with use of the land as a cantonment and include the flagstaff and associated sentry box, however most of these early structures are not shown on later plans of the site (Figure 22). Structures from this early occupation in the study area were most likely demolished when leases were issued, and portions of the Government ground was subdivided in the early 1820s (Phase 2).

The Parramatta River operated as an important line of communication with Sydney and the increase of river traffic and larger boats prompted the construction of a stone-faced wharf in 1808, during the Governorship of William Bligh. The wharf was located within the eastern portion of the study area and was constructed to serve a substantial stone granary that was constructed in the same year (Figure 11).

Historical overlays indicate that structural archaeological remains from this Phase would be associated with the flagstaff, sentry box, and granary (Figure 42). These brick or stone footings would be located on the northern margin of the study area along the Parramatta River and would extend as far as the present line of Noller Parade. Other archaeological remains associated with this period of occupation may include artefact scatters, occupation and yard deposits, and cuts and associated with early development of the area. Deep, unrecorded subsurface features such as cesspits and rubbish pits, as well as contact period archaeology, may be present.

Phase 2: The Commissariat and continued military occupation (1825–c.1870s)

The Commissariat Store was a part of the operation of the convict system in Parramatta during its early years. The Government stores supplied necessities including food, clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts and free settlers who were 'on stores'. However, with the reduction of the number of convicts requiring Government supplies, the Commissariat had a reduced importance.

The Commissariat Stores were established when river traffic began to peak and, in 1821, Commissioner J. T. Bigge noted the need for stores in Parramatta. The Commissariat was constructed in 1825 and was a four-storey stone building (Brown 1995, 91). However, the Commissariat was only used for a small time when the military began occupation of the stores in 1828 in response to the growing military presence in Parramatta. The Commissariat Stores were converted into a Military Barrack and the four-storey stone building became known as the 'Lower Military Barrack'.

Archaeological potential associated with the Commissariat and military occupation is considered high. Archaeological resources, if present, may consist of brick or sandstone footings, services such as drains, artefact scatters, occupation deposits, cesspits, and ephemera including postholes and burnt tree boles (Figure 43).

Phase 3: Early subdivisions and development (c.1820s–c.1860)

During the early 1820s, the population of Parramatta began to increase significantly, prompting Governor Macquarie to extend George Street further to the east. The extension of George Street was prompted by Queen's Wharf Reserve (including the area to the south of George Street) and its use as a centre as both a military regiment and port. The 1823 plan of Parramatta shows several early subdivisions, including Howell's Mills (Phase 3) that appear to initially have been used for residential purposes.

The western half of the study area was occupied by George Howell, who during this period established the first wind and water mill in Parramatta (Phase 3). In addition to Howell's Mill, several small structures fronting the western end of George Street that were associated with the early subdivisions in 1823. As Parramatta began to expand as a settlement, so too did private commerce. Within the study area this included the establishment of the Steam Packet Inn in 1834 (Phase 4). The 1844 plan shows some small structures to the south of the study area in subdivisions that were reserved for J. E. M. Goodman, Lockyer, and Urquhart.

The eastern most part of the study area was reserved for government purposes and contained the military barracks and former commissariat store. The land along the present Noller Parade was leased to the Byrnes brothers in 1841 who established the first cloth factory in Parramatta along the river.

Archaeological potential associated with the early subdivisions and development of Parramatta (Phase 3) is considered high. The archaeological resource may be present as either brick or sandstone footings, artefact scatters, occupation deposits, cesspits, and ephemera including postholes (Figure 44). Additional evidence of the early subdivisions may include infrastructure such as drainage and other services.

Phase 4: Howell's Mill (1823–1872)

George Howell was granted an allotment on June 30, 1823, located within the western most extent of the study area. The structures on the allotments appear to have been constructed with timber and stone and included a timber boundary fence along the eastern side of the house. It is likely that these stone and timber buildings consisted of a small private wharf, grain stores, work sheds, and a house. The Howell wind and water mill continued to operate until 1868 when the Mill was formerly shut down. The Howell lots were purchased by the Parramatta Gas Company in 1872, who likely removed the mill and all its associated structures.

Archaeological potential associated with Howell's Mill (Phase 3) in considered to be low. The acquisition of the former Howell's allotments by the Parramatta Gas Company involved deep excavation that was likely to have removed any archaeological resource associated with Howell's Mill. If archaeological materials associated with this phase are identified, they would be present in either brick or sandstone footings, artefact scatters, occupation fills and deposits, cesspits, dam and mill infrastructure, and ephemera including postholes. Additional evidence of Howell's Mill could include deep subsurface features and infrastructure such as drainage and other services.

Phase 5: Steam Packet Inn and the Emu Hotel (1834–c.1911)

The Steam Packet Inn was established and operating along George Street by 1834, however its original construction and opening is unknown. The Steam Packet Inn operated on George Street until 1861 when it was taken over by John Kell who renamed the Inn the 'Emu Hotel'. Operation of this hotel continued until it was demolished c.1911 when most of the land was cleared to create Queen's Wharf Reserve.

Historic records indicate that at the time of demolition, the Emu Hotel had a verandah around three sides and contained nine rooms that included three attics, a kitchen, pantry storeroom, laundry, basement, and stables outside.

Archaeological potential associated with the Steam Packet Inn and Emu Hotel (Phase 5) is considered high. Following the demolition of the Inn c.1911, development of the area appears to be minimal. If archaeological material associated with Phase 5 is identified it would be present as either brick or sandstone footings, postholes and posts, artefact scatters, occupation fills and deposits, rubbish pits, and evidence from construction and demolition phases such as cuts and fills. Additional evidence of Phase 5 may include deep subsurface features and infrastructure such as drainage and other services.

Phase 6: Byrne's Mill (1841–c.1880s)

Following the renewal of leases at the Reserve in 1841, two acres of land were leased by the Byrnes Brothers, James and William. The land from this time contained a steam mill that operated as flourmill. The flourmill was extended in 1844, involving the construction of a five–storey sandstone building that was used as a cloth factory. This cloth factory was under construction until 1847, when it officially opened and began operation. Several of the structures for the mill were located on government land and an 1843 plan shows these buildings location within the study area. Worker's cottages constructed to the east of the main mill building and were likely built using brick and timber. These workers cottages were located within the study area along Noller Parade and were operational by 1844.

There was no development or additional construction associated with the mill during its operation. Byrne's Mill continued to produce cloth until the mid-1880s when it could no longer compete with the increased mechanisation of the textile industry. The lot and buildings that formerly functioned as Byrne's Mill remained vacant and disused until they were purchased by the Government in 1908. Following this acquisition, the buildings were used by the Benevolent Asylum (Phase 5) and were demolished in 1937 when all structures in this area of the Reserve were levelled.

Archaeological potential associated with Byrne's Mill (Phase 6) is considered high. Demolition of the structures was undertaken at the same time as the Benevolent Asylum in 1937, and limited land modifications have occurred since that time. Archaeological resources associated Phase 6 may be present in brick and sandstone footings from the mill and cottages, artefact scatters, fills and deposits, rubbish pits, and evidence of construction and demolition events (Figure 44). Archaeology associated with Phase 6 may also include infrastructure associated with drainage and other deep unrecorded subsurface features associated with the use of the area as Byrne's Mill.

Phase 7: The Parramatta Benevolent Asylum (1862–1937)

The Parramatta Benevolent Asylum formally opened in 1862 as a response to the growing population of Sydney and its surrounding areas. The main Asylum was in the former Commissariat Stores, however significant construction and expansion was undertaken in the 1860s following the establishment of the Parramatta Benevolent Asylum. This expansion initially included additional drainage and ventilation, outhouses and sheds, and tanks and wells. These additional structures were added to the land by 1870. A large tank and two wells had been built on the site in c.1870 to provide water for the asylum, and following this a kitchen, lavatories, and some structures were added to the area.

The growth of population in Parramatta was gradual and by 1885 another expansion of the facilities was required. In response to this, the government acquired land from the former Byrnes Mill and the brick and stone structures that formerly made up the cloth factory and mill were converted into accommodations and wards. In 1888, land for an exercise ground was granted and was about one acre in size and from this time onwards minimal development or ground modifications were undertaken. The ownership of the Asylum was transferred to the 'Department of Charitable Institutions to Public Health' who did not undertake any changes until the demolition of the Byrnes Mill and factory buildings were demolished in 1920. The Asylum was officially closed in 1936, and all structures from the former Commissariat, Byrne's Mill and George Street Asylum were cleared in 1937, with the land fully vacated by 1939.

Archaeological potential associated with the Parramatta Benevolent Asylum (Phase 5) is considered high. Demolition of the Asylum and associated structures was undertaken in 1937, and limited land modifications have occurred since. Archaeological resource associated with Phase 5 may be present in brick and sandstone footings, artefact scatters, occupation fills and deposits, rubbish pits, and evidence from construction and demolition phases such as cuts and fills (Figure 44). Potential archaeology associated with infrastructure may include drainage, wells and tanks, other unrecorded services and deep unrecorded subsurface features associated with use of the area as the Benevolent Asylum.

Phase 8: Parramatta Gasworks (1872–c.1940s)

The Parramatta Gasworks was officially opened in 1873 when the land that was formerly Howell's Mill was acquired by the Parramatta Gas Company. Construction of the gasworks commenced the same year and included a brick retort house and retaining wall. Pipes for the gasworks and a large gasometer were in late 1872, and initially the gasworks used the extant buildings Howell's Mill. The gasworks was purchased by the Australian Gas Light Company (AGL) in 1890 who undertook significant expansion and development of the area. An 1895 plan of Parramatta shows that by this time, the gasworks included a large factory building and furnace, converters, a gasometer, retaining walls (both along Parramatta River and George Street), coal sheds, accommodations, site offices, and other small structures that had and unknown uses (Figure 22). The Parramatta Gasworks continued to operate on George Street until the mid- to late-1930s. The 1943 aerial photograph shows that complete demolition of the gasworks was undertaken by 1943 with the area cleared and levelled (Figure 41).

Archaeological potential associated with the Parramatta Gasworks (Phase 7) is considered high. Following the demolition of the gasworks in the mid-twentieth century, ground disturbance was minimal excluding some modern developments that are addressed in Part 4.3. Archaeological resource may be present in brick, concrete and sandstone footings associated with structures on the site, gasworks infrastructure including pipes and metal features, artefact scatters, fills, and evidence of construction and demolition events. Additional potential archaeology associated with Phase 7 may include evidence of demolition of Howell's Mill (Phase 3), deep unrecorded subsurface features, and other services such as drainage.

Phase 9: George Street Tramway and Queen's Wharf Reserve in the current day (1883–present)

George Street was established during the first years of British settlement and was the main thoroughfare in Parramatta during nineteenth century. The road serviced the wharves and both the commercial and residential properties along the river until the shutdown of the Government wharf in the mid–1880s. Following the closure of the wharves, road and rail became the primary method for accessing and delivering supplies to the colony and personnel stationed in Parramatta. With increased population and use of George Street, the George Street Tramway was established in 1883. This tramway connected Parramatta Park with the Redbank Wharf at Duck River, via Tramway Avenue. The tramway continued to operate along George Street until March 1943 when it was discontinued.

The 1943 aerial photograph of Queen's Wharf Reserve demonstrates that sometime by the end of this year, all structures that were previously located at the reserve were demolished (Figure 41). Following 1943, Queen's Wharf Reserve underwent limited development and change until the commencement of the construction of the Parramatta Light Rail in late 2018.

Archaeological potential associated with the George Street Tramway (Phase 9) and subsequent localised development of Queen's Wharf Reserve is considered high. Following the closure of the tramway in 1943, George Street was established and there does not appear to be significant change until 2018. Archaeological resource may be present in the form of timber sleepers with iron metal elements. Other archaeological resources associated with Phase 9 is likely to be present in the form of historic fills and deposits, likely associated with use of the tramway and establishment of George Street after 1943. Other archaeological remains may include services and rail infrastructure associated with the George Street Tramway.

Figure 41. 1943 aerial of Queen's Wharf Reserve (PLACEHOLDER- study area to be added in final) (source: SixMaps, 2022)

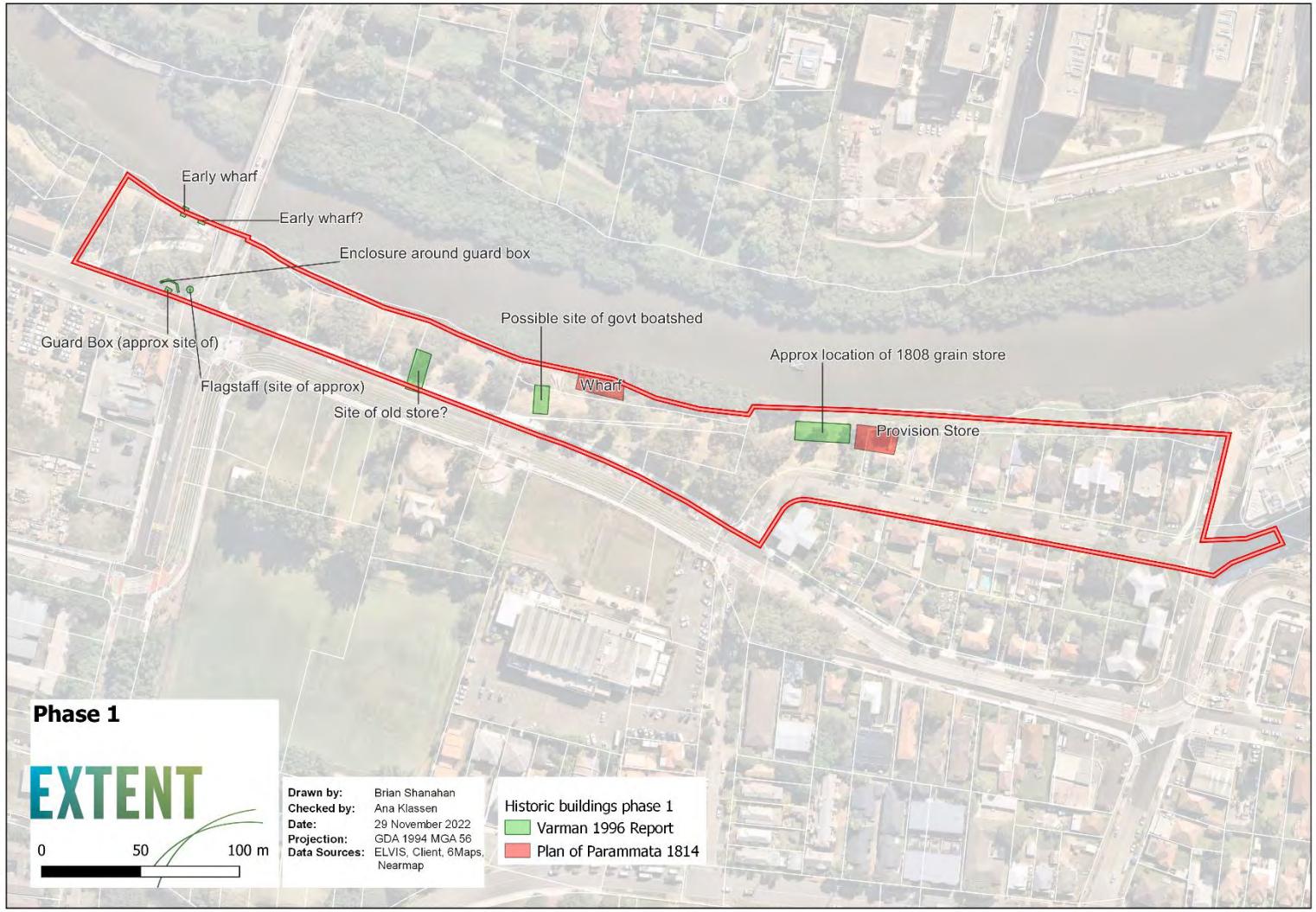

Figure 42 Expected structures within study area, Phase 1

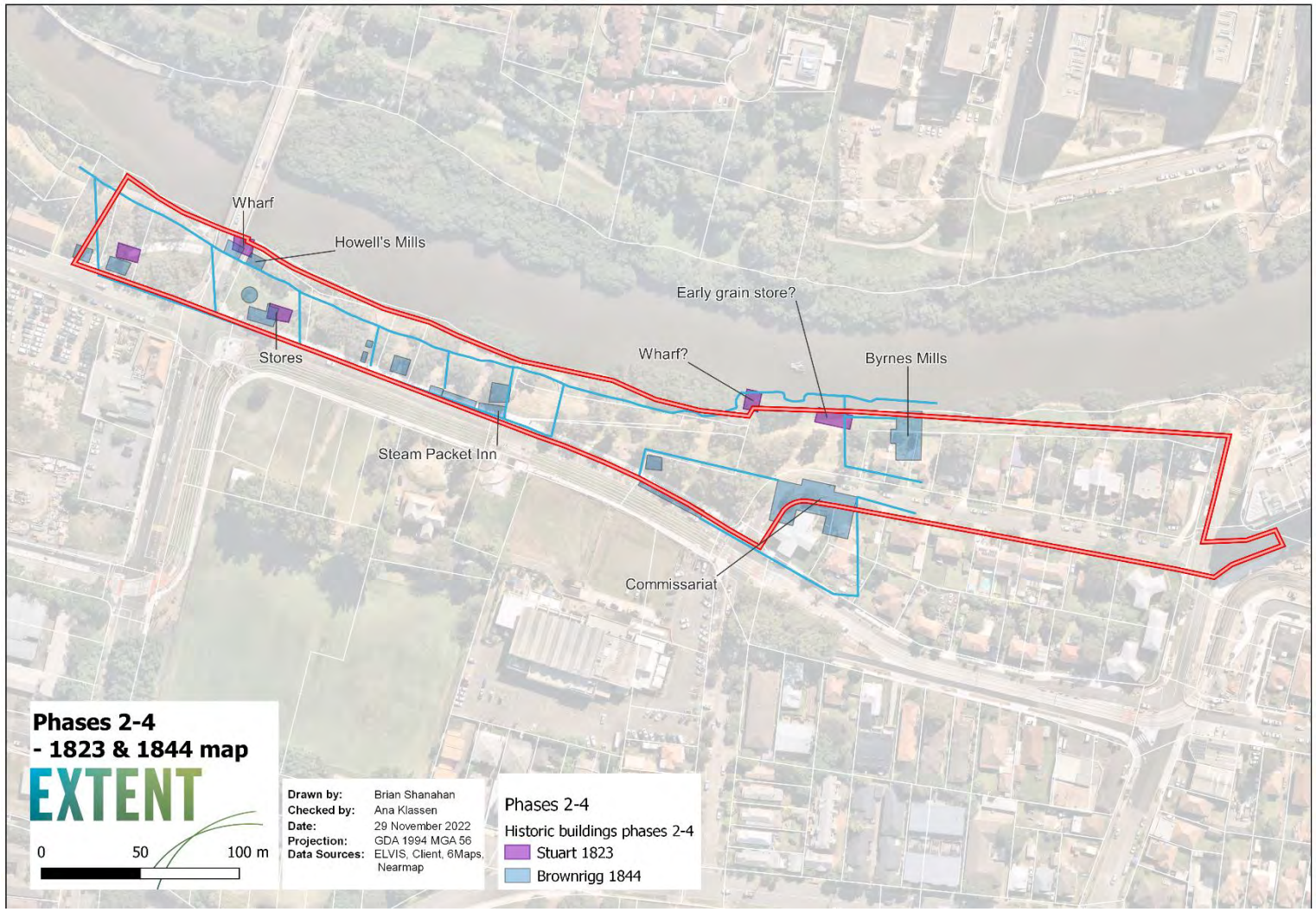

Figure 43 Expected structures within study area, Phases 2-4

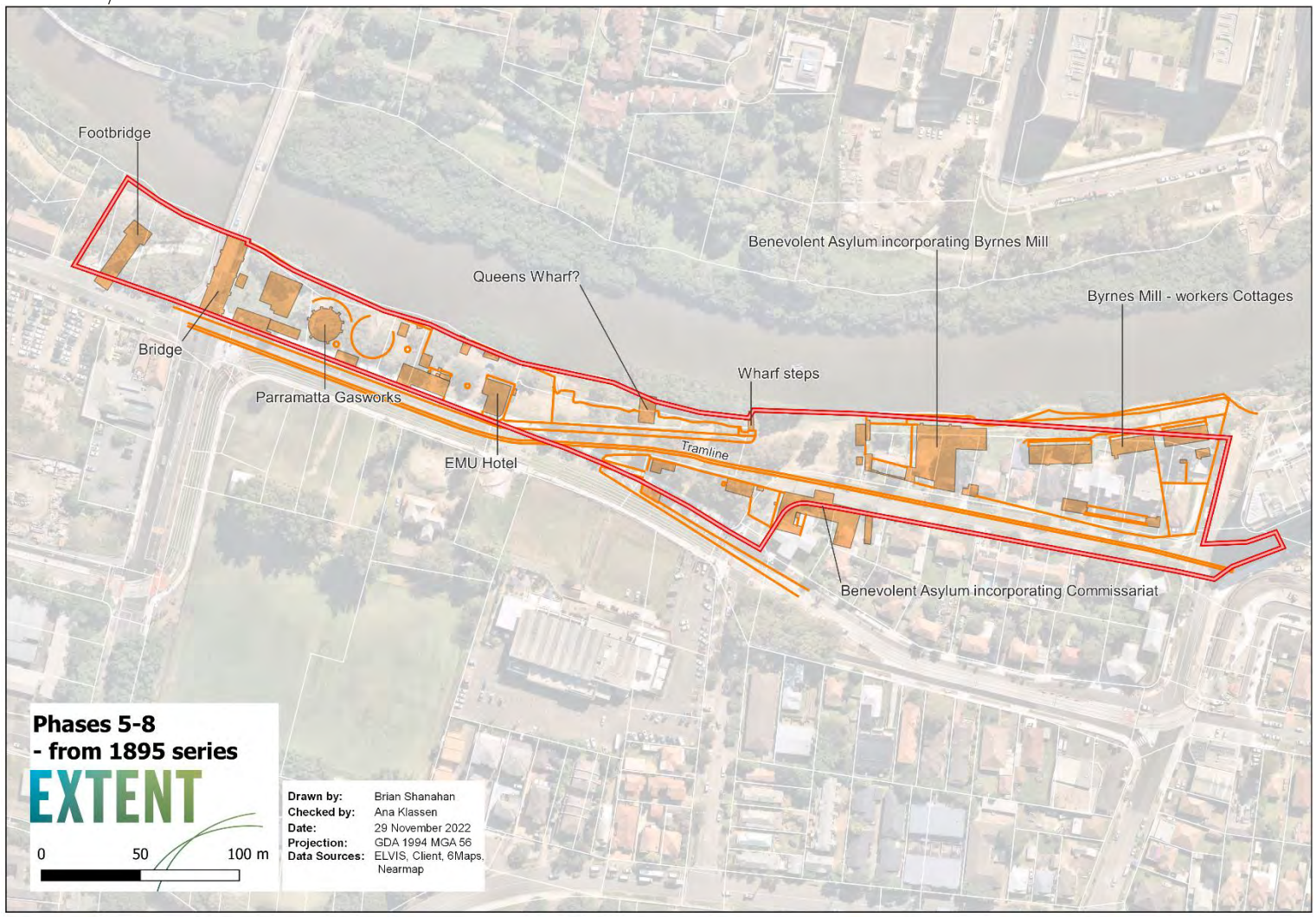

Figure 44. Expected structures within study area, Phases 5-9

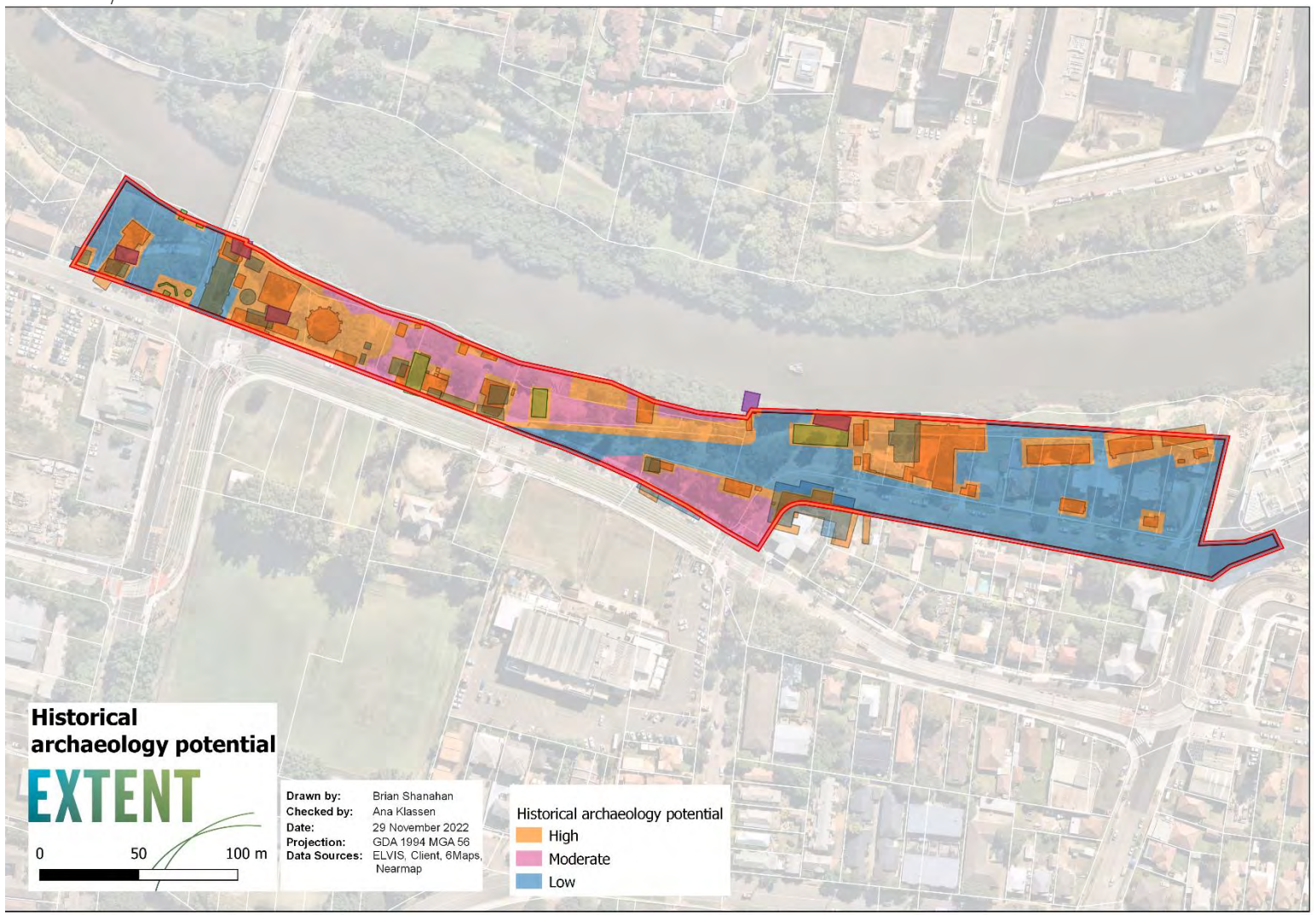

Figure 45. Historical archaeological potential and expected structures

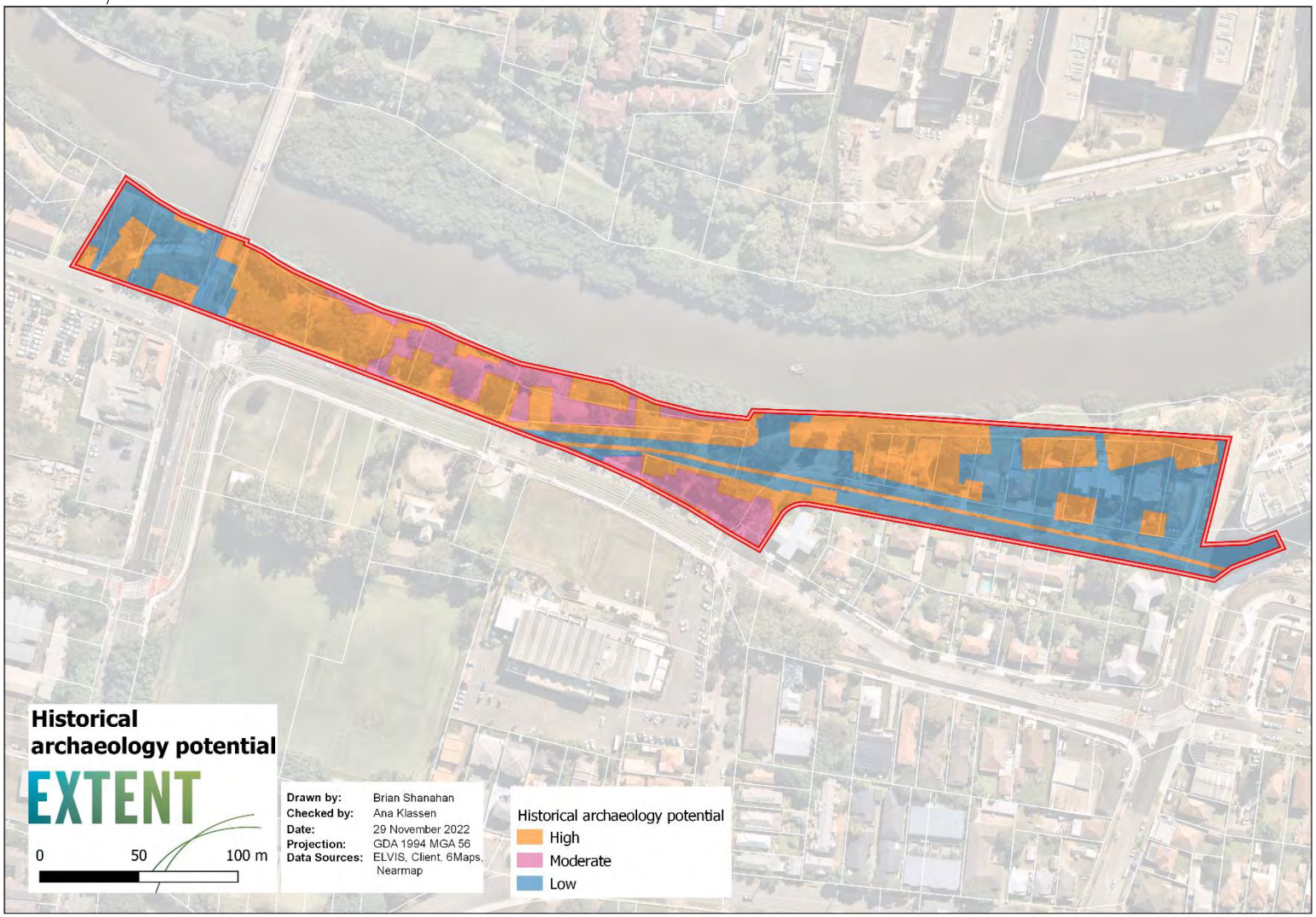

Figure 46. Historical archaeology potential

4.3 Summary of historical archaeological potential

Table 3. Summary of historical archaeological potential

Phase	Subphase	Evidence	Potential	Significance
Phase 1: Colonisation of Parramatta, the first landing phase and military occupation (1788–c.1820s)	Early colonisation of Parramatta	Contact period archaeology, ephemera including burnt tree boles, postholes	Low	State
	Military occupation and soldier's barracks	Sandstone or brick footings of barracks, footings from the gatehouse, sentry box and flagstaff, artefact scatters, occupation deposits and fills, yard surfaces and fills, construction cuts and fills	High	
		Ephemera including tree boles and postholes	Low	
	Wharves, landing place	Evidence of construction of the wharves, stone facings, or timber piles	Moderate	
	1808 granary	Possible stone footings, internal and external paved surfaces	High	
Phase 2: The Commissariat, and continued military occupation (1825–c.1857)	Construction of the Commissariat Stores	Construction cuts and fills, evidence of levelling	High	State
	Operation of the Commissariat Stores	Sandstone or brick footings, artefact scatters, occupation fills and deposits		
	Transition of the Commissariat to the military	Artefact scatters, cuts and fills, occupation deposits, yard surfaces, services including drainage and other infrastructure		
	Pre–1823 land leases and subdivisions	Evidence of early land use, agricultural events, levelling, postholes and posts, artefact scatters		State

Phase 3: Early subdivisions and development (c.1820s–c.1860s)	Post–1823 land leases and subdivisions—Urquhart, Lockyer, Manning and Kell subdivisions	Sandstone or brick footings from early structures, evidence of land clearance and development, artefact scatters, occupation fills and deposits, yard surfaces, postholes, services including drainage and other infrastructure	Low	
	Government subdivisions (eastern end of site)	Sandstone or brick footings from early government structures including the sentry box and flagstaff, artefact scatters, postholes		
Phase 4: Howell's Mill (1823–1872)	Early 1823 land grant, mill and dam	Sandstone or brick footings from early Mill structures fronting George Street, cuts and fills associated with construction of the dam, artefact scatters, occupation deposits, yard surfaces. Evidence of land clearing, modification, and establishment of Howell's Mill	Low	Local
	Expansion of Howell's Mill	Sandstone or brick footings from additional structures built, postholes and posts from recorded timber structures, artefact scatters, occupation fills and deposits, yard surfaces, construction cuts and fills		
	Demolition of Howell's Mill	Demolition cuts and fills, truncated structures including wood and sandstone footings	Low	
Phase 5: Steam Packet Inn and the Emu Hotel (1834–c.1911)	Establishment of the Steam Packet Inn	Construction cuts and fills, evidence of land modification including levelling and cutting	Low	Local
		Sandstone or brick footings, artefact scatters, occupation deposits and fills, yard surfaces, postholes	High	
	Expansion of the Inn and the Emu Hotel	Sandstone or brick footings, artefact scatters, occupation deposits and fills, yard surfaces, construction cuts and fills	High	

	Demolition of the Emu Hotel	Demolition cuts and fills, truncated structures including wood, brick and sandstone footings	High	
Phase 6: Byrnes Mill (1841–c.1880s)	Early establishment of Byrne's Mill	Construction cuts and fills, evidence of land modification including reclamation, levelling, and cutting	High	Local
	Expansion of Byrnes Mill and workers cottages	Sandstone or brick footings from cloth factory, brick footings from worker's cottages, footings of external structures and features, artefact scatters, occupation deposits and fills, yard surfaces, postholes, infrastructure associated with the operation of the mill	High	
		Subsurface features including cesspits and rubbish pits, services, and drainage	Moderate	
Phase 7: The Parramatta Benevolent Asylum (c1860s–1937)	Establishment of Parramatta Benevolent Asylum	Construction cuts and fills, evidence of land modification including levelling and cutting Sandstone or brick footings from the original Benevolent Asylum building, early services, cesspits and rubbish pits, artefact scatters	High	Local
	Expansion of Parramatta Benevolent Asylum	Sandstone or brick footings from original building and subsequent structures, footings of external structures and features, artefact scatters, occupation deposits and fills, yard surface, infrastructure and features associated with the expansion and occupation of Parramatta Benevolent Asylum	High	
		Postholes and other ephemeral features such as cuts indicating land and use and modification	Moderate	

	Demolition of Parramatta Benevolent Asylum	Demolition fills and truncated footings from structures	High	
	Establishment of the Parramatta Gasworks	Construction cuts and fills, evidence of land modification following Phase 4, including mass excavation of land and levelling Brick and concrete footings, sandstone footings (possibly reuse from Phase 4), gasworks infrastructure including metal gasometers and services including pipes, artefact scatters	High	
Phase 8: Parramatta Gasworks (1872–c.1940s)	Expansion of the gasworks	Construction cuts and fills, sandstone, brick and concrete footings, gasworks infrastructure, artefact scatters, occupation deposits and fills, gasworks deposits	High	Local
	Demolition of the gasworks	Demolition fills and deposits, cuts, and truncated sandstone or brick footings	High	
Phase 9: George Street Tramway and Queen's Wharf Reserve in the current day	Early George Street Tramway	Timber sleepers with concrete beds, metal fasteners, construction cuts and fills Infrastructure associated with the early railway and operation of the George Street Tramway	High	
	Development of Queen's Wharf Reserve	Cuts and fills indicative of modifications to the reserve	Moderate	

4.4 Discussion of disturbance

While the area has been subject to several phases of development, areas immediately adjacent to George Street have been subject to significant levels of disturbance as a result of recent development works along.

4.4.1 Site formation processes

Queen's Wharf Reserve has undergone several phases of development, with significant reclamation and levelling undertaken during the nineteenth and twentieth centuries. These include the reclamation of the foreshore in 1808 in association with the construction of the granary. Following the early subdivisions and development during Phase 2 at Queen's Wharf Reserve and the decline in shipping, major landscaping and modification was undertaken along the northern margin of the study area.

Prominent disturbance occurred in 1872 when the western portion of the study area underwent significant change with the demolition of Howell's Mill and deep excavation for the Parramatta Gasworks and associated infrastructure. This disturbance is likely to have removed most archaeological evidence of earlier phases of development in this portion of the study area.

The demolition of structures in the lots previously belonging to J. E. Manning and Urquhart was undertaken sometime in the late nineteenth century. Landscaping for establishment of Queen's Wharf Reserve was also completed during this time with no additional significant modifications to this part of the study area.

The Benevolent Asylum (formerly the Commissariat) was demolished in c.1937 The extent of demolition that was undertaken during this time is unclear. Historical aerial images indicate that the land was cleared by 1943, with no additional structures constructed in the area (Figure 41).

Parramatta Gasworks was demolished by 1943, with ruins of larger infrastructure observable on the 1943 aerial image (Figure 41).

4.4.2 Recent development and disturbance

In recent years, the study area has been subject to significant disturbance as a result of infrastructure works and development. Figure 27 shows areas that have recently undergone archaeological investigation. However, this mapping is limited to a review of available aerial images and is indicative only.

Archaeological investigations and deep excavation were undertaken between 2018 and 2020 at Queen's Wharf Reserve as part of the Parramatta Light Rail project. These excavations were undertaken to the east and west of the Gasworks Bridge to accommodate landscaping works. The slip road that cut through the reserve was removed and replaced with grass. Further to the east of the study area, investigations were undertaken along George Street in the area that would have been the Emu Hotel. The impact of these investigations is currently unknown, however would have likely resulted in the removal of most archaeological material.

Additional developments and disturbance from the late twentieth and twenty-first centuries include the installation of a pedestrian path, extension of George Street to north, some modifications to the landscape, installation of memorials, installation of services and road related infrastructure.

Based on a review of the available historic materials and aerial images, impacts along the northern boundary and eastern extent of the site appear to be localised. Areas identified in Figure 32 are considered to be sterile of archaeological material based on previous investigations that have been undertaken in the area

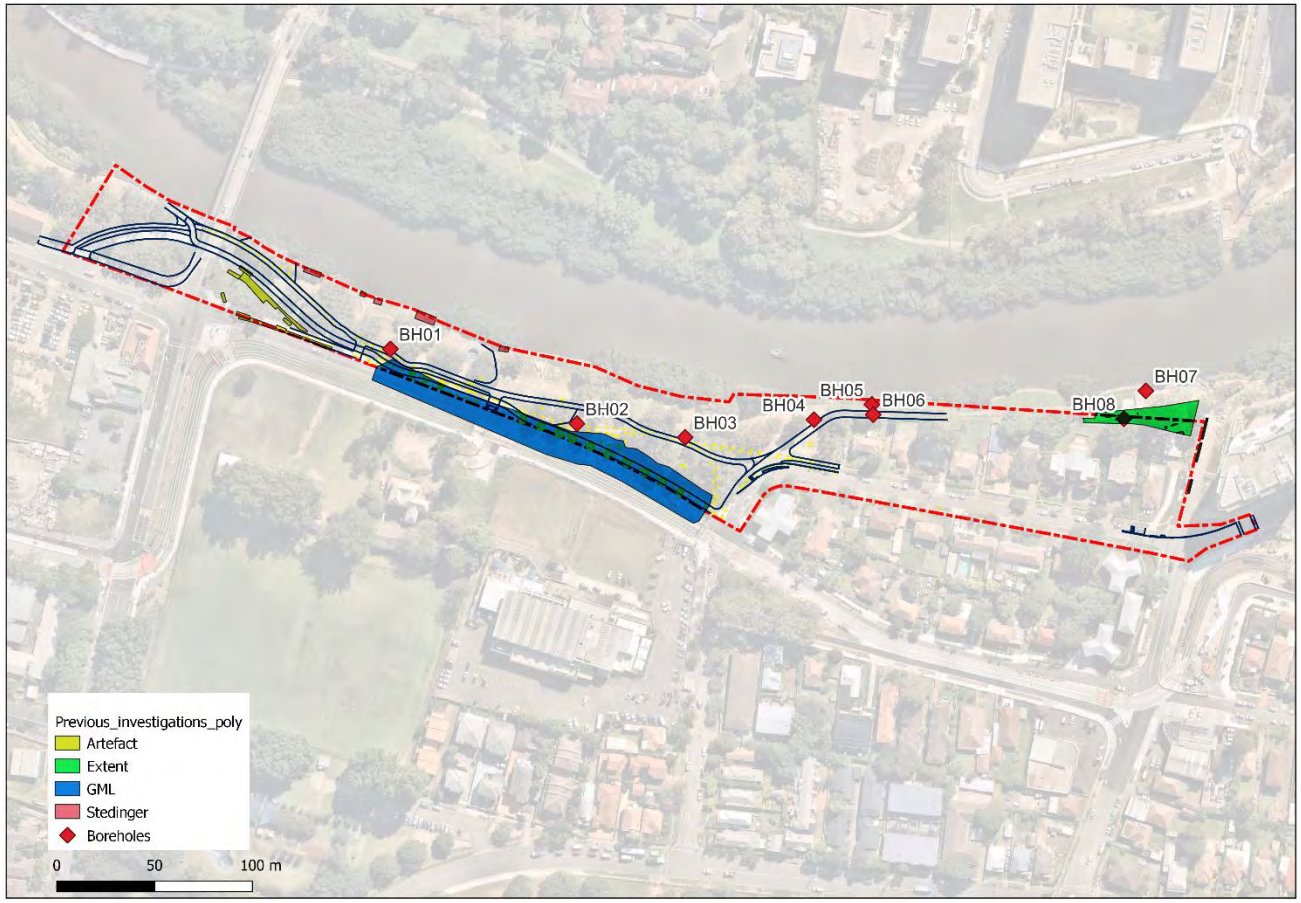

Figure 47. Indicative map showing locations of previous works. Information is notional and based on review of aerial images (Source: NearMap with Extent Heritage additions 2022).

5. Assessment of historical archaeological significance

5.1 Basis for assessment

Archaeological significance refers to the heritage significance of known or potential archaeological remains. While they remain an integral component of the overall significance of a place, it is necessary to assess the archaeological resources of a site independently from aboveground and other heritage elements. Assessment of archaeological significance is more challenging as the extent and nature of the archaeological features is often unknown and judgment is usually formulated on the basis of expected or potential attributes.

The following significance assessment of the subject area's archaeological resource is carried out by applying criteria expressed in the publication 'Assessing Significance for Historical Archaeological Sites and 'Relics', prepared by the Heritage Branch, formerly Department of Planning (NSW) (now the Heritage Division, Office of Heritage and Environment) in December 2009.

5.2 NSW heritage criteria for assessing significance related to archaeological sites and relics

Queen's Wharf Reserve is a complex site that has undergone significant development where structures have been reused or repurposed during subsequent phases of occupation at the site. For the purpose of this assessment, the Phases established in Section 4 of this report have been used to determine their individual significance.

Table 4. Summary of archaeological significance by phase

Phase	Significance
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	State
Phase 2: The Commissariat and continued military use (1825-c.1870s)	State
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	State
Phase 4: Howell's Mill (1823–1872)	Local
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	Local
Phase 6: Byrne's Mill (1841–c.1880s)	Local

Phase	Significance
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	State: original Commissariat building
	Local: Benevolent Asylum occupation
Phase 8: Parramatta Gasworks (1872–c.1940s)	Local
Phase 9: George Street Tramway and Queen's Wharf Reserve today (1883–present)	Local

5.2.1 Archaeological research potential (NSW Heritage Criterion E)

Table 5. archaeological research potential by phase

Phase	Assessment	Meets threshold (yes/no)
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	Archaeological remains from Phase 1 of occupation and development at the site would have the ability to provide information regarding the early settlement and lifeways in Parramatta during initial British settlement of Australia. Structural archaeological resources from this Phase could provide information regarding the construction techniques, location, and early operation of the settlement in the colony. Archaeology associated with the first landing place and development of the early wharves on Parramatta River would offer insight into the early maritime movements and construction of wharves. Notably, the development of wharves from timber to stone could provide information relating to industrial changes and use of the area. Remains associated with military occupation of Queen's Wharf Reserve would be considered rare and would provide a unique insight into early settlement.	yes
Phase 2: The Commissariat and continued military use	Archaeological remains from Phase 2 of occupation relating to the Commissariat and use of it as a military barracks would have the ability to provide information regarding settlement and supply to the colony in the early years. Notably, use of the Commissariat as a military site would be considered to offer high research potential regarding Parramatta's military history.	yes
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	Archaeological remains from Phase 3 of occupation relating to the early subdivisions and development of the reserve would provide significant and valuable information regarding settlement and growth of the colony. Included within this early phase of subdivisions is the development of Howell's Mill (Phase 4), Steam Packet Inn (Phase 5), and Byrne's Mill (Phase 6). These subdivisions and growth of Parramatta would provide information relating to the early years of Parramatta. Significant changes and development were undertaken within the study area during this phase of occupation, and archaeological resource may help inform our understanding of convict and ethnic influences, building settlement, governing, the development of Australia's cultural life, law and order, and social status.	yes

Phase	Assessment	Meets threshold (yes/no)
Phase 4: Howell's Mill (1823–1872)	Archaeological remains from Phase 4 of occupation relating to Howell's Mill (Phase 4) would provide information relating to early wind and water mills in Australia. The establishment of Howell's Mill is associated with Phase 3 and would provide information relating to the development of local economies, commerce, and industry in the early colony. Archaeological resource, if present, would offer an understanding into the operation and use of mills in Parramatta.	yes
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	Archaeological remains from Phase 5 of occupation relating to the Steam Packet Inn and the Emu Hotel (Phase 5) could provide information related to commercial and residential uses of land in the nineteenth century. The archaeological resource and material providing evidence for Phase 5 is not considered rare or unique based on the frequency of commercial footings within the archaeological record. However, the location of the Steam Packet Inn and Emu Hotel within the Parramatta landscape is significant, and would contribute to our understanding of the establishment, development, and growth of Parramatta over the course of eight decades. Archaeological evidence from this Phase could shed light on the changing landscape and significance of Queen's Wharf Reserve throughout history.	yes
Phase 6: Byrne's Mill (1841–c.1880s)	Archaeological remains of occupation relating to Byrne's Mill (Phase 6) would provide information relating to steam mills in Australia. The archaeological resource could provide valuable and significant information relating to commerce and industry in Parramatta. During operation, Byrne's Mill underwent significant expansion and development including the addition of workers cottages. This phase could offer further insight into the current understanding of mills, cloth factories and daily life of workers in nineteenth century Australia.	yes
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	Archaeological remains from Phase 7 of occupation relating to Parramatta Benevolent Asylum (Phase 7) could provide information regarding institutions and life in Parramatta during the late nineteenth and early twentieth centuries. Further archaeological resource could provide information relating to changing use of structures, such as the transition of the Commissariat to military use and finally as the Parramatta Benevolent Asylum.	yes

Phase	Assessment	Meets threshold (yes/no)
	Significant development and reuse were undertaken during this Phase and is unique in the way the site was used. Archaeological resource associated could shed light on the changing nature of relationships and lifeways of people occupying the site.	
Phase 8: Parramatta Gasworks (1872–c.1940s)	Archaeological remains of occupation relating to the Parramatta Gasworks (Phase 8) would provide valuable information relating to changing technology and the use of gas in Parramatta. The archaeological resource would offer further information to the establishment, use and development of gasworks within Parramatta. Evidence relating to this phase could offer further information about the people who lived at and operated the gasworks during this time.	yes
Phase 9: George Street Tramway and Queen's Wharf Reserve today	Archaeological remains relating to the George Street Tramway and Queen's Wharf Reserve is not considered to offer new insight regarding early twentieth century trams in Australia. While the archaeological resource associated with this phase could develop our understanding of transport, it is not considered rare or unique in the information that it can provide.	no

5.2.2 Associations with individuals, events, or groups of historical importance (NSW Heritage Criteria A, B & D)

Table 6 significance relating to associations with individuals, events, or groups of historical importance by phase

Phase	Assessment	Meets threshold (yes/no)
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	The colonisation of Parramatta has associations with its establishment as a Macquarie Town and its growth as centre for the colony by Governor Arthur Phillip and Governor Lachlan Macquarie. The stone granary constructed on the site was one of Governor William Bligh's most substantial buildings and demonstrates Bligh's influence on developing the town. Through this, Phase 1 has significance relating to its associations with individuals of historic importance.	yes

Phase	Assessment	Meets threshold (yes/no)
	Queen's Wharf Reserve, and its history as the first landing place is associated with events relating to early colonisation and settlement in Australia. Phase 2 is considered significant in relation to its association with early colonial events.	
Phase 2: The Commissariat and continued military use	The Commissariat and continued military use during this phase have associations with J. T. Bigge (Royal Commissioner) and the early garrison. The Commissariat is closely associated with Commissioner JT Bigge, who in 1821 ordered and commissioned the construction of the four-storey building. Following its completion in 1825, the Commissariat quickly became home for the regiment based in Parramatta, and through this has significance as a military establishment during the early colonial period. Through its associations and relationship to the early colony, Phase 2 offers rare associations to people, and early governance in Australia.	yes
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	Queen's Wharf Reserve was originally divided into two lots with George Howell in ownership of the western portion of the study area with the eastern portion being subdivided in 1823. Early subdivisions of the Reserve are associated with the settlement of Parramatta and the early years of the colony. Phase 3 is considered significant because of its association with these events.	yes
Phase 4: Howell's Mill (1823–1872)	George Howell was an ex-convict who was granted the western portion of Queen's Wharf Reserve where he constructed a wind and watermill. Phase 4 is associated with George Howell, and the early subdivisions of Queen's Wharf Reserve. Phase 4 was one of the earliest mills in Parramatta, and through this is considered to have immense historical importance.	yes
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	The Steam Packet Inn and the Emu Hotel have no known significant associations with one individual or group.	no
Phase 6: Byrne's Mill (1841–c.1880s)	Byrne's Mill was established by James and William Byrne in 1841 and initially operated as a steam flour mill. Byrnes Mill is associated with James Byrne who was an influential figure in early Parramatta.	yes

Phase	Assessment	Meets threshold (yes/no)
	James Byrne was engaged in early local politics, and was mayor of Parramatta from 1862 until, 1866. Byrnes Mill is considered historically important in its association with James Byrne.	
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	The Parramatta Benevolent Asylum was opened in 1862. The asylum was established as a response overcrowding in the existing asylums in the Sydney district. While the Benevolent Asylum was established in the original Commissariat building, the asylum itself is not associated with any notable individuals or events. The asylum is one of several examples of institutions in the area, with rarer and more notable examples such as Cumberland Hospital. The Parramatta Benevolent Asylum does not offer any insight into the historical importance of individuals or events and is not considered to meet this threshold.	no
Phase 8: Parramatta Gasworks (1872–c.1940s)	The Parramatta Gasworks is associated with the Parramatta Gas Company who purchased the land previously used as Howell's Mill. With the establishment and operation of the Parramatta Gasworks, gas lights were turned on in Parramatta for the first time in 1873. The gasworks, and associated buildings and infrastructure provide an insight into changing technology in Parramatta during the nineteenthcentury. Phase 8 is associated with developmental changes to the area and is one of the only gasworks within the broader Parramatta region. Based on this association, archaeology associated with this Phase is considered to meet this threshold.	yes
Phase 9: George Street Tramway and Queen's Wharf Reserve today	The George Street Tramway and Queen's Wharf Reserve is not associated with and individuals or events. While the tramway was a fundamental aspect to colonial life in Parramatta during the nineteenth-century, it is not considered unique or rare and does not meet the threshold for this criterion.	no

5.2.3 Aesthetic or technical significance (NSW Heritage Criterion C)

Table 7. aesthetic or technical significance assessment by phase

Phase	Assessment	Meets threshold (yes/no)
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	Due to the nature of the archaeology being subsurface, there are currently are no known technical or aesthetic elements associated with this phase of occupancy. This criterion should be reassessed if archaeological evidence suggests technical or aesthetic elements are identified that may meet the threshold for this criterion.	no
Phase 2: The Commissariat and continued military use	Due to the nature of the archaeology being subsurface, there are currently are no known technical or aesthetic elements associated with this phase of occupancy. This criterion should be reassessed if archaeological evidence suggests technical or aesthetic elements are identified that may meet the threshold for this criterion.	no
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	Archaeological resources associated with the early subdivisions and development of the reserve is associated with several other phases of development at the wharf. Evidence directly associated with Phase 3 would be ephemeral in nature, and structural remains may be associated with their relevant Phase. Phase 3 is not considered to meet the threshold for this criterion.	no
Phase 4: Howell's Mill (1823–1872)	Archaeological resources associated with Howell's Mill may provide some evidence of technical innovation in that the mill operated as a combined wind and watermill.	yes
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	Due to the nature of the archaeology being subsurface, there are currently are no known technical or aesthetic elements associated with this phase of occupancy. This criterion should be reassessed if archaeological evidence suggests technical or aesthetic elements are identified that may meet the threshold for this criterion.	no
Phase 6: Byrne's Mill (1841–c.1880s)	There may be elements associated with the operation of the mill that demonstrate some degree of technical achievement.	yes
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	Due to the nature of the archaeology being subsurface, there are currently are no known technical or aesthetic elements associated with this phase of occupancy. This criterion should be reassessed if archaeological evidence suggests technical or aesthetic elements are identified that may meet the threshold for this criterion.	no

Phase	Assessment	Meets threshold (yes/no)
Phase 8: Parramatta Gasworks (1872–c.1940s)	Archaeological remains associated with the Parramatta Gasworks may provide information relating to technical advancements within Parramatta during this time. The transition from wind and waterpower to gas represented significant technical change in Parramatta.	yes
Phase 9: George Street Tramway and Queen's Wharf Reserve today	Due to the nature of the archaeology being subsurface, there are currently no known technical or aesthetic elements associated with this phase of occupancy. This criterion should be reassessed if archaeological evidence suggests technical or aesthetic elements are identified that may meet the threshold for this criterion.	no

5.2.4 Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, C, F & G)

Table 8. significance on the basis of demonstrating the past through archaeological remains by phase

Phase	Assessment	Meets threshold (yes/no)
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	Structural remains of occupation and development at the site may help share stories and information regarding the early settlement and lifeways in Parramatta during the initial settlement of Australia. Structural elements associated with the wharves and early allotments may contribute significantly to understanding early management of imports and exports to the settlement. Remains relating to this phase are considered rare and have significant value in representing the past through archaeological remains.	yes
Phase 2: The Commissariat and continued military use	Structural remains from Phase 2 associated with the Commissariat and continued military use may demonstrate the past through archaeological remains. These remains may be representative of the developing and changing role of Queen's Wharf Reserve in the early years of settlement in Parramatta. Archaeological remains may demonstrate the transition from early convict settlement to military outpost and finally as a commercial centre in the nineteenth century.	yes

Phase	Assessment	Meets threshold (yes/no)
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	Structural remains which provide evidence of the private occupancy of the early subdivisions and development of the reserve may represent the growth and development of Queen's Wharf Reserve over the decades. Archaeological remains from Phase 3 may demonstrate the transition from Government use to commercial, residential, and industrial uses in the mid-nineteenth century. These remains may represent the development of Parramatta and the changing use of the reserve throughout the nineteenth century.	yes
Phase 4: Howell's Mill (1823–1872)	Structural remains and use of the site as Howell's Mill may demonstrate the past use of the site through its archaeological remains. Archaeological resource associated with the phase may demonstrate the establishment of wind and watermills in Parramatta. Howell's Mill is representative of development of the early colony, and archaeological remains may reflect this rapid growth and changing use of the reserve.	yes
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	Archaeological remains relating to the Steam Packet Inn and the Emu Hotel may provide insight into the development and formalisation of George Street as a main thoroughfare through Parramatta. If sealed deposits are identified, they may offer insight into the individuals who lived and worked at the inn over the course of the nineteenth to early twentieth century. Remains associated with Phase 5 of occupation at the site, may overall be informative of the development, establishment of Parramatta. These remains would demonstrate the past of Queen's Wharf Reserve and could provide valuable information relating to the people who lived, visited, and operated the Inn.	yes
Phase 6: Byrne's Mill (1841–c.1880s)	Archaeological remains relating to Byrne's Mill may provide further information regarding the development of Parramatta. Byrne's Mill began operation in 1841 as the first steam mill. Archaeological resource from this Phase may offer an insight into the people who lived at and operated the mill. Footings and sealed deposits from the workers cottages may provide information relating to the people based at Byrne's Mill during this time. Remains associated with Phase 6 may be informative to the development and transition to steam powered mills in the mid-nineteenth century.	yes

Phase	Assessment	Meets threshold (yes/no)
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	Archaeological remains relating to the Parramatta Benevolent Asylum may demonstrate the past. Structural remains and sealed deposits mat provide information relating to late nineteenth century institutions in the broader Sydney region and the people who were housed in these institutions. Archaeological resources identified from Phase 7 may also demonstrate the changing use and modification to the original Commissariat building. The changing use of the Commissariat and surrounding land may be demonstrated and interpreted through the surviving archaeological resources in this area. These archaeological remains may demonstrate the past, including information relating to the people who lived there, and the development of the site overall.	yes
Phase 8: Parramatta Gasworks (1872–c.1940s)	Archaeological remains relating to the Parramatta Gasworks may demonstrate the past use of the site. Resource from this time would provide information relating to the establishment and operation of gas production in Parramatta. The establishment of the Parramatta Gasworks in 1872 marked a significant point in the transformation of Parramatta from a rural village to a regional centre. Archaeological resources, both structural and sealed intact deposits may have the ability to demonstrate the past and the lives of people who lived here during this Phase.	yes
Phase 9: George Street Tramway and Queen's Wharf Reserve today	Archaeological remains associated with the George Street Tramway may demonstrate the urbanisation and growth of Parramatta. Evidence associated with the tramway and extension of George Street to the east may provide information relating to the overall development of Parramatta, from early settlement to the present day.	yes

5.3 Summary statement of significance

Queen's Wharf Reserve has a rich history that spans more than two centuries of non-Indigenous settlement. During this time, the reserve has been subject to significant development and changes.

Archaeological Research Potential (NSW Heritage Criterion E)

Phases 1 and 2 of development at Queen's Wharf Reserve may offer valuable research potential into the establishment of the early colony in Parramatta. Archaeological resource from these Phases could inform our understanding of convict life in Parramatta, and life within the Military District.

Archaeological remains associated with Phases 1 and 2 are likely to be present in the form of deposits, and structural remains. These resources may provide valuable information and research into the location of early colonial structures and the overall settlement of Parramatta in the eighteenth and early nineteenth centuries. Within the archaeological record, these remains are considered rare and would be considered State significant on this basis.

Phases 1 and 2 meet the threshold for this criterion.

Archaeological resource from Phases 3 to 8 may offer significant information and valuable research potential relating to the military and lifeways of the people who lived and worked within the study area during these phases. Archaeological materials relating to these phases that are identified, may further develop our understanding of the changing uses of the site.

Archaeological remains associated with Phases 3–8 are likely to be present in the form of features, deposits, structural remains, and artefact scatters. These resources may provide a valuable insight into the development of Parramatta as an early convict town, military outpost, and later a commercial centre.

Phases 2–8 meet the threshold for this criterion.

Archaeological resource from Phase 9 at Queen's Wharf Reserve is not considered rare, nor would it offer significant new insight into the history of Queen's Wharf Reserve. There are several examples of tramlines across the broader Sydney area and within Parramatta that would provide a higher research value.

Phase 9 does not reach the threshold for this criterion.

Associations with Individuals, events, or groups of historical importance (NSW Heritage Criteria A, B & D)

Phases 1 and 2 are associated with the early British settlement of Australia, and as a military centre for the British garrison. Through its association with early settlement of the colony, these phases would be considered significant.

Phases 1 and 2 meet the threshold for this criterion.

Phases 3 and 4 are associated with George Howell and his development of part of the study area as a mill complex.

Phases 3 and 4 meet the threshold for this criterion.

Phase 6 is associated with James Byrne who was an influential political figure within Parramatta in the mid nineteenth century. Through the mill's association with James Byrne this phase is considered significant.

Phase 6 meets the threshold for this criterion.

Phase 8 is associated with the establishment of the Parramatta Gasworks which marked a significant technological advancement and development within Parramatta. The successful construction and operation of the Parramatta Gasworks marked an event that was important factor in the late-nineteenth century development of Parramatta.

Phase 8 meets the threshold for this criterion.

Phases 5, 7, and 9 are not associated with any individuals or notable events and are not considered significant when assessed under this criterion.

Phases 5, 7 and 9 do not meet the threshold for this criterion.

Aesthetic or technical significance (NSW Heritage Criteria C)

No phases meet the criterion for Aesthetic achievement. However, evidence of some technical achievement may survive in association with the operation of Howell's Mill and Byrne's Mill.

Phases 1, 2, 3, 5, 7 and 9 do not meet the threshold for this criterion.

Phases 4, 6 and 8 have some potential to meet the threshold for this criterion.

Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, B &D)

All identified phases of development at Queen's Wharf Reserve have the potential to demonstrate the settlement and development of Parramatta.

Phases 1 and 2 of development may provide valuable information relating to early convict settlement and the transition of Parramatta from a military outpost to a centre for the British regiment in the late 18th and early 19th centuries.

Phases 3–9 of development has the potential to reflect the expansion and urbanisation of Parramatta through the establishment of commercial, industrial, and residential structures on the reserve.

6. Potential impact on archaeological resources

6.1 Proposed development

The City of Parramatta Council are undertaking active transport improvements in Queen's Wharf Reserve and Noller Parade in Parramatta. This development and upgrade to existing infrastructure has been prompted by several factors including inadequate pathways for the high demand of cycling and pedestrian movements as well as the construction of the Parramatta Light Rail.

Located along the southern side of Parramatta River between Macarthur Street and Alfred Street, the proposed active transport link will feature separated pedestrian and cyclist paths in Queen's Wharf Reserve and a two-way on road cycleway at Noller Parade. Importantly, the Queen's Wharf Reserve link facilitates improved infrastructure to Alfred Street Bridge (currently in construction) over the Parramatta River. This project is part of George Street East Pedestrian and Cyclist Paths, which successfully received funding through Transport for NSW's 'Get NSW Active' grant.

The works includes:

- Creation of separated pedestrian and cyclist paths in Queen's Wharf Reserve;
- Provision of a two-way on road cycleway at Noller Parade;
- Improved path connections and DDA compliance;
- Removal of selected small trees and the planting of additional trees;
- Provision of new park furniture including signage, seating and bins;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works (e.g. kerb and gutter and drainage works);
- Reconstructed retaining walls; and
- Improved electrical works.

The concept plan is still at draft stage, with some potential to reroute the paths based on changed design, built heritage and historical archaeological considerations. At present, the ground disturbance associated with the path comprises:

- Demolition of the existing footpath and reforming of a wider path in the same location, including excavation to 225mm below the ground surface,

- Installation of new path lights along the route, including the excavation of footings are approximately 1.2m x 1.2m wide, and 650mm in depth,
- The formation of new pathways, including excavation of 225mm below the ground surface,
- Auxiliary works including excavations for tree removal and planting, and removal of benches and garden beds.

6.2 Potential archaeological impact

Proposed works at Queen's Wharf Reserve have the potential to impact historical archaeological remains associated with all phases of development identified in this report. Figure 48, Figure 49, Figure 50 and Figure 51show the proposed works and depths of impact in relation to potential historical archaeological features in the area. The depth of significant archaeological material within the study area is expected to be as shallow as 150–200mm below the current ground surface.

Demolition of existing footpath and installation of a wider footpath

The expected depth of excavation for the installation of the footpath is approximately 250–300mm beneath the ground surface.

Demolition and removal of the existing footpath is not expected to impact any archaeological remains in the area.

Ground disturbance and excavation for the installation of the new footpath is expected to impact archaeology from all identified phases of development at Queen's Wharf Reserve (Figure 48, Figure 49, Figure 50 and Figure 51).

Installation of lights and footings for light poles

Significant ground disturbance and excavation is required for the installation of lights and footings for the light poles. Excavation for the light poles is approximately 500mm x 500mm, with a total depth of 600mm.

Excavation for some lights and foundations is expected to impact archaeology from all identified phases of development at Queen's Wharf Reserve. The location of some proposed lights is not expected to impact archaeology (Figure 48, Figure 49, Figure 50 and Figure 51).

Formation of new pathways

The expected depth of excavation for the installation of new pathways is approximately 250–300mm from the ground surface.

Ground disturbance and excavation associated with the formation of new pathways is expected to impact archaeology from all identified phases of development at Queen's Wharf Reserve (Figure 48, Figure 49, Figure 50 and Figure 51).

Civil infrastructure works

Proposed civil infrastructure works include modifications to kerbing, drainage and installation of various services.

Excavation for the proposed services includes depths of up to 600mm and is expected to impact archaeology from all identified phases of development at Queen's Wharf Reserve.

Modifications to the existing kerbing is not expected to impact any archaeology within the study area.

Auxiliary works

Proposed auxiliary works includes excavation for tree removal and planting, and removal of benches and garden beds. These works are expected to involve ground disturbance of up to 300mm in depth.

Ground disturbance for the described auxiliary works is expected to impact archaeology from all identified phases of development at Queen's Wharf Reserve.

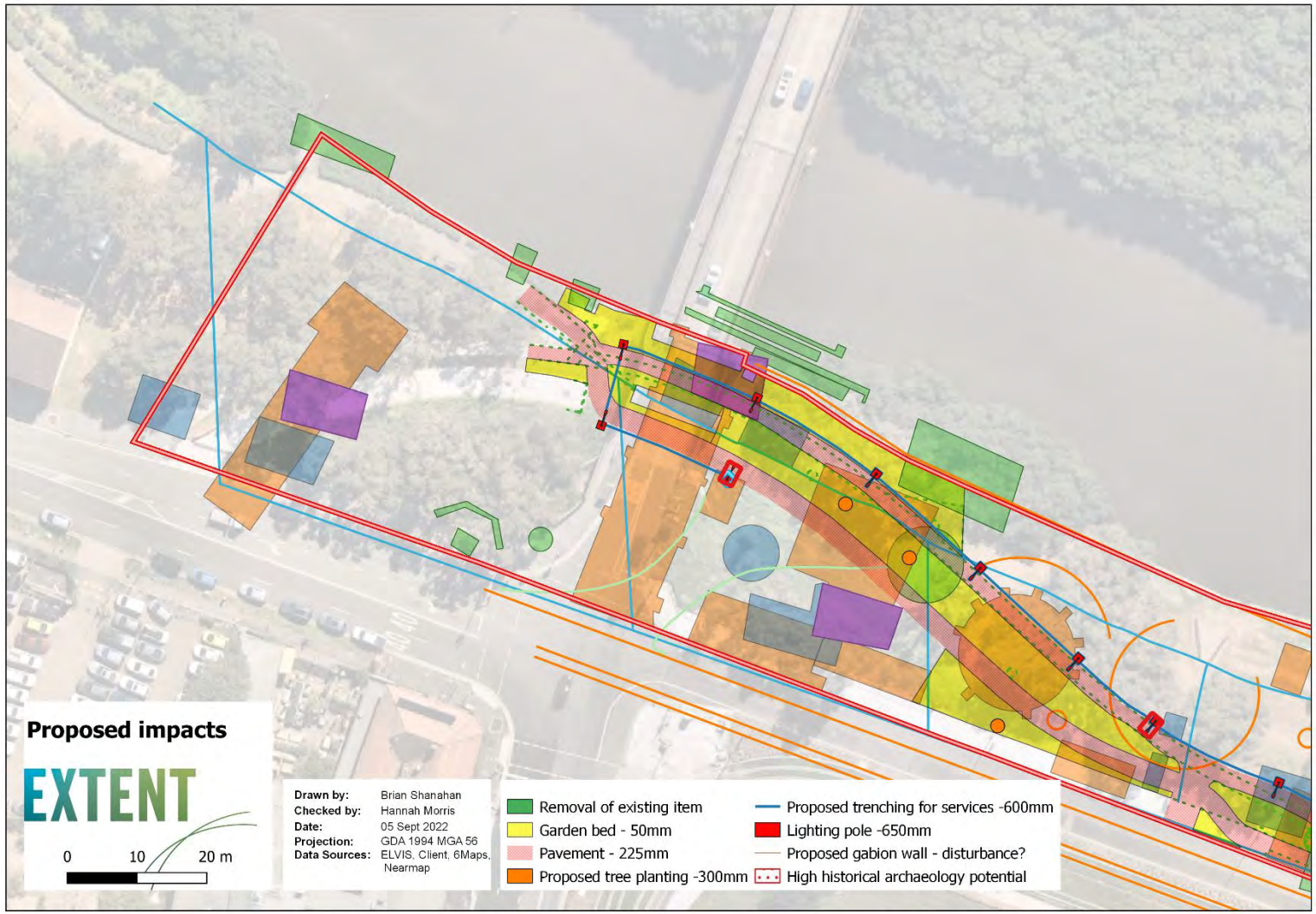

Figure 48. Proposed works in relation to expected archaeological resource (western portion of the site)

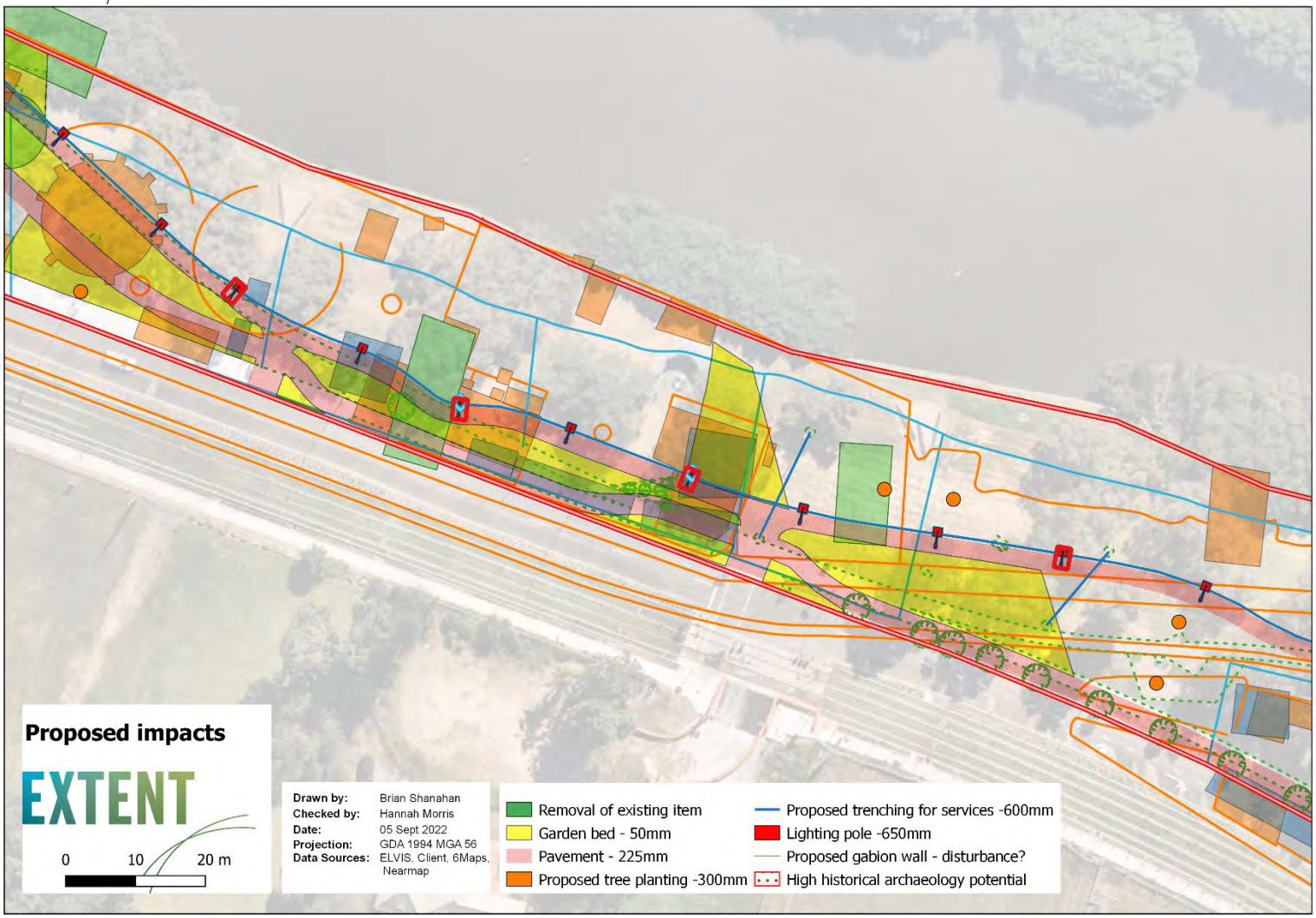

Figure 49. Proposed works in relation to expected archaeological resource (west central portion of the site)

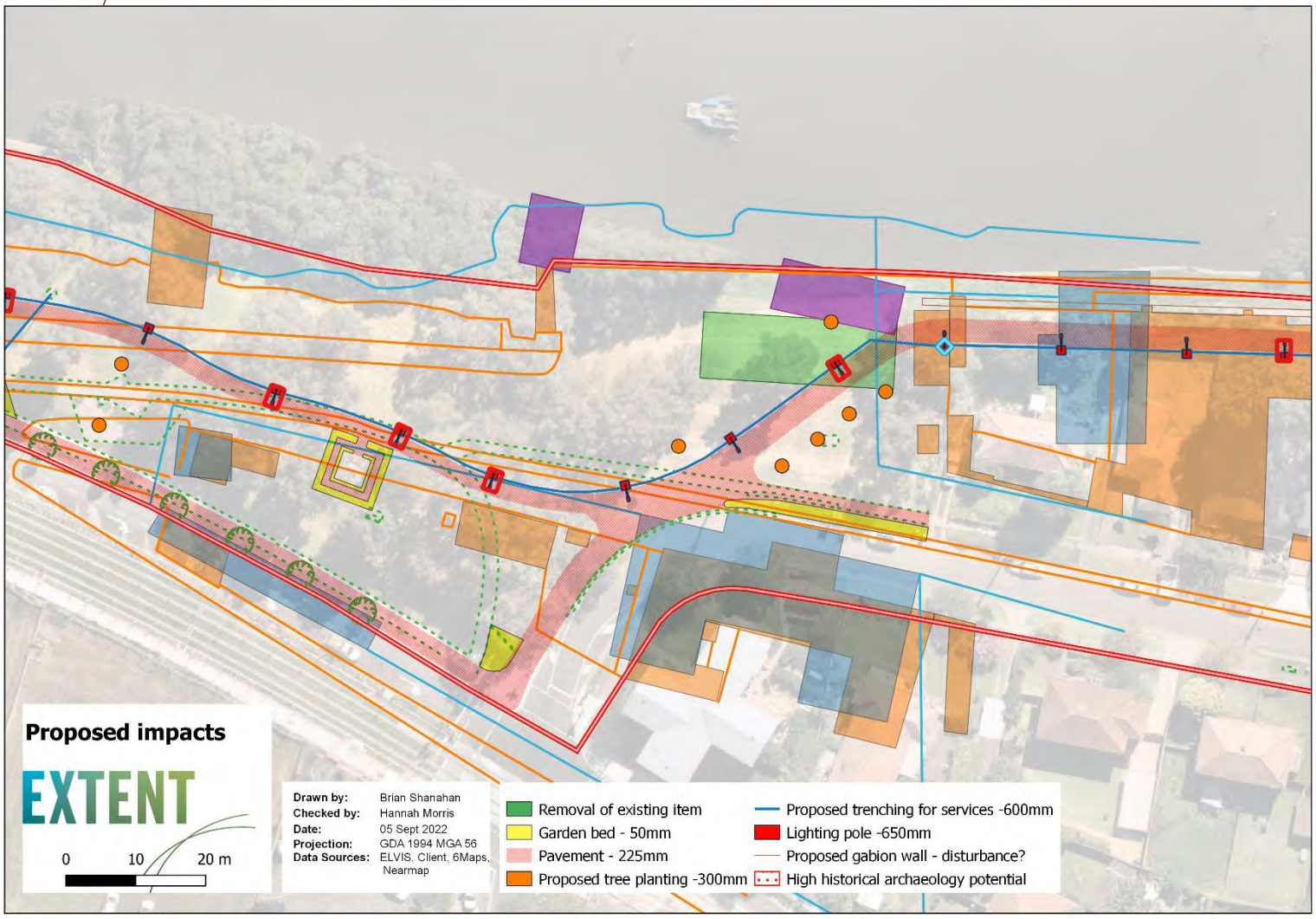

Figure 50. Proposed works in relation to expected archaeological resource (east central portion of the site)

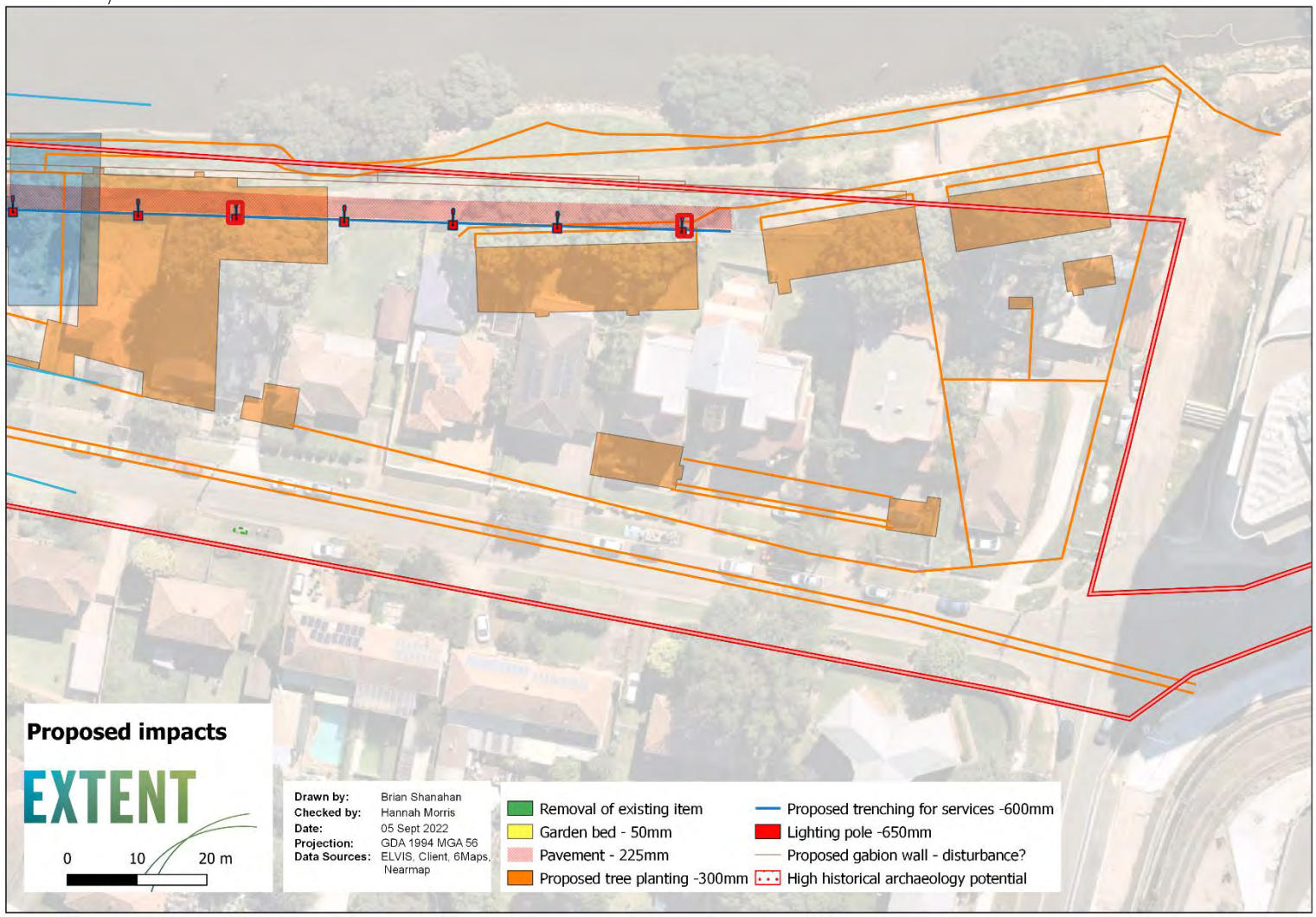

Figure 51. proposed works in relation to expected archaeological resource (eastern portion of the site)

7. Conclusions and recommendations

7.1 Key findings and conclusions

The study area for the proposed active transport link is located at Queen's Wharf Reserve, Parramatta. The study area extends from the west of Gasworks Bridge and east to Alfred Street along Noller Parade. The study area is located the south of Parramatta River and extends along the existing alignment of George Street.

Queen's Wharf Reserve has a rich history dating from 1789 and is considered a significant archaeological landscape. Research undertaken for this report identified nine phases of development spanning from 1788 until present. These phases included:

- Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)
- Phase 2: The Commissariat and continued military occupation (1825–c.1870s)
- Phase 3: Early subdivisions and development (c.1820s–c.1860)
- Phase 4: Howell's Mill (1823–1872)
- Phase 5: Steam Packet Inn and the Emu Hotel (1834–c.1911)
- Phase 6: Byrne's Mill (1841–c.1880s)
- Phase 7: The Parramatta Benevolent Asylum (1862–1937)
- Phase 8: Parramatta Gasworks (1872–c.1940s)
- Phase 9: George Street Tramway and Queen's Wharf Reserve in the current day (1883–present)

The archaeological resources associated Phases 1, 2, and 3 have been assessed as having the potential State Significant, and all other phases meet the threshold for local significance.

Within the study area, there is one listing of a State Significance item (comprising two separate extant sites):

- HMAS Parramatta Shipwreck and Memorials (SHR 01676).

There are also three locally listed items:

- Queen's Wharf Reserve and Stone Wall Potential Archaeological Site (LEP I1489);
- Gasworks Bridge, (LEP 1487); and

- Wetlands (LEP I735).

The proposed works for the active transport link have the potential to expose or impact archaeological remains from all identified phases of development. Excavation for lighting and light pole foundations, and auxiliary and civil infrastructure works are likely to impact archaeological resource significantly.

7.2 Recommendations

Based on the findings of this report, the following recommendations are made:

- Further archaeological investigations in the form of test excavations are required to determine the location, integrity, presence, and/or absence of archaeological evidence that would be impacted by the proposed development,
- Test excavations would identify but not remove State significant relics,
- A Section 140 permit would be required to undertake test excavations due to the potential presence of state significant archaeology,
- An Archaeological Research Design (ARD) is required, in conjunction with this report, to apply for a Section 140 permit.
- Additional requirements for the application of a Section 140 permit include the nomination of an Excavation Director, provision of appropriate curriculum vitae and response to the criteria for assessing excavation directors, and a development consent and approved stamped plans (or a statement as to why it is not required),
- Additional archaeological investigations, including monitoring or salvage excavations, may be required dependent on the results of the test excavation program,
- Works within the SHR curtilage should be avoided where possible. If impacts to the memorials listed on the SHR are required, no works should be undertaken within the SHR curtilage without a Section 60 permit and assessment by a built heritage specialist,
- Changes to these recommendations would be subject to revision following the analysis of the test excavation results. This would directly influence the type of permissions or notifications required during construction,
- Aboriginal objects are subject to the *Due Diligence Code of Practice for Aboriginal Objects (2010)*, and the recommendations outlined in the Queen's Wharf Reserve and Noller Parade Active Transport Link Aboriginal Cultural Heritage Assessment Report, and
- This report has not identified potential for human remains. However, if human remains are identified, all works should cease in the affected areas and the local police should be contacted. The site will be the responsibility of the police and coroner during investigation of the human remains. Suspected human remains may be partial, truncated or intact.

Extent Heritage has recommended applying for a Section 140 application rather than a Section 139(4) permit exemption. This recommendation follows the legislation outlined in Section 141 of the *Heritage Act (1977)* which states that an excavation permit is required if the proposed activities or works will,

- disturb or excavate land that is likely to contain archaeological relics of State heritage significance
- have a major impact on relics of local heritage significance.

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APPENDIX C- HISTORICAL ARCHAEOLOGICAL POST EXCAVATION REPORT

EXTENT

QUEENS WHARF RESERVE AND NOLLER PARADE ACTIVE TRANSPORT LINK— GEORGE STREET EAST TEST EXCAVATIONS

HISTORICAL ARCHAEOLOGICAL POST-EXCAVATION REPORT

Prepared for City of Parramatta

April 2024 — Draft 1

SYDNEY
MELBOURNE
BRISBANE
HOBART

PEOPLE
CENTRED
HERITAGE

Document information

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EXECUTIVE SUMMARY

Extent Heritage Pty Ltd was commissioned by City of Parramatta to prepare a historical archaeological post-excavation report to present the findings of the historical archaeological test excavation undertaken at Queens Wharf Reserve, Parramatta between 12 October and 1 November 2023 for the proposed George Street East pedestrian and cyclist path development. In addition to presenting the results of the historical archaeological test excavation program, the report provides a reassessment of the archaeological potential and significance of the study area and an assessment of the revised concept design and proposed development impacts. The report provides recommendations for the management and mitigation of impacts on relics of local and State significance by the proposed development within the study area.

The historical archaeological test excavation was carried out in accordance with conditions attached to an excavation permit (HMS ID 2487) issued under Section 140 of the *Heritage Act 1977* (NSW). The excavation works were guided by the findings of the Historical Archaeological Impact Assessment (HAIA) (Extent Heritage 2023b) and the approved research design and methodology outlined in the Historical Archaeological Research Design (HARD) (Extent Heritage 2023a). The historical archaeological test excavation program was undertaken in conjunction with Aboriginal archaeological test excavation, under AHIP #5105.

This report has been prepared in response to Condition 10 of the S140 excavation permit (HMS ID 2487).

Key findings

- Eleven test trenches (TTs) were excavated across Queens Wharf Reserve to determine the location and integrity of archaeological resources identified in the HARD (Extent Hertiage 2023a).
- State significant archaeological remains associated with the military barracks and commissary store during Phase 2 (1825 – c.1870s) was present in the southern portion of the study area within TT4 and TT5, including intact structural remains of the boundary wall and associated gravel surface.
- Archaeological features across the study area were identified at a depth between 450mm and 800mm below current ground surface.
- A total of 328 individual artefacts recovered across seven of the test trenches, comprising a minimum number of 100 items. The majority of artefacts were recovered from twentieth-century fill deposits and could be dated between the late nineteenth to mid twentieth century.
- The test excavations characterised the historical development of the study area, the levels of fills capping historical archaeological remains, the absence of buildings identified on plans, and degree of landscaping that has occurred at Queens Wharf Reserve.

Recommendations

- Potential historical archaeological impacts during groundworks should be managed under a s140 excavation permit. Additional permits may be required to manage Aboriginal archaeology.
- An Archaeological Research Design (ARD) should be compiled to support the s140 application prior to the commencement of any proposed ground disturbance works.
- The Archaeological Research Design should take account of the revised assessment of potential archaeological impacts. That ARD should take account of the results and recommendations of the Aboriginal Test Excavation Report (Extent Heritage 2024) that was carried out concurrently with the historical archaeological testing programme.
- The ARD should address how potential archaeological impacts will be managed at construction stage. This should include recommendations for monitoring of any groundworks that are likely to disturb relics, by a suitably qualified historical archaeologist. Proposed groundworks should be classified according to potential impact and an appropriate archaeological management strategy should be outlined for each area or activity.
- Provision should be made for a meeting with the principal contractor prior to commencement of works and provision for delivery of a heritage induction for on-site staff.
- Any archaeological relics that are exposed should be investigated and documented to determine if they relate to the predicted archaeological resource, and to determine their archaeological significance. Appropriate management, as outlined in the ARD and endorsed by Heritage NSW, could require avoidance through minor redesign, such as the introduction of additional fill if possible, or localised archaeological salvage excavation to the depth of the proposed impact.
- A copy of this report should be lodged with Heritage NSW in compliance with Condition 10 of the section 140 excavation permit (HMS ID 2487).
- The artefact assemblage will be stored securely by City of Parramatta within a dry and stable heritage collections repository, and the report and associated records lodged with a publicly accessible data repository.
- The Heritage Interpretation Plan prepared by Extent Heritage (Extent Heritage 2024b) should be implemented at the site in accordance with Condition 6 of the s140 excavation permit (HMS ID 2487), with the results of the archaeological investigation informing the content.
- Any proposed future ground excavation works on the site outside the current scope of works as outlined in this report would be subject to an archaeological impact assessment. Any such assessment should be prepared with reference to this report.

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1. INTRODUCTION

1.1. Project initiation

Extent Heritage Pty Ltd was commissioned by City of Parramatta to prepare a historical archaeological post-excavation report to present the findings of the historical archaeological test excavation program undertaken between 12 October and 1 November 2023 at Queens Wharf Reserve, Parramatta as part of the proposed George Street East pedestrian and cyclist path development.

The Historical Archaeological Impact Assessment (HAIA) prepared by Extent Heritage in 2023 identified low to high potential for the survival of archaeological relics of local and State significance across the study area. The HAIA determined that the proposed works would likely impact archaeological relics of local and State significance associated with several identified phases of site development. Consequently, the HAIA recommended further archaeological investigations in the form of test excavation was required.

The historical archaeological test excavation was carried out in accordance with conditions attached to an excavation permit (HMS ID 2487) issued under Section 140 of the *Heritage Act 1977* (NSW). The excavation works were guided by the findings of the Historical Archaeological Impact Assessment (Extent Heritage 2023b) and the approved research design and methodology outlined in the Historical Archaeological Research Design (HARD) (Extent Heritage 2023a). The historical archaeological test excavation program was undertaken in conjunction with Aboriginal archaeological test excavation, under AHIP #5105.

In accordance with Condition 7 of the s140 excavation permit (HMS IS 2487), a public archaeology open day was held during the excavation program on Saturday 28 October 2023. The open day included a pop-up exhibition titled 'River Stories' and provided the opportunity for interpretation, public education, and public access to the results of both the historical and Aboriginal archaeological investigations. Further information regarding this event can be found in 'Queens Wharf Reserve and Alfred Street Pedestrian Bridge – Heritage Interpretation Plan' (Extent Heritage 2024b).

Following the results of the archaeological investigations, Extent Heritage provided preliminary advice on areas of avoidance relating to both historical and Aboriginal archaeology to the City of Parramatta. As a result of this collaboration, City of Parramatta revised the concept design and reduced the overall proposed development impacts, ensuring the primary heritage management strategy continued to be avoidance of local and State significant archaeology. This report provides a reassessment of the archaeological potential and significance of the study area and an assessment of the revised development impacts.

This report has been prepared in response to Condition 10 of the S140 excavation permit (HMS ID 2487).

1.2. Study area location and identification

The study area comprises Queens Wharf Reserve and Noller Parade and is located in the suburb of Parramatta within the City of Parramatta Local Government Area (Figure 1). The study area lies along the southern foreshore of the Parramatta River and is bounded by George Street and Noller Parade to the south, Alfred Street to the east, and extends beyond Macarther Street (Gasworks Bridge) to the west. Queens Wharf Reserve comprises public parkland with a walking path, mature trees, memorials and Aboriginal art sculptures, and forms part of the Parramatta Heritage Walk route.

The study area encompasses all or part of the following land parcels:

- Lot B DP 433896
- Lot 1 DP 69432
- Lot 34 DP 1107897
- Lot 56 DP 1107686
- Lot 1 DP 909045
- Lot 1 DP 128847
- Lots 1, 2, and 3 DP 1151643
- Lot 1 DP 126881
- Lot 1 DP 224186
- Lots 1, 3 to 11 DP 35895
- SP 46699
- Lot A DP 444716
- Lot A DP 959111

A total of eleven test trenches extending across Queens Wharf Reserve were excavated as part of the archaeological test excavation program, as shown in Figure 2 .

Figure 1. The study area.

Figure 2. Study area with test trench locations

1.3. Proposed development impacts

City of Parramatta is developing a cycleway and pedestrian path network as part of the Queens Wharf Reserve and Noller Parade Active Transport Link Project. Known as the George Street East Pedestrian and Cyclist Paths, the proposed development will involve the construction of separate pedestrian and cyclist paths along the southern river foreshore through Queens Wharf Reserve, as well as a dual cycleway along Noller Parade. The proposed works will also include landscaping works and the installation of lighting and associated services.

The archaeological test excavation program as described in the ARD (Extent Heritage 2023a) was guided by the proposed ground disturbance impacts associated with the original concept design as listed below in Table 1.

Table 1. Proposed ground disturbance impacts from previous concept design, as detailed in the HAIA (Extent Heritage 2023b) and ARD (Extent Hertiage 2023a).

Proposed development	Ground disturbance impacts
Redevelopment of existing pathway including demolition for path widening	Max. 225mm depth
Development of new pathways	Max. 225mm depth
Installation of light poles along path route	Max 650mm depth. Footing dimensions 1200mm x 1200mm.
Installation of signposts	Max. 450mm depth
Trenching for electrical services	Max. 600mm depth.
Landscaping works including tree removal and new plantings (25L pot size)	Max 300mm depth.
Removal of existing grass for proposed garden beds	Max. 50mm depth

Following the results of the archaeological investigations, Extent Heritage provided preliminary advice to the City of Parramatta regarding areas of concern relating to both historical and Aboriginal archaeology. As a result of this collaboration, City of Parramatta revised the concept design and reduced the overall proposed development impacts, ensuring the primary heritage management strategy continued to be avoidance of local and State significant archaeology. This resulted in a reduction of proposed ground impacts by using fill to build up the ground level between 100mm – 500mm along the northern side of the pathway where the light poles and electrical conduits are to be located. Additionally, service trenching impacts were further reduced through placement beneath the concrete pathway on the northern side allowing for reduced cover. Based on the revised concept design, the proposed development will involve the following ground disturbance as listed below in Table 2.

Table 2. Proposed ground disturbance impacts from revised concept design.

Proposed development	Total ground disturbance impact	Actual impacts to existing ground level *
Redevelopment of existing pathway including demolition for path widening	Max. 225mm depth	0mm-125mm
Development of new pathways	Max. 225mm depth	0mm-125mm
Installation of light poles along path route	Max 650mm depth. Footing dimensions 1200mm x 1200mm.	150 mm -550mm
Installation of signposts	Max. 450mm depth	0 mm – 350mm
Trenching for electrical services below pathway	Max. 425mm depth.	0mm – 325 mm
Landscaping works including tree removal and new plantings (25L pot size)	Max 300mm depth.	0mm – 200mm
Removal of existing grass for proposed garden beds	Max. 50mm depth	

*along northern side of pathway only, where 100mm – 500mm of fill will be introduced to raise the existing ground level

FIGURE- of concept design- overview wide shot.

1.4. Objectives

The objectives of this report are to present the results of the historical archaeological test excavation program undertaken in the study area and to respond to the archaeological research design outlined in the HARD (Extent Heritage 2023a), in order to meet the final reporting requirements outlined in Condition 10 of s140 Excavation Permit (HMS ID 2487).

In addition to presenting the results of the historical archaeological test excavation program, the report provides a reassessment of the archaeological potential and significance of the study area and an assessment of the revised development impacts. The report provides recommendations for the management and mitigation of impacts to relics of local and State significance by the proposed development within the study area.

1.5. Relevant reports and investigations

The study area has been subject to the following heritage reporting and investigation:

- 'Queens Wharf Reserve and Noller Parade Active Transport Link – George Street East Test Excavations. Aboriginal Archaeological Test Excavation Report' (Extent Heritage 2024a)
- 'Queens Wharf Reserve and Alfred Street Pedestrian Bridge – Heritage Interpretation Plan' (Extent Heritage 2024b)

- ‘Queens Wharf Reserve and Noller Parade Active Transport Link – Historical Archaeological Research Design’ (Extent Heritage 2023a)
- ‘Queens Wharf Reserve and Noller Parade Active Transport Link – Historical Archaeological Impact Assessment’ (Extent Heritage 2023b)
- ‘Queens Wharf Reserve and Noller Parade Active Transport Link – Aboriginal Cultural Heritage Assessment Report’ (Extent Heritage 2023c)
- ‘Queens Wharf Reserve and Noller Parade Active Transport Link – Statement of Heritage Impact’ (Extent Hertiage 2022)

1.6. Limitations

This report presents the results of historical archaeological test excavations only and where relevant refers to the results of the Aboriginal archaeological test excavations that were conducted concurrently. The results of the Aboriginal archaeological test excavations are addressed in ‘Queens Wharf Reserve and Noller Parade Active Transport Link – George Street East Test Excavations. Aboriginal Archaeological Test Excavation Report’ (Extent Heritage 2024a).

1.7. Excavation team and author identification

The excavation team included:

- Brian Shanahan, Excavation Director
- Graham Wilson, Excavation Director
- Hannah Morris, site supervisor
- Catherine Fenech, archaeologist
- Peter Woodley, archaeologist
- Guy Hazell, site surveyor

This report was authored by Brian Shanahan (Excavation Director and National Technical Lead, Digital and Geospatial Heritage), Clare Fitzpatrick (Heritage Advisor) and Hannah Morris (Senior Heritage Advisor), with technical input and quality assurance review provided by Graham Wilson (Principal Heritage Advisor). Artefact analysis and reporting was carried out by Clare Fitzpatrick. Photogrammetry was undertaken by Guy Hazell (Site Surveyor) and mapping was prepared by Brian Shanahan.

1.8. Acknowledgements

Extent Heritage acknowledges the assistance of Michelle Wang and Adam Cook from City of Parramatta.

2. HISTORICAL CONTEXT

2.1. Phases of historical development

The following section provides a concise summary of historical events across the study area on the southern foreshore of the Parramatta River, arranged in accordance with the nine major phases of site development and illustrated with relevant historical plans and images. A detailed historical context for the entire study area can be found in the Historical Archaeological Impact Assessment (Extent Heritage 2023b).

2.1.1. Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788 – c.1820s)

The British settlement at Parramatta, originally named Rose Hill, was established on 2 November 1788. With the new colony based at Sydney Cove in danger of starvation, convicts were sent to Parramatta to commence farming on the fertile land (Kass et al 1996, 14). The first landing place of the colonists in Parramatta comprised a natural stone formation where the river narrowed and was located within the study area east of the present day Gasworks Bridge

The initial development of colonial infrastructure within the study area reflects its early use as a military outpost and wharf for river traffic between Parramatta and Sydney. During this phase, a timber wharf was constructed in c.1790 within the study area, becoming a focal point for the colony at Parramatta. Consequently, a series of government structures including military barracks and a store building were erected in the vicinity of the study area on the southern side of present day George Street (Stewart 1823). Evan's 1804 plan of Parramatta reveals the study area contained structures associated with the military barracks including a flagstaff and sentry box.

To facilitate the landing of larger boats and increased river traffic, a secondary wharf was built in 1808 further east along the river within the study area (Varman 1996, 12). This stone wharf also served the three-storey grain store building that had been constructed in the same year.

Figure 3. c.1809 watercolour of a solider guarding the first landing place at Queens Wharf by George William Evans. The three-storey grain store, constructed in 1808, can be seen in the background to the centre right. Source: SLNSW, PXD 388.

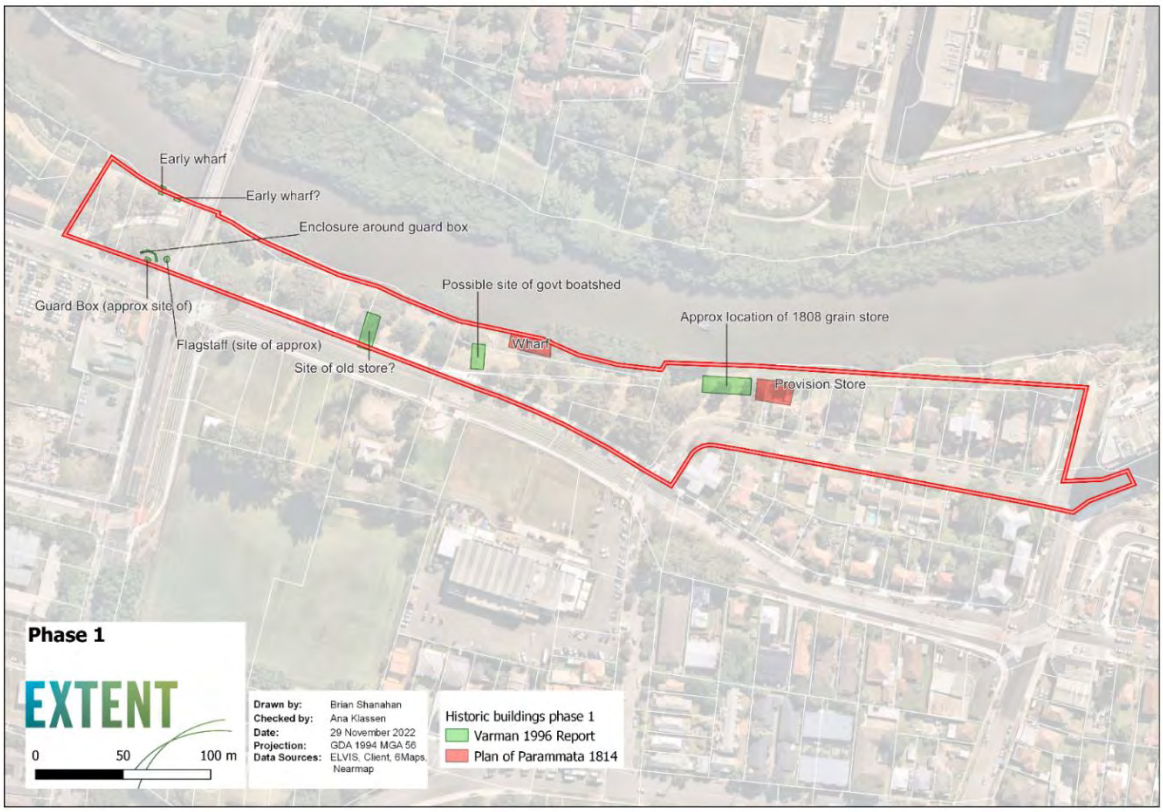


Figure 4. Locations of structures associated with Phase 1.

2.1.2. Phase 2: The Commissariat and continued military occupation (1825 – c.1870s)

The Commissariat Store, a four storey stone building, was constructed in 1825 and formed part of the operation of the convict system in Parramatta during its early years, supplying necessities including food, clothing, liquor, machinery, building material, and other goods. However, with the reduction of the number of convicts requiring Government supplies and the growing military occupation in Parramatta, the Commissariat was converted into military barracks in 1828. Known as the 'Lower Military Barrack', its establishment was accompanied by the construction of additional infrastructure within Queens Wharf Reserve during the 1830s, including a brick privy, brick drain, guard house, and the brick boundary wall fronting George Street (Johnstone 1836).

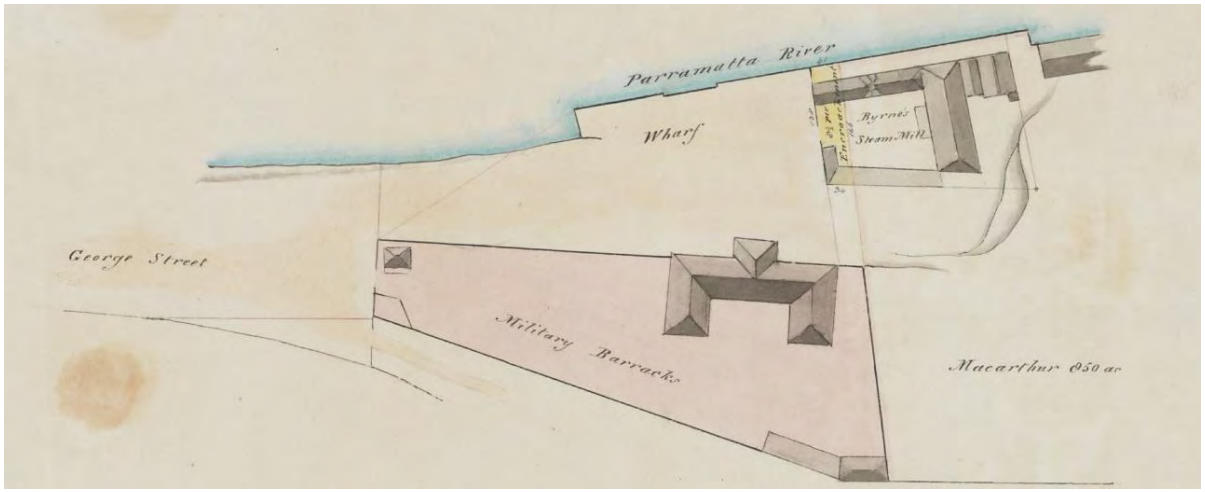


Figure 5. Extract from 1843 plan of Byrne's Encroachment, Parramatta, showing Commissariat Stores/Lower Military Barracks to the south, and Byrne's Steam Mill to the north. *Source:* SLNSW, Z/CA 84/21.

2.1.3. Phase 3: Early subdivisions and development (c.1820s – c.1860)

While colonial development in Parramatta was initially underpinned by farming and military occupation, the subsequent decline of government agriculture saw the town's eventual shift towards free occupation. What began as a planned penal colony soon morphed into a town characterised by new enterprises, businesses, and industries owned by free occupants. The subdivision of Queens Wharf Reserve in the early 1820s brought about the development of industry within the study area.

The western half of the study area was occupied by George Howell who established a windmill and watermill in 1828(see Phase 4). In addition to Howell's Mill, there were several buildings fronting the western end of George Street associated with the early subdivision, as well as the Steam Packet Inn (see Phase 5). Meanwhile, the eastern part of the study area was reserved for government purposes and contained the military barracks and former commissariat store. The land along the present Noller Parade was leased to the Byrnes brothers in 1841 who established the first cloth factory in Parramatta along the river (see Phase 6).

Figure 6. Brownrigg's 1844 plan of Parramatta (Source: SLNSW M ZM3 811.1301/1844/1).

2.1.4. Phase 4: Howell's Mill (1823 – 1872)

In 1828 ex-convict George Howell, who was granted the western section of the reserve in 1823, constructed a windmill and watermill on the riverbank to grind the growing number of crops being produced in the area (Higginbotham 1989, 68). Situated adjacent to present day Macarthur Street, the location of the mills was strategically chosen to allow for a constant water supply for grinding grain (Johnstone 1836). The structures on the allotment appear to have been constructed with timber and stone and included a timber boundary fence along the eastern side of the house. The stone and timber buildings comprised a small private wharf, grain stores, work sheds, and a house. Following the closure of the mill in 1868, Howell's allotment was purchased by the Parramatta Gas Company in 1872.

Figure 7. 1844 drawing by unknown artist showing Howell's Mills and Paramatta River. *Source:* SLNSW, Mitchell Library V1B/Parr/15.

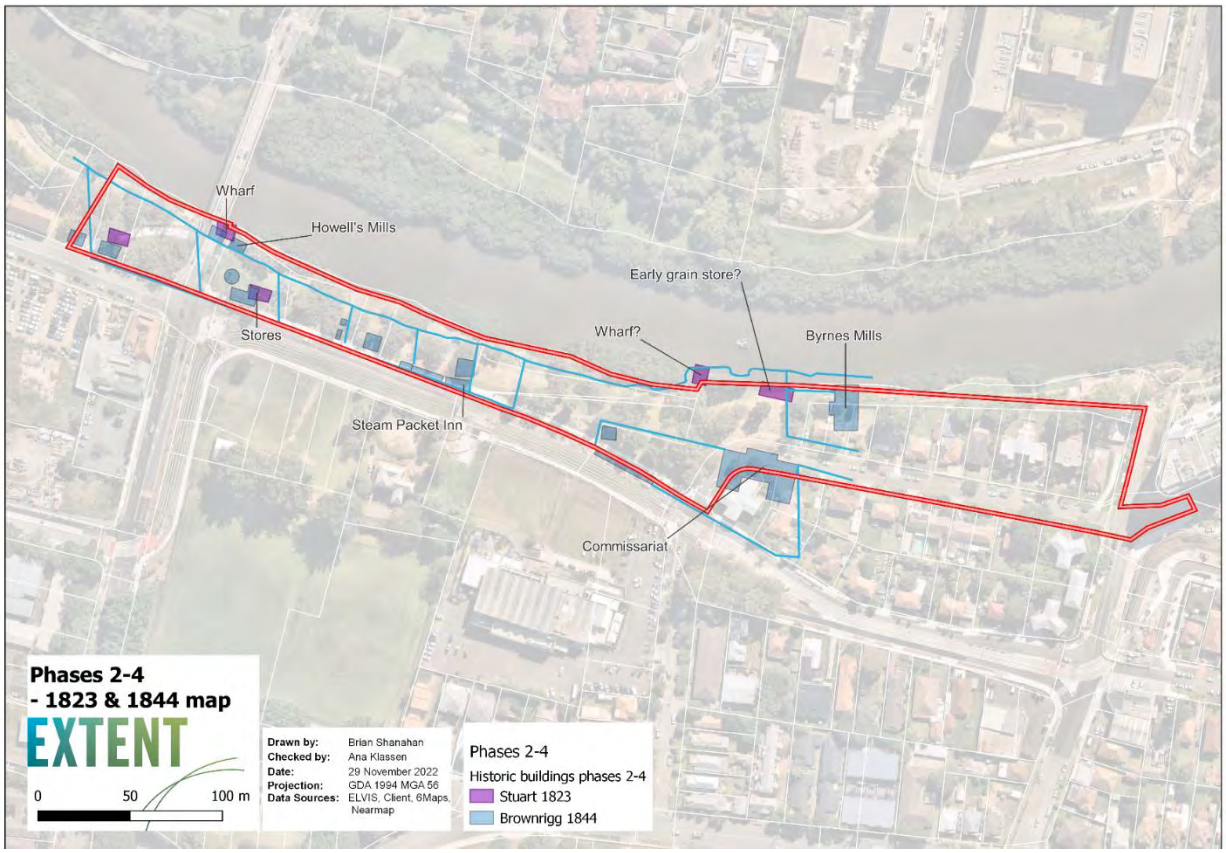


Figure 8. Study area with overlay of historical development from Phase 2-4.

2.1.5. Phase 5: Steam Packet Inn and the Emu Hotel (1834 – c.1911)

The Steam Packet Inn (renamed Emu Hotel in 1861) was established on George Street in c.1834. The inn was a site of social and recreational activity amongst workers, travellers and locals, and was initially described as a pleasant place for rest and retreat (The Sydney Herald 1838, 1). By the 1890s, the inn had gained a reputation for disorder, with historical records describing unsanitary conditions and several accounts of theft (Evening News 1897, 5), Evening News 1897, 5). Following its closure in 1908, the hotel was demolished in c.1911. Historical records indicate that at the time of demolition, the Emu Hotel had a verandah around three sides and contained nine rooms that included three attics, a kitchen, pantry storeroom, laundry, basement, and detached stables.

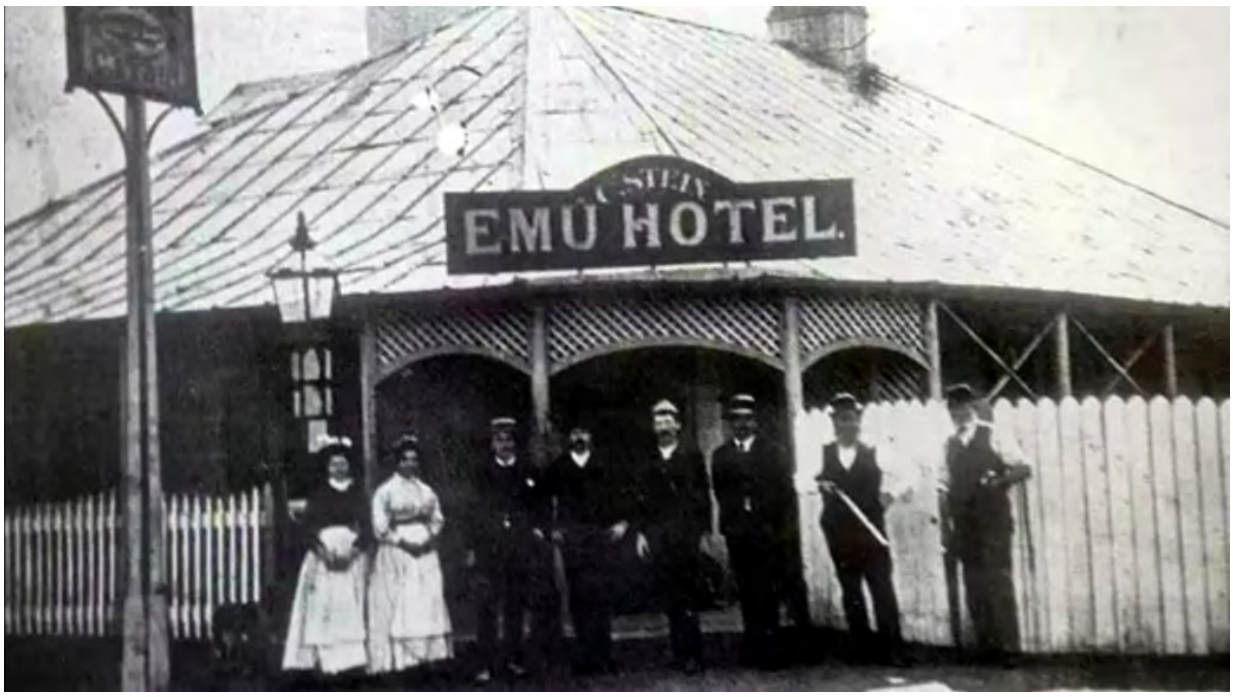


Figure 9. c.1890 photograph of staff outside Emu Hotel. *Source:* Time Gents.

2.1.6. Phase 6: Byrnes Mill (1841 – c.1880s)

The eastern section of the Reserve followed a similar development path as in the west and saw the construction of Byrne's Mill in 1841. Established by brothers James and Williams Byrne on a leased lot that formerly comprised part of Elizabeth Farm, the structure initially consisted of a steam-powered flourmill, before being extended in 1844 to include a prominent five-storey cloth factory addition. By 1847, the cloth factory was manufacturing lama cloth, tweeds, checks, doeskins, and kersemeres (The Sydney Morning Herlad 1947, 2). Byrne's Mill was also one of several factories in the area producing a cloth known as Parramatta tweed, that was being exported to England by the 1850s (The Biz 1959, 7). By 1853, two cottages were erected to the east of the main mill buildings to accommodate workers employed at the mill (Allan 1853).

Byrne's Mill continued to produce cloth until the mid-1880s when it could no longer compete with the more efficient, mechanised mills in Victoria and South Australia. The lot and buildings that

formerly functioned as Byrne's Mill remained vacant and disused until they were purchased by the Government in 1908. Following this acquisition, the buildings were used by the Benevolent Asylum (Phase 7) and were demolished in 1937 when all structures in this area of the reserve were levelled.

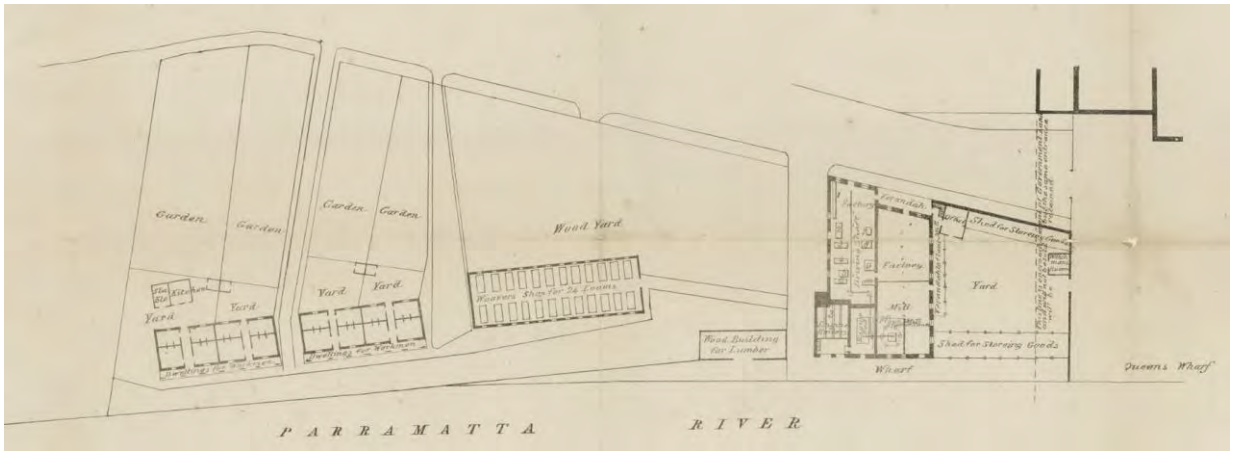


Figure 10. Extract from 1853 plan of the mills, cloth factory and cottages adjoining the Queens Wharf, Parramatta. *Source:* SLNSW, M2 811.1323/1853/1 , Z/M2 811.1323/1853/1

2.1.7. Phase 7: The Parramatta Benevolent Asylum (1862 – 1937)

The end of convict transportation in the early 1840s and the subsequent withdrawal of military personnel throughout the 1850s left Parramatta with a legacy of imposing penal era buildings, the majority of which would later be converted into public institutions. At Queens Wharf Reserve, the NSW Government repurposed the Former Commissariat Stores/Lower Military Barracks into the Parramatta Benevolent Asylum for destitute elderly men in 1862 to counter overcrowding in the existing benevolent asylums in Sydney and Liverpool (Freeman's Journal 1862, 5). By 1870, the Benevolent Asylum had expanded, and series of improvements were made including additional drainage, ventilation, outhouses, sheds, and tanks and wells, followed by a kitchen and lavatories.

Admissions officially ceased in 1936 and the remaining patients were transferred. By the 1940s all structures associated with the Parramatta Benevolent Asylum, Commissariat, Byrne's Mill and the former Gasworks were demolished.

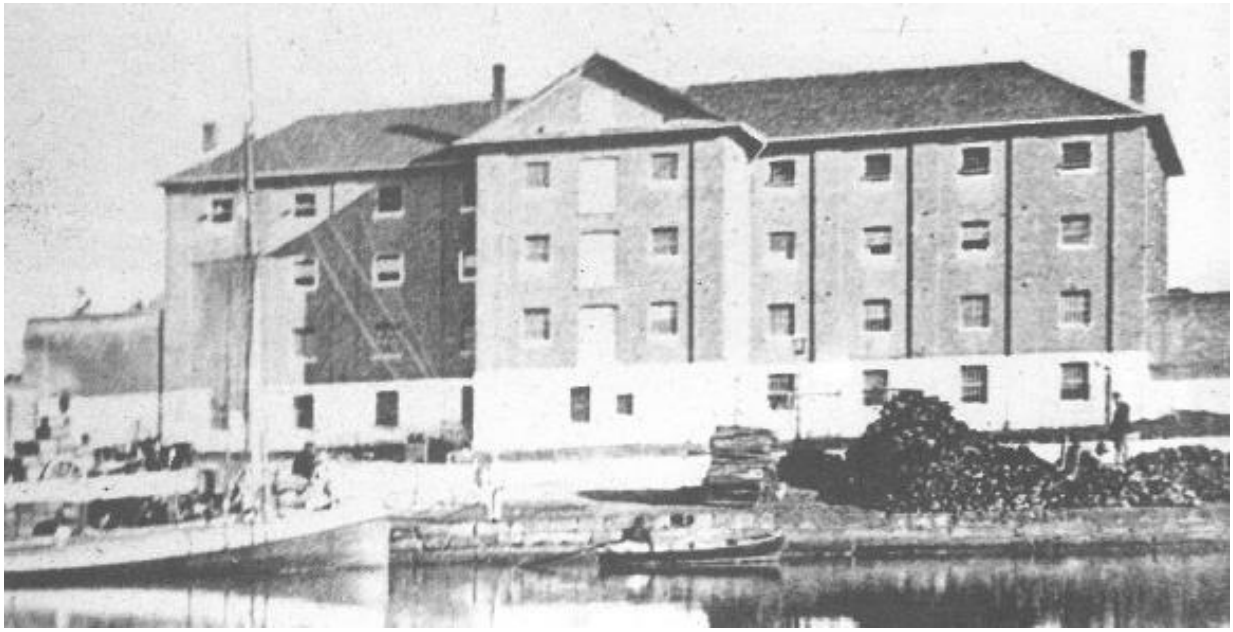


Figure 11. c.1870 photographic plate showing the former Commissariat Store/Lower Military Barrack, now in use as the Parramatta Benevolent Asylum. *Source:* Shylie & Ken Brown, Parramatta: a town caught in time, 1870, Hale & Iremonger, Sydney.1995

2.1.8. Phase 8: Parramatta Gasworks (1872 – 1940s)

A gasworks facility fronting George Street was erected by the Paramatta Gas Company in 1872 (The Sydney Morning Herald 1872, 5). Established on the western portion of Queens Wharf Reserve following the closure of Howell's Mills in 1868, the facility not only reflected continued industrial expansion within the project area into the late nineteenth century, but also marked Parramatta's entry in the industrial age of gas (The Cumberland Argus and Fruitgrowers Advocate 1933, 3).

Historical records show that the gasworks consisted of a large factory building and furnace along George Street (New South Wales Department of Lands 1895). Along the waterfront of the Parramatta River, there were two iron gasometers and a retaining wall (New South Wales Department of Lands 1895). In the initial years, the gasworks used the buildings from Howell's Mill. The Gasworks significantly expanded in 1890 under the new ownership of the Australian Gas Light Company (AGL) and by 1895, the complex featured a large factory building and furnace, converters, a gasometer, retaining walls, coal sheds, accommodation, and site officers (New South Wales Department of Lands 1895). The Parramatta Gasworks continued to operate on George Street until the mid- to late-1930s before its eventual demolition by the early 1940s.

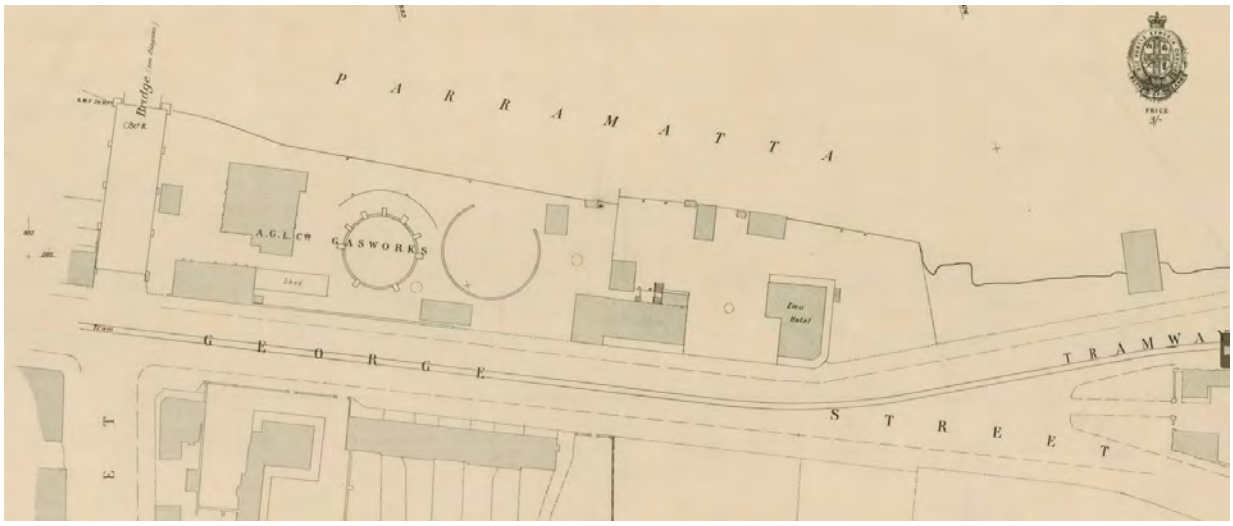


Figure 12. Figure 13. Extract from 1895 plan of Parramatta showing the Paramatta Gasworks (then known as the Australian Gas Light Company (AGL) Gasworks). *Source:* SLNSW, FL374212.

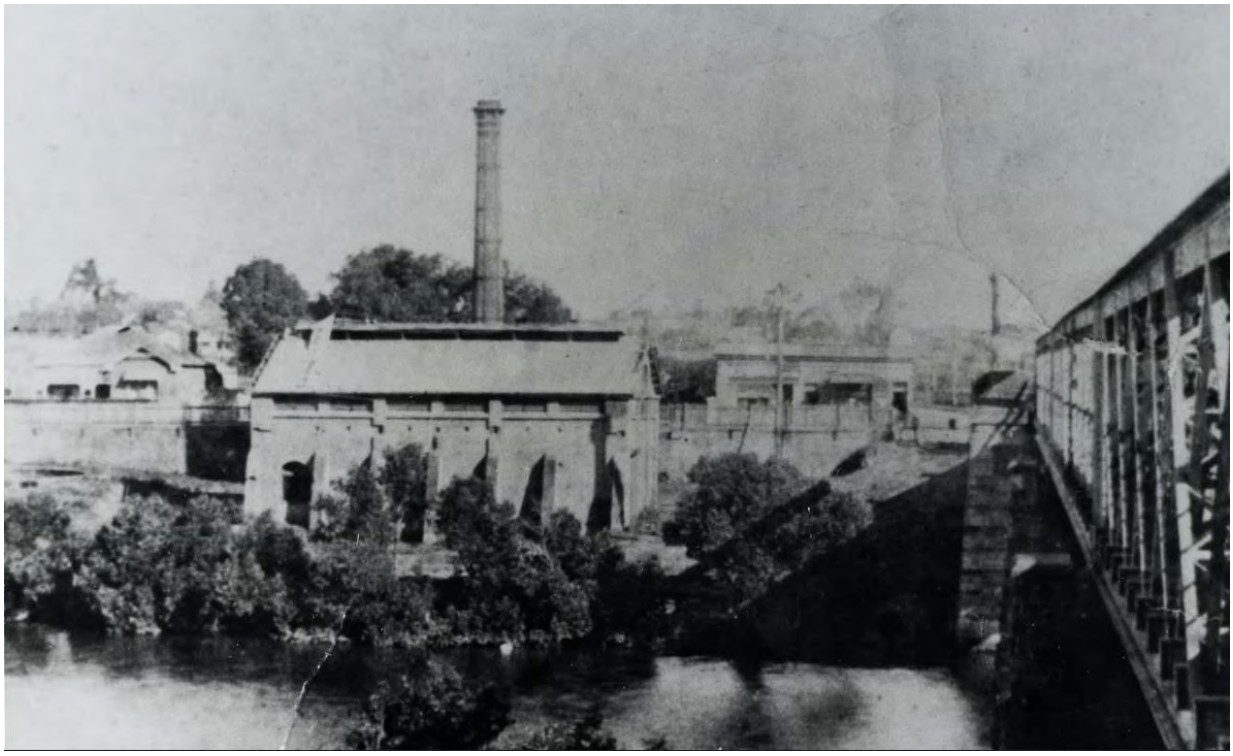


Figure 14. Post-1885 photograph of the Paramatta Gasworks complex. *Source*: City of Parramatta Council's Research and Collection Services. Object number LSP00841

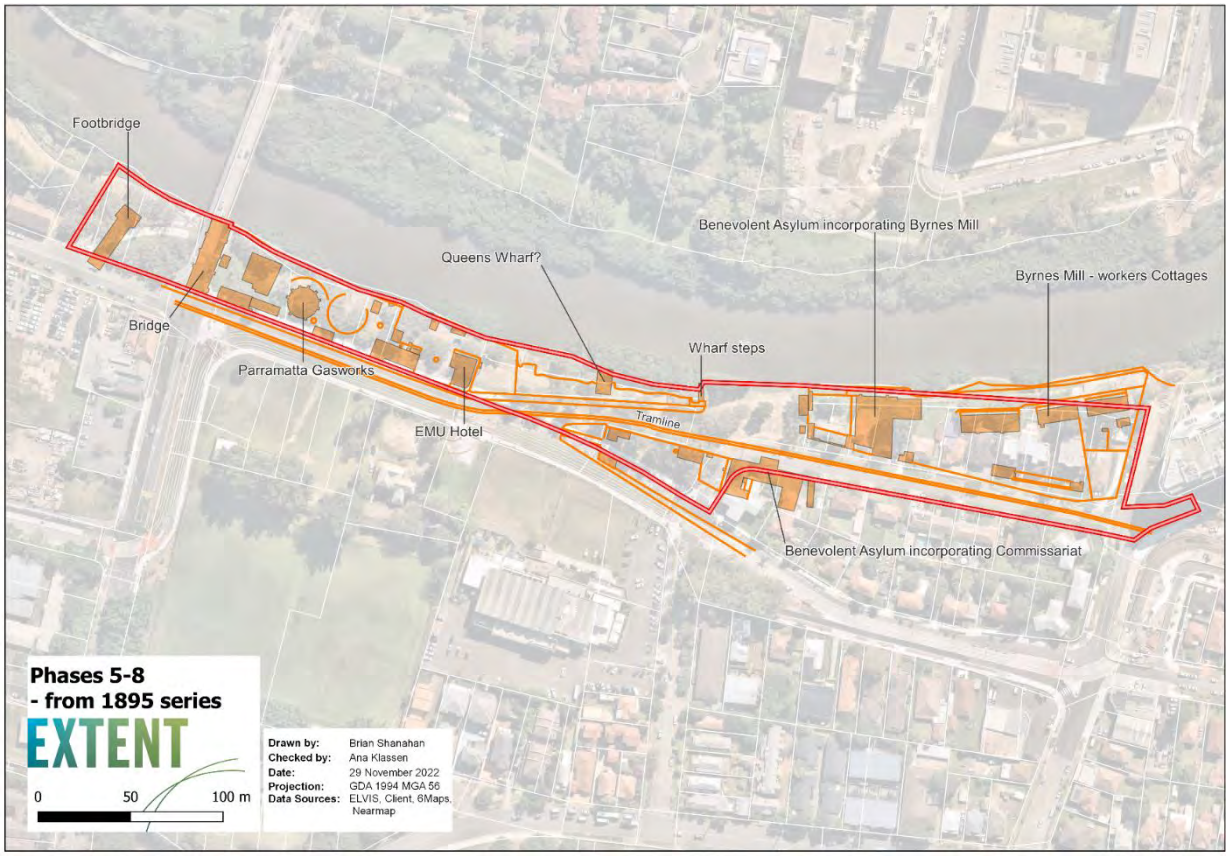


Figure 15. Study area with overlay of historical development from Phase 5-8.

2.1.9. Phase 9: George Street Tramway and Queens Wharf Reserve (1883 – present)

George Street functioned as one of the main thoroughfares in Parramatta during the nineteenth century, servicing the wharves and both the commercial and residential properties along the river. While maritime travel along the Parramatta River had long served as the primary mode of travel between Sydney Cove and Parramatta, the growth of the railways from 1850 onwards resulted in a decline in steamboat travel. A private steam tramway service was established in 1883 by steamboat owner Charles Jeanneret to deliver passengers to his wharf, from where his steamers would then quickly transport passengers to Sydney (The Sydney Morning Herald 1883, 5). Known as the Parramatta Tramway, this private tramway ran from the park gate in George Street, Parramatta, to Duck River along the line of the future Noller Parade. The tramway continued to operate along George Street for six decades until it was decommissioned in 1943.

By 1943, all structures that were previously located at the reserve had been demolished. Since then, Queen's Wharf Reserve has undergone minimal change, with development primarily limited to landscaping, up until the construction of the Parramatta Light Rail in 2018.

Figure 16. c.1940 photograph of tram along the George Street tramway. *Source:* City of Parramatta Council's Research and Collection Services. Object number LSP01059.

3. EXCAVATION METHODOLOGY

3.1. Introduction

The excavation works were guided by the approved research design and methodology outlined in the Historical Archaeological Research Design (Extent Heritage 2023a). The HARD incorporated a theoretical framework and research questions alongside an excavation methodology designed to target areas of archaeological potential in order to understand the nature and extent of archaeological evidence remaining at the site. Due to the presence of complex historical and Aboriginal archaeology within Queens Wharf Reserve, a combined historical and Aboriginal excavation program was required. The integrated testing strategy responded to the parallel legislative requirements and systems for managing historical and Aboriginal archaeology. The historical archaeological excavation methodology is outlined below.

3.2. Excavation strategy

The archaeological test excavation program undertaken between 12 October and 1 November 2023 consisted of eleven test trenches (TT) located across Queens Wharf Reserve for the purpose of investigating both historical and Aboriginal archaeology. Within the test trenches orientated north to south, a total of three Aboriginal test pits (ATP) were excavated.

The proposed development impacts across the area consist of the construction and redevelopment of pathways, installation of light poles and trenching for associated services, and landscaping including new tree plantings and garden beds. The position of the test trenches corresponded with the location of the light pole footings that are anticipated to have the deepest impacts across the area with a maximum excavation depth of 650mm and measuring 1200mm by 1200mm in width. With a total of 30 proposed light poles to be installed, the location of each test trench was chosen for its ability to provide information about potential historical and/or Aboriginal archaeological features of local and State significance.

Table 3 summaries the proposed test trenches and their rationale as outlined in the HARD (Extent Heritage 2023a). Due to a number of constraints during excavation including tree roots, extant concrete surfaces and adjacent construction works, the locations and sizes of several test trenches required reconfiguration, as well as updated objectives. These changes are highlighted within the table in bold. For further information concerning the rationale for reconfiguration, see Part 4 below.

Figure 17 to Figure 20 show the excavated test trench locations overlying the footprints of historical structures and the depths of impact of the proposed development.

Table 3. Proposed test trenches across the study area and rationale.

TT	Location	Size	Type	Objective
1	**Moved 2m west Orientation shifted E-W**	3m x 2m	Historical	Locate structural remains of nineteenth century weavers shop building that formed part of the Byrnes Mill and cloth factory complex (Phase6) and later Benevolent Asylum (Phase 7).
			Aboriginal	Investigate PSB and QWR PAD 1 (AHIMS 45-6-4094)
2	**Orientation shifted E-W**	3m x 2m	Historical	Locate structural remains of nineteenth century Byrnes Mill and cloth factory building (Phase 6) and later Benevolent Asylum (Phase 7).
3	Proposed	3m x 2m	Historical	Locate structural remains of 1808 government grain store (Phase 1).
			Aboriginal	Investigate PSB and QWR PAD 1
4	Proposed	**4m x 2m**	Historical	Locate structural remain of military barracks wall (Phase 2).
			Aboriginal	Investigate PSB and QWR PAD 1
5	**Moved 2m south**	**5m x 2m**	Historical	Locate remains of the former tramway (Phase 9) **Locate structural remain of military barracks wall (Phase 2).**
			Aboriginal	Investigate PSB and QWR PAD 1
6	Proposed	3m x 2m	Aboriginal	Investigate PSB and QWR PAD 1
7	Proposed	3m x 2m	Aboriginal	Investigate PSB and QWR PAD 1
8	**Moved 2m northwest**	3m x 2m	Historical	Locate structural remains of c.1834 Steam Packet Inn/Emu Hotel (Phase 5)
			Aboriginal	Investigate PSB and QWR PAD 1
9	**Moved 2m northeast**	**3m x 3m**	Historical	Locate structural remains of early nineteenth century buildings (Phase 3).
			Aboriginal	Investigate PSB and QWR PAD 1
10	Proposed	3m x 2m	Historical	Locate structural remains of early nineteenth century buildings (Phase 3) and the late nineteenth century Parramatta Gasworks gasometer (Phase 8).
			Aboriginal	Investigate PSB and QWR PAD 1
11	**Moved 27m east** **Orientation shifted E-W**	3m x 2m	Historical	Locate structural remains of 1828 Howells Mill buildings (Phase 4) and ~~late nineteenth century Parramatta Gasworks structures (Phase 8).~~ **Access the subsurface landscape.**

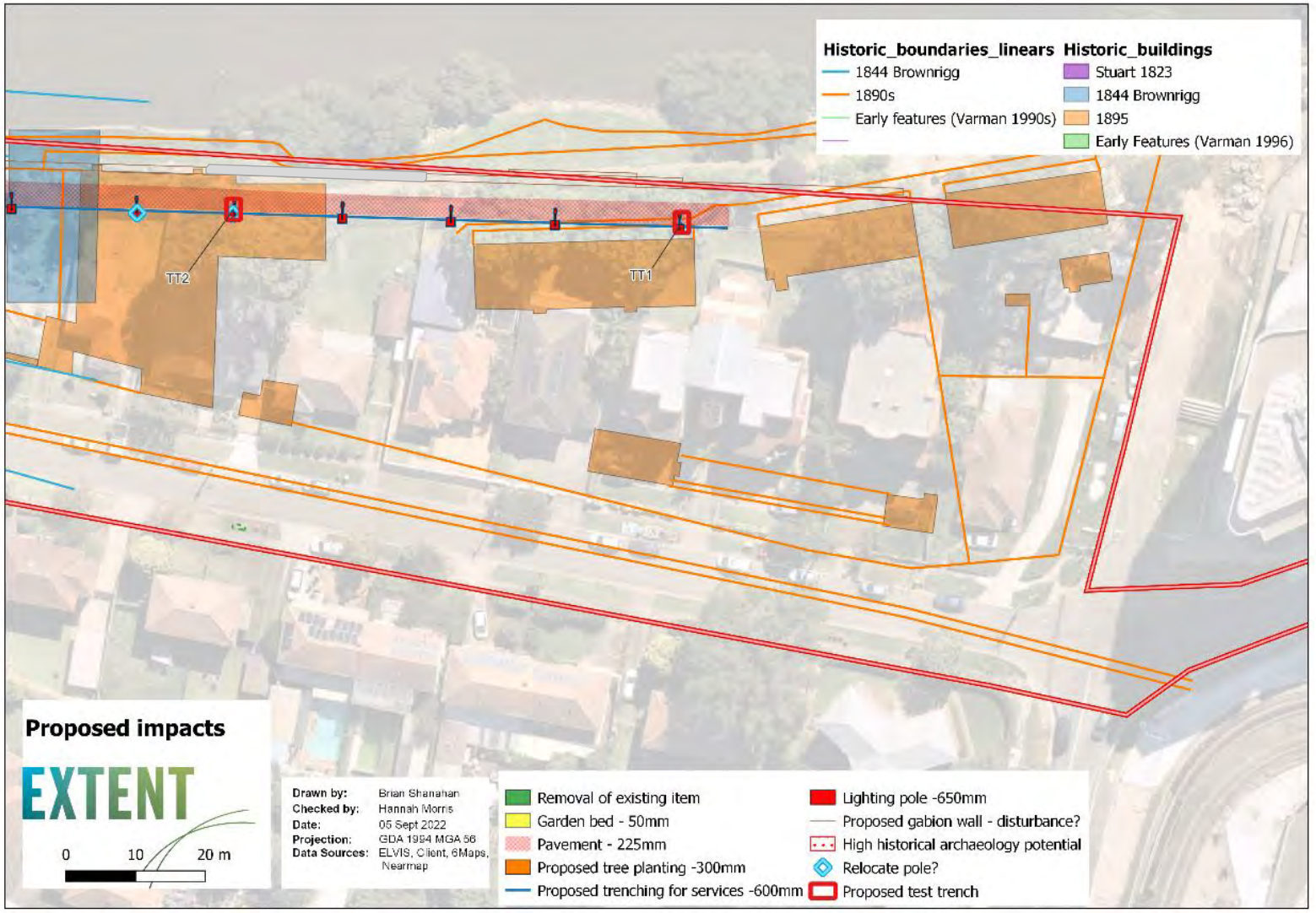


Figure 17. Depths of impacts and test trench locations in Noller Parade to Afred Street section.

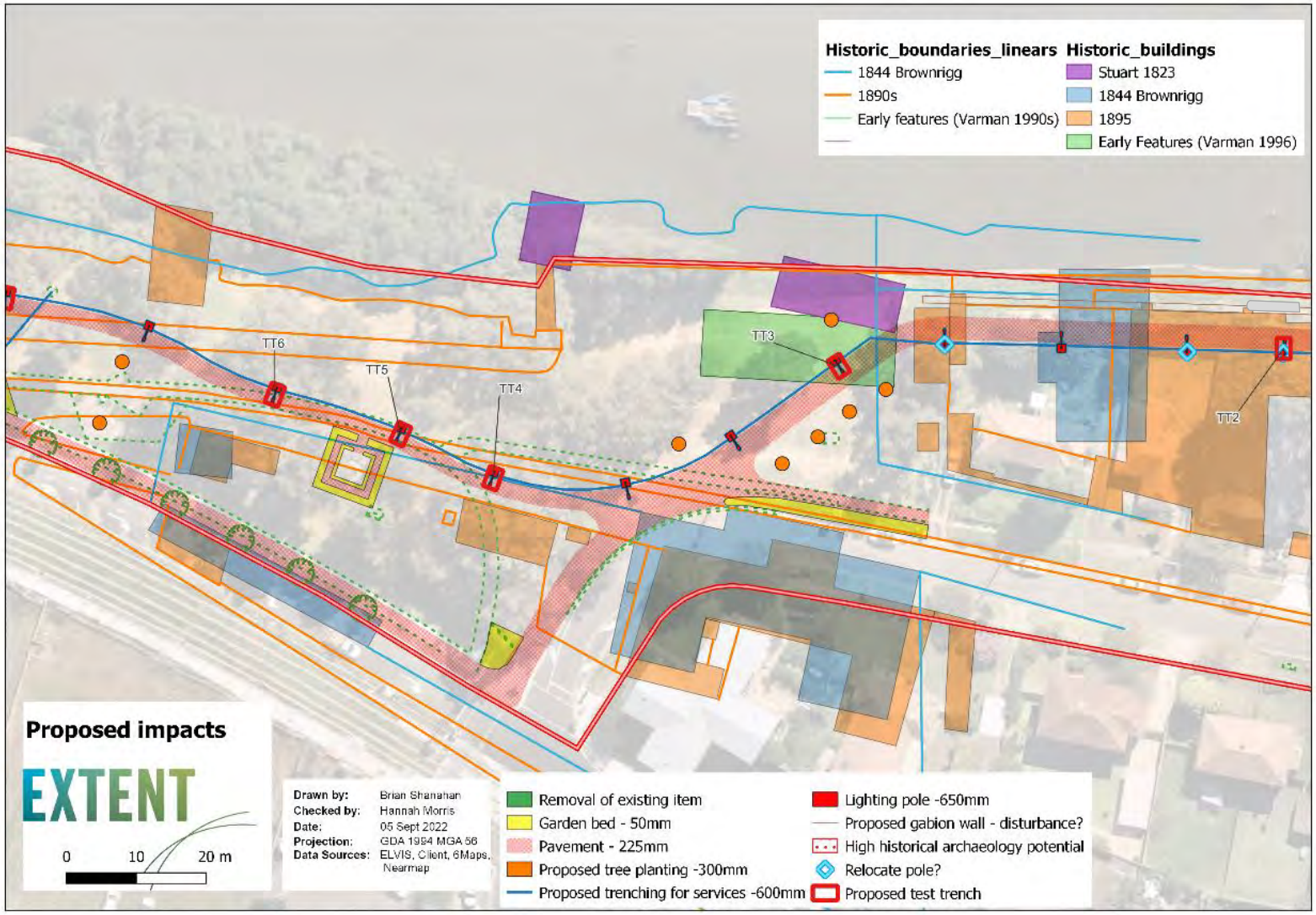


Figure 18. Depths of impacts and test trench locations in George Street and Noller Parade section.

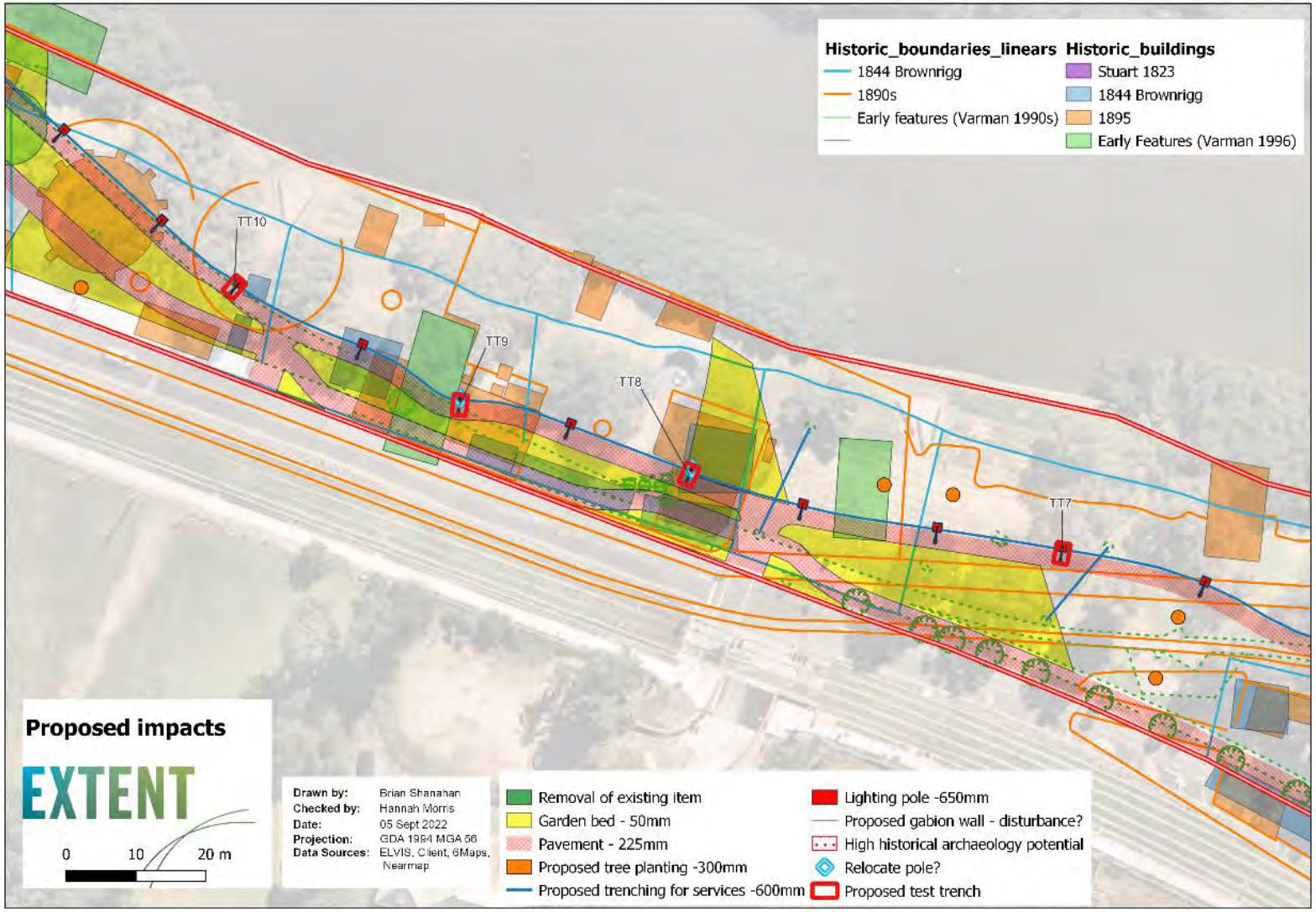


Figure 19. Depths of impacts and test trench locations in George Street section.

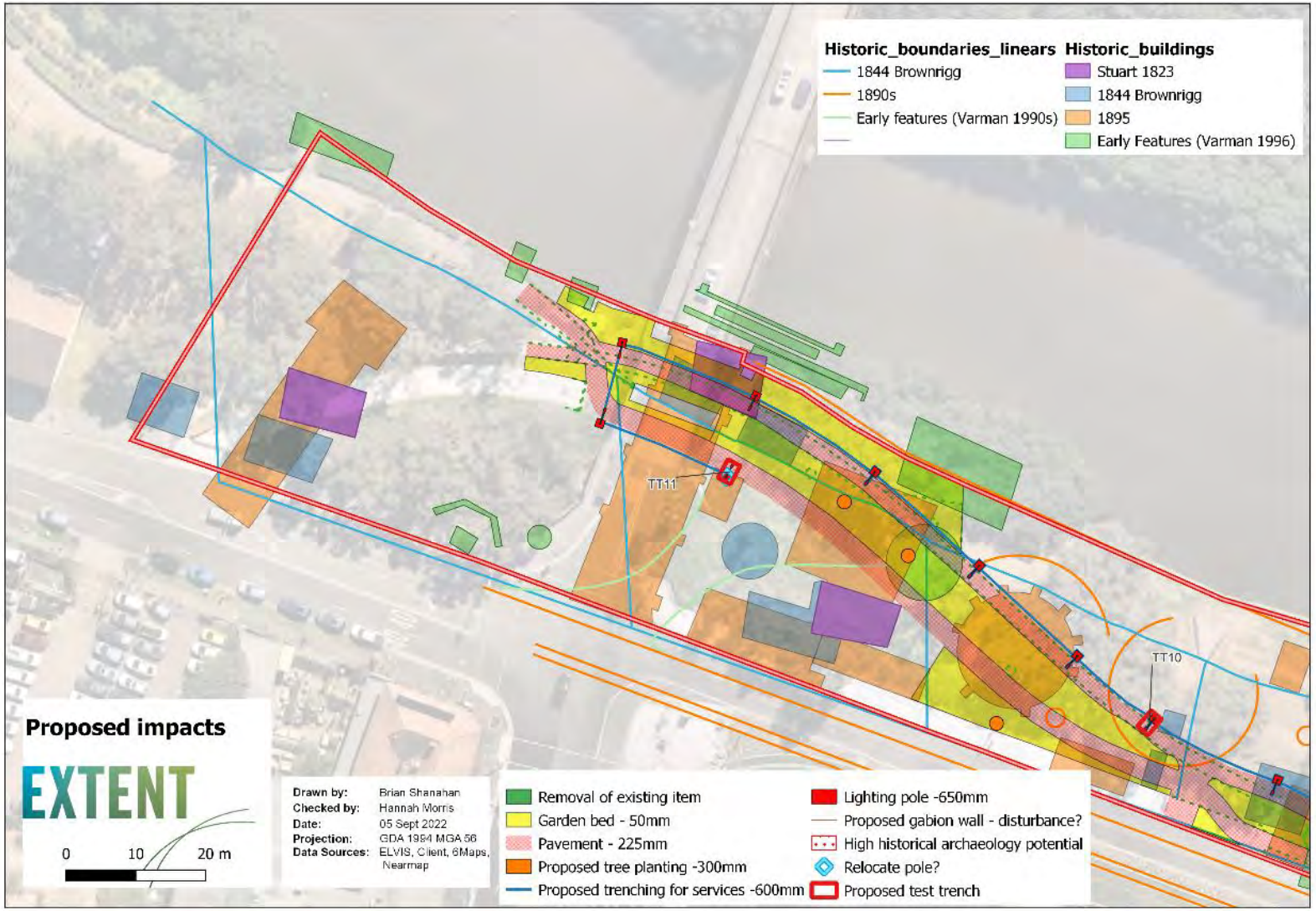


Figure 20. Depths of impacts and test trench locations in Gasworks Bridge section.

3.3. Excavation process

In general, the historical archaeological test excavation program included the following tasks as set out in the HARD (Extent Heritage 2023a):

- Mobilisation and site establishment, including transportation of equipment, finalising the test trench locations on the ground and establishing site data for surveying and planning.
- Excavation of the test trenches, including the mechanical excavation of overlying fill deposits down to the level of impact or where archaeological remains are exposed, depending on which was encountered first. Machine excavation ceased and manual excavation commenced upon the discovery of archaeological remains.
- The archaeological monitoring of all machine excavation was carried out under the supervision of the approved Excavation Director.
- Manual archaeological excavation to clean any archaeological remains exposed. Small hand tools such as pointing trowels, picks, shovels, brushes and pans were used in manual excavation, either for cleaning up excavated areas or revealing exposed features or deposits.
- Once archaeological remains were exposed and assessed, investigative sondages were opened in selected locations within the area to gather further information; for example; to characterise additional subsurface features, depth of certain deposits or structures, and/or soil or artefact sampling (see below).
- Recording of the exposed archaeological remains, including photography, planning, DGPS and total station survey, photogrammetry, and written descriptions.
- At the conclusion of the excavation program all archaeological features were covered with geofabric and backfilling commenced.

For the management of historical archaeological relics as part of the concurrent Aboriginal test excavation, the following process was followed:

- Excavation of the Aboriginal archaeological test pits (TP) within the larger historical archaeological test trenches was undertaken under the supervision of the Excavation Director approved by Heritage NSW to direct the historical archaeological component of the program.
- The historical archaeology personnel monitored the removal of underlying historical soil horizons in controlled manual excavation of 50-100mm increments.

3.3.1. Site recording

The archaeological recording of the site was conducted according to the following methods:

- A site datum, keyed to Australian Height Datum (AHD) was established to record the levels of extant deposits and features.
- Where any archaeological remains were exposed, measured drawings were prepared. These would be keyed into the master site plan.
- The location of archaeological remains was also plotted using an RTK and total station to assist with identifying and re-locating remains as part of any future investigations.

- All archaeological deposits and features were allocated a unique context number and recorded in detail on pro-forma context sheets, providing an overview of key finds and related contexts. The context sheets indicate the depth of significant deposits and features, as well as the trench's stratigraphic profile. This is supplemented by the Harris matrix within this report which shows the stratigraphic relationships between features and deposits.
- Photographic recording of all phases of work on site was undertaken, using a scale bar and north arrow.
- Standard survey and recording methods were supplemented by digital recording techniques where archaeological evidence was well preserved. This included:
    - Photogrammetry recording
    - RTK survey
    - Total station survey
    - Integration of hand recorded and digital survey datasets in GIS and 3D modelling software to provide an augmented 3D record of the site.
    - 3D and GIS spatial outputs to assist post-excavation analysis, redesign of the proposed development and subsequent interpretation of archaeology at the site.

3.3.2. Artefact management

- Artefacts were recovered as a result of machine excavation of demolition fills and manual cleaning of features and deposits during the historical archaeological test excavation.
- A small artefact assemblage was retrieved from fills and deposits during the excavation works.
- The artefacts were provenanced according to their contexts before being labelled and bagged in suitable polyethylene bags and stored in a temporary secure storage location.
- All historical artefacts, including those recovered from the Aboriginal archaeology test pits were retained for analysis during the post-excavation phase of archaeological works in order to fully answer the research questions guiding the archaeological investigation.
- Historical artefacts recovered from the sieve during the excavation of ATP's were largely undiagnostic and small. Except where diagnostic with datable characteristics, these artefacts were consequently, except bulk catalogued by spit and material class.
- As several Aboriginal glass artefacts have been identified in proximity to the study area and across Parramatta, all glass artefacts were assessed by a lithic specialist (Rebekah Hawkins, Senior Heritage Advisor) in order to identify possible evidence of modification by Aboriginal people.
- The artefacts were cleaned, sorted, catalogued, and analysed. The primary features of the cataloguing system include the use of minimum number of item (MNI) counts and the attribution of functional categories to artefacts. Unless otherwise stated, number and percentages in this report refer to MNI. Due to the limited number of artefacts recovered from the site, no type series was developed.
- The results of the artefact analysis are presented in this report. The artefact analysis aims to characterise the total artefact assemblage and provides a discussion of the assemblage in relation to the history of the site and the research questions posed in the HARD (Extent Heritage 2023a).

- At the conclusion of the post excavation analysis and reporting, the artefacts will be handed over to the client (City of Parramatta) for retention within the City of Parramatta Council's heritage collections repository.
- If Aboriginal artefacts were recovered within the historical archaeological test trenches during the combined excavation program they were to be managed in accordance with the methodology outlined in the ACHAR (Extent Heritage 2023c) and conditions of the AHIP issued for the project.

3.4. Post excavation analysis and recording

This test excavation report comprises the results of the excavation, illustrated with photos of any remains exposed, an assessment of their extent, condition and archaeological significance, and recommendations for their future management. It includes a response to the research questions outlined in the HARD (Extent Heritage 2023a).

The final archive of archaeological material comprises all site records produced throughout the physical investigation, including context sheets, photographs, drawings, and artefacts (inventoried, boxed, labelled, and catalogued), as well as a final copy of the post-excavation report.

4. EXCAVATION RESULTS

4.1. Introduction

This section includes a detailed description of the archaeological contexts (structural remains, features, and deposits) identified during the historical archaeological excavation program, and their spatial and chronological relationship. Each archaeological context described in the text below is accompanied by a unique context number allocated during excavation and provided in square brackets '[0.000]'. Site records including the context register, context sheets, photograph register, and photograph contact sheets are provided in Appendix D, and the archaeological site plans are provided in Appendix E.

4.2. Test Trench 1

TT1 was located at the eastern extent of Queens Wharf Reserve and was excavated to investigate potential structural remains associated with the nineteenth century weavers shop building that formed part of the Byrnes Mill and cloth factory complex during Phase 6 (1841 – 1880s) and its subsequent use from 1908 by the Parramatta Benevolent Asylum during Phase 7 (1862-1937). Due to space restrictions, the trench was moved 2m west and the orientation of the trench was changed from north to south, to east to west (Figure 21).

TT1 measured 3m x 2m and was entirely mechanically excavated to just below the depth of proposed impact (730mm) as no archaeological features were identified during monitoring of the excavator (Figure 22). The shallow topsoil [1.001], 20-30mm thick, capped a compact dark silty clay introduced fill [1.002] that contained bitumen, asbestos cement, sandstone rubble, road ballast and measured 450mm thick. Underlying [1.002] was a second introduced fill [1.003] that contained a higher clay and shale content and measured 250 mm thick. The base of this deposit was not encountered, and no natural soil profiles or identifiable nineteenth century deposits were identified within the trench (Figure 23 and Figure 24).

No evidence associated with Byrne's Mill or other historical features were identified and no artefacts were recovered.

Figure 21. Overview of TT1 location, looking northeast. Note the confined space and fence constraints that moved the proposed location further west and changed orientation.

Figure 22. Overview of TT1, looking west.

Figure 23. TT1 south section, looking south.

Figure 24. TT1 north section, looking north

4.3. Test Trench 2

TT2 was located in the eastern portion of the study area, 65m west of TT1. TT2 was excavated to investigate the potential structural remains associated with Byrnes Mill and cloth factory complex during Phase 6 (1841–1880s) and its subsequent use from 1908 by the Parramatta Benevolent Asylum during Phase 7 (1862-1937). Similar to TT1, due to space restrictions the orientation of the trench was changed from north to south, to east to west.

TT2 measured 3m x 2m and was entirely mechanically excavated to just below the depth of proposed impact (700mm) as no archaeological features were identified during monitoring of the excavator (Figure 25). Below the grey sandy loam topsoil [2.001] (100mm) was a grey clay loam with sand lenses and high ash content [2.002], with a variable thickness of 400mm – 550mm sloping down to the northeast corner. This twentieth century mixed fill comprised building materials including dry pressed brick fragments and fibrous cement sheeting. A small assemblage of domestic artefacts [MNI=18] was also recovered including a smoking pipe and cigarette holder made from Bakelite, a newspaper fragment from 1931, and a collection of glass bottles dating from 1920 into the mid-twentieth century including ink bottles, patent medicine bottles and a lemonade bottle. A

clay pipe fragment with a bowl decorated with a ship and anchor motif was also recovered from [2.002] and likely dates earlier, from the mid nineteenth to early twentieth century.

Underlying [2.002] was a second introduced fill [2.003] comprising orange-brown clay with grey sandy loam lenses and small sandstock brick and lime mortar inclusions. Although containing some demolition material fragments, [2.003] was not identified as a demolition deposit. Artefacts recovered from [2.003] included fragments of glass bottles for beverage storage and fragments of fine earthenware tableware. The base of this deposit was not encountered, and no natural soil profiles were identified within the trench (Figure 26 to Figure 28).

No evidence associated with Byrne's Mill or other historical features were identified and it is unclear whether archaeological evidence associated with this phase was impacted by later twentieth century landscaping processes or remains intact below.

Figure 25. Overview of TT2, looking east.

Figure 26. TT2 north section, looking north.

Figure 27. TT2 east section, looking east.

Figure 28. TT2 west section, looking west.

4.4. Test Trench 3

TT3 was located west of TT2, 13m south of the Parramatta River retaining wall. The trench was excavated to identify evidence of the 1808 government grain store that was likely located within this part of the site, as well as to understand the underlying stratigraphy of the area.

TT3 measured 3m x 2m and was orientated north to south (Figure 29). The trench was mechanically excavated until the lowest strata where two layers of ash and charcoal fill were encountered at approximately 600mm below ground level. TT3 was excavated to below the depth of proposed impact (650mm-700mm), with an exploratory sondage excavated in the southwest corner reaching a maximum depth of 800mm (Figure 30 and Figure 31).

The compacted silty loam topsoil [3.001] varied in thickness between 50mm – 150mm and capped a 400mm – 600mm thick twentieth century mixed fill of compact orange clay/ silt [3.002] extending across the trench. [3.002] contained rubble inclusions of sandstock and dry pressed brick, sandstone and concrete, as well as charcoal, gravel, asphalt, yellow clay and twentieth century glass bottle fragments.

Below [3.002], a historical dump or fill event was identified and contained fills [3.003], [3.004] and [3.005] deposited on [3.006], as illustrated in Figure 32 and Figure 33. This event was investigated using a sondage located in the southwest corner of the trench measuring 300mm by 1200mm. Fill [3.003] was 150mm thick and consisted of a charcoal rich grey ashy silty sand. Artefacts included clay smoking pipes (MNI=4) likely dating from the mid to late nineteenth century and small fine earthenware teaware fragments. Fill [3.004] comprised an undulating introduced orange fine grained sand fill with ironstone staining, measuring between 3mm in the north and up to 120mm in the southwest corner. In some places, fill [3.004] was mixed in with fill [3.003]. Finally, fill [3.005], another charcoal rich ashy silt measuring 20mm thick was identified in pockets below fill [3.004].

Underlying fill [3.005] and the historical dump or fill event was another thin historical fill layer [3.006] of brown clayey silt measuring 20mm thickness and observed across the whole trench. Within the sondage in the southwest corner of the trench, a firm yellow silty clay with frequent white, orange and red speckles [3.007] was observed underlying [3.006]. It is likely that the layer continued across the entire trench, however as the excavations within the sondage had reached a depth of 800 mm below the ground surface no further exploration was undertaken.

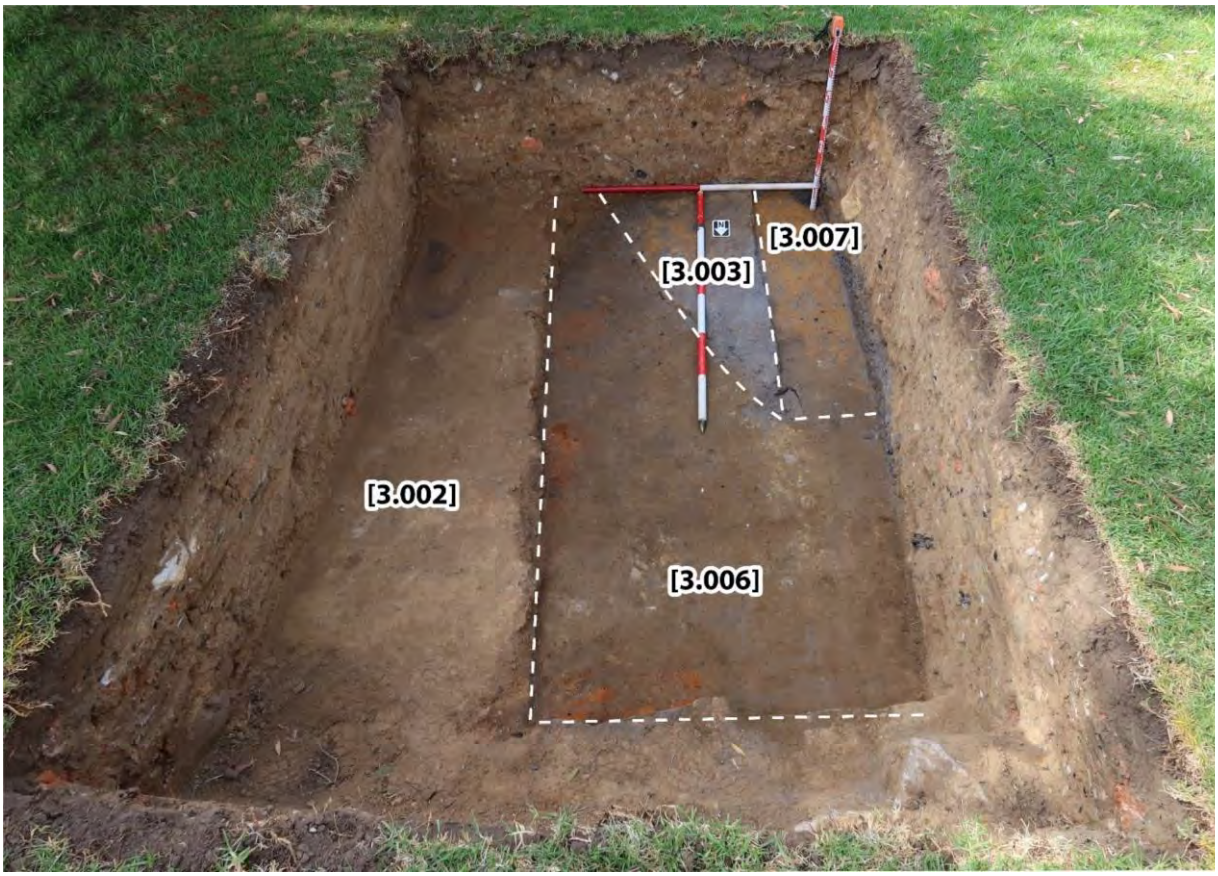


Figure 29. Overview of TT3, looking south.

Figure 30. TT3 west section, looking west.

Figure 31. Overhead shot of sondage in southwest corner of TT3, looking south.

Figure 32. Detail of TT3 south section of sondage in southwest corner of trench, looking south.

Figure 33. TT3 west section of sondage in southwest corner, looking west.

4.5. Test Trench 4

TT4 was located near the George Street and Noller Parade intersection, southwest of TT3. The trench was excavated to identify evidence associated with the military occupation of the Commissariat during Phase 2 (1825-c.1870s), namely the brick boundary wall fronting Parramatta River. The trench was also positioned in an area where the PSB was anticipated to be shallow.

TT4 was orientated east to west and initially measured 3m x 2m before being extended an additional metre to the east (4m x 2m). The trench was mechanically excavated until historical archaeological remains were first identified at a depth of 470mm below ground level. TT4 was excavated to below the depth of proposed impact (650mm- 1000mm), with an exploratory sondage excavated along the east section reaching a maximum depth of 1400mm (Figure 34).

The topsoil [4.001] comprised several lenses of soils representing current and former landscaping within the reserve, varying in thickness between 250mm and 350mm. This thick topsoil layer capped a cluster of mixed fill deposits [4.002, 4.003, 4.004] observed across different areas of the trench. Below [4.001] across the southern half of the trench was mixed fill [4.003] with asphalt, brick and cement mortar within a reddish yellow sandy silt matrix in the southeast and demolition fill [4.004] in the southwest. The removal of mixed fill [4.002] across the north of the trench revealed that both [4.003] and [4.004] extended to the north (Figure 35 and Figure 36). Mixed fill [4.003] had a variable depth of 50mm-400mm in the eastern half of the trench sloping down into the northeast corner where it reached a maximum depth of 950mm below ground level. The fill event was likely associated with landscaping activities at the reserve during the twentieth century and was used to fill the steeply sloping gradient up to a level surface (see Figure 34).

Partially underlying [4.003] was demolition fill [4.004], located primarily in the western half of the trench. Context [4.004] was a dense demolition deposit containing a high proportion of sandstock brick rubble, some of which likely dated between the early to mid-nineteenth century. This deposit was likely associated with the demolition of an adjacent wall or building to the south of the trench location and was found overlying ashlar sandstone blocks [4.007] and the early to mid-twentieth century landscaping deposit [4.005] (Figure 35).

A portion of the military barracks boundary wall [4.007] associated with Phase 2 (1825-c.1870s) was exposed in the southwest corner of the trench at a depth of 470mm, comprising four sandstone blocks (Figure 37). The larger stone alignment was interpreted as forming part of the wall, with the two smaller blocks abutting the northern side interpreted as a buttress. All blocks had evidence of dressing and were exposed to a depth of 180mm. The large sandstone block had an exposed length of 340mm, with the smaller fully exposed stone measuring 250mm by 150mm. Abutting the outer face of the boundary wall [4.007] to the north was gravel surface [4.006], likely associated with landscaping and terracing activities during this phase of development. The gravel surface was exposed at a depth between 500mm to 650mm below ground level. The gravel surface [3.007] was relatively intact and comprised tightly packed sandstone aggregate of varying sizes (5mm up to 50mm). The gravel surface [4.006] extended 1800mm from the boundary wall to the top of a steep,

battered slope, with the edge of this terraced level running parallel with the boundary wall alignment.

The gravel surface, measuring 60mm in thickness, was observed overlying the natural B horizon clay [4.014]. The natural B horizon clay [4.014] was exposed at depth of 500mm below ground level during the excavation of four spits (200mm) in the 500mm x 500mm Aboriginal Test Pit, located at the northeastern extent of the gravel surface [4.006]. The ATP location was chosen to maximise the potential sample size of underlying deposits and to minimise the impact on the gravel surface retained. The natural B horizon clay [4.014] soil profile was also exposed in the form of the weathered surface [4.009] of the battered slope (cut [4.013]).

North of the gravel surface [4.006] and battered slope [4.009] and following the complete removal of the overlying twentieth century landscaping deposit [4.005], a series of fills [4.008 and 4.010] were identified at the base of the battered slope within service cut [4.012] (Figure 38). The service cut had truncated the lower terrace of the battered slope. An investigative sondage was placed along the east section, excavating through cinder ash fill [4.008] to reveal a mottled clay fill [4.010] containing a salt glazed terracotta service pipe [4.011]. The cinder/ash pipe trench fill [4.008] contained a dark olive green case gin bottle base, dating from late eighteenth to late nineteenth century.

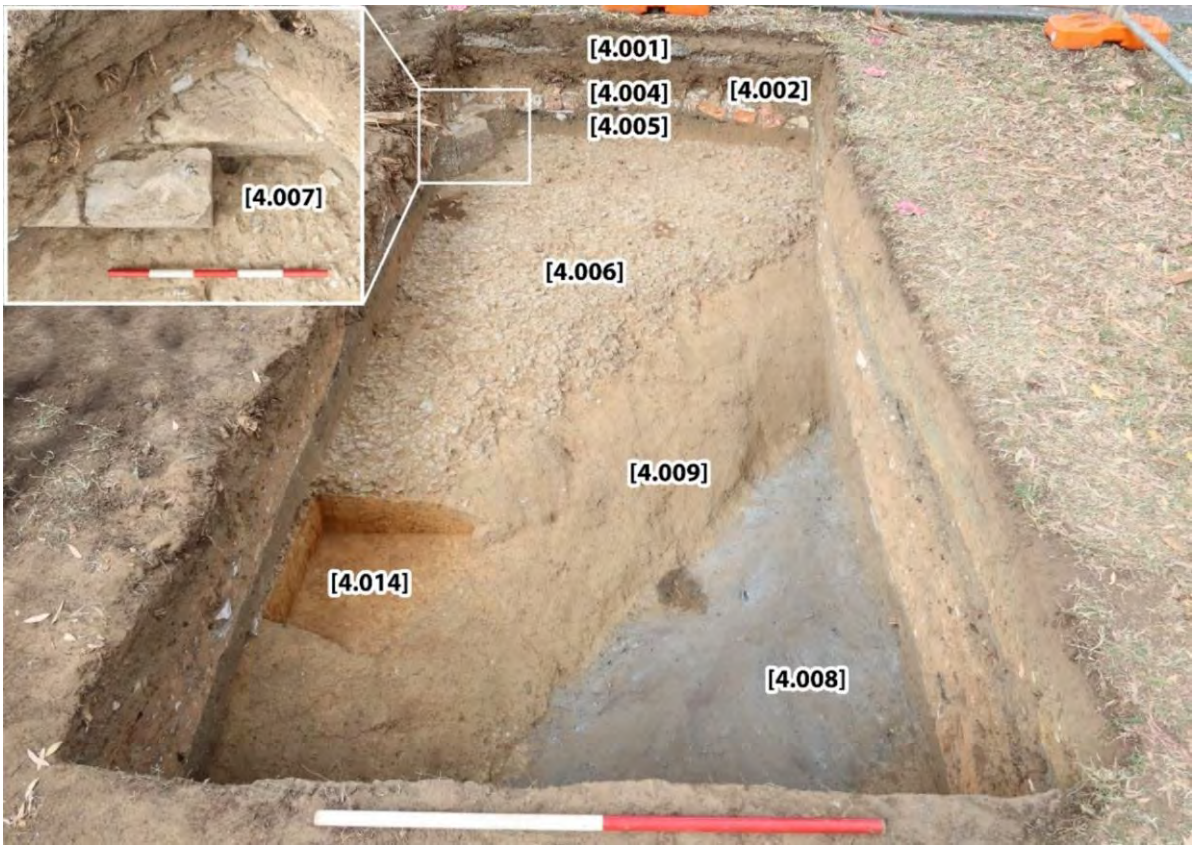


Figure 34. Overview of TT4, looking west. Detail inset showing sandstone boundary wall [4.007] in southwest corner.

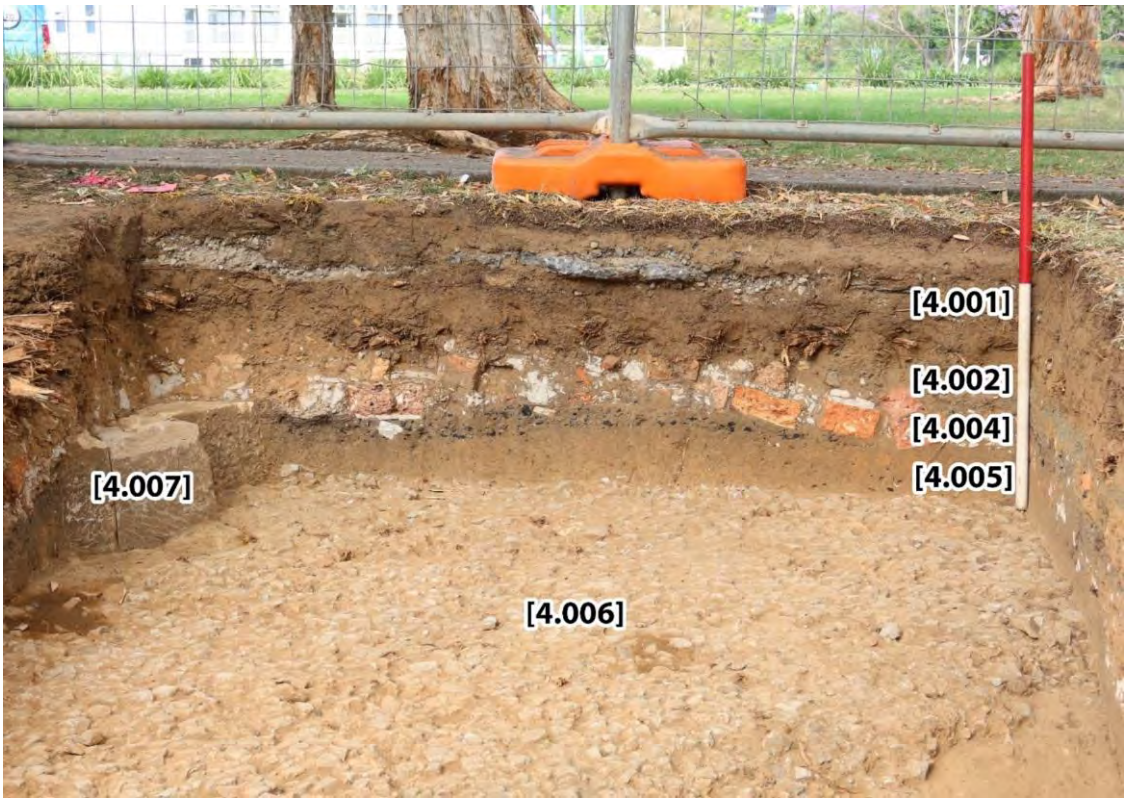


Figure 35. TT4 west section showing topsoil [4.001] and overlying mixed fill and demolition deposits [4.002 and 4.004], with twentieth century landscaping deposit [4.005] abutting the sandstone boundary wall [4.007]. The gravel surface [4.006] can be seen abutting the sandstone blocks [4.007].

Figure 36. TT4 east section, looking east.

Figure 37. Detail of sandstone blocks [4.007] and abutting gravel surface [4.006], looking southwest.

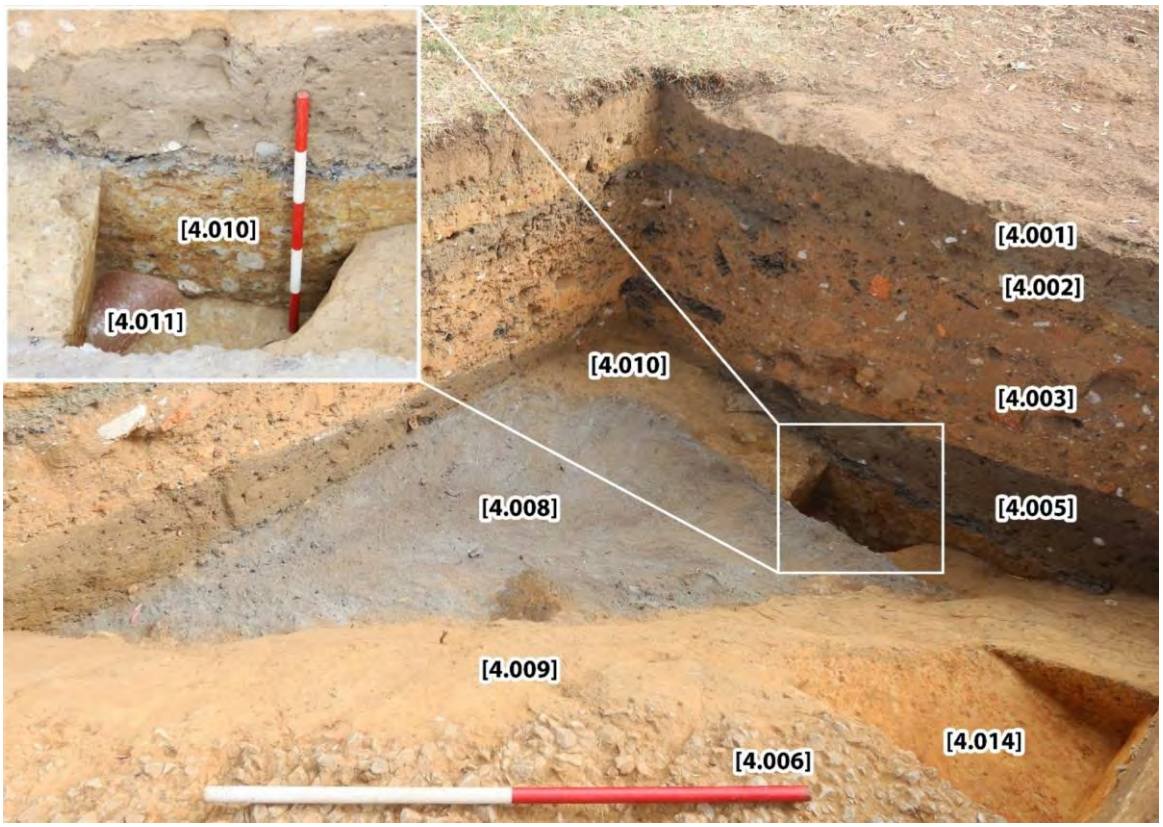


Figure 38. Northeast area of TT4 showing service cut [4.013] truncating battered slope [4.009], looking northeast. Detail inset shows service pipe and fills exposed within sondage.

4.6. Test Trench 5

TT5 was located 12m west of TT4, near the Geroge Street and Noller Parade intersection. The trench was originally positioned 2m further north in the location of the proposed light pole footing with the aim of locating the remains of the former tramway and investigating the PSB. The relocation of the trench due to the extant footpath resulted in TT5 also capturing the military barracks northern boundary wall associated with Phase 2 (1825 – c.1870s)

TT5 was orientated north to south and measured 5m x 2m. Excavation of TT5 saw a continuation of the historical archaeological features identified in TT4, including the military barracks boundary wall, associated gravel surface, and the service pipe. The trench was mechanically excavated until historical archaeological evidence was first identified at a depth of 450mm in the southern half of the trench. Mechanical excavation continued in the northern half of the trench, ceasing at the depth of maximum proposed impact (650mm), as only modern fills were encountered below topsoil [5.001].

In the northern half of the trench below the topsoil [5.001] a substantial cut [5.005] was identified at a depth of 200mm, measuring 2500mm by 2000mm. The cut [5.005], interpreted as a rubbish dump, contained mixed fills [5.002], [5.003] and [5.004], that all contained modern inclusions such as machine made brick fragments, telephone cord fragment and fragments of amber glass. The base of this rubbish dump or levelling event was not reached as it continued beyond maximum depth of impact (650mm). The cut [5.005] truncated earlier deposits and historical features including ash lens [5.007], gravel surface [5.009], packing fill [5.016] and PSB [5.012].

In the southern half of the trench below the topsoil [5.001], a series of fills were observed overlying the key historical archaeological features of the trench including the military barracks boundary wall [5.010] and associated construction features such as construction cut [5.013] and packing fill [5.016], and the gravel surface [5.009]. Overlying the boundary wall [5.010] was a mixed rubble fill [5.008] discretely contained within robber trench cut [5.017] and measuring 250mm thick. These two contexts were likely associated with the deconstruction of the upper course of sandstone blocks along the boundary wall during the twentieth century. Below the rubble fill [5.008], a thin layer (50mm) of remnant mortar [5.011] was observed at a depth of 450mm, lying directly over the sandstone blocks of boundary wall [5.010].

The boundary wall [5.010] comprised two large sandstone blocks running in an east west alignment and measuring 480mm in width and 850mm and 1350mm in length. The blocks were exposed to a maximum depth of 180mm and showed evidence of ashlar tooling. At the eastern end of the wall, a medium sized sandstone block was laid perpendicular to the wall alignment and likely formed part of a buttress. The sandstone blocks were located within construction cut [5.013] with a shell lime mortar [5.019] packed between the stones. A packing fill [5.016] was observed abutting the southern face of the wall [5.010].

South of the construction cut [5.013] a large posthole [5.024] cut into the PSB [5.012] was identified at a depth of 400mm below ground level, beneath a diffused root disturbed layer [5.018] (5-250mm) underlying the topsoil [5.001] (200mm). This area was excavated within a 500mm x 500mm test pit as part of the Aboriginal test excavation program to investigate the truncated PSB [5.012] north of the boundary wall [5.010]. Consequently, a portion of the posthole fill [5.025] was excavated stratigraphically in 50mm spits, with the remainder of the posthole cut [5.024] and fill [5.025] captured in the north and west sections of the test pit. Small undiagnostic historical artefacts (<10mm) including brick, glass and ceramic fragments were recovered throughout the upper root disturbed layer [5.018] during the sieving of the ATP spits 1-2 (0-100mm), however no historical artefacts were recovered within the underlying posthole fill [5.025]. In the west section, the posthole cut [5.024] extends into the north section and is diffused at the south end, likely caused by the removal of the post as well as the overlying bioturbation [5.018]. At 300mm depth the test pit west section captured the vertical drop of the posthole cut [5.024], with the exposed cross section measuring 350mm and tapering slightly to 300mm at the base of the test pit. Similarly, the north section captures the diffusion of the posthole cut [5.024] in the upper 300mm, before tapering to a vertical cut. The base of the posthole cut [5.024] and fill [5.025] was not encountered, with excavations ceasing at a maximum depth of 1200mm below ground level, with the posthole depth measuring 800mm.

Abutting the northern face of the boundary wall [5.010] was gravel surface [5.009], identified at a depth of 550mm below ground level. The gravel surface [5.009] was exposed beneath an ash layer [5.007] underlying the topsoil [5.001]. The exposed extent of the gravel surface measured 1300-1800mm by 2000mm, extending into the east and west trench walls, and truncated by cut [5.005] in the north. The gravel surface, measuring 50mm in thickness, comprised tightly packed sandstone aggregate of varying sizes (up to 60mm). The gravel surface in TT5 was constructed directly onto PSB [5.015] rather than the natural B horizon clay as observed in TT4.

Although truncated in areas by historical development, evidence of PSB was also identified in the north of TT5 where a large service pipe [5.014] was exposed cutting into PSB [5.015]. The large service pipe [5.014] was identified at a depth of 950mm and orientated east to west, running approximately parallel with the boundary wall alignment [5.010] with a fall to the east-northeast. The service trench cut [5.022] and truncated the PSB [5.015], with the service trench backfill consisting of redeposited PSB [5.023]. The base of the cut [5.022] and fill [5.023] were not identified, with excavations reaching a maximum depth of 1250mm below ground level. A small collection of clay smoking pipes fragments [MNI=4] were found during excavation of the ATPs in this area, with their context attributed to the redeposited PSB backfill [5.023]. These pipes likely date between the mid-nineteenth to early twentieth century.

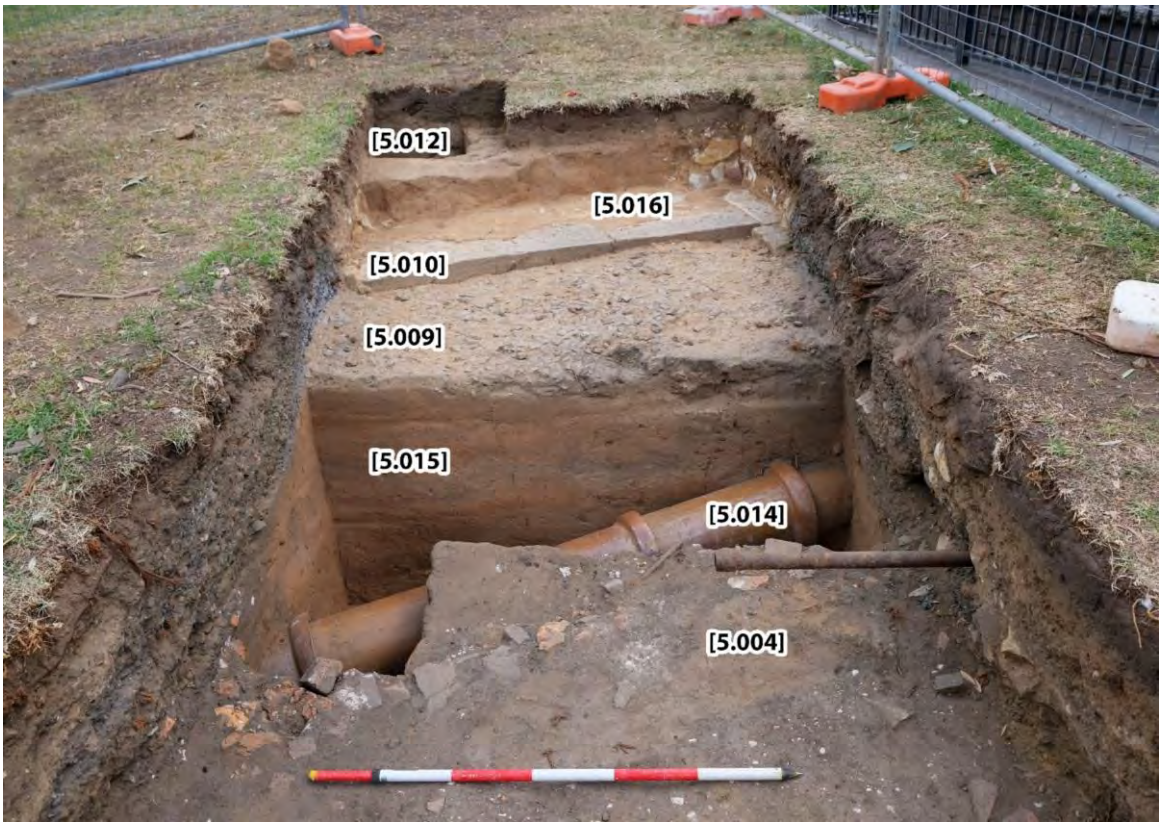


Figure 39. TT5 overview, looking south.

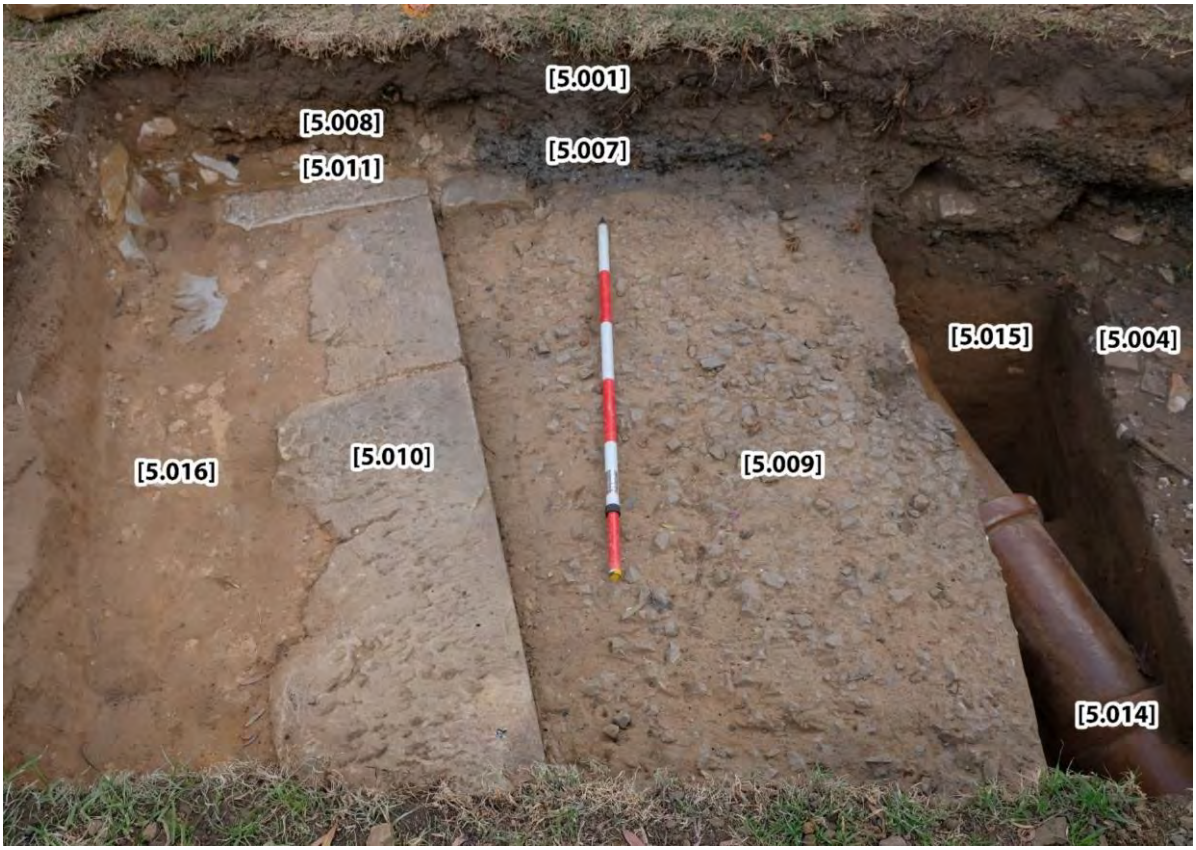


Figure 40. TT5 overview of southern half of trench, looking west.

Figure 41. Overview of TT5, facing northwest.

Figure 42. Detail of sandstone footings, looking southwest.

Figure 43. Detail of southwest corner of trench.

Figure 44. Detail of sandstone footings and associated gravel surface, looking south.

Figure 45. TT5 east section, looking east.

Figure 46. ATP5 within TT5. Excavation of PSB around service trench.

4.7. Test Trench 6

TT6 was located in the middle portion of the study area, 17m northwest of TT5. TT6 was excavated to investigate PSB and QWR PAD 1. Based on historical research and predictive modelling, there was a low potential for historical archaeological remains in this area.

TT6 was orientated north to south and measured 3m x 2m. The trench was mechanically excavated until PSB [6.007] was identified below the topsoil [6.001] (100mm thickness) and underlying modified A2 horizon [6.002] (120mm thickness). Following this, manual excavation of the Aboriginal test pit (ATP6) commenced. ATP6 was excavated to a depth of 900mm.

Two service trenches [6.004] and [6.006] aligned east to west were identified at a depth of 220mm, truncating the modified A horizon (6.002] and PSB [6.007], however they were not excavated.

No historical archaeological features were identified within TT6, and no historical artefacts were recovered.

Above. Figure 47. Location of service trenches in TT6 (right: 6.006/6.005; left: 6.004/6.003), facing west.

Left. Figure 48. Section of TT6 showing topsoil 6.001, modified A2 6.002, and natural PSB 6.007 with ironstone banding, facing east.

4.8. Test Trench 7

TT7 was located in the middle portion of the study area, approximately 40m west of TT6. Similar to TT6, the trench was excavated to investigate PSB and QWR PAD 1. Based on historical research and predictive modelling, there was a low potential for historical archaeological remains in this area.

TT7 was orientated north to south and measured 3m x 2m. The trench was entirely mechanically excavated to below the depth of impact (750mm) as there were no historical features identified that warranted manual excavation. The trench was covered by a shallow topsoil [7.001] (50mm thickness) overlying a compact grey clayey silt landscaping fill [7.002] measuring 700mm in thickness. Landscaping fill [7.002] was cut in the northern end by cut [7.003] containing asbestos contaminated mixed fills [7.004] and [7.005]. Cut [7.003] appeared vertical in section for 400mm before it sloped gently north to the base of excavation (750mm). A small number of historical artefacts were recovered from mixed fill [7.005] within cut [7.003] including a vinegar bottle (1925-1950), a pharmaceutical vial (post 1920), beer bottle (post 1950) and a cast iron sulky wagon side step.

No natural soils were observed so consequently no ATP was excavated within the floor of TT7.

Figure 49. TT7 east section.

Figure 50. TT7 overview looking south.

4.9. Test Trench 8

TT8 was located in the middle portion of the study area, approximately 55m west of TT7. TT8 was excavated to investigate the potential structural remains of the c.1834 Steam Packet Inn (later Emu Hotel) associated with Phase 5 (1834-1911). The location of TT8 was shifted 2m northwest of the proposed location (although still within the historical building footprint) to avoid impacting the extant footpath.

TT8 measured 3m x 2m and was orientated north to south. The trench was entirely mechanically excavated to the depth of proposed impact (650-700mm). No archaeological features were identified during monitoring of the excavator. Below the topsoil [8.001] (100mm), a mixed fill [8.002] was encountered extending across the entire trench. The mixed fill [8.002] consisted of lenses of red-brown sandy silts interspersed with mottled red-brown and yellow-brown clay and a clean sand lense. Inclusions consisted of concrete and fibrous asbestos cement as well as a small number of artefacts including unidentified iron alloy fragments, a light bulb base (bayonet), Bristol glazed coarse stoneware fragment and the base of dark green glass bottle with sand pontil scar (likely dating between 1825 and 1880). The base of this deposit was not reached, with excavations ceasing at 650mm -700mm below ground level.

No evidence associated with the Steam Packet Inn/Emu Hotel was identified. No other historical archaeological features or natural soil profiles were encountered.

Figure 51. TT8 overview and south section.

4.10. Test Trench 9

TT9 was located in the western portion of the study area, 32m west of TT8. The trench was relocated 2m northeast from its proposed location to avoid tree roots and asbestos cement fragments observed on the ground surface. The trench was excavated to locate structural remains of early nineteenth century buildings associated with Phase 3 (1820s -1860s).

TT9 measured 3m x 3m and was mechanically excavated until PSB [9.005] was encountered at a depth of 300-400mm below ground level in the northern half of the trench. Stratigraphy in TT9 comprised topsoil [9.001] (100mm) overlying a mixed fill [9.002] (300mm) that capped the PSB [9.005] in the northern half of the trench. Mixed fill [9.002] comprised brown silty clay with poorly sorted gravels, sandstone and brick rubble. Underlying mixed fill [9.002] in the southern half of the trench was a dark grey-brown silty clay fill [9.003] within cut [9.004] that truncated the PSB [9.005]. Manual excavation of an Aboriginal test pit [ATP9] was carried out in PSB [9.005] in the northern portion, reaching a depth of 1800mm below ground level.

No evidence of early nineteenth century buildings or other historical archaeological features were encountered.

Figure 52. Overview of TT9, facing east.

Figure 53. Overview of TT9 showing cut and fill (identified by white arrows) in section of ATP9, facing south.

4.11. Test Trench 10

TT10 was located in the western portion of the study area, 34m west of TT9 and near the George Street and Macarthur Street intersection. The trench was excavated to locate structural remains of early nineteenth century buildings associated with Phase 3 (1820s -1860s), as well as the late nineteenth century Parramatta Gasworks gasometer from Phase 8 (1872-1940).

TT10 measured 3m x 2m and was orientated north to south. The trench was mechanically excavated until brick footings associated with the gasworks gasometer structure were identified at a depth of 700-800mm below ground level. Excavations continued past the depth of proposed impact (650mm) to a maximum depth of 700mm in the north and 900mm in the south in an attempt to identify the depth of the natural soil profile as part of the Aboriginal test excavations, however no natural soils were encountered.

The topsoil [10.001] measured 70-100mm in thickness and capped a compact landscaping fill [10.002] that contained inclusions of brick, sandstone and asbestos cement fragments, measuring up to 380mm thick. The base of this deposit was undulating. Below [10.002] was a mixed fill with a sandy matrix [10.003], measuring 310-360mm in thickness. In the southern portion of the trench, brick footings [10.004] associated with the gasometer structure were exposed beneath mixed fill [10.003] at a depth of 750-800mm. The footings [10.004] comprised a row of machine made bricks running east to west, curving slightly towards the north. Exposed to a depth of two courses (130mm), the footings [10.004] were three bricks wide (250mm) and bonded with buff coloured, fine grained cement. The interior face of the footings showed evidence of damage with the corners of bricks chipped away, likely caused by the demolition of the gasworks in c.1940.

Below mixed fill [10.003] and abutting the gasometer footings [10.004] to the south was a dark brown fine-grained fill [10.005] (10-15mm thick). Beneath [10.005] an ash layer [10.006] was exposed to a depth of 10mm however was not fully excavated. A small patch of asphalt [10.007] was

exposed underlying dark brown fill [10.005] in the southwest corner of the trench and was also likely associated with the demolition of the gasworks.

Figure 54. Overview of TT10, facing south.

Figure 55. Detail of brick footing 10.004, facing south.

Figure 56. Eastern section of TT10 showing fills 10.002 and 10.003 over brick footing 10.004, facing east.

Figure 57. Northern face of bricks associated with gasworks structure 10.004 and detail of damage caused by demolition works, facing south.

4.12. Test Trench 11

TT11 was the westernmost trench excavated as part of the program and was located east of the Gasworks Bridge. The trench was originally positioned adjacent to the Gasworks Bridge in order to locate structural remains of the 1828 Howells Mill buildings from Phase 4 (1823-1872) as well as the late nineteenth century Parramatta Gasworks structures from Phase 8 (1872-1940s). The relocation of the trench 27m east due to access constraints resulted in TT11 instead investigating the subsurface landscape in order to characterise the area. The new location also had the potential to identify structural evidence of buildings within the vicinity of the Howells Mill complex associated with Phase 4 (1823-1872).

TT11 measured 3m x 2m and was orientated east to west. The trench was mechanically excavated until a tar dump [11.004] was encountered at a maximum depth of 380mm and excavations ceased. The sequence of deposits overlying the tar dump [11.004] included the topsoil layers [11.001] and [11.002] (140mm thickness) and a compact clay brick rubble fill [11.003] measuring 240mm thick with inclusions of asbestos cement and amber beer bottle glass.

Figure 58. Overview of TT11, facing north.

4.13. Artefact analysis

The Queens Wharf Reserve assemblage consisted of a total of 328 individual artefacts, representing a minimum of 100 items. Artefacts were recovered from eight of the eleven test trenches during the test excavation program, including from the Aboriginal Test Pits (ATPs) located within the trenches (Table 4). The majority of the assemblage (85%) can be attributed to mixed fill deposits associated with the development and management of the landscape in the twentieth century, with the remainder of the assemblage (15%) recovered from service trench fills likely dating to the late nineteenth century. The artefacts recovered from these contexts were highly fragmented, with over half (51%) of the assemblage only 5-10% intact. Although only fragmentary, the assemblage provides a snapshot of material life of late nineteenth and twentieth century Parramatta.

Table 4. Artefact bearing deposits from Queens Wharf Reserve excavation program.

Area	Context Number	Context Description	Number of Artefacts (MNI)
TT2	2.002	Twentieth century fill	22
	2.003	Orange brown clay fill	8
		Total:	**30**
TT3	3.002	Compact clay orange silt with rubble inclusions	3
	3.003	Charcoal rich grey ashy silt sand fill	6
	3.005	Charcoal rich grey ashy silt fill	2
		Total:	**11**
TT4	4.003	Mixed fill with asphalt, brick, and cement	8
	4.005	Fill including redeposited PSB	9
	4.008	Upper fill in service cut 4.012	8
	4.010	Lower fill in service cut 4.012	3
		Total:	**28**
TT5	5.008	Sandstone and brick mixed fill in robber trench	2
	5.023	Fill in service cut 5.022 for pipe 5.014	4
		Total:	**6**
TT7	7.005	Fill in cut 7.006	9
		Total:	**9**
TT8	8.002	Modern fill	5
		Total:	**5**
TT10	10.003	Mixed fill	11
		Total:	**11**

4.13.1. Overview of material class

As is typical in historical archaeology, the majority of the assemblage comprised glass (35%) and ceramic (32%). This was followed by metal (19%) and faunal material (7%). Less common were artefacts made from organic, composite, synthetic, and building materials (Table 5). The majority of the ceramics in the assemblage comprised fine earthenware (15) and kaolin (12) with only several examples of coarse stoneware (4) and porcelain (1). Of the metal artefacts, 15 were iron alloy, with few examples of brass, copper alloy and bronze. Organic and synthetic materials included paper (1) and Bakelite (3).

Table 5. Overview of material classes across all areas at Queens Wharf Reserve.

Material Class	TT2	TT3	TT4	TT5	TT7	TT8	TT10	Total (MNI)
Building Material	1						1	**2**
Ceramic	8	8	7	5		1	3	**32**
Composite	1					1		**2**
Faunal	2		5					**7**
Glass	9	3	9	1	8		4	**35**
Metal	7		6		1	2	3	**19**
Organic	1							**1**
Synthetic	1		1					**2**

4.13.2. Overview of activity groups

Where possible, artefacts were classified as representing a particular activity group and within this group, specific function and sub function (Table 6). This was possible for 75% of the assemblage, with over a quarter of the assemblage too fragmentary to be attributed to an activity or functional group. However, some of the unidentified activity objects could be attributed to a specific function such as bottles.

The assemblage contained items associated with beverage storage (13%), comprising bottles. Excluding the storage of aerated water, these items stored a variety of alcoholic products including beer, wine, and gin. The assemblage also contained items associated with food service (14 %) comprising tableware and teaware. Recreation items made up 14% of the assemblage and included clay smoking pipes as well as a Bakelite pipe and cigarette holder. There were smaller counts of items relating to architectural/structural activities (8) food storage (3), clerical activities (2) and pharmaceutical goods (2). For the full range of activities and functions associated with the assemblage, see Table 6.

Table 6. Activity and specific function association of artefacts in the assemblage.

Activity	Function and subfunction	No. of Artefacts (MNI)
Architectural/Non-Structural	Covering (Tile)	1
	Door Furnishing (Hinge)	2
	Electrical (Light Globe)	1
Architectural/Structural	Brick (sandstock	1
	Fastening (Nail)	5
	Window (Glass)	2

Activity	Function and subfunction	No. of Artefacts (MNI)
Beverage Service	Tumbler	1
Beverage Storage	Bottle (Aerated water, Beer/Wine, Gin, Lemonade)	13
Clerical	Bottle (ink)	2
Diet	Meat (Cow, Sheep)	6
	Seafood (Cockle)	1
Domestic	Toilet (Ballcock float)	1
	Water (Tap)	1
Economy	Coin (Penny)	1
Food service	Cutlery (Serving spoon)	1
	Tableware (Bowl, Plate,)	8
	Teaware (cup, saucer)	4
	Unidentified (handle)	1
Food Storage	Bottle (Oil/Vinegar/Sauce)	2
	Bottle Stopper (oil, vinegar, sauce)	1
Garden	Tool (trowel)	1
Hygeine	Hair (comb)	1
Pharmaceutical	Bottle (Patent medicine, vial)	2
Recreation	Smoking (cigarette holder, pipe	14
Social/Political	Newspaper (article)	1
Transport	Sulky (step)	1
Unidentified	Bottle, Cap, Fixture, Jar, Jug, Rod, Vessel, Unidentified	25

4.13.3. Dating overview

Almost a one quarter of the assemblage had one or more datable attributes gleaned from manufacturers marks or known dates of fabric or decoration types. Most of these manufacturing date ranges span several decades although several artefacts had a date range of less than ten years.

It is important to note these manufacturing dates to not necessarily correspond to usage, with many items likely in circulation for a number of years.

Although the majority of the manufacturing date ranges fall within the twentieth century the date ranges for two glass artefacts pre-date this period including a dip moulded case gin bottle and a free blown bottle base with sand pontil, dating up to the late nineteenth century, (c.1880). Several artefacts in the assemblage have manufacturing date ranges from the nineteenth century into the early twentieth century, including a Lamont patent aerated water bottle (1876-1910) and a twelve clay pipes likely dating from the mid nineteenth to early twentieth century.

4.13.4. Overview by phase and archaeological context

4.13.4.1. Late nineteenth century service trench fills

Fifteen artefacts were recovered from the service cut fills [4.008] [4.010] and [5.023] associated with the installation of a late nineteenth century service [4.011] and [5.014] encountered in TT4 and further exposed in TT5. The temporal relationship of the service pipe with the military barracks boundary wall and gravel surface was understood during excavation through the stratigraphic sequence of the service cuts and fills, however the artefacts recovered from the service trench fills provide additional evidence. Artefacts recovered from service trench fills [4.008] and [4.010] include a dip moulded case gin bottle (c.1760-1880), fragments of olive green beer/wine bottle glass, transfer printed fine earthenware fragments and clay pipe stem embossed with '[LO]NDON' denoting place of manufacture. In TT5, 38 clay pipe fragments from at least four pipes were recovered from service trench fill [5.023]. The pipes exhibited a range of designs including a rouletted rim, harp motif and a basketweave motif, while one pipe had a makers mark denoting Cork, Ireland as the place of manufacture. Although limited by the small quantity of artefacts recovered, the evidence they provide confirms a mid to late nineteenth century date for the construction of the trench and installation of the service pipe.

4.13.4.2. Twentieth century landscaping and levelling fills

Excavations revealed the landscape of Queens Wharf Reserve has been characterised by not only historical development of the area during the nineteenth century, but by the management of the environment through levelling and landscaping in the twentieth century. Although eleven test trenches were excavated across the study area, due to the size of the reserve these landscaping activities and levelling events are somewhat disparate and difficult to connect through stratigraphic relationships alone. The artefacts recovered from these contexts comprise 85% of the assemblage and provide evidence for interpreting these deposits.

In the eastern portion of the study area, a small domestic assemblage was recovered from TT2 (MNI=30) and could generally be attributed to the twentieth century, with most artefacts dating from 1920 up to 1960. Across the total artefact assemblage, those from TT2 had the greatest variety in functional types (12 activities) and level of intactness, with two complete Angus & Co. ink bottles (1922-1950), one complete E.C De Witt & Co patent medicine bottle for kidney and bladder pills (1920-1960) and one complete Summons & Graham lemonade bottle (1922-1938). Other twentieth

century artefacts included a smoking pipe and cigarette holder both made from Bakelite and a newspaper article fragment from The Daily Telegraph dated Tuesday 17 February 1931 (http://nla.gov.au/nla.news-article246140168), while a clay pipe fragment with a ship and anchor motif likely dates slightly earlier between the mid nineteenth to early twentieth century.

In looking at the artefactual evidence within TT3 there was a clearer distinction between fills. Underlying the topsoil in mixed fill 3002, typical twentieth century amber beer bottle glass was found. In contrast, the underlying fill 3.003 contained three clay pipes, two of which could be dated to the nineteenth century. One pipe stem was marked with 'SUNFLOWER' and advertised a tobacco brand manufactured by the Hignett Brothers and Co. in Liverpool, England (1850-1900), while another was embossed with 'LACHLANDER' and was likely made by London pipe maker C. Crop (1856-1891) (Gojak 45, Lindberg 3). These pipes possibly indicate the deposit was associated with an earlier fill event during the nineteenth century.

Across TT4 and TT5 the artefacts (MNI=19) recovered from the later deposits [4.003], [4.005] and [5.008] overlying the structural remains could be generally attributed to the late nineteenth and earlier twentieth century and included a Bakelite comb, Lamont patent aerated water bottle (1876-1910). Window glass fragments and large cast iron door hinges (2) were found in twentieth century landscaping deposits underlying the demolition deposit [4.004]. Although not directly associated with the demolition event, it is possible these artefacts were deposited during this event which likely disturbed the landscaping fill [4.005].

In the western portion of the study area, artefacts (MNI=25) were recovered from twentieth century fills TT7, TT8, and TT10. In TT7, the artefacts generally fit within this timeframe as evidenced by a Champion's Vinegar Co. oil/vinegar bottle (1925-1950) and an amber beer bottle made by Australian Glass Manufacturers in 1950, as well as fragments of machine made colourless and amber bottles with external threads and crown seals. A cast iron step belonging to a horse drawn sulky wagon was also found in TT7 and likely dates up to the mid twentieth century. No evidence of the Steam Packet Inn/Emu Hotel was identified in TT8, including any evidence of demolition deposits and associated artefacts. However, amongst the twentieth century material found in [8.002] was the heavy a hand blown dark green glass bottle with sand pontil, likely dating from 1825 up to 1880. Finally, TT10 contained a handful of fragmented and unidentified artefacts as well as an amber beer bottle made by Australian Glass Manufacturers in 1946 and a 1942 penny showing George VI. These artefacts were all recovered from the sandy mixed fill [10.003] overlying the gasometer structure that was demolished in c.1940.

5. DISCUSSION

5.1. Introduction

The following part considers the results of the excavation and the historical analysis to provide an interpretative discussion of the results.

5.2. Overview of test trenches

Archaeological testing has demonstrated that archaeology of historical significance survives to varying degrees throughout Queens Wharf Reserve. Limitations are based on the fundamental limitations of an archaeological testing programme. The test trenches were generally excavated for the purpose of characterising the nature of overburden to the depth of proposed maximum impacts. Therefore, it is entirely possible that structures or occupation relating to the Byrnes Mills complex, or to early historic occupation around the wharf area remains in situ below the proposed impact depth.

5.3. Discussion of the Commissary Store and Barracks

The testing uncovered archaeological evidence for the commissary store and barracks in TT4 and TT5. This consisted of the base course of the wall that was set into a level terrace which had been cut into the early topsoils and PSB. Based on the exposed elements of the wall it appears to have consisted of large dressed rectangular sandstone that were finished and laid as ashlar blocks. Blocks projecting beyond the main wall face and which were partially exposed in both test trenches suggest that the wall had pilasters or projecting engaged rectangular columns.

The commissary store and barracks were part of a network of government buildings constructed throughout the early town of Parramatta. These imposing buildings and their walled environs were intended to facilitate and to communicate control of people and resources in this very important early colonial settlement. Context is provided by other major government building projects that are broadly contemporary with the construction and occupation of the barracks. Notable examples are the Female Factory, the second gaol and the Upper Barracks.

The Commissary Store was constructed beside the government wharf so that goods and supplies could be transported up and down the river and stored securely. Part of the stores were soon reallocated as military accommodation and became known as the lower barracks to distinguish it from the upper barracks (currently Lancer Barracks). This dual purpose, or rather rapid repurposing of the building contrasts with the Upper Barracks which was specifically designed to be a barracks. The most relevant points of comparison for the purposes of this report are the enclosing elements of these sites. The upper Barracks which was designed and constructed between 1818-20 was enclosed at the front by a brick wall and by a stockade on the other three sides (Sahni and City of Parramatta, 2020) This would appear to have been a pragmatic attempt to create an imposing front-

facing façade while securing the remainder of the perimeter in a more expedient manner. The use of brick also followed other contemporary structures such as Liverpool Convict Barracks (Extent Heritage 2023d). By contrast the boundary wall foundations of the Commissary and Lower Barracks that were exposed during archaeological testing comprise of large, dressed sandstone blocks. This raises a couple of possibilities. Construction of the commissary commenced in 1825 and the enclosing wall may have been constructed after the main commissary building. The earliest definite depiction of the enclosing wall is on the 1843 plan of Byrne's Encroachment. However, it's worth noting that construction commenced on the altogether more imposing Parramatta Female factory in 1818. It was the first purpose built female factory in the colony and was designed by Francis Greenway. The buildings and enclosing walls are constructed of sandstone that was quarried locally. A pencil sketch undertaken in 1823 by Robert Charles Harry, shortly after its completion shows a stretch of wall with repeating pilasters. A watercolour by noted artist Augustus Earle showing the early factory buildings around 1826 also appears to depict pilasters, or rectangular engaged columns along the enclosing walls (Figure 60) Greenway had previously employed pilasters in the design of on the façade of the brick building at Hyde Park barracks, Sydney, which was completed before the Female Factory. This underlines that they were part of the evolving architectural vocabulary employed at institutional and governmental buildings constructed during the late 1810s and 1820s.

Figure 59.Hyde Park Barracks c.1820. *Source:* SLNSW FL3323021

Figure 60. Detail of Parramatta Female Factory, detail from Augustus Earle, c1826 *Source:* NLA PIC Solander Box A33 #T85 NK12/47).

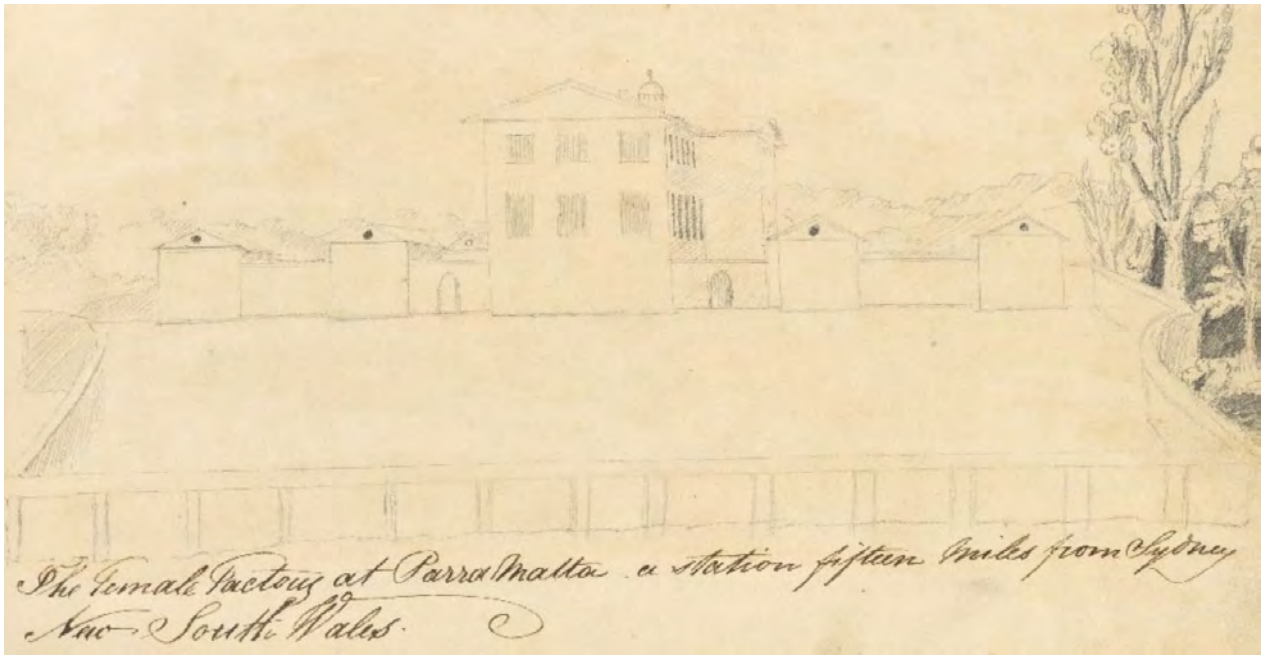


Figure 61.Parramatta Female Factory, pencil sketch, 1823, Robert Charles Harry, National Library of Australia, nla.pic-an6239017

This configuration is confirmed in a plan showing extensions and additions to the complex which was drawn in 1840. (the earlier structural elements are coloured grey). This establishes a precedent for the use of sandstone enclosing walls employing pilasters immediately before the construction of the commissary. The availability of quarried sandstone, skilled masons and convict labourers, as well as a template for the construction of such enclosing walls raises the possibility that the Commissary and its enclosing walls were conceived of as a single building project. It is also worth considering that the associated landscaping elements immediately north of the commissary or barracks wall make more sense as part of a holistic design scheme.

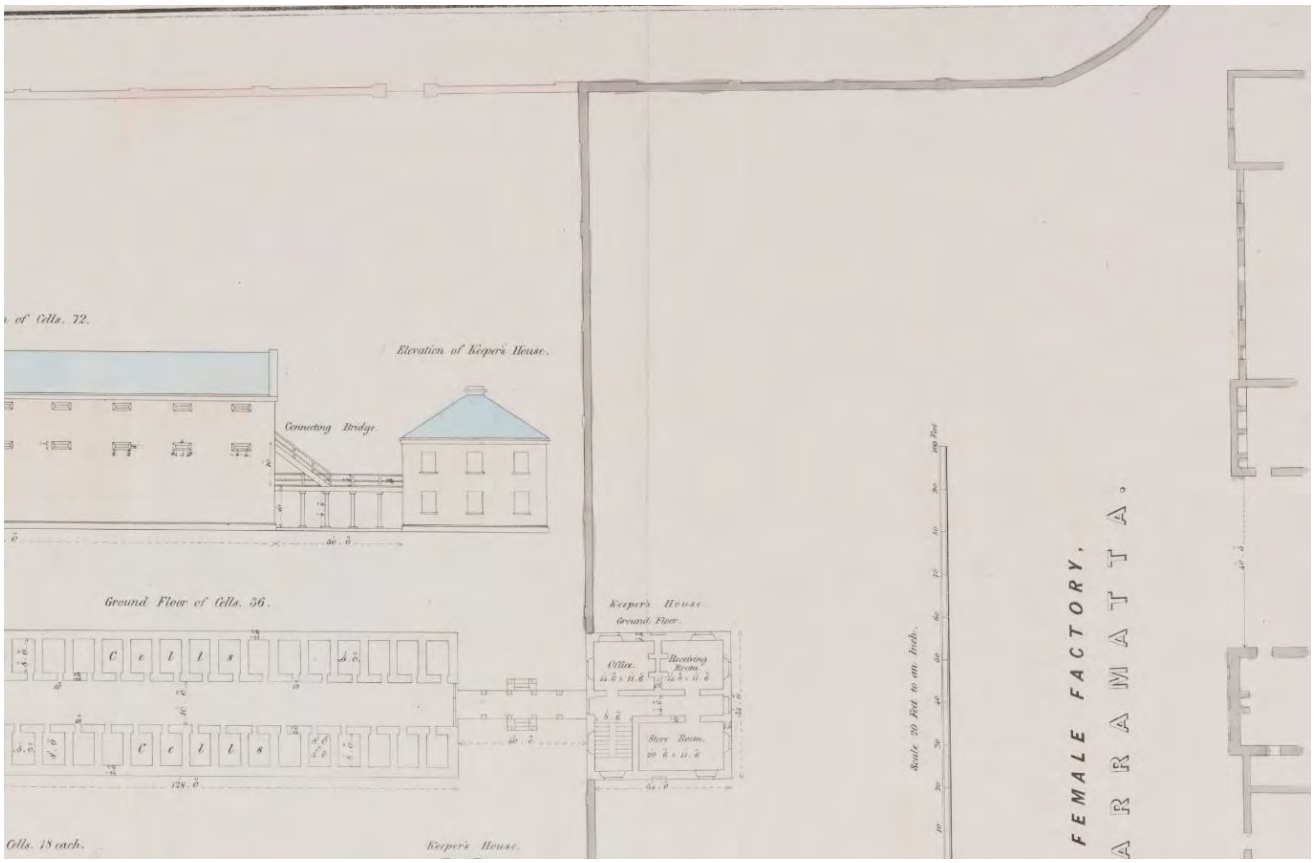


Figure 62. Range of solitary cells erected at the Female Factory at Parramatta : accompanying plans and estimates of buildings proposed by Captn. Maconochie, R.N. / [drafted with corrections by] H.H. Lugard, Lt. R.E. ; [originally designed by Francis Greenway], drawn 1840, printed 1841.

5.3.1. Wall footings and associated landscaping

The test excavations determined that the wall had been constructed on a terrace that was cut into the earlier landform. This was probably to accommodate the natural downward slope towards the river bank. An external berm or terrace immediately outside the wall was also created by scarping and cutting away the natural landform. This berm was covered in a chipped stone or metalled surface. This landscaping outside the barracks must have accentuated the degree of separation between it and the more public wharf area.

5.3.2. Potential evidence for occupation inside the commissary or barracks

TT4 extended within the site of the old commissary and barracks yard. An Aboriginal test pit excavated in the SE corner of the main test trench exposed a historic fill that was identified as bioturbation possibly associated with a tree bole or root system that descended into the early soil horizon (PSB). Further investigation determined that a large, backfilled posthole was present in the NW corner of the test pit. The depth of the posthole indicates that the post was substantial. However, the area investigated was too limited to definitively determine if it related to a structure that was part of the commissary barracks or the later asylum. A photograph taken in the 1890s

reveals that a series of timber structures including weatherboard buildings and a timber post barn-like structure were then present in the yard so it is possible that the posthole relates to one of these.

Figure 63. The courtyard of the Old Mens Asylum,George St, Parramatta, circa 1890 (City of Parramatta Collection)

Figure 64. Outside the Old Mens Asylum, also known as the George Street Asylum, with a view of the commissariat store (City of Parramatta Collection)

Figure 65. Detail from The courtyard of the Old Mens Asylum,George St, Parramatta, circa 1890 (City of Parramatta Collection)

5.4. Presence or absence around Byrnes Mills, the Emu Hotel, the Steampacket Inn and other subdivisions

TT1, TT2 & TT3 were opened over the locations of the Byrnes Steam Mill complex, and the possible site of the early granary building. Twentieth-century fills were encountered in all trenches suggesting that the ground level has been raised across this area. TT3 was partially excavated to a greater depth and potentially to the interface of earlier historic and alluvial deposits. However, this was well below the proposed depth of impact. Apparent absence of archaeology associated with the very substantial mill complex can likely be explained by the fact that the ground level was raised significantly in this area. The positional accuracy of the granary, based on Varman's guesstimate, is moot given the depth of later fill in this area.

TT8 and TT9 were located to test the potential for preservation of buildings and associated occupation in the centre of the reserve. Cartographic sources indicated that buildings were once present in these locations, while historical descriptions and photographs indicate that some of these structures were substantial.

The Emu Hotel appears to have been a substantial building. Apparently, it was

> a brick building with verandah on three sides and serviced the steamers travelling the river between Sydney and Parramatta. Although early photos appear to show a one storey building, Mr Bryant says the Emu Inn had an attic in which there were upstairs rooms and a downstairs cellar. (William Bryant quoted in M. Roberts 2022).

TT8 was placed to determine if the Emu Hotel or associated occupation survived in this location. Modern fills were exposed to the depth of proposed impact (c650mm depth). The inconclusive results mean that the Emu hotel may survive here at a greater depth. One explanation for the depth of modern fill in this location is that the hotel appears to have occupied downward sloping ground towards the river. The cellar mentioned in the description may have been built into the sloping ground.

Figure 66. Series of photographs showing that the Emu Hotel was level with the early street but appears to have had a lower ground or basement level to the rear where the ground dropped towards the river

TT9 was located in an area of overlapping historic buildings. However, no buildings footings, foundations or postholes were found in this location. Modern fill was removed to expose a pit containing twentieth century glass and other material. It was cut directly into the early soil horizon/PSB. It is possible that the earlier buildings were largely removed in this area and that there was further disturbance associated with landscaping of the reserve. However, the presence of intact early PSB raises the possibility that postholes, pits or deeper wall foundations could survive in it at a depth of around 400-450mm.

The apparent absence of nineteenth century archaeology in TT8 can be explained by the variable early topography. The early ground level must drop more steeply here, because modern fills were encountered to the depth of proposed impact. The apparent absence of historical features in TT9 might be explained by extensive demolition and landscaping works associated with the creation of the reserve. However, the presence of intact PSB horizons raises the possibility that deeper cut features such as pits or postholes or wall foundation trenches could survive in places below the level of proposed impact; and that demolition debris and further intact archaeology could survive northwards where the ground originally sloped downwards towards the river.

5.5. Howell's Mills and the gasworks

TT10 and TT11 were intended to assess the potential for preservation of archaeology associated with the gasworks, and potentially the earlier mill complex. The brick footings of a structure associated with the gasworks was exposed in TT10. This is probably the large tar pit indicated on the 1895/6 detail series maps. TT11 was abandoned at a depth of 350mm below ground level due to the presence of potentially contaminated hyrdrocarbon deposits. Taken together the structural remains and the contaminated material indicate that the gasworks complex survives to some degree below the park. No archaeology relating to the mill complex was exposed. It is likely the have been damaged by the gasworks, although it elements could survive, under the gasworks, particularly towards the river.

5.6. Insight from the artefactual assemblage

Most artefacts were recovered from general fill layers, as opposed to clearly defined and stratified archaeological features. Nonetheless, certain artefacts are testament to past activities on the site. A cast iron step from a horse trap was found in a layer of mixed fill. However, it is a physical link to a regular and everyday activity where passengers were taxied between the wharf and the town. A substantial door hinge recovered from fill was likely dumped during the demolition of the old commissary, barracks and asylum.

5.7. Terrain and early topography of the site

The archaeological testing programme has determined that there is reasonable potential for archaeology relating to the various phases of occupation survives throughout the reserve. Historical archaeology, where encountered was generally below the general depth of proposed impacts. The

proposed development will be located to the north of the commissary and barracks complex and so should not impact on this significant archaeology that was encountered at a shallower depth. In some cases modern fill was encountered to the base of the test trenches, raising the possibility that archaeological deposits or structures could survive at a greater depth, such as in TT1-3. In general terms the testing programme confirmed our understanding of the earlier historic landform, which falls from street level northwards towards the river. However, the inherent variability of the topography of this complex historic cultural landscape, combined with impoacts of later demolition and parkland landscaping mean that it is difficult to predict preservation at a micro-level.

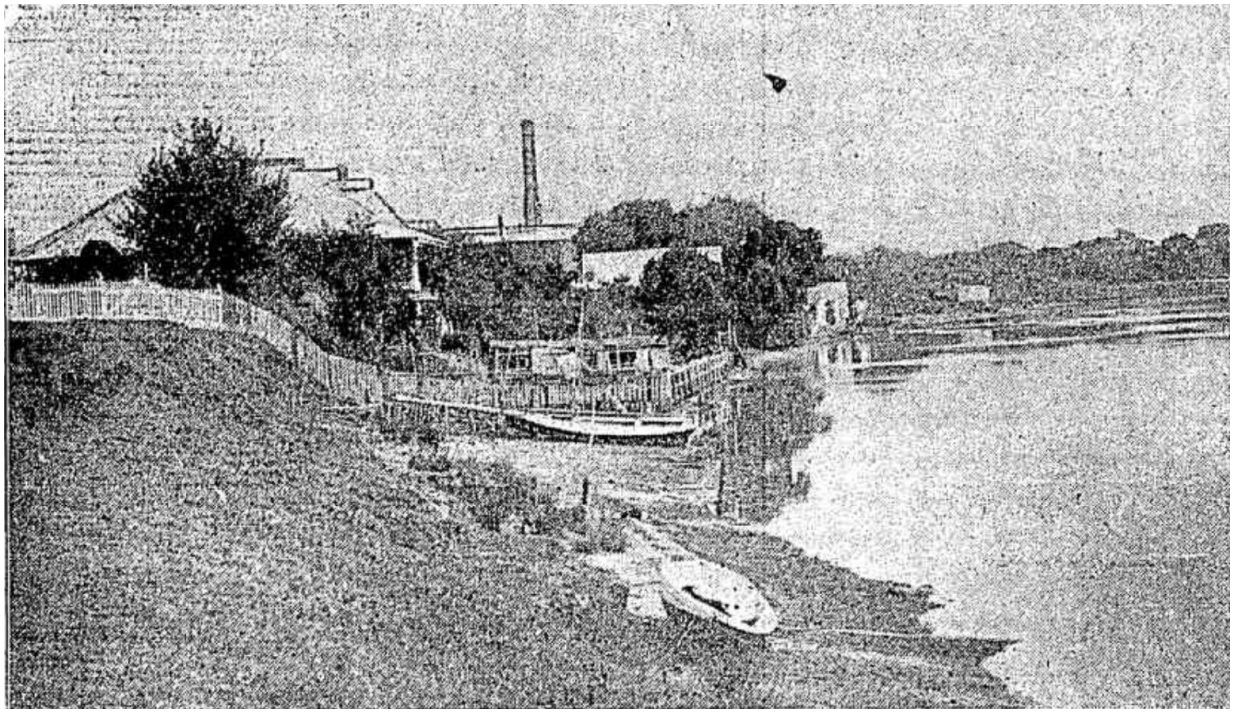


Figure 67. Glimpses of early Parramatta Cumberland Argus and Fruitgrowers Advocate Friday 13 May 1927 p18.

6. RESPONSE TO ARCHAEOLOGICAL RESEARCH DESIGN

6.1. Research Framework

The following research framework provided a context and methodology to guide the test excavation program at Queens Wharf Reserve. It incorporates a theoretical framework and research questions alongside a methodology used in targeting areas of archaeological potential to understand the nature and extent of archaeological evidence remaining at the site.

6.2. Research Themes

The Heritage Council of New South Wales has published a list of historical themes, to provide direction and guidance for heritage assessment and management. The historical themes relevant to the documented occupation of the subject area are listed in Table 8 below. Details of the phases of occupation associated with each theme are also included.

Table 7. Heritage Council of NSW research themes and relevant phase of occupation.

Australian theme	NSW theme	Local themes notes	Occupation phase
Peopling Australia	Convict	Activities relating to incarceration, transport, reform, accommodation, and working during the convict period in NSW (1788-1850)	**Phase 1—early colonisation of parramatta** Construction of early wharves, jetties and associated infrastructure. **Phase 2—the commissariat and continued military occupation** The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores'.
	Agriculture	Activities relating to the cultivation and rearing of plant and animal species, usually for commercial purposes	**Phase 1—early colonisation of parramatta** Between 1790 and c.1820, the centre of the study area was used as a landing place for goods. An 1808 granary was located on the study area. Archaeological investigations have the potential to refine the tentative location of the site and to determine the nature of any associated structures. **Phase 4—Howell's Mill** Howell's Mill was established as the first water and wind mill in Parramatta including stone and timber buildings consisting of a small private wharf, grain stores, work sheds, and a house. Cartographic and artistic representations provide a basic overview of the milling complex. Archaeological investigations have the potential to reveal more about the nature of the buildings and associated industrial infrastructure. **Phase 6—Byrnes' Mill** The Byrnes' flour mill complex included worker's cottages constructed to the east of the main mill building occupied between 1841 and 1844. The integration of workplace and residential areas has the potential to provide a holistic

Australian theme	NSW theme	Local themes notes	Occupation phase
			understanding of the lives of the mill workers and the process of colonial industrialisation.
Developing local, regional and national economies	Commerce	Activities relating to buying, selling and exchanging goods and services	**Phase 1—early colonisation of parramatta** The Parramatta River operated as an important line of communication with Sydney and the increase of river traffic and larger boats prompted the construction of a stone-faced wharf in 1808. **Phase 2—the commissariat and continued military occupation** The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores' **Phase 3—early subdivisions and development** Byrnes' brothers established the first cloth factory in Parramatta along the river in 1841. **Phase 4—Howell's Mill** Howell's Mill was established as the first water and wind mill in Parramatta. **Phase 6—Byrnes' Mill** The land from this time contained a steam mill that operated as flourmill. The flourmill was extended in 1844.
	Health	Activities associated with preparing and providing medical assistance and/or promoting or maintaining the well being of humans	**Phase 7—The Parramatta Benevolent Asylum** The Parramatta Benevolent Asylum, owned by the government, was used to house and provide medical services to the destitute, unwell, and people with nowhere else to go. It utilised the Byrnes' Mill buildings, and included outhouses, sheds, tanks, wells, and additional structures. A kitchen, lavatories, and some more structures were added later during the period of its use. Following growth of the population, additional buildings associated with Byrnes' Mill were converted to accommodations and wards. An exercise ground was added. The

Australian theme	NSW theme	Local themes notes	Occupation phase
			ownership of the Asylum was transferred to the 'Department of Charitable Institutions to Public Health'.
	Industry	Activities associated with the manufacture, production, and distribution of goods	**Phase 1—early colonisation of parramatta** The Parramatta River operated as an important line of communication with Sydney and the increase of river traffic and larger boats prompted the construction of a stone-faced wharf in 1808. **Phase 3—early subdivisions and development** Byrnes' brothers established the first cloth factory in Parramatta along the river in 1841. **Phase 4—Howell's Mill** Howell's Mill was established as the first water and wind mill in Parramatta including stone and timber buildings consisting of a small private wharf, grain stores, work sheds, and a house. **Phase 6—Byrnes' Mill** The land from this time contained a steam mill that operated as flourmill. The flourmill was extended in 1844, involving the construction of a five–storey sandstone building that was used as a cloth factory. **Phase 8—Parramatta Gasworks** The Parramatta Gas Company operated Parramatta Gasworks that included pipes, a large gasometer. The gasworks was purchased by the Australian Gas Light Company (AGL) in 1890 who undertook significant expansion and development of the area, including a large factory building and furnace, converters, a gasometer, retaining walls (both along Parramatta River and George Street), coal sheds, accommodations, site offices, and other small structures that had and unknown uses. **Phase 9—George Street Tramway and Queen's Wharf Reserve**

Australian theme	NSW theme	Local themes notes	Occupation phase
			Following the closure of the wharves, road and rail became the primary method for accessing and delivering supplies to the colony and personnel stationed in Parramatta. With increased population and use of George Street, the George Street Tramway was established in 1883.
	Transport	Activities associated with the moving of people and goods from one place to another, and systems for the provision of such movements	**Phase 1—early colonisation of parramatta** The Parramatta River operated as an important line of communication with Sydney and the increase of river traffic and larger boats prompted the construction of a stone-faced wharf in 1808. Phases 2-8 also included continued use of Queens Wharf Reserve and its wharves to transport goods, services, and people between Sydney and Parramatta. **Phase 9—George Street Tramway and Queen's Wharf Reserve** Following the closure of the wharves, road and rail became the primary method for accessing and delivering supplies to the colony and personnel stationed in Parramatta. With increased population and use of George Street, the George Street Tramway was established in 1883.
Building settlements, towns, and cities	Towns, suburbs, and villages	Activities associated with the provision of accommodation, and particular types of accommodation.	**Phase 5—Steam Packet Inn and the Emu Hotel** The hotel provided accommodation to those travelling to Parramatta or beyond which may have included workers, merchants, the general public, or government representatives. **Phase 6—Byrnes' Mill** The Byrnes' flower mill complex included worker's cottages constructed to the east of the main mill building occupied between 1841 and 1844.
Working	Labour	Activities associated with defending places from hostile takeover and occupation	**Phase 1—early colonisation of parramatta** The Parramatta River operated as an important line of communication with Sydney and the increase of river traffic and larger boats prompted the construction of a stone-faced wharf in 1808.

Australian theme	NSW theme	Local themes notes	Occupation phase
			Phase 3—early subdivisions and development Byrnes' brothers established the first cloth factory in Parramatta along the river in 1841. **Phase 4—Howell's Mill** Howell's Mill was established as the first water and wind mill in Parramatta including stone and timber buildings consisting of a small private wharf, grain stores, work sheds, and a house. **Phase 6—Byrnes' Mill** The land from this time contained a steam mill that operated as flourmill. The flourmill was extended in 1844, involving the construction of a five–storey sandstone building that was used as a cloth factory. **Phase 8—Parramatta Gasworks** The Parramatta Gas Company operated Parramatta Gasworks from 1873. The gasworks was purchased by the Australian Gas Light Company (AGL) in 1890.
Governing	Defence	Activities associated with the governance of local areas, regions, the State and the nation, and the administration of public programs – includes both principled and corrupt activities.	**Phase 2—the commissariat and continued military occupation** The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores'. **Phase 3—early subdivisions and development** The eastern most part of the study area was reserved for government purposes and contained the military barracks and former commissariat store. **Phase 7—The Parramatta Benevolent Asylum** The Parramatta Benevolent Asylum, owned by the government, was used to house and provide medical services to the destitute, unwell, and people with nowhere else to go. It utilised the Byrnes' Mill buildings, and included outhouses, sheds, tanks, wells, and additional structures. A kitchen, lavatories, and some

Australian theme	NSW theme	Local themes notes	Occupation phase
			more structures were added later during the period of its use. Following growth of the population, additional buildings associated with Byrnes' Mill were converted to accommodations and wards. An exercise ground was added. The ownership of the Asylum was transferred to the 'Department of Charitable Institutions to Public Health'.
	Government and administration		**Phase 1—early colonisation of parramatta** Between 1790 and c.1820, the centre of the study area operated as the Soldier's District. Around c.1804 the study area was used as a cantonment and included the flagstaff and associated sentry box. **Phase 2—the commissariat and continued military occupation** The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores'.
	Law and order	Activities and processes associated with the provision of social services by the state or philanthropic organisations	**Phase 1—early colonisation of parramatta** Between 1790 and c.1820, the centre of the study area operated as the Soldier's District. Around c.1804 the study area was used as a cantonment and included the flagstaff and associated sentry box. **Phase 2—the commissariat and continued military occupation** The Commissariat and continued military use during this phase have associations with J. T. Bigge (Royal Commissioner) and the early garrison. The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores'.
	Welfare	Activities associated with creating,	Phase 2—the commissariat and continued military occupation

Australian theme	NSW theme	Local themes notes	Occupation phase
		maintaining, living in and working around houses and institutions.	The Commissariat Store was a part of the operation of the convict system in Parramatta, supplying clothing, liquor, machinery, building material, and other goods for use by the military, administration, convicts, and free settlers who were 'on stores'. **Phase 7—The Parramatta Benevolent Asylum** The Parramatta Benevolent Asylum, owned by the government, was used to house and provide medical services to the destitute, unwell, and people with nowhere else to go. It utilised the Byrnes' Mill buildings, and included outhouses, sheds, tanks, wells, and additional structures. A kitchen, lavatories, and some more structures were added later during the period of its use. Following growth of the population, additional buildings associated with Byrnes' Mill were converted to accommodations and wards. An exercise ground was added. The ownership of the Asylum was transferred to the 'Department of Charitable Institutions to Public Health'.
Developing Australia's cultural life	Domestic life		**Phase 4—Howell's Mill** Howell's Mill was used for residential purposes. The differences and similarities between residences of different purposes within the study area and wider parramatta might be inferred from the archaeological record including artefacts and structure configurations. **Phase 5—Steam Packet Inn and the Emu Hotel** The hotel shows a different side to domestic life. It contained nine rooms that included three attics, a kitchen, pantry storeroom, laundry, basement, and stables outside. **Phase 6—Byrnes' Mill** The Byrnes' flower mill complex included worker's cottages constructed to the east of the main mill building occupied between 1841 and 1844.

6.2.1. Broad research questions

What can archaeology tell us about the natural environment, landscape, and PSB, and the impact that colonisation had?

The PSB was demonstrated to have survived in a number of locations throughout the reserve. However, occupation and construction activities associated with colonial occupation altered the earlier landform. Direct impacts through construction, levelling or other landscaping works can be demonstrated in the environs of the Commissary Store and Barracks. The barracks wall and appears to have been cut into the PSB. This indicates that some degree of impact or truncation of the early landform across the southern part of the reserve where the ground level was higher. The PSB was scarped away entirely on exterior, or northern side, of the barracks wall in TT4 where the mettled surface was placed directly on the B-horizon soil. By contrast, the PSB was found beneath the equivalent mettling in TT5. However, the exposed section face clearly indicates that the PSB had been cut into, or terraced in preparation for the construction of the barracks wall and that these impacts lessened to the north due to the downward slope of the landform towards the river.

How do archaeological resources reflect the development of the study area and Parramatta from a penal settlement to the present?

The base course of the boundary wall of the commissary and barracks directly attest to the colonial occupation in this part of Parramatta during the first four decades of the nineteenth century. The wall and the external landscaping reflected a clear concern to create a visible and practical boundary between the government and then military spaces, and the more public space around the wharves to the north.

No structural evidence relating to Byrnes Mills complex or the various subdivisions was exposed. Some of the artefactual assemblage could relate to this era of occupation.

The partially exposed remains of a gasworks wall mainly indicates that there is potential for more extensive structural elements to survive in this part of the site. Observations of a thick 'tarry' layer exposed in TT11 that was also observed in section at the river bank suggests that this detritus from gas production was dumped across the site after it was decommissioned.

Evidence for later infill or levelling across the reserve was exposed in a number of test trenches. This suggests that the earlier topographies of the area have been significantly modified in places.

What does material evidence reveal about consumerism and changing tastes across the nineteenth and early twentieth century?

The evidence does not support answering this question.

6.2.2. Site specific research questions

What is the nature and extent of archaeological remains uncovered during testing?

The archaeological testing has demonstrated that there is potential for historical archaeology throughout the reserve. While the early pre-colonisation landforms were encountered, they were modified or entirely scraped away in places. Intact State significant archaeology associated Phase 2 (1825-1870) was exposed in two of the eleven test trenches. These remains consisted of the sandstone footings of the commissary store/ military barracks boundary wall and associated landscaping.

At what depth were significant historical archaeological are deposits reached?

Approximately 450mm depth in places.

Can archaeological resources provide distinctions between the lives and practices of convicts, freed convicts, and free settlers? Can information be gleaned about the interrelationships between these social groups?

While some artefacts such as clay pipes provide evidence of late nineteenth and early twentieth occupation of Queens Wharf Reserve, these objects were all recovered from redeposited fills rather than occupation deposits. Clay pipes, however, have a clear association with lower socio-economic status, and consequently we can surmise they were likely used by the working class or labourers.

The majority of the assemblage was attributed to contexts associated with twentieth century landscape modification activities. Additionally, the assemblage was highly fragmented, with over half the assemblage between 5-10 % intact. As such, limited artefactual, chronological, and contextual information is available to give insight into the lifestyle and activities of the range of occupants and the interrelationships between social groups.

The commissary store and military barracks were a crucial part of the operation of the convict system in Parramatta. However, the small portion of the wall itself, found in TT4 and TT5, cannot provide any additional insight into the distinction in lives between convicts and settlers.

Can archaeological resources provide distinctions between the lives and practices of mill workers versus occupants on other parts of the site?

No evidence for the lives of the mill workers, nor of occupants of other parts of the site, was recovered. With only 100 artefacts recovered during test excavations from redeposited contexts and twentieth century fills nature of the assemblage and contextual evidence was not conducive to making this sort of finer grained analysis.

What archaeological evidence of commercial activities and industries are identified, and how did they develop over time?

All the test trenches where evidence of Howell Mill, Byrnes' Mill complex, government grain store, and Steam Packet Inn/Emu Hotel were anticipated were found to only contain introduced fills. Consequently, substantial information about commercial activities and industries in the reserve could not be gleaned.

A small portion of the AGL gasworks gasometer was exposed in TT10. The brick structure was not fully excavated in length or depth, due to the extent and depth of impact being reached. Exposure of the feature demonstrated it is present below the fills at 800mm below ground level. While the feature was somewhat intact, the bricks were slightly damaged, likely during the process of demolishing the gasworks. The limited extent and type of archaeology associated with the AGL gasometer did not present any research value or additional understanding of the site that is not known from secondary sources.

Can evidence be identified of the reuse of spaces and structures across different phases and for different purposes?

Reuse of individual buildings or specific spaces within the study area were not identified. However, the overall conversion of the area into a reserve in during the late twentieth century would be described as extensive reuse of the open space for public use.

Can evidence relating to technical advancements or achievements associated with the development industries within the study area be identified?

No evidence related to technical advancements or achievements were identified.

Can differences in manufacture, production, distribution, and physical arrangement/construction of Byrnes' Mill and Howell's Mill, and the associated complexes, be identified?

Test trenches 1, 2, and 11 were anticipated to exposed evidence of the mills and associated complexes. In TT1 and TT2, imported fills were encountered to the depth of impacts of the works (600 mm below the ground surface) and, as a result, no evidence of these features were identified.

The original location of TT11 was not able to be investigated due to construction works being undertaken on Gasworks Bridge and the trench was moved approximately 27 m to the east. In this new location, no evidence of Howell Mill was identified, instead only contaminated soils associated with the AGL gasworks were encountered. Due to these factors, no evidence of the functioning and physical components of the mills or associated complexes were identified and comparisons between the enterprises could not be made.

What can the archaeological resources reveal about government and military oversight of people and activities within the study area? Is evidence of order, punishment or benevolence present?

Structural footings associated with the military barracks and commissary store boundary wall were encountered in TT4 and TT5. As only a small portion was exposed, specific evidence about law and order could not be ascertained. The perception of colonial oversight of Parramatta, in part via a strong military presence, would have not been lost on convicts, free convicts, and settlers arriving at the wharves from the River, as well as those visiting and living in and around the economic, social, and government hub that was located at Queens Wharf Reserve.

Can evidence of early contact between early colonists and European settlers and Aboriginal peoples be identified in the archaeological record?

There was no direct archaeological evidence for contact period archaeology within the study area.

7. SIGNIFICANCE REASSESSMENT

7.1. Introduction

The following Part presents the original statement of significance as assessed prior to excavation in 'Queens Wharf Reserve and Noller Parade Active Transport Link - Historical Archaeological Impact Assessment' (Extent Heritage 2023b), and a reassessment of significance following excavation.

7.2. Existing statement of significance

Queen's Wharf Reserve is a complex site that has undergone significant development whereby structures have been reused or repurposed during subsequent phases of occupation at the site. For the purpose of the significance assessment within the HAIA (Extent Heritage 2023b), the significance of each phase of historical development was assessed individually against the four NSW Heritage Criteria as listed in 'Assessing Significance for Historical Archaeological Sites and 'Relics" (Heritage Branch, Department of Planning 2009). The four NSW Heritage Criteria for assessing significance related to archaeological sites and relics are:

- archaeological research potential (current NSW Criterion E);
- associations with individuals, events, or groups of historical importance (NSW Heritage Criteria A, B, and D);
- aesthetic or technical significance (NSW Heritage Criterion C); and
- ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, C, F, and G).

Archaeological Research Potential (NSW Heritage Criterion E)

Phases 1 and 2 meet the threshold for this criterion. Phases 1 and 2 of development at Queen's Wharf Reserve may offer valuable research potential into the establishment of the early colony in Parramatta. Archaeological resource from these Phases could inform our understanding of convict life in Parramatta, and life within the Military District. Archaeological remains associated with Phases 1 and 2 are likely to be present in the form of deposits, and structural remains. These resources may provide valuable information and research into the location of early colonial structures and the overall settlement of Parramatta in the eighteenth and early nineteenth centuries. Within the archaeological record, these remains are considered rare and would be considered State significant on this basis.

Phases 2–8 meet the threshold for this criterion. Archaeological resource from Phases 3 to 8 may offer significant information and valuable research potential relating to the military and lifeways of the people who lived and worked within the study area during these phases. Archaeological materials relating to these phases that are identified, may further develop our understanding of the changing uses of the site. Archaeological remains associated with Phases 3–8 are likely to be present

in the form of features, deposits, structural remains, and artefact scatters. These resources may provide a valuable insight into the development of Parramatta as an early convict town, military outpost, and later a commercial centre.

Phase 9 does not reach the threshold for this criterion. Archaeological resource from Phase 9 at Queen's Wharf Reserve is not considered rare, nor would it offer significant new insight into the history of Queen's Wharf Reserve. There are several examples of tramlines across the broader Sydney area and within Parramatta that would provide a higher research value.

Associations with Individuals, events, or groups of historical importance (NSW Heritage Criteria A, B & D)

Phases 1 and 2 meet the threshold for this criterion. Phases 1 and 2 are associated with the early British settlement of Australia, and as a military centre for the British garrison. Through its association with early settlement of the colony, these phases would be considered significant.

Phases 3 and 4 meet the threshold for this criterion. Phases 3 and 4 are associated with George Howell and his development of part of the study area as a mill complex.

Phase 6 meets the threshold for this criterion. Phase 6 is associated with James Byrne who was an influential political figure within Parramatta in the mid nineteenth century. Through the mill's association with James Byrne this phase is considered significant.

Phase 8 meets the threshold for this criterion. Phase 8 is associated with the establishment of the Parramatta Gasworks which marked a significant technological advancement and development within Parramatta. The successful construction and operation of the Parramatta Gasworks marked an event that was important factor in the late-nineteenth century development of Parramatta.

Phases 5, 7 and 9 do not meet the threshold for this criterion. Phases 5, 7, and 9 are not associated with any individuals or notable events and are not considered significant when assessed under this criterion.

Aesthetic or technical significance (NSW Heritage Criteria C)

Phases 1, 2, 3, 5, 7 and 9 do not meet the threshold for this criterion. Phases 4, 6 and 8 have some potential to meet the threshold for this criterion. No phases meet the criterion for Aesthetic achievement. However, evidence of some technical achievement may survive in association with the operation of Howell's Mill and Byrnes' Mill.

Ability to demonstrate the past through archaeological remains (NSW Heritage Criteria A, B &D)

All identified phases of development at Queen's Wharf Reserve have the potential to demonstrate the settlement and development of Parramatta. Phases 1 and 2 of development may provide

valuable information relating to early convict settlement and the transition of Parramatta from a military outpost to a centre for the British regiment in the late 18th and early 19th centuries. Phases 3–9 of development has the potential to reflect the expansion and urbanisation of Parramatta through the establishment of commercial, industrial, and residential structures on the reserve.

A summary of archaeological significance organised by phase is shown below in Table 8.

Table 8. Summary of archaeological significance organised by phase at Queens Wharf Reserve.

Phase	Significance
Phase 1: Colonisation of Parramatta, the first landing place and military occupation (1788–c.1820s)	State
Phase 2: The Commissariat and continued military use	State
Phase 3: Early subdivisions and development of the reserve (c.1820s–c.1860s)	State
Phase 4: Howell's Mill (1823–1872)	Local
Phase 5: Steam Packet Inn and the Emu Hotel (c.1834–1911)	Local
Phase 6: Byrnes' Mill (1841–c.1880s)	Local
Phase 7: The Parramatta Benevolent Asylum (c.1860s–1937)	State: original Commissariat building
	Local: Benevolent Asylum occupation
Phase 8: Parramatta Gasworks (1872–c.1940s)	Local
Phase 9: George Street Tramway and Queen's Wharf Reserve today	Local

7.3. Revised statement of significance

7.3.1. Significance assessment

The statement of significance remains unaltered.

8. REVISED IMPACT ASSESSMENT

8.1. Proposed development and mitigation of impacts

Following the results of the archaeological investigations, Extent Heritage provided preliminary advice to the City of Parramatta regarding areas of concern relating to both historical and Aboriginal archaeology. As a result of this collaboration, City of Parramatta revised the concept design and reduced the overall proposed development impacts, ensuring the primary heritage management strategy continued to be avoidance of local and State significant archaeology. This resulted in a reduction of proposed ground impacts by using fill to build up the ground level between 100mm – 500mm along the northern side of the pathway where the light poles and electrical conduits are to be located. Additionally, service trenching impacts were further reduced through placement beneath the concrete pathway on the northern side allowing for reduced cover.

8.2. Revised ground disturbance impacts

Based on the revised concept design, the proposed development will involve the following ground disturbance as listed below in Table 9.

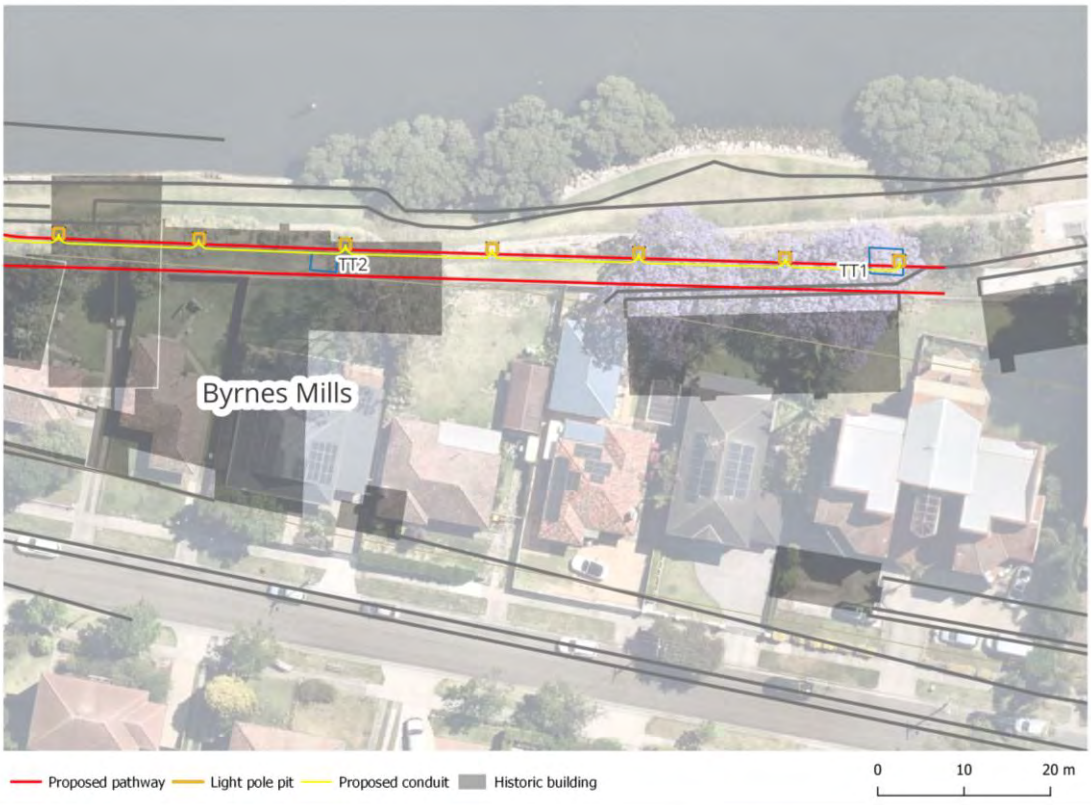
Table 9. Proposed ground disturbance impacts from revised concept design.

Proposed development	Total ground disturbance impact	Actual impacts to existing ground level *
Redevelopment of existing pathway including demolition for path widening	Max. 225mm depth	0mm-125mm
Development of new pathways	Max. 225mm depth	0mm-125mm
Installation of light poles along path route	Max 650mm depth. Footing dimensions 1200mm x 1200mm.	150 mm -550mm
Installation of signposts	Max. 450mm depth	0 mm – 350mm
Trenching for electrical services below pathway	Max. 425mm depth.	0mm – 325 mm
Landscaping works including tree removal and new plantings (25L pot size)	Max 300mm depth.	0mm – 200mm
Removal of existing grass for proposed garden beds	Max. 50mm depth	

*along northern side of pathway only, where 100mm – 500mm of fill will be introduced to raise the existing ground level

8.3. Potential impacts to historical archaeological resource

Test excavations revealed that there is a fairly consistent layer of 100mm to 200 mm of topsoil or imported fill present across all test trenches excavated. Furthermore, intact historical archaeological evidence was identified at depths between 400mm and 800mm below ground level. With the revisions made by City of Parramatta to the design to reduce pathway and electrical services depths, it is unlikely the construction of pathways and conduits will to impact potential historical archaeological resource. The proposed light pole footings, however, may impact potential historical archaeological resource due to their discrete but deeper footprint of up to 550mm inclusive of the minimum additional introduced fill.



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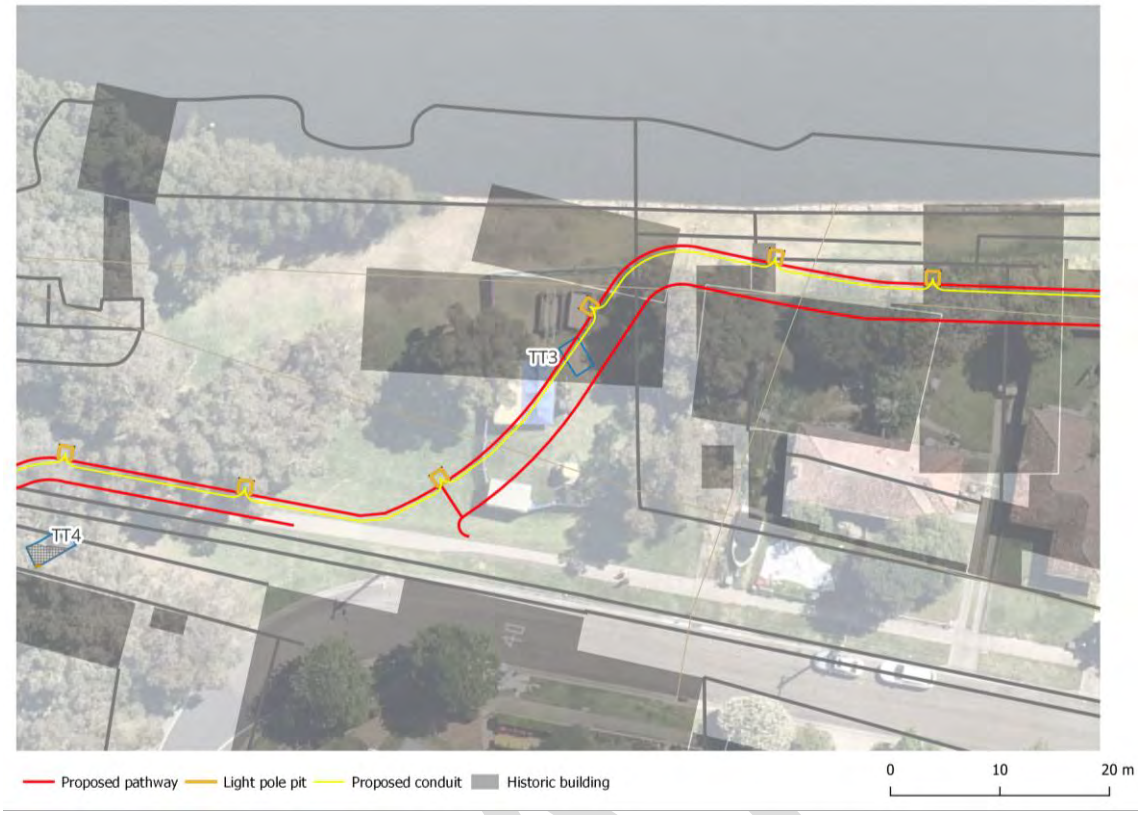

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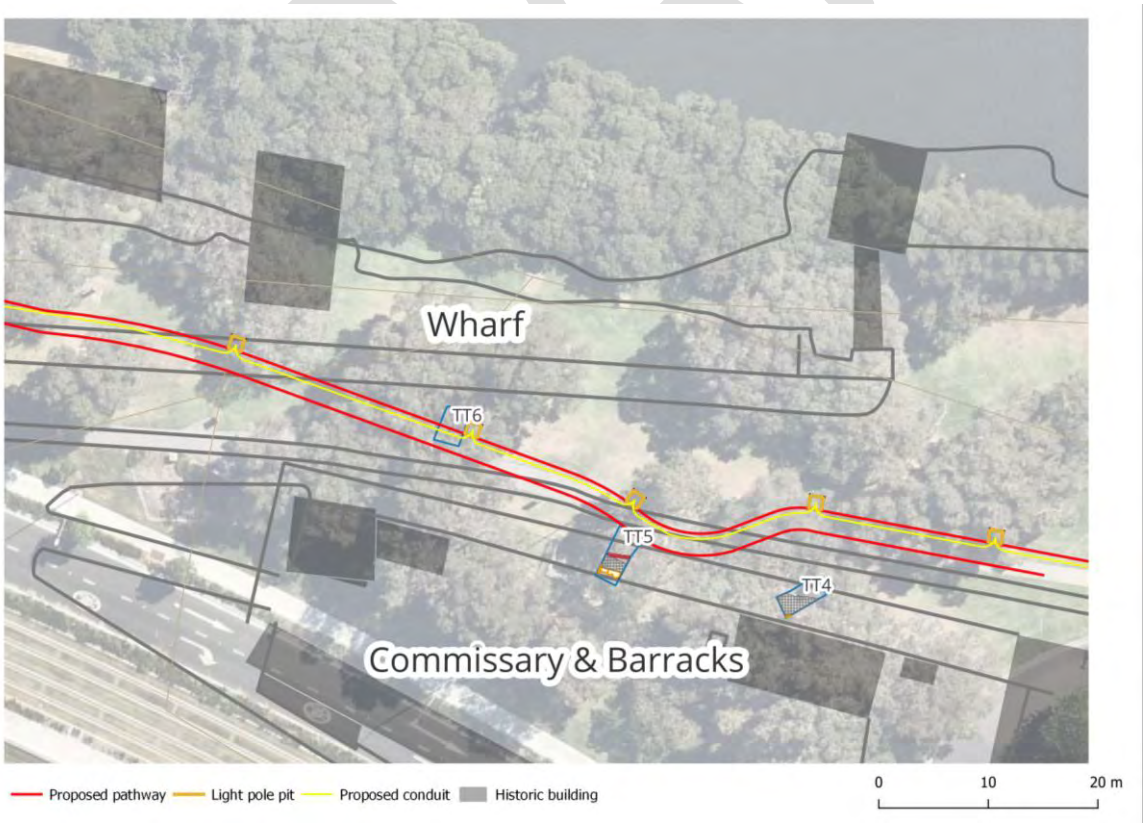

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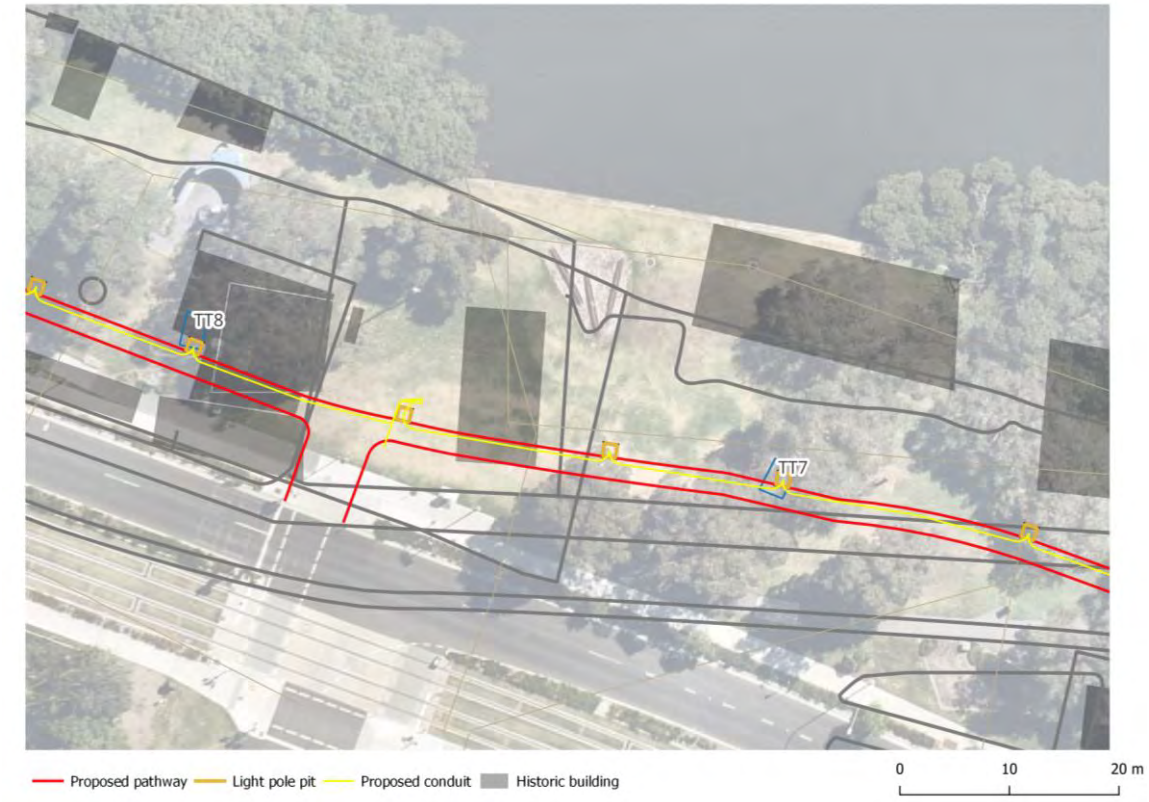

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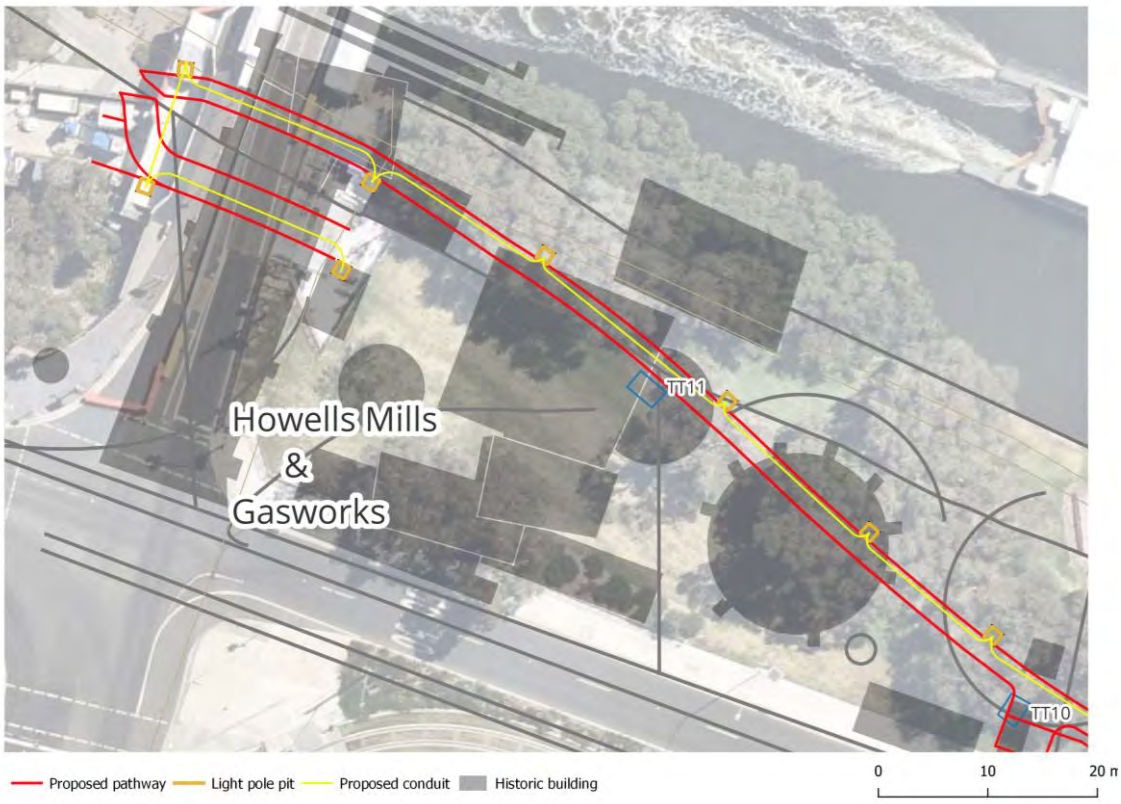

Figure 73. Proposed impacts in the vicinity of TT4, TT5 and TT6.

9. CONCLUSIONS AND RECOMMENDATIONS

9.1. Conclusions

The archaeological testing programme was designed to characterise historical archaeological potential across the Queens Wharf Reserve. The locations of test trenches were intended to address archaeological potential in a representative sample of areas flagged as potential high impact areas during draft concept design stage. The testing locations were revised slightly in the field in some cases based on constraints such as access, appropriate distance from tree canopies and the presence of existing pathways. The impact of the archaeological testing process was also refined to be relatively proportional to the impact of the proposed development.

The test excavations characterised the historical development of the study area, the levels of fills capping historical archaeological remains, the absence of buildings identified on plans, and degree of landscaping that has occurred at Queens Wharf Reserve. Consequently, Extent Hertiage recommends that no further archaeological test excavations are required.

The testing program and an assessment of revised development impacts has determined there is potential to expose archaeological relics within the area of the proposed development. Further mitigation involves ongoing redesign to consider the results of this archaeological assessment and testing. Extent Heritage recommends an archaeological monitoring program to occur during the excavation and demolition portion of the construction program, operating under a s140 permit.

9.2. Recommendations

- Potential historical archaeological impacts during groundworks should be managed under a s140 excavation permit. Additional permits may be required to manage Aboriginal archaeology.
- An Archaeological Research Design (ARD) should be compiled to support the s140 application prior to the commencement of any proposed ground disturbance works.
- The Archaeological Research Design should take account of the revised assessment of potential archaeological impacts. That ARD should take account of the results and recommendations of the Aboriginal Test Excavation Report (Extent Heritage 2024) that was carried out concurrently with the historical archaeological testing programme.
- The ARD should address how potential archaeological impacts will be managed at construction stage. This should include recommendations for monitoring of any groundworks that are likely to disturb relics, by a suitably qualified historical archaeologist. Proposed groundworks should be classified according to potential impact and an appropriate archaeological management strategy should be outlined for each area or activity.
- Provision should be made for a meeting with the principal contractor prior to commencement of works and provision for delivery of a heritage induction for on-site staff.

- Any archaeological relics that are exposed should be investigated and documented to determine if they relate to the predicted archaeological resource, and to determine their archaeological significance. Appropriate management, as outlined in the ARD and endorsed by Heritage NSW, could require avoidance through minor redesign, such as the introduction of additional fill if possible, or localised archaeological salvage excavation to the depth of the proposed impact.
- A copy of this report should be lodged with Heritage NSW in compliance with Condition 10 of the section 140 excavation permit (HMS ID 2487).
- The artefact assemblage will be stored securely by City of Parramatta within a dry and stable heritage collections repository, and the report and associated records lodged with a publicly accessible data repository.
- The Heritage Interpretation Plan prepared by Extent Heritage (Extent Heritage 2024b) should be implemented at the site in accordance with Condition 6 of the s140 excavation permit (HMS ID 2487), with the results of the archaeological investigation informing the content.
- Any proposed future ground excavation works on the site outside the current scope of works as outlined in this report would be subject to an archaeological impact assessment. Any such assessment should be prepared with reference to this report.

APPENDIX D- ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

Queens Wharf to Noller Parade Active Transport Link

Aboriginal Cultural Heritage Assessment Report

Prepared for Parramatta City Council

January 2023 - FINAL

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Executive summary

Extent Heritage has been engaged by the City of Parramatta Council to undertake an Aboriginal Cultural Heritage Assessment Report (ACHAR) in advance of proposed development to install a cycleway and pedestrian path network as part of the Queens Wharf Reserve and Noller Parade Active Transport Link Project. The proposed project area (hereafter referred to as the 'study area') is located in Queens Wharf Reserve on the southern bank of the Parramatta River, Parramatta. The proposed development consists of a mix of shared paths, comprising of separated (off-road) cycleways and pedestrian paths, and on-street cycleways. Additional design elements include new tree planting, installation of improved lighting, minor landscaping works, and minor civil infrastructure.

A search of the Aboriginal Heritage Information Management Systems (AHIMS) database was completed on 20 July 2022 for an area of land which encompasses the study area. The search resulted in the identification of two registered sites within the study area:

- AHIMS ID 45-6-3312, and
- AHIMS ID 45-6-3131.

A site visit of the study area was completed on 4 August 2022. The walkover did not identify any additional Aboriginal sites located above the ground surface. The site visit suggested that discrete areas of modern excavation and ground disturbance had occurred across the site, and reclamation fill toward the Parramatta River was likely to have built up the area substantially.

Background research identified that the study area is located on the Parramatta Sand Sheet (PSS). As a result, the project boundary is considered a Potential Archaeological Deposit (PAD) which may contain Aboriginal objects dating to the Pleistocene, Holocene, and contact period. These objects may hold high scientific potential and social/cultural value. An excavation program is required to fully understand the nature of subsurface archaeological remains within the study area.

Extent Heritage has been engaged by Parramatta City Council to prepare an excavation methodology (Appendix 7). The study area has the potential for contact period archaeology. As a result, the excavations cannot be undertaken in accordance with the Code of Practice (2010) and an Aboriginal Heritage Impact Permit (AHIP) is required to authorise the excavations. The Code of Practice, however, will inform the excavation methodology to ensure best practice.

Two AHIPs exist within the study area (AHIP 4657 and 4825) as these works are an extension of the project undertaken by City of Parramatta for the Alfred Street Pedestrian and Cyclist Bridge Development (directly east of the study area). The works associated with the Queens Wharf Reserve and Noller Parade Active Transport Link do not impact the areas of the existing AHIPs, which are also held by City of Parramatta.

In order to support the application of an AHIP, Extent Heritage has commenced consultation with Aboriginal stakeholders. Consultation has been undertaken in accordance with the Code of Practice and the *Aboriginal Cultural Heritage Consultation Requirements for Proponents*

2010 (DECCW 2010a; the 'Consultation Requirements'). The results of ongoing consultation with Aboriginal stakeholders are outlined in Section 2.

A draft ACHAR and excavation methodology was distributed to Aboriginal stakeholders 17 November 2022. The results and feedback identified during the review will be incorporated into the ACHAR document.

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1. Introduction

1.1 Project description

City of Parramatta Council is proposing to install a cycleway and pedestrian path network as part of the Queens Wharf Reserve and Noller Parade Active Transport Link Project. The objectives of the shared path are to:

- establish an uninterrupted shared path along the foreshore to the tip of Camellia at the confluence of Duck and Parramatta River;
- achieve the aim contained in the NSW Government's Sharing Harbour Access Plan, which is "to improve public access to, and enhance the recreational enjoyment of Sydney and its tributaries for the people of Sydney and visitors to the city"; and
- contribute toward the accomplishment of Council's 'Parramatta Ways' vision by connecting people and places within the LGA with a high quality network of shared paths and provide opportunities for commuting and recreational active travel in quiet, attractive surrounds with quality amenities that will be suitable for any residents from mothers with prams to the elderly.

The proposed development consists of a mix of shared paths, separated (off-road) cycleways and pedestrian paths, and on-street cycleways. Additional design elements include demolition of existing park seating and garden beds, removal of selected trees and new tree planting, installation of improved lighting, minor landscaping works, and minor civil infrastructure.

Extent Heritage has been engaged by the City of Parramatta Council to undertake an Aboriginal Cultural Heritage Assessment Report (ACHAR) in advance of proposed development. The ACHAR would identify any Aboriginal object and places, and cultural heritage values, located within the proposed Active Transport Link project boundary. The results of this assessment will be used to inform the development of a master plan for the proposed mixed-use infrastructure. The ACHAR would also be used to support an Aboriginal Heritage Impact Permit (AHIP), required to authorise investigative excavations necessary to further understand the archaeological potential and significance of the study area.

1.2 Study area

The study area is located on the southern bank of the Parramatta River. The westernmost point of the proposed area reaches just beyond Macquarie Street (Gasworks Bridge) and the eastern most point reaches Alfred Street, Parramatta. This comprises Queens Wharf Reserve and Noller Parade. At present, the study area is a public parkland with a walking path, several mature paperbark trees, Aboriginal art sculptures, and memorials. The reserve forms part of the Parramatta Heritage Walk route.

The study area is located in the Deerubbin Local Aboriginal Land Council (LALC) boundary, Parramatta City Council Local Government Area (LGA), Parish of Saint John, and within the Cumberland County.

The study area comprises all or part of the following land parcels:

- Lot B DP 433896
- Lot 1 DP 69432
- Lot 34 DP 1107897
- Lot 56 DP 1107686
- Lots 1, 2, and 3 DP 1151643
- Lot 1 DP 909045
- Lot 1 DP 128847
- Lot A DP 444716
- Lot A DP 959111
- Lot 1 DP 126881
- Lot 1 DP 224186
- Lots 1, 3 to 11 DP 35895
- SP 46699

Four heritage items are located within the study area (Table 1). However, these items relate to historical archaeology, landscape, and built heritage. As they do not relate to Aboriginal heritage, they are addressed in the Historical Archaeological Assessment (HAA) and Statement of Heritage Impact (SOHI) being undertaken by Extent Heritage for the Queens Wharf and Noller Parade Active Transport Link.

Table 1 Heritage listed items within the study area.

Item Name	Item Number	Item Type
Queen's Wharf Reserve and stone wall and potential archaeological site	Parramatta LEP 2011 I489	Historical archaeological site and built heritage feature
HMAS Parramatta shipwreck and memorials	Parramatta LEP 2011 I01676	Built heritage memorial structure
Gasworks Bridge	Parramatta LEP 2011 I487	Built heritage structure
Wetlands	Parramatta LEP 2011 O735	Landscape

1.3 Authorship

This report was completed by Hannah Morris (Senior Heritage Advisor, Extent Heritage) and Catherine Fenech (Heritage Advisor, Extent Heritage) with review and input from Oliver Macgregor (Principal, Extent Heritage).

Figure 1 The study area

2. Aboriginal consultation

2.1 The process

Consultation has been undertaken in accordance with procedures set out in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW, 2010)*. These guidelines identify a four-stage process of consultation, which includes:

Stage 1: Notification of project proposal and registration of interest

- Pre-Notification – Identification of the Aboriginal parties through contacting various government agencies.
- Notification – Contacting any Aboriginal community organisations identified to determine their interest (if any) in the project. This includes the placement of an advertisement in local print media seeking expressions of interest from Aboriginal community members.

Stage 2: Presentation of information about the proposed project

- Presentation of Project Information – Briefing Registered Aboriginal Parties (RAPs) about the project proposal and scope of the Aboriginal Cultural Heritage Assessment Report (ACHAR). This is usually undertaken through written correspondence and/or an on-site visit and may undergo several iterations through the project lifetime as the nature of the assessment changes (e.g., field survey may lead to a requirement for test excavations).

Stage 3: Gathering information about cultural significance

- Seeking cultural information – Collection of information identifying any known Aboriginal objects of cultural value or places of cultural significance in the study area.
- Consultation protocols – Identification of any protocols that the RAPs would like adopted during the information gathering process, including how sensitive information will be managed.
- Potential impacts and mitigation measures – Discussion of potential impacts to heritage and appropriate mitigation options prior to developing the ACHAR. This is often undertaken onsite at the end of any field program and/or as part of the overall report review phase.

Stage 4: Review of draft Aboriginal cultural heritage assessment report

- Review of draft report – Review of the draft ACHAR by the RAPs, to provide comments on the overall findings, assessment of cultural significance and recommendations for management of Aboriginal heritage within the study area.

The consultation process for this project has two aims. Firstly, it is designed to comply with the Heritage NSW – DPC consultation procedures to obtain and take into consideration comment and feedback input from registered Aboriginal parties regarding our proposed assessment

methodology, our assessment report, and its management recommendations. Secondly, through consultation with knowledge holders, the process seeks to accurately identify any Aboriginal cultural places and values that may be affected by proposed development of the study area.

2.2 This project

2.2.1 Identification of RAPs

Aboriginal community consultation was initiated by Extent Heritage in July 2022. This consultation process was part of an ACHAR for the study area. In accordance with Stage 4.1.2 of the Consultation Requirements, Extent Heritage corresponded with the following organisations to obtain the names of Aboriginal people who may hold cultural knowledge of the study area:

- Greater Sydney Local Land Services
- Parramatta City Council
- Native Title Service Corporation (NTSCorp)
- Parramatta LALC
- Heritage NSW (DPC)
- National Native Title Tribunal
- Office of the Registrar, *Aboriginal Land Rights Act* 1983.

In accordance with Step 4.1.3 of the Consultation Requirements, an advertisement was placed in the *dailytelegraph.com.au* on 27 July 2022 inviting Aboriginal individuals or organisations to register an interest in the project by 10 August 2022. In addition, correspondence was sent to all Aboriginal individuals and organisations identified through the completion of Step 4.1.2 on 28 July 2022, inviting them to register an interest in the project by 12 August 2022. The registration date was extended to 19 August 2022 following feedback from one stakeholder that COVID, the high number of ACHAR consultations being undertaken in Parramatta, and consultation fatigue may cause stakeholders to miss an opportunity to participate in the project. A second opportunity to register for the project was sent on 18 November 2022 as all RAPs on the Heritage NSW list (registered or not) were sent the draft ACHAR and test excavation methodology. Registrations for interest in the project were to be provided by 19 December 2022.

2.2.2 Registration

The consultation process has resulted in the identification of 26 Registered Aboriginal Parties (RAPs) (Table 2).

Table 2: List of Registered Aboriginal Parties.

Organisation	Contact
A1 Indigenous Services	Carolyn Hickey
Aragung Cultural Heritage Site Assessments	James Eastwood
Amanda Hickey Cultural Services	Amanda Hickey
Barraby Cultural Services	Lee Field
Butucarbin Aboriginal Corporation	Jennifer Beale
B.H. Heritage Consultants	Ralph Hampton
Clive Freeman	Clive Freeman
[redacted]	[redacted]
Darug Custodian Aboriginal Corporation	Justine Coplin
Darug Land Observations	Jamie and Anna Workman
Darug Ngurra Aboriginal Corporation	Dirk Schmitt (Joel Tubbs)
Deerubbin LALC	Steve Randall
Dharug Strategic Management Group	Richie Howitt
Didge Ngunawal Clan	Lilly Carroll and Paul Boyd
Freeman & Marx Pty Ltd & Burrabirang	Clive Freeman
Gunjeewong	Shayne Dickson
Gunya Aboriginal Cultural Heritage Services Pty Ltd	Adam Gunther
Kamilaroi Yankuntjatjara Working Group	Phil Khan
Koori Digs	Korri Currell
Merrigarn	Shaun Carroll
Minnamunnung	Aaron Broad
Muragadi	Jesse Johnson
[redacted]	[redacted]
Murra Bidgee Mullangari Aboriginal Corporation	Darleen and Ryan Johnson
Ngambaa Cultural Connections	

Organisation	Contact
Waawaar Awaa Aboriginal Corporation	Rodney Gunther
Widescope Indigenous Group	Donna and Steven Hickey
[redacted]	[redacted]
Woronora Plateau Gundungara Elders Council	Kayla Williamson
Wurrumay	Vicky Slater
Yurrandaali Cultural Services	Bo Field

2.2.3 Draft ACHAR and excavation methodology

The draft ACHAR and associated excavation methodology were sent to the RAPs on 18 December 2022 for review for the mandated twenty-eight-day review period. Responses were received by 29 December 2022 As a result, Requirement 15a of the Code of Practice will been satisfied and the methodology will be developed in consultation with the RAPs.

Five corporations provided feedback presenting support for the draft test excavation methodology:

- [redacted],
- Dide Ngunawal Clan,
- Koor Digs Services,
- Muragadi Heritage Indigenous Corporation, and
- Waawaar Awaa Aboriginal Corporation.

2.2.4 Summary of consultation

A complete log of completed actions and correspondence received during Aboriginal community consultation for the current assessment project will be included in Appendix 2 and summarised in Table 3 (below).

Table 3. Summary of Aboriginal consultation for the project

Consultation stage	Description	Date initiated	Date completed
1	Pre-notification	20 July 2022	26 July 2022
2	Registration of interest (including advertisement in dailytelegraph.com.au on 27 July 2022)	27 July 2022	19 August 2022

Consultation stage	Description	Date initiated	Date completed
3, 4	Review of draft ACHAR and excavation methodology	18 November 2022	19 December 2022
	Field investigation	-	-
4	Final draft ACHAR and draft ATER, including impact and mitigation options	-	-
5	Finalised ACHAR	-	-

3. Existing environment

The study area is located on the Cumberland Plain, an extensive low-lying plain overlying the Bringelly sub-group of the Wianamatta Group shales, with surficial geology dominated by alluvial materials derived from the Wianamatta Group.

These landscapes restrict the occurrence of several archaeological site types, such as rock shelters, rock engravings, and grinding grooves, which require sharp exposed sandstone relief not common in these areas. Surface artefact scatters and buried cultural material are likely to be more prevalent. This has been proved by other archaeological investigations near the study area.

Queens Wharf Reserve is situated on the southern bank of the Parramatta River, a major watercourse and main tributary of Sydney Harbour. The study area is located approximately 19 km west of the harbour mouth, at the estuary junction where the water transitions from saline sea water to brackish.

Soil landscape mapping suggests the eastern part of the study area is located within 'Disturbed Terrain', characterised by extensive deposits of landfill including soil, rock, building and waste material up to a depth of 1 m, and extensively clearing of native vegetation. The western part of the study area has been identified as Birrong soil landscape.

Borehole testing and previous archaeological investigations have determined that the study area lies on a sand sheet comprising aeolian, alluvial, and remnant soil landscapes both sides of the tidal Parramatta River. This sand sheet is variously referred to as the Parramatta Sand Sheet (PSS), Parramatta Sand Body (PSB), or Parramatta Sand Terrace (PST) (this report will refer to the sand profile as PSS).

Historical land disturbance has primarily comprised land clearing, construction of several phases of buildings from the 1820s including a military barracks, flour and cloth mills, benevolent asylum, and gasworks, and acting as the location of several maritime landing sites. More recent ground disturbance has been associated with landscaping and service installation. These disturbances have likely reduced and/or removed upper layers of the PSS and therefore also evidence from the Aboriginal archaeological record.

3.1.1 Bioregion

The Cumberland Plain is an extensive low-lying plain within the Sydney Basin bioregion. The local topography is characterised by level to gently undulating alluvial floodplains adjacent Parramatta River (Chapman et al. 2009).

With a maximum thickness of 300 m, the Wianamatta Group was deposited during the Triassic period (c.251.9–201.3Mya) and includes three major geological units: Ashfield Shale (consisting of laminate and dark grey siltstones), Bringelly Shale (consisting of shale with occasional calcareous claystone, laminate, and infrequent coal) and Minchinbury Sandstone (consisting of fine to medium-grained quartz lithic sandstone) (GAASC 2017; Office of Environment and Heritage [OEH] 2019).

Topographically, the study area is situated on the edge of a terrace overlooking the Parramatta River. It is located on the riverbank and has a gentle slope northward toward the water (1.4% on the western portion of the study area and 3.5% on the eastern portion) (Figure 2).

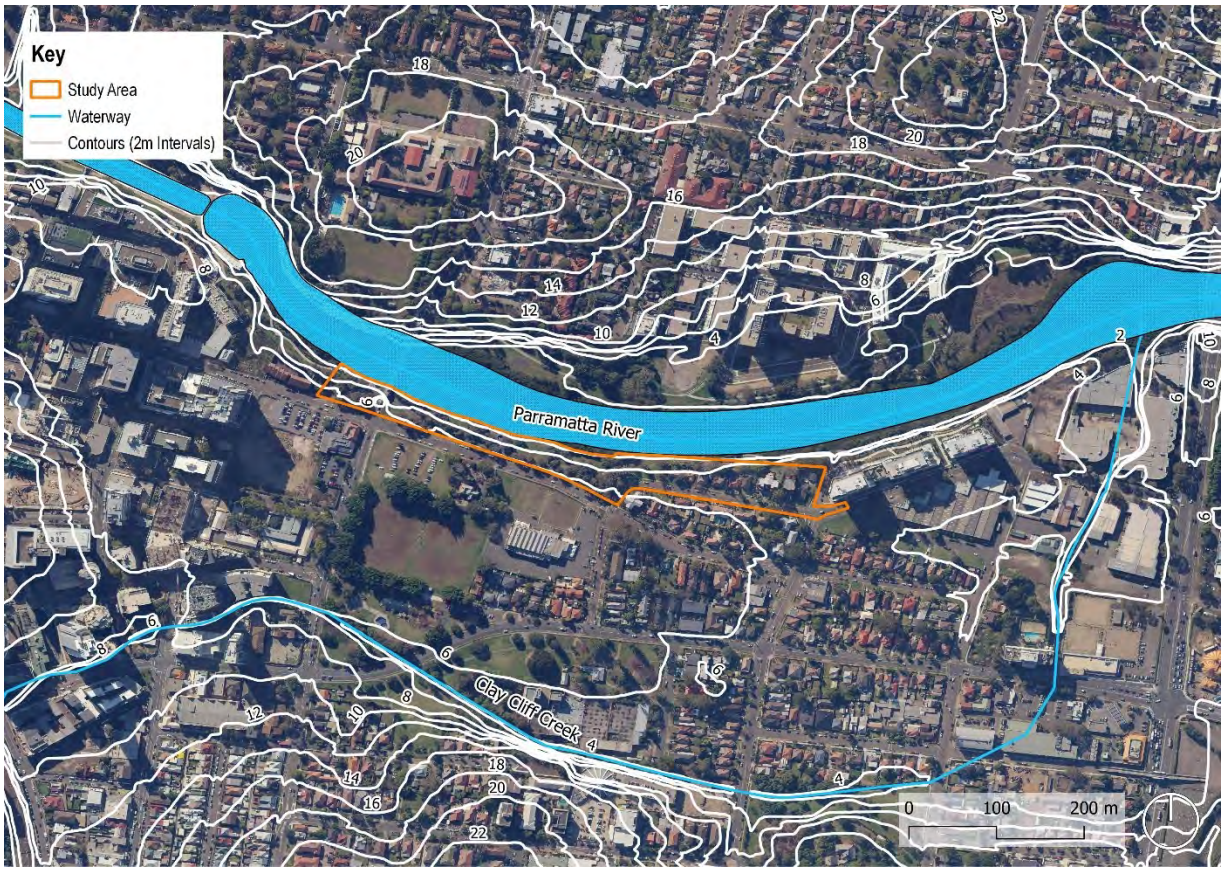

Figure 2 Topography of the study aera and surrounding landscape (source: NSW Planning and Environment).

3.1.2 Soil landscape

Soil landscape mapping of the region by the Soil Conservation Service of NSW (SCSNSW) shows the majority of the study area is located within 'Disturbed Terrain'. As seen in Figure 3, the study also comprises a section of the Birrong landform in the western portion.

Figure 3 Soil landscapes associated with the study area (source: NSW Planning and Environment with Extent Heritage additions 2021).

Disturbed Terrain

Soils within Disturbed Terrain landscapes are characterised by extensive deposits of landfill, including soil, rock, building and waste material up to a depth of 1 m, and have been extensively cleared of their native vegetation (Chapman and Murphy 1989). Areas of Disturbed Terrain often mark locations where reclamation fills were deposited on previous swamps, estuaries, and wetlands. This includes the lower reaches of the Parramatta harbour foreshore. Despite the name, archaeological excavations across Parramatta in areas of Disturbed Terrain have repeatedly shown intact, or partially intact, pre-co lonial soil profiles surviving below more recent fill units.

The topography of areas of Disturbed Terrain is characterised by local relief, commonly less than2 m but occasionally up to 10 m, with levelled slopes of less than 30% gradient (Figure 3). These areas are often landscaped and artificially drained. Geotechnical and archaeological research has been extensive in the Parramatta CBD and its surrounds, and has identified that much of Parramatta is underlain by a deep alluvial and fluvial sand body, the PSS, as well as alluvial clays and muds of Clay Cliff Creek located to the south of the study area.

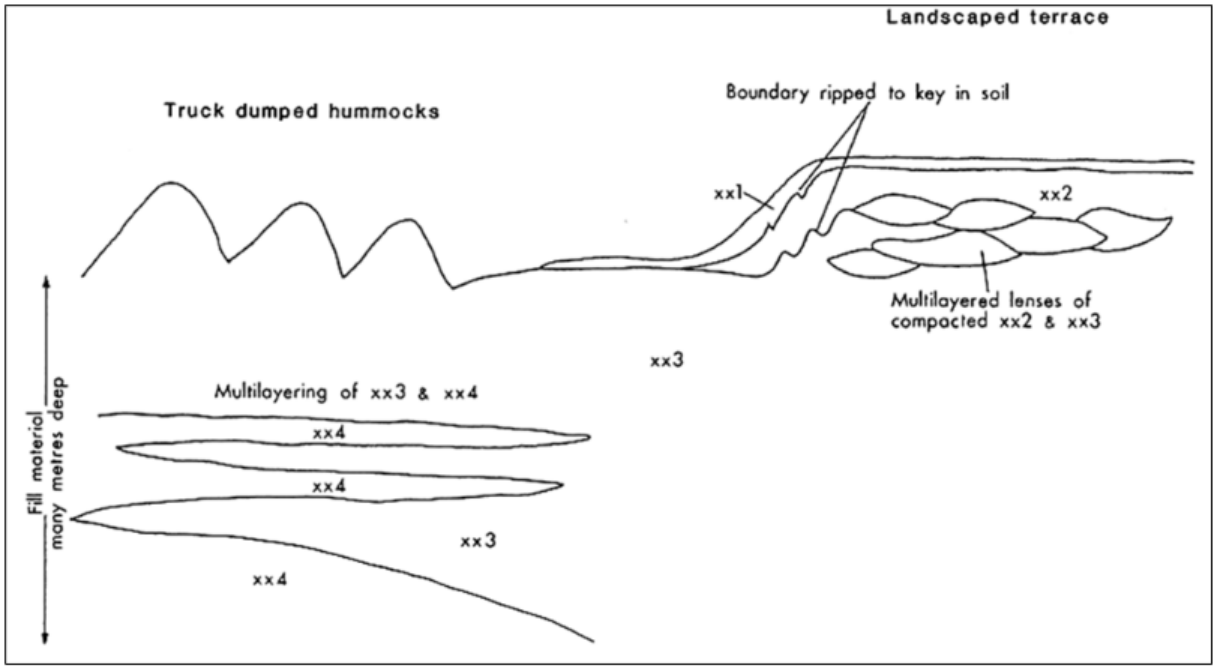

Figure 4 Schematic cross-section of Disturbed Terrain soil landscape illustrating the occurrence and relationship of the dominant soil materials (source: NSW Planning and Environment).

Birrong

The Birrong soil landscape is a fluvial deposit dominated by silt and clay alluvial material. The soil landscape forms the broad concave floodplain of watercourses, draining the Wianamatta Group shales, on the Cumberland lowlands. The dominant soil materials are a dark brown pedal silty clay loam (A1 horizon) with moderately pedal structure and tough ped fabric generally occurring as a topsoil (100-400 mm thick), above a bleached hardsetting clay loam (A2 horizon) with weakly pedal to apedal massive structure that is hardsetting when dry as a subsoil (<350 mm). The transition between the A horizons is sharp. The archaeologically sterile horizon (B horizon) consists of an orange mottled silty clay with moderately pedal structure and smooth-faced dense ped fabric (<100 mm). This B horizon transitions to a second B horizon of light grey mottled salty heavy clay which often overlies bedrock.

The topography of the Birrong landscape is typically level to gently undulating alluvial floodplains, characterised by a local relief to 5 m and slopes of less than 3%. Landfill has occurred in many areas. This is likely to be relevant to the study area where significant reclamation has occurred along the Parramatta River foreshore during the early colonial period.

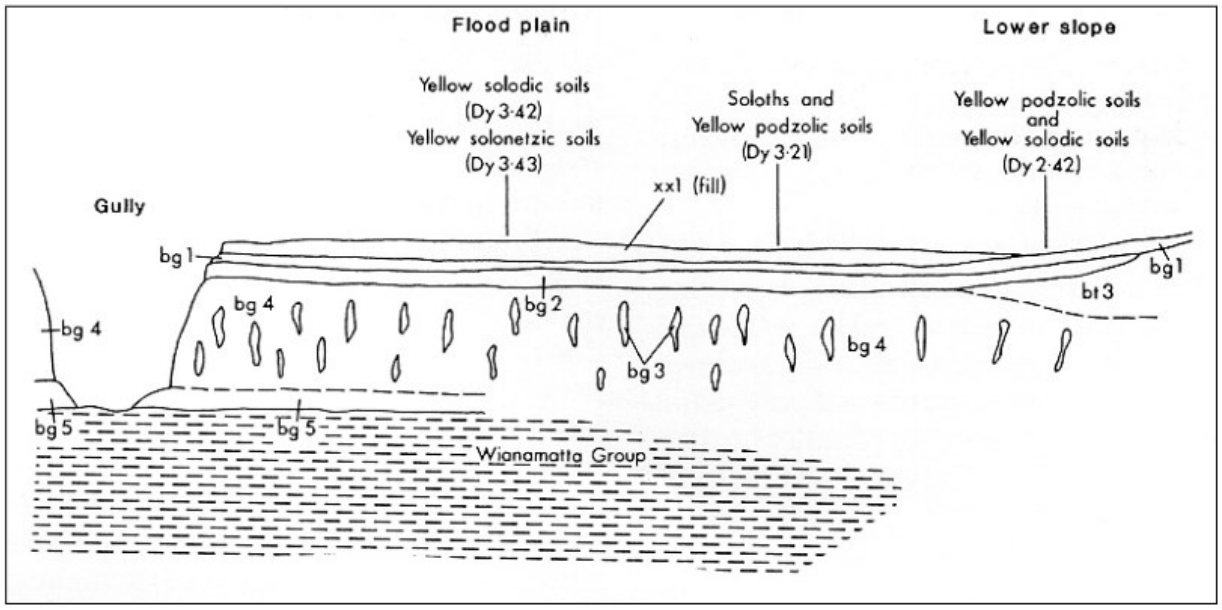

Figure 5 Schematic cross-section of Disturbed Terrain soil landscape illustrating the occurrence and relationship of the dominant soil materials where xx1 comprises fill, bg1 and bg2 comprise the A1 and A2 soil horizons, bg3, bg4, and bg5 comprise the B horizons (source: NSW Planning and Environment).

Parramatta Sand Sheet

The PSS is an alluvial and fluvial sand deposit extending for approximately 2.5 km along the Parramatta River, within a corridor of approximately 200 m from the bank. It is located largely on the south side of the river but with small sections on the north bank. Based on radiocarbon dating, the PSS is thought to have formed approximately 50,000 years ago (JMcDCHM 2005), although OSL dates from different locations across the deposit indicate some areas formed only at the onset of the Last Glacial Maximum (LGM) approximately 20,000 years ago (Extent Heritage 2019, 16). More recent dating of the sand sheet showed Aboriginal presence in Parramatta at 30,000 years ago (McDonald 2007).

In 2008, Peter Mitchell (Groundtruth Consulting) was engaged to investigate the soil profile of Parramatta. The aim was to provide a guide for future development by flagging the likely presence of the PSS and associated Aboriginal archaeology on the sites of future projects. The following methods were utilised to determine areas of PSS: review of historic plans, results of archaeological fieldwork, contours and landscape features, information about other soil materials and mapping of known drains, waterholes, and swamps along the River (Groundtruth Consulting 2008, 2). Archaeological investigations since then have confirmed the extensive and significant presence of the PSS and associated Aboriginal archaeology.

Mitchell noted that Clay Cliff Creek and the Parramatta River were the two streams of most importance. However, according to Mitchell, the PSS is a depositional feature of the river; no significant quantity of sand was ever transported by Clay Cliff Creek (Groundtruth Consulting 2008, 5). The catchment of the Creek would be associated with the Blacktown soil landscape. Later archaeological excavations (eg Hassall Street—AHMS, 2016) have refuted this assessment and found a soil profile similar to the PSS.

The PSS is frequently found to extend to approximately 1 m in depth, although has in places been found present at depths of beyond 3 m, underneath more recent swamp deposits and extensive modern fill (Comber Consultants 2010). The PSS has been determined to be largely situated between ~4 m and 8 m AHD.

Due to the extensive development of Parramatta, Mitchell notes that much of the sandsheet has been destroyed, resulting in an increasing importance of any surviving sections (Groundtruth Consulting 2008, 1). Robin Thomas Reserve (RTR), situated on the opposite side of George Street to the study area, is listed on the NSW State Heritage Register (Listing Number 01863) as an 'Ancient Aboriginal and Early Colonial Landscape' for its location on the PSS. The listing notes that the PSS holds a special significance and tangible link with the cultural past of Aboriginal peoples. Moreover, RTR is marked as a 'Parramatta Sand Body Conservation Area' due to its high sensitivity and potential to contain evidence of pre-contact and early colonial Aboriginal occupation.

3.1.3 Vegetation

Prior to extensive historical vegetation clearance for early industry and modern urbanisation, the region would have been dominated by open and/or wet sclerophyll forest. The Cumberland Plain, and the alluvial sands of Parramatta in particular, are commonly associated with hard-leaved scribbly gum, rough-barked apple, and old man banksia. Creek lines within the Cumberland Plains may possess riparian corridors containing dense bushland that may reflect pre-European vegetation. However, the study area was extensively cleared in the early nineteenth century.

The areas of Disturbed Terrain are associated with opportunistic weeds such as cobbler's peg (*Bidens Pilosa*), purple top (*Verbena bonariensis*), and ribwort (*Plantago lanceolata*). Most areas have been turned into grassland or lawn, typically of the kikuyu (*Pennisetum clandestinum*), couch (*Cynodon dactylon*), and paspalum (*Paspalum dilatatum*) grasses. The areas of Birrong soils are associated with tall open forest and woodland with small relic stands of ironbark (*Eucalyptus paniculate)*, turpentine (*Syncarpia glomulifera)*, and Sydney blue gum (*Eucalyptus saligna*) forest and woodland are present.

3.1.4 Hydrology

The study area is located on the southern bank of the Parramatta River, situated in the western section of the Sydney Metropolitan region. Parramatta is the location where tidal sea water meets the freshwater inland stream, becoming brackish. The freshwater flows into the Parramatta River from the Domain Creek, the Darling Mills Creek, and the Toongabbie Creek and is met by salt tides from Sydney Harbour.

Classified as a drowned valley, this estuary is the largest tributary of Sydney Harbour. The Parramatta River catchment area covers 252.4 square kilometres, with 13.7 square kilometres of estuary. The estuary extends from Parramatta to Clarks Point (Woolwich) in the north and Yarilbin Point (Birchgrove) in the south. The average depth of the river is 5.1 m, with an average tidal ebb and flow of just over 1.5 m. The river is tidal up to the Charles Street Weir, 300 m upstream of the study area.

The study area is approximately 330 m west of the confluence between Clay Cliff Creek and the Parramatta River (Figure 6-Figure 7). Clay Cliff Creek deposited fresh water into a lagoon that was situated approximately 115 m south of the study area, within the fields of Robin Thomas Reserve. The lagoon was quite large, measuring approximately 25 m wide and 90 m long. This lagoon is no longer present. Groundtruth (2011) geotechnical investigations and historic aerials show that Clay Cliff Creek was diverted and capped sometime during the 1880s. Where the Parramatta River was brackish to saline, the creek and lagoon would have provided an important source of fresh water to the local Aboriginal people.

The study area is bordered to the north by the Parramatta River and to the south by Clay Cliff Creek, forming a resource-dense pocket of land.

Figure 6 Association of the original alignment of Clay Cliff Creek and the Parramatta River.

Figure 7 Waterways associated with the study area, including original alignment of Clay Cliff Creek.

3.1 Historical land use and disturbance

The Queens Wharf Reserve has been subject to intense development from 1788 to present, primarily involving military structures and industrial development. In 1790, the first public wharf was constructed, along with military barracks and grain store complexes. A second wharf was constructed in in 1808. In 1825, a larger Commissariat store is built just behind the stone store. Within three years of its construction the Commissariat store is converted to a military barracks.

In 1823, Howell's wind and water mill was established along the Parramatta River. This structure included the damming of the river along a natural rock formation below the modern Gasworks Bridge and was flanked to the east by affiliated buildings by the 1830s. By the 1840s, substantial structures extended from the mill to within meters of the public wharf along the George Street frontage.

In 1834-1835, the Lennox Wall (a large stone wharf) was constructed to the east of the 1808 wharf. During the 1840s, Byrnes steam flour mill was established along the river. In 1870, Howell's mill was demolished in favour of the Gasworks, including the destruction of Howell's Dam sometime between 1870-1877. The Gasworks itself was constructed between 1872-1873 with the addition of the Gasworks Bridge in 1881. Between 1883-1884, a tramline was established in the area. In the 1960s, Parramatta City Council upgraded the area to public parklands.

This intense historical development of the study area has included a range of ground impacts and disturbances including construction, demolition, service installation, vegetation clearance and planting, and landscaping. The foreshore was also built up with reclamation fills to enable construction on the riverbank.

Based on an understanding of these developments and archaeological investigations in the vicinity of the study area, it is highly likely that the upper natural soil profile was removed or heavily disturbed during the historical period. As a result, surface and shallow subsurface Aboriginal objects will have been removed or moved from their original context. Due to the depth of the PSS within the study area, there is a potential for Aboriginal objects to remain in situ. Redeposited natural sands and historical archaeological contexts may also possess Aboriginal objects.

4. Ethnographic record

Aboriginal people organised into various ethnolinguistic and territorial groups have occupied the Sydney region for thousands of years. This is a land rich with traditional customs, laws, beliefs, and values. This section provides a summary of Aboriginal history in the study area prior to, at, and shortly after, British invasion. Early colonial records, Aboriginal cultural knowledge, and oral histories have assisted in identifying characteristics of Aboriginal culture, activities, and land use in and around the study area prior to the displacement of local Aboriginal communities in the early nineteenth century.

From an archaeological perspective, Aboriginal peoples have inhabited the Sydney Basin for at least 45,000 years.

The Aboriginal population of the region, comprising several large linguistic groups consisting of smaller clans, is estimated to be between 5,000 and 8,000 individuals prior to British invasion.

The traditional lands of Parramatta belonged to the Burramattagal/Boromedegal people who spoke a dialect belonging to the Darug language group. Their land corresponds roughly with the upper reaches of the Parramatta River, and their descendants maintain a strong connection to the area today.

The Parramatta River and its tributaries, estuaries, and mangrove swamps formed critical resources for Burramattagal communities. The river itself provided a reliable supply of fresh water, as well as freshwater and estuarine fish, crayfish, mangrove crabs, and cobra (toredo) worms. Terrestrial animals from the surrounding open forest were drawn to the water and were hunted for food. Important plants and animals were also found in mangrove wetlands and the river's fertile floodplains, providing medicines, fibres, vitamins, and other food staples.

British invasion had a devastating and lasting impact on Aboriginal communities. While there were positive engagements on the early frontier such as the development of an incipient fish trade in Parramatta town, a combination of disease, dispossession, and violence (both state-sanctioned and unofficial) led to the deaths of many Aboriginal people and destroyed traditional ways of life.

4.1.1 Aboriginal social organisation

Aboriginal people have been in Australia since the beginning of the Dreaming. They have been here from the start of time and came from the land. From an archaeological perspective, Aboriginal communities have lived in the area known as NSW for at least 45,000 years (NPWS 2003, 14). To date, at least thirty-eight Aboriginal language groups have been identified within NSW (NPWS 2003, 14). Examples of these broader cultural-linguistic groups in NSW include the Darug (alternative spellings include 'Dharug,' 'Dharuk' and 'Dharook'), Darkinjung, Gandangara (also spelled as 'Gundungarra'), Tharawal (also referred to as 'Dharawal'), Kuringai and Awabakal (Attenbrow 2010, 23, 32). Each group had their own territory, practices, diet, dress, and dialects. Since the 1970s, archaeologists and anthropologists working in the Sydney region have largely adopted the nomenclature for cultural-linguistic groups compiled by Capell (1970) and amended by Eades (1976) (Attenbrow 2010). On the basis of this research, the study area is considered to have been occupied by Darug-speaking groups. Within this language group, the Parramatta area was the territorial lands of the Boromedegal (also spelt 'Burramattagal', 'Boora me di-gal', 'Booramedegal' and 'Burramedigal') clan, who spoke a dialect of the Darug linguistic group.

In 1788, the Aboriginal population for the Sydney region was estimated to be between 5,000 and 8,000 people, of which about 2,000 comprised of inland Darug communities. Of the inland Darug community, about 1,000 people were estimated to live between Parramatta and the Blue Mountains and about 1,000 between what are now Liverpool and Campbelltown (Murray and White 1988).

The Darug people are generally thought to have lived in smaller groups of around fifty members each. Each group retained its own hunting district and moved through Country seasonally (Murray and White 1988). The inland groups, in particular, are thought to have moved more often according to the season, with summer attracting large numbers of clans to the land around the Nepean and Hawkesbury Rivers, and winter dispersing these clans over the plain and into the mountains (Kohen and Lampert 1987, 357). As such, these groups frequently converged with others to trade, hunt, fight, feast, arrange marriages, resolve disputes, and share information (AHMS 2014b, 18). Recorded examples of interactions between different Aboriginal groups include a gathering of three clans on their way to Camden to learn a new song (Backhouse 1843), Burramattagal people venturing out to Manly to feast on a beached whale (Tench 1979) and groups of hunters near Carabeely cooperating on a large-scale kangaroo hunt (Barrallier 1897).

4.1.2 The Darug language

The Darug language group was the largest of the Aboriginal language groups in the Sydney region, although it is uncertain if this was the actual name which its clans used to refer to themselves prior to European settlement (NPWS 2003, 188). The Darug themselves are part of a larger language group that originally extended from the eastern suburbs of Sydney as far south as La Perouse, west as far as Bathurst and north as far as the Hawkesbury River (Eades 1976). Some historical maps also indicate a distinction between the Darug with the coastal Darug people comprising the Guringai people and possibly the 'Eora' group as well (e.g., Capell 1970; Kohen 1993; Ross 1988).

Most of our knowledge of the Darug language group comes from the work of pioneer anthropologist Robert Hamilton Mathews who produced 'Dharruk' word/vocabulary lists 'from the lips of old natives acquainted with the language' at Windsor in the early twentieth century (Mathews and Everitt 1900). The Darug language group consists of two dialects; one was used in the region east of Parramatta and between Sydney Harbour and Botany Bay, while the other is spoken in the west around the Hawkesbury, Blue Mountains, and Nepean (also known as 'Muru Murak' or 'Mountain Pathway') districts (NPWS 2003, 188–189; Murray and White 1988). A third group to the north of Sydney Harbour speaks the Kuringai language, while the Tharawal language region covers the south from Botany to Jervis bays (Murray and White 1988; Murray and White 1988).

The dialects of the Darug language are complex with a rich vocabulary and grammar complete with numerous tenses (NPWS 2003, 189). Significantly, the Australian English vocabulary reflects the influence of Darug people and culture of the Sydney Basin in the incorporation of words such as boomerang, corroboree, dingo, koala, kookaburra, wallaby, and the bush call 'coo-ee' which are derived from Darug languages (NPWS 2003, 189).

4.1.3 Aboriginal use of the environment

The coast of the Sydney Basin Bioregion (as well as that of the other coastal bioregions in NSW), offered a variety of environments between the sea and the ranges that were used by the Aboriginal people of the area (NPWS 1980). The range of environments had a profound influence of the lives of the Sydney Basin Aboriginal communities (NPWS 2003, 189). As hunters and gatherers, these communities were reliant on the natural environment which affected population size, social interactions, and degree of mobility of each group (NPWS 1980). Around Sydney itself, food availability—especially fish and shellfish gathered from the sea—changed seasonally and was more reliable in summer than in winter (NPWS 2003, 189). Further inland, Aboriginal communities relied on possum, vegetable roots, seeds, and berries as well as mullet, eel, and kangaroo for sustenance (Murray and White 1988).

In Darug country, typical dwellings were two-sided bark tents (known as 'gunyahs' throughout NSW), while sandstone rock shelters were used in harsh weather if they were available (NPWS 2003, 189). In the map of NSW drawn by William Dawes in March 1791, some 'native hunting huts' were observed to be present on an area of 'tolerably good country' somewhere in Camden near present-day Catherine Field. Collins (1798) described how shelters were made of pieces of bark laid together over a framework of timber to form a low-lying, hut-like shelter that was large enough to hold eight people. According to Tench each hut was:

> '… *nothing more than a large piece of bark, bent in the middle and open at both ends, exactly resembling two cards set up to form an acute angle.*' (Tench 1996, 112)

In addition to providing bark for dwellings, trees were an important source of bark and timber for a range of material culture including tools, weapons, and vessels. Canoes were used for accessing the major waterways of the Cumberland Plain for hunting and fishing activities. Tench (1996, 112) observed that the canoes used by the inland clans 'differed in no wise from those found on the seacoast'.

The typical Aboriginal tool kit on the Cumberland Plain was observed to comprise stone flakes, ground stone axes, hatchets, spears, clubs, and bowls (Tench 1961). Stone tool technology on the Cumberland Plain appears to be dominated by the edge-ground hatchet made of basalt pebbles recovered from the bed of the Nepean, ground on sandstone outcrops and hafted to a wooden handle with grass-tree resin or native beeswax (Kohen and Lampert 1987, 358). These hatchets were used to cut footholds in trees for climbing hunters, and to enlarge the base of a hollow tree so that fires could be lit to drive possums from their nests (Kohen and Lampert 1987, 358). Unlike the spears used by the coastal clans, however, the inland clans barbed their spears with stone instead of shell (Kohen and Lampert 1987, 356-357). Flaked chert from gravels recovered from the Nepean River were also hafted on the end of spear throwers to be used as chisels (Kohen and Lampert 1987, 360). Red and yellow silcretes along South and Eastern Creeks, in particular, were used as the material for both barbs and chisels by the inland clans (Kohen and Lampert 1987, 360).

A range of animals were a critical source of food and materials. Skin cloaks were made using possum and kangaroo fur (Kohen and Lampert 1987, 357). Darug men were generally responsible for hunting possums, fish, birds, and kangaroo, and often collaborated with other bands to hunt and eat the larger animals. The Darug were also known to have set traps and snares for quail and possums as well as dig pit traps for other small mammals (Kohen and Lampert 1987, 358). Fish traps were built along rivers and creeks so that mullet and bass could be speared easily with a multipronged fishing spear, similar to that used on the coast (Kohen and Lampert 1987, 358). Other animals that were hunted by the Darug included the platypus, bats, yabbies, freshwater mussels, tortoises, and various water birds (Kohen and Lampert 1987, 358).

The staple diet of the Darug clans also consisted largely of yams gathered by the women and children with digging sticks (Kohen and Lampert 1987, 357-358; NPWS 2003, 189). The wild yam was so significant to the Darug that they adopted it as the name for themselves (Yarrow) (Attenbrow 2002, 31; Pascoe 2014, 26), although, the term ‘Darug’ (a wild yam) was only applied to the language group after 1870 (Attenbrow 2002, 31).The banks along the Nepean River were often submerged by floodwaters which produced a rich soil that allowed these yams to grow in abundance (Kohen and Lampert 1987, 357-358). Another plant food, the ‘burrawang’ (*Macrozamia communis*) and a smaller species of macrozamia were also gathered by the Darug (Kohen and Lampert 1987, 357).

4.1.4 Aboriginal fire regimes

The first Australians were also known as the ‘fire-makers’ (Cox 1815) as they used fire for a wide variety of activities, including to open paths, to ‘clean’ the country, drive animals into the paths of hunters, and cook the kill thereafter. They also used fire to keep warm at night and carry as a torch the next day, treat wood, melt resin, and crack stone for tools as well as for gatherings to dance and share stories around it.

The presence of fire was noted almost immediately by colonists who arrived Sydney, from the moving lights seen on the harbour at night (Banks 1998, 243) to lone trees burning on the Cumberland Plain, ‘the smoke issuing out of the top part as through a chimney’ (White 1790). ‘In all the country thro’ which I have passed,’ wrote Governor Arthur Phillip in May 1788, ‘I have

seldom gone a quarter of a mile without seeing trees which appear to have been destroyed by fire' (Phillip 1914).

Historical sources also provided an insight into local burning regimes by Aboriginal communities during the colonial period. On a hot dry day in September 1790, Collins (1798) observed Aboriginal people 'burning the grass on the north shore opposite to Sydney, in order to catch rats and other animals'. Almost exactly twelve months later, on 31 August 1791, they were 'firing the country' again in the same place on a hot day ahead of heavy rains. While Collins (1798) regarded this to be a 'remarkable coincidence', this practice suggests a connection to the land and an understanding of the seasons which the settlers could not fathom. This dismissive attitude would prove devastating to the colony during the 1799 flood of the Hawkesbury River. Settlers who ignored the flood warnings given by Aboriginal people were engulfed by a destructive torrent as the 'river swell[ed]' to more than fifty feet perpendicular height above its common level' (Collins 1798, Appendix VI).

4.1.5 The 1789 smallpox epidemic

The landscape was criss-crossed with Aboriginal paths, many of which were later utilised by Europeans moving across the land. The same paths that wove these Aboriginal communities together, however, also spread the smallpox virus throughout NSW in 1789. In particular, the devastating outbreak of smallpox forced major reorganisations amongst clan groups. When William Bradley sailed into Sydney in May 1789, he recorded the 'dreadful havoc' that smallpox had wrought amongst Aboriginal peoples, stating that 'we did not see a Canoe or a Native the whole way coming up the Harbour and were told that scarce any had been seen lately except laying dead in and about their miserable habitations' (Bradley 1969). Traditional burial practices broke down and clans merged as entire communities were taken by the virus (Hunter 1793). Bodies were found in caves and by streams, around the harbour and all along 'the path between Port Jackson & Broken Bay' (Bradley 1969). The impact of smallpox continued to ripple across the country, reducing communities in the Hunter 'from about 200, to 60' (Backhouse 1843, 401).

4.2 The study area

4.2.1 Burramattagal/Boromedegal

The Parramatta CBD (about 1.3 km to the west of the study area) is presently thought to have been the territorial lands of the Boromedegal (also spelt 'Burramattagal', 'Boora me di-gal', 'Booramedegal' and 'Burramedigal') clan at the time of European settlement (Heritage NSW – DPC n.d.) based on the extant ethnographic record (Attenbrow 2002, 24; Kohen 1986, 65; 1993, 21). The words 'Burramutta' and 'Parramatta' appear to have been similar, if not the same words; there being only one sound in Aboriginal language for European equivalents of 'B' & 'P', and 'D' and 'T' (Tench 1979, 239).

'Burramutta' translates as either 'the head of the river' or 'the place where eels lie down'. The term 'Burramattugal', with the masculine suffix 'gal', refers to the people—specifically the men—who lived in the Parramatta region (Collins 1975, 453; Kass et al. 1996, 5–6; Tench 1979, 292). The Burramattugalclan also appear to have belonged to a larger cultural group that extended

across western Sydney, although exact affiliations of pre-contact groups in Parramatta remain open to debate (Heritage NSW – DPC n.d.).

4.2.2 Subsistence

The Parramatta area supported a range of environments that supported a diverse range of plant and animal species. The Parramatta River provided a reliable supply of freshwater and estuarine fish, crayfish, mangrove crabs, and cobra (toredo) worms. Terrestrial animals from the surrounding open forest would have been drawn to the water and where they were hunted. Several tree species present in the district were also important sources of bark that could be used in the construction of shelters, canoes, and twine. Medicines, fibres, vitamins, and other food staples could also be obtained from gathering plants and hunting animals in mangrove wetlands and the river's fertile floodplains. The abundance and intersection of diverse resources at Parramatta made this area a particularly attractive location for Aboriginal occupation and use.

Kangaroos, wallabies, possums, sugar gliders, bandicoots, wombats, echidnas, fruit bats (flying foxes) and other smaller mammals were amongst the wide range of land animals that inhabited the Sydney region and hence, available for hunting to both coastal and hinterland Darug communities. Since most Australian land animals are not migratory, their availability and abundance do not vary markedly across the seasons (Attenbrow 2010, 70). Darug men were responsible for hunting possums, fish, birds, and kangaroo, and often collaborated with other bands to hunt and eat the larger animals. Fire was also used to reduce undergrowth and to catch game (NPWS 2003, 189). Food was cooked lightly on open fires or in ovens beneath the ground (NPWS 2003, 189).

Many food sources—such as birds and their eggs, tree dwelling mammals, and honey from native bees—were also collected from climbing trees using footholds cut into the trunks with a stone axe. Two significant Aboriginal men from the Sydney region, Colebee and Ballederry (who lived in Parramatta), called these individuals the 'climbers of trees' after their practice of skilfully ascending gums in pursuit of animals (Tench 1793, 126).

Shellfish were a significant dietary component of Darug people who had access to the coast and estuaries. Archaeological evidence from shell middens in the upper estuarine reaches of the Parramatta River indicates that the shellfish procured by Aborigines in this locale included rock oysters and cockles and, to a lesser extent, Hercules whelks, mud oysters, spiny oysters, winks, and horn shells (Attenbrow 2010, 67). While there is little direct archaeological evidence of the utilisation of shellfish in the immediate Parramatta area, it is known that shellfish middens once existed at various riverside locations along the length of the Parramatta River. 'Numerous shell middens along the river' were observed by the writer Levy (1947) in the early twentieth century at Homebush and Shepperds Bay to the east of Parramatta.

Aboriginal fishing methods are known to have been varied and included line fishing from bark canoes, spear fishing in the shallow waters and utilising nets, traps, and fish poisons (Figure 8). A greater number and variety of fish than are present today were known to have been present along the upper Parramatta River at the time of contact. Collins (1798) noted that Aboriginal people in the Sydney region caught bream and mullet. Other types of fish that were probably present in the river include mulloway, flathead, estuary perch, bass, and whiting (Attenbrow

2010, 69). Eels appear to have been another significant riverine resource and were procured with both pronged spears and hollow log eel traps (Kass et al. 1996).

Figure 8. Sketch by Joseph Lycett of two Aboriginal men spearing eels, c. 1817. Source: National Library of Australia, PIC MSR 12/1/4, http://nla.gov.au/nla.obj-138499671.

Darug women used digging sticks to harvest yams, a staple food for their communities (NPWS 2003, 189). Starchy tubers and roots, bush fruits and native seeds were frequently consumed. Certain plant foods—such as the black bean and cunjevoi plants along with some varieties of wild yam (*Dioscorea* sp.) were unpalatable or toxic in their natural state and required complex processing before consumption. Tench (1793, 83) described how 'a poor convict' became violently ill after eating a poisonous yam. Having seen the Darug people eating the same yam, he concluded that the Darug had a way of preparing them to render them an 'innocent food' (Tench 1793, 83). To combat their toxicity, these foods were typically roasted in ashes, open fires, or earth ovens, before being pounded and baked into cakes, grated, peeled, or sliced using bone, stone, and shell implements. They were then leached for lengthy periods of time in water (Beck 1985, 107, 211).

Much of the material evidence of traditional Aboriginal life was removed from the ground surface through historical actions undertaken in the early years of British occupation. Middens were excavated by settlers to provide lime for mortar in early colonial buildings, aggregate for paths, and a calcium-rich addition to poultry feed. Most of the disturbance of shell middens occurred in areas of the river close to settlement building activity such as Parramatta and Sydney.

4.2.3 Use of the environment

Social organisation and territory were also determined by resources, especially those associated with fresh or salt water. As a result, Aboriginal people in NSW were considered either saltwater people of the coastal clans, or freshwater people of inland clans. The Burramattagal, the protectors of Parramatta, were in a unique location where fresh and salt water met.

Burramattagal translates to 'place where the eels lie down' to breed. The eel is also a unique animal as it can move on land, and through both fresh and salt water. Jules Christian, a Burramattagal Woman, described the subsistence of the region through the eel totem:

> The eel has 'the ability to swim in freshwater then transition with ease into the saltwater of the ocean. The eels ability to work its way out of the water onto grassy land areas, climb over and under concrete barriers, stands in contrast to fish that are either just fresh water, or salt water variety, and definitely cannot live without water' (Garland Magazine 2021).

As the eel is a spiritual totemic, it is generally not eaten by the Burramattagal people who instead relied heavily a wide variety of fish. Fresh species caught further up the Parramatta River included flathead and perch, brackish species including Australian Bass and Luderick, and marine species including bream, mulloway, and whiting. Rich estuarine environments also provided nesting opportunities for herons, cormorants, and some native duck species, offering both game and seasonal eggs. The upper fresh waters also drew in terrestrial resources such as kangaroo, wallaby, and possum. The rich riverbed soils support many plant species, most notably the yams.

4.2.4 Early interactions and acts of resistance

The arrival of Europeans to the country of the Darug people in 1788 had swift and often devastating effects on the Aboriginal population of the Sydney Basin (NPWS 2003, 189). The impact was so rapid that many records and stories of the Darug communities were lost in the early years of colonization (NPWS 2003, 189). Violence and the destructive effects of a smallpox epidemic in 1789 wiped out most of the coastal people and the inland Dharug communities around the Hawkesbury-Nepean area (NPWS 2003, 189).

Prior to the frontier wars, a short-lived fish trade sprang up in Parramatta with Aboriginal people selling fresh bream and mullet for bread and salted meat (Collins 1798). As Collins (1798) documented sometime in June 1791:

> Since the establishment of that familiar intercourse which now subsisted between us and the natives, several of them had found it their interest to sell or exchange fish among the people at Parramatta; they being contented to receive a small quantity of either bread or salt meat in barter for mullet, bream, and other fish. To the officers who resided there this proved a great convenience, and they encouraged the natives to visit them as often as they could bring them fish.

In a sign of things to come, this incipient trade was brought to an abrupt end when a convict destroyed a canoe belonging to one of the Aboriginal fish traders (Collins 1798). This triggered a reprisal attack by members of the local Aboriginal community on another convict which

eventually led to the cessation of the fish trade and of friendly relations between the settlement and Aboriginal community in Parramatta (Collins 1798).

Just a month earlier, Collins (1798) documented another conflict between the settlers and an Aboriginal party 'of the tribe inhabiting the woods' who were seen 'coming out of a hut at the middle of the settlement, dressed in such clothing as they found there, and taking with them a quantity of corn in nets' (Collins 1798). A member of the Aboriginal party was shot by a settler, who:

> perceiving one of them preparing to throw a spear at him, he levelled his piece, which was loaded with small shot, and fired at him. The native instantly dropped his spear, and the whole party ran away, leaving behind them the nets with the corn, some blankets, and one or two spears. It was supposed that the native was wounded.

In response, a convict who was employed to dig a well at Prospect Hill was allegedly 'murdered, or rather butchered' by the same Aboriginal party. This was 'probably in revenge for the shot that was fired' at them (Collins 1798).

In spite of hardships, the settlement at Parramatta remained a site of significant interaction and engagement between the European settlers and Aboriginal communities well into the early nineteenth century. Initiated by Governor Major General Lachlan Macquarie in 1814, a series of annual general meetings or 'Congress of Meeting of the Natives inhabiting the Country lying between the Blue Mountains and Port Jackson' was held on 28 December each year (Macquarie 1917b) until 1821 (when Major General Thomas Brisbane succeeded Macquarie as the governor). Aboriginal clans were also known to have come 'not less than one Hundred Miles' to attend Governor Macquarie's 'Annual Meeting of the Natives' at Parramatta (Macquarie 1917a, 95) (Figure 9).

Several propositions were made to the Aboriginal communities during these meetings, including the abandonment of their hunting and gathering lifestyle to become 'regular settlers' as well as sending their children to school (Macquarie 1917b). The 'Native Institution for Educating and Civilizing the Children of the Aborigines' was hence established in Parramatta (formerly located next to St. John's Anglican Cathedral Church) and operated between 1814 and 1820. While Macquarie (1917b) portrayed the institution as a great success, other accounts describe low levels of student enrolment from the resistance of Aboriginal parents to send their children to school (Brook and Kohen 1991, 86). William Shelley, the first superintendent and principal instructor of the Parramatta institution, noted the reluctance of Aboriginal parents to give up their children in 1815 and Yarramundi (the son of Gombeeree, the Darug elder who met Captain Philip in 1791), spoke of the fear of 'men in black clothes' taking the children to the institution in 1818 (Brook and Kohen 1991, 263).

Figure 9. Augustus Earle c. 1826 'The annual meeting of the native tribes at Parramatta, New South Wales'. Note the Old Kings School building in the background, on top of the hill. Source: National Library of Australia, http://nla.gov.au/nla.obj-134502097.

Those who survived the 1789 epidemic (which decimated much of the Darug population), as well as subsequent disease, violence, and dispossession of their country, went on living on the fringes of European settlements (Murray and White 1988). In some cases, they continued hunting on estates which were formerly their Country, supplementing these resources with those from the European settlers (NPWS 2003, 189).

4.2.5 Pemulwuy

The Aboriginal warrior named Pemulwuy (c.1750–1802) belonged to a tribe that resided in the Botany Bay area and was a leader of the resistance against European occupation. In 1792, Pemulwuy began participating in several raids against European settlers in the Sydney region. In 1797, he led a party of Aboriginal warriors, against a group upwards of a hundred armed settlers, during what is now known as the 'Battle of Parramatta' (Collins 1798).

While the precise location of this battle remains unknown, description of the event indicates that an Aboriginal raiding party was pursued by settlers to the outskirts of Parramatta after repeated attacks on the northern farms (Collins 1798). After the settlers entered the town, they were followed by Pemulwuy and a 'large body of natives' which initiated an exchange of thrown spears and musket fire (Collins 1798).

Sustaining severe injuries to the head and body from musket round, Pemulwuy was taken to Parramatta Hospital (on Marsden Street, in what is now known as the Parramatta Justice

Precinct) (Collins 1798). Pemulway escaped with an iron around his leg and was later encountered on the lower reaches of the Georges River near Botany Bay, having recovered from his wounds (Collins 1798).

Pemulwuy was eventually outlawed by Governor King with a price of 20 gallons of spirit placed on his head (Kass et al. 1996, 49). He continued his campaign of resistance until 1802 when he was killed in an ambush. Following his death, Pemulwuy's son, Tedbury, continued his father's campaign in the Sydney and Parramatta districts. Tedbury was captured in 1805 but freed later that year. Active Aboriginal resistance in the Parramatta area during the early nineteenth century largely came to an end following Tedbury's death in 1810 (Kass et al. 1996).

4.2.6 Parramatta Native Institute

The Parramatta Native Institute was established by Governor Lachlan Macquarie in December 1814, and was run by William Shelly, a Christian missionary. The institution was intended to provide education for Aboriginal children, whilst also operating as a children's home and asylum. One student of note is Maria Lock, daughter of Yarramundi of the Boorooberongal clan of the Darug. Maria was one of the fist Aboriginal people to claim a land grant and is remembered as a matriarch of the Darug people of western Sydney.

This Institution is significant as the first school dedicated to Aboriginal children in New South Wales. The Institution was short lived in Parramatta, moving to Blacktown in 1823 where it operated until its closing in 1833. The Institution aimed to instill a diligent subservience amongst pupils as this was thought to be desirable among lower classes. The practice of removing Aboriginal children from their families under the pretense of education occurred at the Native Institution and is an important precursor to the policies which led to the stolen generations.

4.2.7 Post-contact

Many traditional Aboriginal groups had already broken up and scattered or re-aligned themselves into new groups by the time they were documented by colonial diarists, missionaries, and early British visitors to the area. The various Aboriginal 'tribes' referred to by colonists in the nineteenth century, were the result of major post-contact social re-organisation. The displacement and dislocation of Aboriginal communities from their traditional lands forced remnant Aboriginal bands to merge in order 'to provide mutual protection and to maintain viable social and economic units' (Attenbrow 2010; Kohen 1986). It has since been suggested that pre-contact clans and bands no longer existed as identifiable groups as early as the 1820s (Attenbrow 2010).

Aboriginal people who remained in the Sydney Basin in the early-to-mid-1800s tended to live on the fringes of colonial society and became increasingly dependent on welfare. Government allocations of blankets and slop clothing, and the bartering of fish and game for sugar, flour and alcohol also reflect the changes that occurred in Aboriginal culture and lifestyle. These changes were replicated throughout greater Sydney, including the Parramatta district.

The 1828 Census recorded the 'Parramatta Tribe' as comprising forty-nine people. Blanket Returns for the Parramatta District dating to the 1830s and 1840s, however, make no mention of a distinct 'Parramatta Tribe'. The records do note groups from Duck River, Prospect, Eastern

Creek, and Kissing Point visiting Parramatta to collect blankets (Colonial Secretaries Correspondence: Special Bundles (Aborigines) Reel 3076, SR NSW). The available historical records are largely silent on the presence and activities of Aboriginal people at Parramatta by the 1850s. It is likely that many Aboriginal people in this region had moved away or 'assimilated' into the developing European social, economic and religious fabric by this time.

4.3 Contemporary connections

Western Sydney has the largest Aboriginal and Torres Strait Islander population of any region in Australia. Within the Parramatta community there are several active Dharug organisations and advisory committees. City of Parramatta Council actively aims to provide a platform for First Nations peoples through the First Nations Advisory Committee. Membership to the committee is open to all First Nations residents of Parramatta and allows their voices to be heard on strategic matters, council projects, and other local issues.

Continued connection to country is evident through the presentation of Aboriginal history at the annual Eel Festival. Every March the community gathers to celebrate the Parramatta namesake and its significance to the Barramuttagal people, who would traditionally gather in autumn to trade goods while sharing stories and meals. The Eel Festival is hosted at Elisabeth Farm and includes Welcome to Country, smoking ceremony, corroboree, and performances, among yarning circle, classes in weaving, and Darug language workshops.

A number of events and celebrations are also held during NAIDOC week in July, including the Barramattagul Fun Day, to celebrate the history, culture and achievements of members of the Aboriginal and Torres Strait Islander community.

4.4 Information provided by RAPs

This section will be updated after further consultation.

5. Archaeological record

5.1 Summary of archaeological findings

- Geotechnical investigations and previous archaeological investigations have confirmed that the study area overlies the crest of the PSS, spanning 1–1.5 m in thickness. PSS in other parts of Parramatta have been found to be 4-6 m in depth. In most instances, the upper 200–300 mm of the PSS has been removed or impacted by historical and modern ground disturbance activities. Aboriginal artefacts have often been found at depths of more than 400 mm below the current ground surface.

- Aboriginal artefacts recovered from within the PSS have dated from the late Pleistocene to the early nineteenth century, though most objects have dated to the mid-to-late Holocene. Without further investigation, the nature of the potential artefact assemblage within the study area remains unknown.

- Archaeological material has been recovered disparately from the PSS surrounding the study area. Quantities have spanned from a few artefacts within a scatter to more than 6,000 artefacts. Artefacts have been primarily found in low densities, reflecting dispersed background scatters.

- Stone artefact scatters are the most likely features to be found within this landscape. Stone artefacts are the most common artefact type identified in the Cumberland Plains and Parramatta. Stone artefacts were mostly manufactured from indurated mudstone/tuff/chert (IMTC) and silcrete, with artefacts also made from quartz, quartzite, and basalt.

- Following British invasion, Aboriginal people were shown to be adaptive and innovative by knapping ceramic and glass to manufacture tools.

- Due to land clearance in the early nineteenth century, there is no potential for culturally modified trees. There is also no potential for grinding grooves, shelters/closed sites, and rock art sites due to the limited exposed bedrock outcropping.

- The archaeological potential of the study area is moderate to high, as indicated by the numerous archaeological investigations in the immediate vicinity of the study area.

5.2 Regional Aboriginal archaeological context

Extensive archaeological investigations spanning the past 40 years have identified clear patterns in the distribution and age of buried deposits within the Parramatta CBD. Of note is the deep sand deposit adjacent to the Parramatta River, formed by alluvial and fluvial actions. Excavations of the PSS demonstrated it contains significant cultural deposits dating from the Pleistocene to the Holocene and contact period (JMDCHM 2005).

These phases were characterised as an upper unit composed of primarily silcrete artefacts containing several formal implement types associated with the mid- to late Holocene (e.g., backed artefacts, edge-ground axes), and a lower unit composed of indurated mudstone/tuff (IMT) artefacts with fewer formal implement types. The upper unit consisted of a much higher percentage of artefacts (~75%) than the lower unit (~25%). Cultural deposits throughout this deep fluvial sand sheet are spatially discrete, are often constrained to the upper 1.5 m of the deposit and have been dated to ~30,000 years ago. The sand sheet is largely situated between 4 and 8 m Australian Height Datum (AHD) and is confined to within ~200 m of the Parramatta River.

Despite areas of high artefact density, most investigations in the area have found sterile or near sterile PSS elsewhere across Parramatta. One notable investigation was undertaken at 140 Macquarie Street where excavations extended to 3.2m below the modern surface (2m of which was historical and modern fill materials), and found the southern edge of the PSS capped below more recent, likely Holocene, swamp deposits (Comber Consultants Pty Ltd, 2010). No artefacts were found from the PSS, which was almost certainly truncated by later events, but a series of Thermoluminescence ages were collected from its upper part which indicated a formation age of about 50–60 ka (W4396: 49.5±2.8 ka and W4398: 58.4±6.1 ka at 300 mm below surface; and W4397: 57.6±5.1 ka at 800 mm below surface). More recent and ongoing works at the Cumberland Hospital (Parramatta North) have recovered a comparable optically stimulated

luminescence (OSL) age of 50.8±3.6 ka (GL17165) at 1.95m below surface (Geoprospection, 2019), and would lend support to its formation in Marine Isotope Stage (MIS) 3.

Between 2009 and 2019, Extent Heritage (formerly AHMS) have undertaken five archaeological excavations across the PSS. Chronological samples were taken from all the excavations, and we now have twenty-eight OSL ages from the PSS. These ages suggest that substantial parts of the deposit formed at the onset and peak of the Last Glacial Maximum (LGM) through the to the start of the Holocene (5–10 ka). These ages are comparable with RTA-G1 and suggest a much later formation than those at 140 Macquarie Street and the Cumberland Hospital. A handful of ages show late Holocene activity, but for the most part the deposit appears to have stabilised by about 10 ka, and any latter activities have likely become integrated through pedoturbation and/or surface re-working. Indeed, a number of the OSL ages show a complex and highly mobile history, with significant over-dispersion and/or zero dose grains, all indicative of such processes. It is acknowledged in all instances that the upper soil profiles are disturbed by later colonial and post-colonial activities.

5.3 Key investigations

Archaeological Salvage excavation of site CG1 (AHIMS 45-5-2648)—Jo McDonald Cultural Heritage Management (JMCHM), 2005

A series of extensive archaeological investigations on the eastern outskirts of the Parramatta CBD comprised the one of most important excavations of an Aboriginal occupation site in Parramatta. Located at the corner of Charles Street and George Street (340 m west of the study area), the 2005 investigations were the first to systematically collect an artefact assemblage from the PSS, with a total of 6,763 cultural artefacts recovered (an artefact density of 32 artefacts per square meter). The majority of these artefacts were recovered from the upper 200 mm of the natural soil profile while others were recovered as localised artefacts from a depth of over 400 mm from the surface of the natural deposit. The excavations recovered five complete hatchets, as well as hammerstones, anvils, grindstone fragments, cobble chopping tools, and a small perforated shark's tooth.

The excavation indicated that Aboriginal people living in the area during the Pleistocene had a preference for silicified tuff and silcrete, with additional use of chert, quartz, banded tuff, and igneous/volcanic material. Artefact typology indicates multiple phases of occupation of the river terrace, ranging from 1,000 – 2,000 years ago to potentially 10,000 – 20,000 years ago.

No dating samples were taken from this site during the investigations. However, five radiocarbon ages were recovered from the adjacent site, 'RTA-G1' (AHIMS ID 45-6-2673) (see KNC 2017 below).

Parramatta Light Rail historical archaeological salvage excavations—GML Heritage (GML), forthcoming

GML undertook historical salvage excavations along George Street as part of the Parramatta Light Rail. The northern portion of HAMU 15 extended into the study area (GML 2020 64-65). The post-excavations results of these works have not been published. However, Extent Heritage understands that the works uncovered evidence of Emu Hotel, the Barracks, the Parramatta Benevolent Asylum, and a number of convict huts. These features were capped by redeposited

PSS. Aside from its relation to the historical archaeological features, these redeposited sand layers were often difficult to distinguish visually from the intact natural PSS.

Parramatta Light Rail: Aboriginal Cultural Heritage Assessment Report—Kelleher Nightingale Consulting (KNC), 2017

KNC undertook an ACHAR for a study area spanning central Parramatta. The project boundary includes a small portion of the Queens Wharf Reserve, adjacent to George Street, which overlaps with the current study area for the Queens Wharf Reserve to Noller Parade Cycleway (Figure 10).

Two areas of PAD (PLR PAD 2 and PLR PAD 3), investigated as part of the ACHAR, fell within the present study area. The PADs were identified for their location on the PSS, proximity to the Parramatta River, and minimal anticipated historical disturbances. Despite the size of the PAD areas, only a small number of 50 cm by 50 cm test pits were excavated. One test pit (TS 6) was excavated in PLR PAD 2, and two test pits (TS 4 and TS 5) in PLR PAD 3 (Figure 10).

TS 6 (PLS PAD 2) was located between George Street and the footpath of Queens Wharf Reserve. Excavations of TS 6 ceased at 830 mm below the surface, due to the identification of historic brick structure and brick rubble (KNC 2017, 39). The deposits excavated were interpreted as relating to road construction, landscaping, service installation, historic construction, and demolition. No natural soils were identified. The results of this test pit indicated to KNC that the general area was highly disturbed (KNC 2017, 40). KNC noted the potential for PSS below this historic fill. An understanding of adjacent excavations (GML forthcoming, Extent 2020) and borehole tests (Stedniger 2016) demonstrates that PSS does exist below the historical layers and was not identified due to the shallow nature of the excavation.

A single Aboriginal artefact was recovered from a depth of 450-550 mm within a layer of redeposited natural clay sand fill (KNC 2017, 39). The artefact was a flaked piece of pink silcrete measuring between 10-14mm, weighing 0.4g with 0% cortex.

KNC also excavated two test pits (TS 4 and TS 5) in PLR PAD 3, east of PLR PAD 2 (TS 6). Excavations to a depth of 700 mm from the surface showed the area contained disturbed fill deposits in the upper layers associated with historical and modern developments (KNC 40-41). This was interpreted as indicating that the upper PSS was potentially stripped. As with PLS PAD 2, subsequent studies have indicated that PSS exists below the level excavated in these test pits.

KNC determined that PLR PAD 2 and PLR PAD 3 should no longer be considered areas of archaeological potential (KNC 2017, 40-41). Extent Heritage disagrees with this suggestion as the test excavations undertaken were shallow and more extensive test excavations within Queens Wharf Reserve would be required to fully understand the natural soil profile.

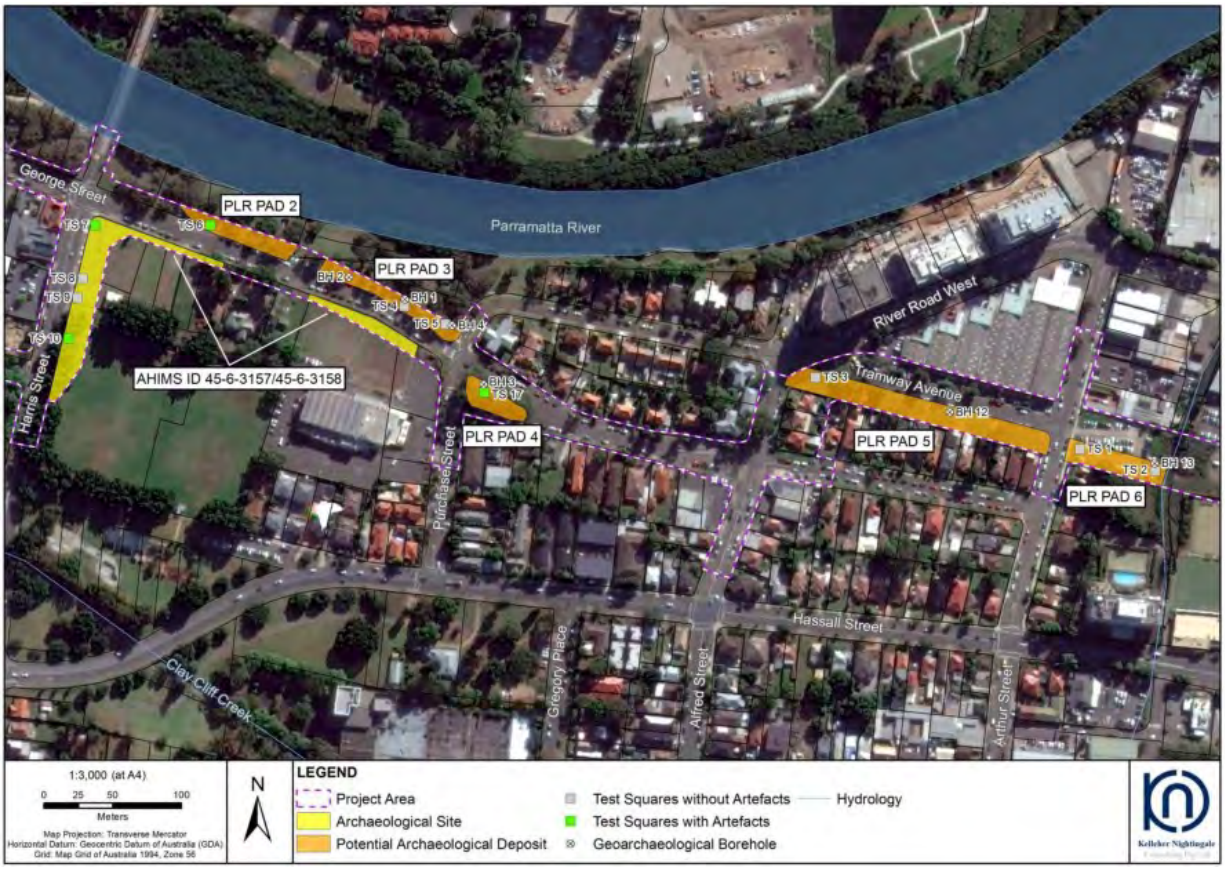

Figure 10 Archaeological test excavations undertaken by KNC (2017) as part of the Parramatta Light Rail Project (source: KNC 2017, figure 12).

Robin Thomas Reserve, Parramatta, Masterplan Stage 1: Aboriginal Heritage Test Excavation Report—Extent, 2020

The test excavation of Robin Thomas Reserve (RTR) was undertaken by Extent Heritage between August and September of 2019. RTR is located directly south of the Queens Wharf Reserve, on the opposite side of George Street. Several test excavations in RTR have resulted in Aboriginal lithics being identified.

The text excavation of RTR identified the PSS at varying depths across the study area. Results show the upper 200-900 mm of the PSS to be significantly impacted by modern and historical activities, with the lower Pleistocene PSS being largely undisturbed (Extent Heritage 2020, 63). The test excavation program consisted of seventeen test pits (Extent Heritage 2020,17). A total of twenty-five Aboriginal artefacts were recovered from seven of the test pits, at depths ranging between 300 mm to 1.4 m, resulting in an artefact density of 1.47 artefacts per square meter (Extent Heritage 2020, 55). Notably, fifteen artefacts (57.69% of the total assemblage) were recovered from test pit one, including a conjoin between a core and a flake which may suggest that core reduction, tool manufacture, or maintenance took place on the site (Extent Heritage 2020, 63).

The assemblage predominantly consisted of whole and fragmented flakes, one tool with evident use wear, several cores, and debitage (Extent Heritage 2020, 74). The cortex present within the

assemblage is smooth, indicating that the material was most likely procured from river gravels, possibly from the nearby Parramatta River.

The excavated assemblage indicated that the preferred material was IMTC, followed by silcrete (Extent Heritage 2020, 63). This is consistent with artefact material preferences on sites throughout the Cumberland Plain as IMTC is generally most common during the late Pleistocene into the early Holocene, with increased silcrete use from the mid-late Holocene. The RTR assemblage resulted from a late Pleistocene occupation of the PSS, dating to between 27,000 and 30,000 years ago during arid conditions (Extent 2020, 55-75).

A glass artefact, which appeared to have been potentially flaked by Aboriginal people, was recovered from modern fill (Extent Heritage 2020, 63). The artefact is manufactured on black bottle glass which has a date range of 1830 – 1870 (Burke and Smith 2004). Identification of this type of artefact would be reflective of contact period archaeology. However, further analysis would be required to confirm that the artefact was flaked by Aboriginal people. Comber Consulting (2019) identified twelve potential Aboriginal glass artefacts during their excavations of the adjacent Hassall Street footpath, which borders RTR. The presence of this potential contact period archaeology increases the possibility of similar archaeological remains being identified within the study area of the Queens Wharf Reserve to Noller Parade Cycle Path.

Alfred Street Pedestrian and Cyclist Bridge Development, Parramatta: Aboriginal Cultural Heritage Assessment Report and Salvage—Extent Heritage, 2021-2022

The Alfred Street excavation, undertaken by Extent in 2021, consisted of a study area overlapping the current study area, north of Noller Parade along the waterfront immediately west of Alfred Street (Figure 11). This location is of high Aboriginal potential and sensitivity due to its location on the PSS. Extent Heritage salvaged the western portion of the River Road West PAD (AHIMS ID 45-6-3131), following previous investigations of the eastern portion of the site by AHMS (2014).

The Extent Heritage salvage excavations resulted in thirteen Aboriginal objects recovered from the PAD (Extent Heritage 2021, i). This suggests sparsely distributed Aboriginal objects within the PAD, with an overall density of 0.7 artefacts per m^2 (Extent Heritage 2021, 51). Most artefacts were retrieved from the upper 300 mm, with others recovered at a maximum dept of 1.1 m. The recovered assemblage was too small to provide any reliable relative dates (Extent Heritage 2021, 51). However, optically stimulated luminescence (OSL) dates derived from the PSS within the archaeological trenches suggests that the archaeological evidence originated from occupation of the area during the terminal Pleistocene and early Holocene periods (c.20,000-10,000 BP) (Extent Heritage 2021, 51). The site was interpreted as reflecting ephemeral Late Pleistocene visitation of the area associated with the Parramatta River, followed by more systematic and more frequent visitation and occupation of the region in the Holocene.

The eastern portion of the current study area is subject to the AHIPs approved as part of the excavations at Alfred Street (Appendix 8).

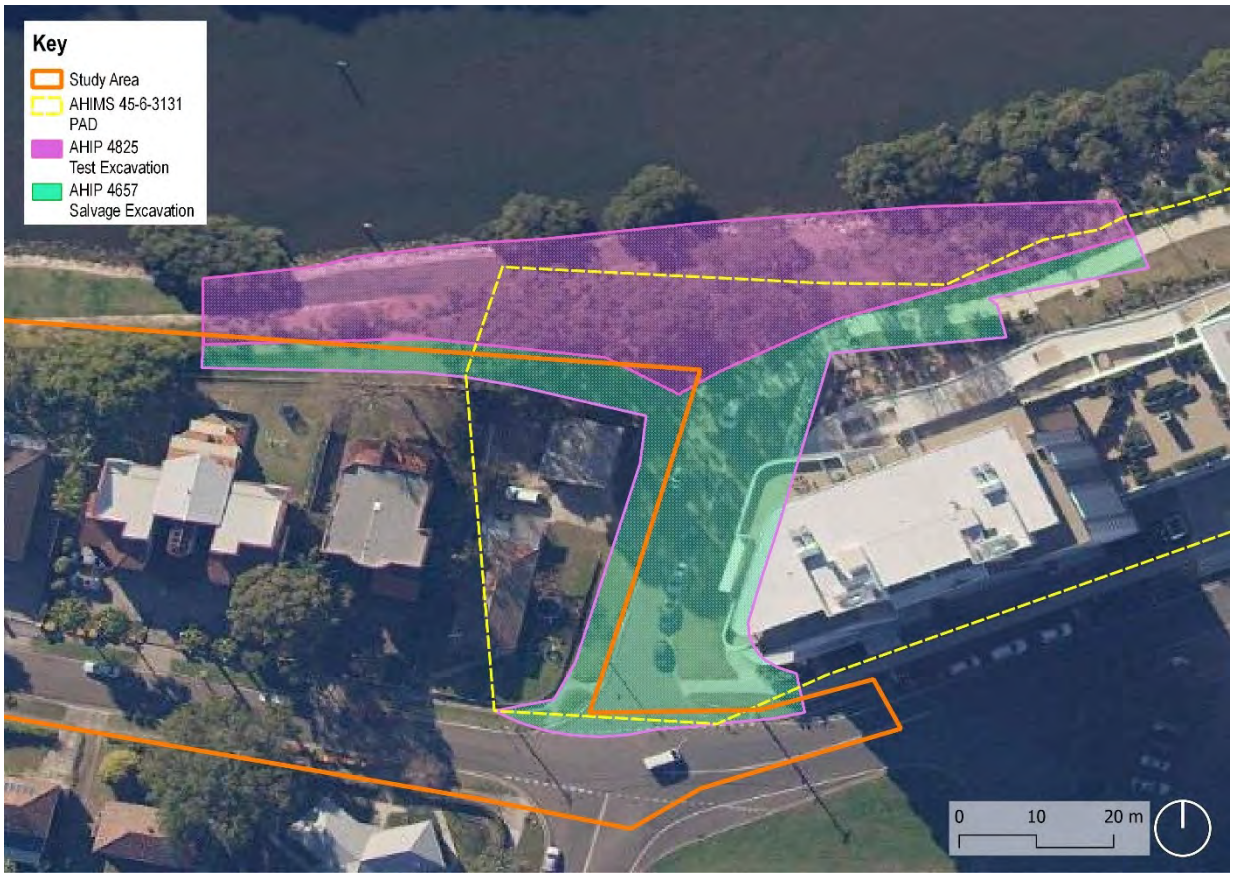

Figure 11 Extent of Alfred Street test and salvage excavations undertaken by Extent Heritage (2021-2022).

Parramatta, NSW: a deep time Aboriginal cultural landscape —Owen, 2022

In 2022, Owen compiled the results of twenty-six archaeological studies within Parramatta (Figure 12). Analysis of the data utilised the Eastern Regional Sequence (ERS) to separate recovered lithics into four periods (Owen 2022, 12-13). By analysing the age of an assemblage based on ERS typology, and within the context of the larger Parramatta area, it was possible to map the cultural land use of Parramatta. The archaeological pattern indicated shifting land use between phases 2 and 2B (Table 4) (Figure 13). This shift suggested a period of intensification heralded by an increase in population and population density. This likely led to further developing of social complexity and technological adaptations, invention of new technology, and methods of trading and raw resource procurement becoming restricted (Owen 2022, 19).

During such periods, it was previously expected to see a spread of archaeological material as groups of people expanded outward; However, in Parramatta, the opposite occurs. This constriction or withdrawal into smaller areas through time could suggest limited land access by increased territoriality, increasing social boundaries, or could be associated with river traditions and behaviour linked to tidal/flood hazards (Owen 2022, 19). It has been noted that at the point of contact in 1788, there was a clear cultural divide between the coastal saltwater people and the inland freshwater people with the tidal estuarine waters of Parramatta River providing a boundary point or strategic location between these two factions (Owen 2022, 20). The fixture or reinforcement of social boundaries could explain the artefact assemblages.

Owen's research places the study area firmly within the PSS at the brackish/tidal eastern third of the Parramatta River (Owen 2022, 25). The site is bordered by a Phase 1 site towards the western extent (location 17 Figure 13) and just north of a combination Phase 2 and 2B site (location 22 Figure 13). The proximity of these known sites and date ranges to the study area indicates the potential for Aboriginal artifacts which further the narrative of Aboriginal land use.

Table 4 Results of Owen (2022)

Phase	Date Range	Activity/Localities	Interpretation
1	Pre 7,000 BP	Eastern end of Parramatta Concentrated 300m	Cluster extends away from river up slopes of Macquarie Street, onto alluvial slopes of Clay Cliff Creek, use of a range of local resources and high mobility between locations
2	7,000-1,500 BP	Few additional locations generally parallel to the river and elevated landforms associated with wetland (alluvial) Concentration around 1km area	Shares most locations with Phase 1, retaining a defined cultural barrier within a territory or boundary Minor additional sites may be due tidal/flooding fluctuations
2B	1,500-1788 BP	Fewer sites than Phases 1 & 2 4 general locations, generally on higher ground with 21/22 on lower landform/river (see map)	Period of transition, with movement from Phase 2 locations into Phase 2B locations Decreasing mobility
3	1788–contact phase	Very similar to Phase 2B	Either a continuity of use in these areas or some other social force, for example forced occupation on the outskirts of British Colonial settlement

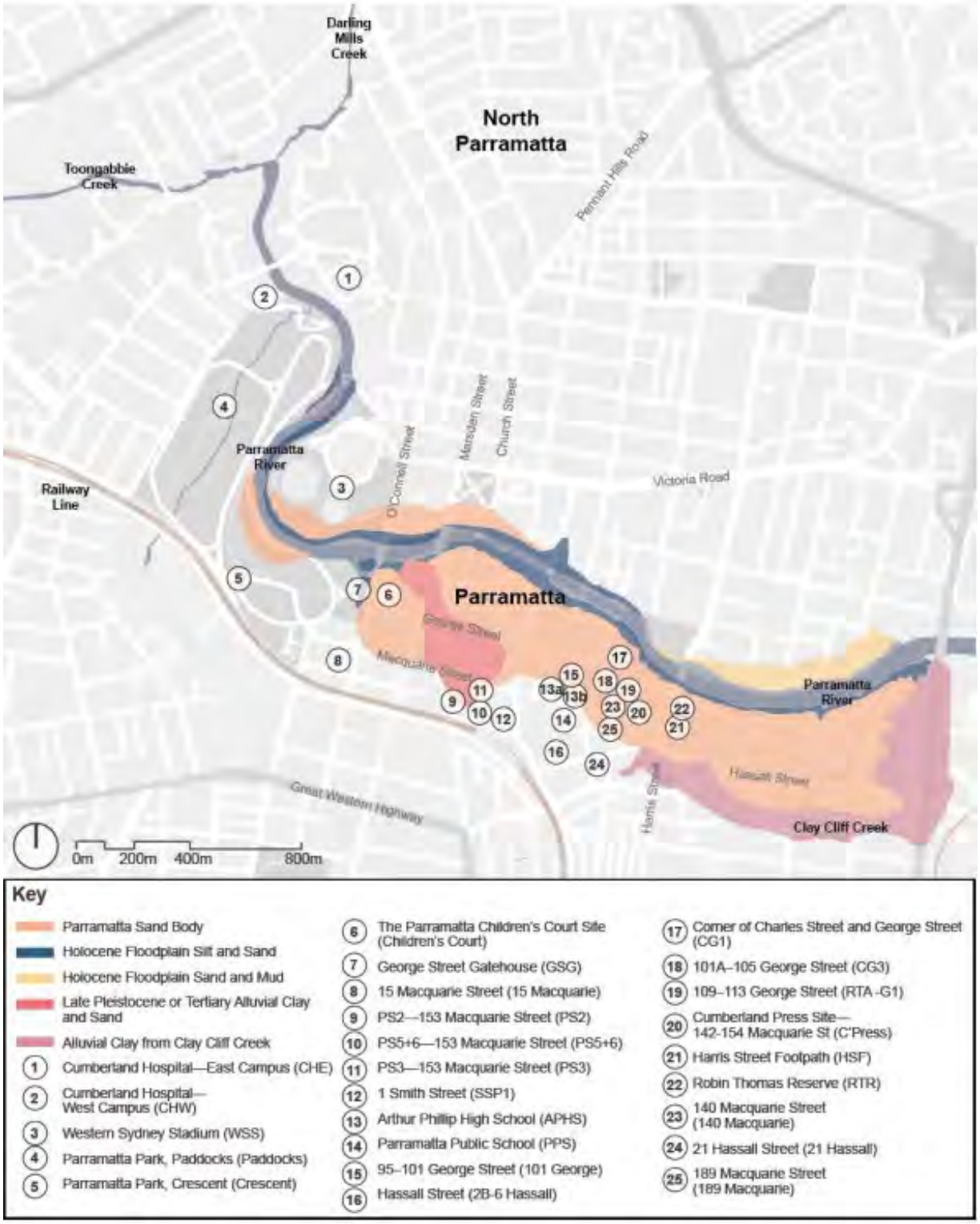

Figure 12 Places, features and interpretation of the Holocene Aboriginal cultural landscape prior to colonisation. Source: Own, White, Dharug Custodial Knowledge holders, drawing on interpretation of archaeological records, historical maps, traditional knowledge and geophysical data (Source: Owen 2022, figure 8).

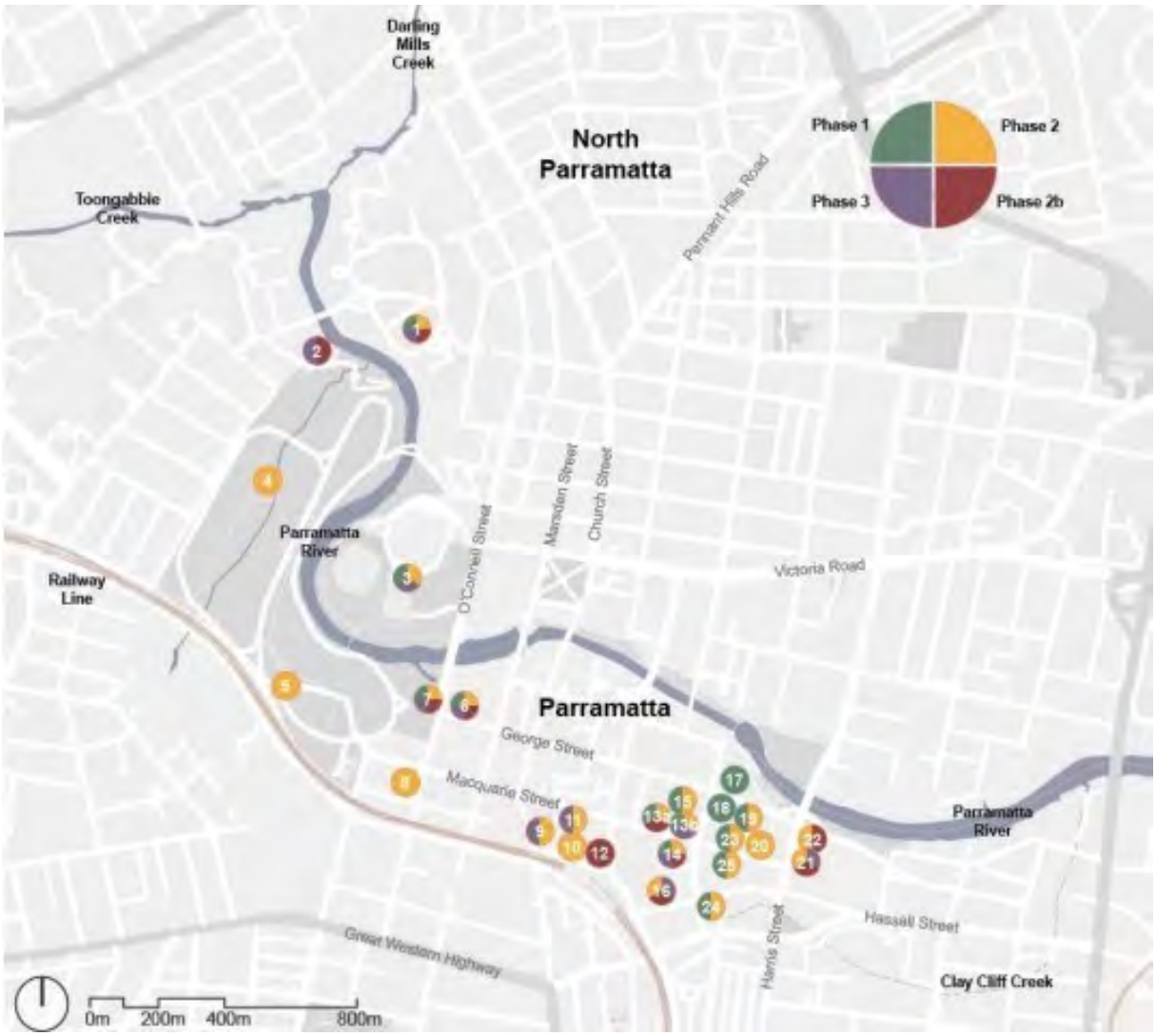

Figure 13 The location of Aboriginal sites across Parramatta coloured according to the ERS Phases outlined in table 4 note the location of Queens Wharf Reserve to the north of point 22 (Source: Owen 2022, 3)

Borehole Logs. From Soldiers' Precinct (Queen's Wharf Reserve), Parramatta—Stedinger, 2016

Borehole testing was undertaken by Stedinger (2016) within (or directly adjacent to) the study area. These works consisted of two areas within the precinct. Area A included three boreholes (numbered one to three) located between Harris Street and Purchase Street, along George Street. Area B included five boreholes (numbered four to eight) located between Purchase Street and Alfred Street. Each borehole measured 50 mm to 100 mm in width, and were drilled to a maximum depth 280 cm. The findings are summarised in the table below (Table 5).

The highest elevation of PSS was recovered from borehole three, which encountered natural sand at 320 mm below the surface. It is possible that this layer comprised redeposited natural material, as seen during excavations in Queens Wharf Reserve and Robin Thomas Reserve (GML forthcoming and Extent 2020). The highest elevation of PSS was recovered from borehole one, which encountered natural sand at 1.5 m below the surface. Across the boreholes in which the PSS was identified, it continued to either the water level or the depth at which the borehole

ceased. Boreholes were concluded at an average depth of 2.43 m below the ground surface. The PSS measured 1.1 m to 2.2 m thick.

The results of the borehole investigation in the study area align with the findings of the archaeological investigation at Alfred Street conducted by Extent Heritage (2020). Alfred Street is situated immediately to the east of the study area and overlaps the easternmost border of the QWR study area along Parramatta River waterfront. The Alfred Street excavation indicated an average of 200-300 mm of modern disturbance overlying 1 m to 1.5 m of PSS in the area.

Table 5. Summary of the borehole results (Stedinger 2016).

Bore-hole	Profile Summary	Borehole Description	Summary
1	0-124 cm – Fill 124-152 cm – Thin deposit of potential historic material 152-260 cm – PSS	Site of former Gasworks which primarily comprises reclamation fills. A potential historic deposit was identified, however this is also likely to be part of the reclamation fill. This deposit was overlying PSS. However, the depth of the PSS suggests Aboriginal archaeological potential is relatively low.	PSS identified but low archaeological potential
2	0-83 cm –Fill 83-91 cm – Thin deposit of potential historic material 230 cm – Water table 91-280 cm – PSS sand	The borehole primarily comprises modern and historical fills overlying PSS. The PSS is identified almost a metre below the current ground surface, perhaps truncated. The PSS continues below the water table.	PSS identified and moderate archaeological potential.
3	0-32 cm – Fills 32-250 cm – PSS	Shallow modern fills directly overlying PSS. This BH appears to be the most intact area of natural sand deposits.	PSS identified and high archaeological potential
4	0-74 cm – Fills 74-126 cm – PSS 126-280 cm – Transition to clay	Shallow levelling fills, identified as modern due to blue-metal inclusions, directly overlying PSS. PSS in this area may have the potential for Aboriginal archaeology due to its relative shallowness. The PSS transitions to sterile B horizon clay.	PSS identified and high archaeological potential
5	0-205 cm – Fills 205-221 – Silty clay 220 – Water table	Significant modern and reclamation fills. Bluemetal inclusions suggest that the fill is modern to at least 145 cm below the surface. A layer of 'light grey silty clay' was identified between 205-211 cm below the surface. This may be PSS or sterile B horizon, however the report indicates that there is no evidence for intact or in situ Aboriginal objects. Due to the depth of the potential PSS and closeness to the water table, this area is unlikely to possess Aboriginal archaeology.	Possible PSS identified but low archaeological potential

6	0-93 cm – Fills 93-300 cm – PSS 200 cm – Water table	Significant reclamation fill overlying PSS. The water table is identified at 200 cm below the surface. Due to the depth of the PSS and closeness to the water table, this area is unlikely to possess Aboriginal archaeology.	PSS identified but low archaeological potential
7	0-103 cm – Fills	There were no natural soil profiles in Borehole 7. The borehole reached bedrock at 103 cm from the surface.	No PSS identified
8	0-60 cm – Fills 60-245 cm – PSS	Shallow levelling fills, identified as modern due to bluemetal inclusions, directly overlaying PSS. PSS in this area may have the potential for Aboriginal archaeology due to its relative shallowness. Bedrock or coarse material identified at 245 cm below the surface.	PSS identified and archaeological high potential

Figure 14 Location of Boreholes (Source: Stedinger 2016, figure 1.1, and Niche 2017, figure 3).

Queens Wharf Reserve Shared Path Aboriginal Objects Due Diligence Assessment—Niche, 2017

In 2017, Niche prepared a due diligence assessment for Parramatta City Council. The study area comprised a majority of the study area outlined in this ACHAR. Niche undertook additional borehole testing. The three boreholes were focused between Stedinger BH 3 and BH 4 (Niche 2017, 14).

Table 6. Summary of the borehole results (Niche 2017)

Bore-hole	Profile Summary	Borehole Description	Summary
9	0-27 cm – Fill 27 cm – PSS	PSS is overlain by levelling fill consisting of sand, clay, and brick rubble. The PSS is at a great depth below the surface, reducing the potential for Aboriginal archaeology.	PSS identified and low archaeological potential
10	0-10 cm – Topsoil 10 cm – PSS	The PSS is overlain by grassy topsoil (turf bedding) only. As such, the PSS is very close to the surface. It is possible that the PSS identified is redeposited.	PSS identified and high archaeological potential.
11	0-57 cm – Fill 57 cm – PSS	Sand is overlain by silty loam with sandstone, slag, and blue-metal inclusions. The PSS is also very close to the ground surface.	PSS identified and high archaeological potential

By utilising the borehole data, Niche identified an area of constraint where the PSS was identified as closer to the surface and might be impacted by the proposed development (Figure 15).

Figure 15 Area of constraint for proposed works where PSS is shallowest and appears to be within the impact zone (Niche 2016, figure 4).

Table 7. Summary of local studies undertaken near the study area.

Project	Findings	Approximate distance from study area
Borehole Sampling Stedinger 2016	PSS identified in seven of eight of the boreholes drilled within Queens Wharf Reserve Shallowest PSS was identified 320 mm below the ground surface Several areas had limited archaeological potential within the PSS due to the presence of the water table and potential removal of the upper layers of the soil profile	Within study area
Borehole Sampling Niche 2017	Three additional boreholes drilled within Queens Wharf Reserve PSS identified between 10-57cm below the current ground surface An 'area of constraint' identified where PSS is shallow and likely to be impacted by the proposed development	Within the study area
PLR Kelleher Nightingale Consulting 2017	Excavation of three test pits within Queens Wharf Reserve Single pink silcrete artefact excavated from a depth of 450-550 mm Excavation interrupted by historic structures, however PSS exists beneath the deposits Several historical artefacts recovered	Within the study area Test pit between QWR footpath and George St. (Southern extent of study area)
Alfred Street Extent Heritage 2021-2022	Thirteen aboriginal objects excavated from River Road West PAD (artifact density of 0.7 artefacts per m^2) Majority of artifacts recovered form upper 300 mm, others from a maximum of 1.1 m below the surface OSL dates deposits to terminal Pleistocene and early Holocene periods (c.20,000-10,000 BP) Indicates ephemeral Late Pleistocene visitation	Overlapping study area to the east Continues along eastern border of study area
Robin Thomas Reserve Extent Heritage 2019-2020	Seventeen 1 m^2 test pits Twenty-five artefacts recovered (artifact density of 1.47 artefacts per m^2) Fifteen artefacts recovered from TP 1 indicate onsite tool manufacture/maintenance	200m

Project	Findings	Approximate distance from study area
	Artefacts recovered from 300 mm-1.4 m below the surface Artefact types include predominantly flakes or flake fragments, cores, and debitage Predominantly smooth IMTC and silcrete indicate material collected from river gravels Identified PSS at varying depths across the study area, with largely undisturbed Pleistocene PSS Indicative of occupation during the late Pleistocene, approx. between 27,000 and 30,000 during arid conditions Potential Aboriginal worked glass artifact, notes twelve glass artifacts identified by Comber Consultants at previous excavation along Hassall Street footpath – potential for contact archaeology in the area	
CG1 Jo McDonald Cultural Heritage Management 2005	6,763 artefacts recovered from PSS (artefact density of 32 artefacts per m^2) Majority of artefacts recovered from upper 200 mm Localised deposits over 400 mm deep Artefact types include hatchets, hammerstones, anvils, grindstones, cobble choppers, and ornamental items (shark's tooth) Indicative of multiple phases of occupation ranging from 1,000-2,000 years ago to 10,000-20,000 years ago	340 m

5.4 Aboriginal Heritage Information Management System

The AHIMS database, managed by Heritage NSW, includes spatial and compositional information of Aboriginal sites (i.e., objects, places, and declared Aboriginal Places) recorded within NSW. These sites have been identified through academic and compliance-based cultural resource management projects, often associated with modern developments.

A search of the AHIMS database was completed on 20 July 2022 for an area of land at datum GDA, zone 56, from -33.8244, 151.0009 latitude- longitude to -33.8066, 151.0318 latitude-longitude. Land surrounding the study area was included within the search parameters to gain information on the regional archaeological context and inform predictive statements regarding the archaeological potential of the study area.

The AHIMS search results identified sixty-four registered sites (Figure 17). The frequency of AHIMS site features is included in Table 8 below.

Table 8. Site features recorded in the AHIMS search area

Site feature	Number	Percentage
Artefact	14	8.68%
Potential Archaeological Deposit (PAD)	31	19.22%
Potential Archaeological Deposit (PAD), Artefact	17	10.54%
Hearth, Potential Archaeological Deposit (PAD), Artefact	1	0.62%
Artefact, Aboriginal Resource and Gathering, Potential Archaeological Deposit (PAD)	1	0.62%
Total	64	100%

The most frequent site types identified in the database are Potential Archaeological Deposits (PADs), followed by artefacts sites (comprising isolated finds, scatters, and deposits). Significantly, most of these sites lie within the Parramatta CBD area, along the southern foreshore of the Parramatta River. This spatial imbalanced of registered Aboriginal sites between the northern and southern foreshores likely reflects the paucity of investigations on the northern foreshore and, conversely, the intensity of modern development and accompanying compliance-based archaeological research on the southern foreshore. The extensiveness of the PSS on the southern foreshore may have also impacted the distribution of sites.

Two registered AHIMS site was located within the study area:

- AHIMS ID 45-6-3312
- AHIMS ID 45-6-3131

This site, PLR ATF 1, was registered by Kelleher and Nightingale (2017) and is a ‘valid’. This location was excavated as part of the archaeological testing for the Parramatta Light Rail Project and resulted in the recovery of a single silcrete artefact. No AHIMS site card is available on the

database. Due to the project being State Significant, no AHIP was required to progress in the area. The artefact associated with this AHIMS site will have already been harmed/removed as part of the project and, as such, should be changed to ‘destroyed’ on the AHIMS register.

AHIMS ID 45-6-3131 is a PAD partially overlapping with the eastern edge of the study area. A portion of the PAD was Extent Heritage as part of the Alfred Street Pedestrian and Cyclist Bridge Development. The testing and salvage program recovered evidence of terminal Pleistocene and early Holocene periods. An AHIP was approved for test excavations (AHIP 4657) and salvage excavations (AHIP 4825) (Figure 11). No AHIP has been applied for the further management of artefacts.

Several site types are not located within the vicinity of the study area. Culturally modified trees are unlikely to be identified within the Parramatta CBD due to historical land clearance. Sites which require bedrock outcrops, such as closed/shelter deposits, art sites, and grinding grooves, are also absent due to geology of the area. Shell middens are also absent from the AHIMS search results. While shell middens were would have existed within the vicinity of the site, historical use of this easily accessible resource for mortar, as well as erosional factors, have likely removed evidence of this practice.

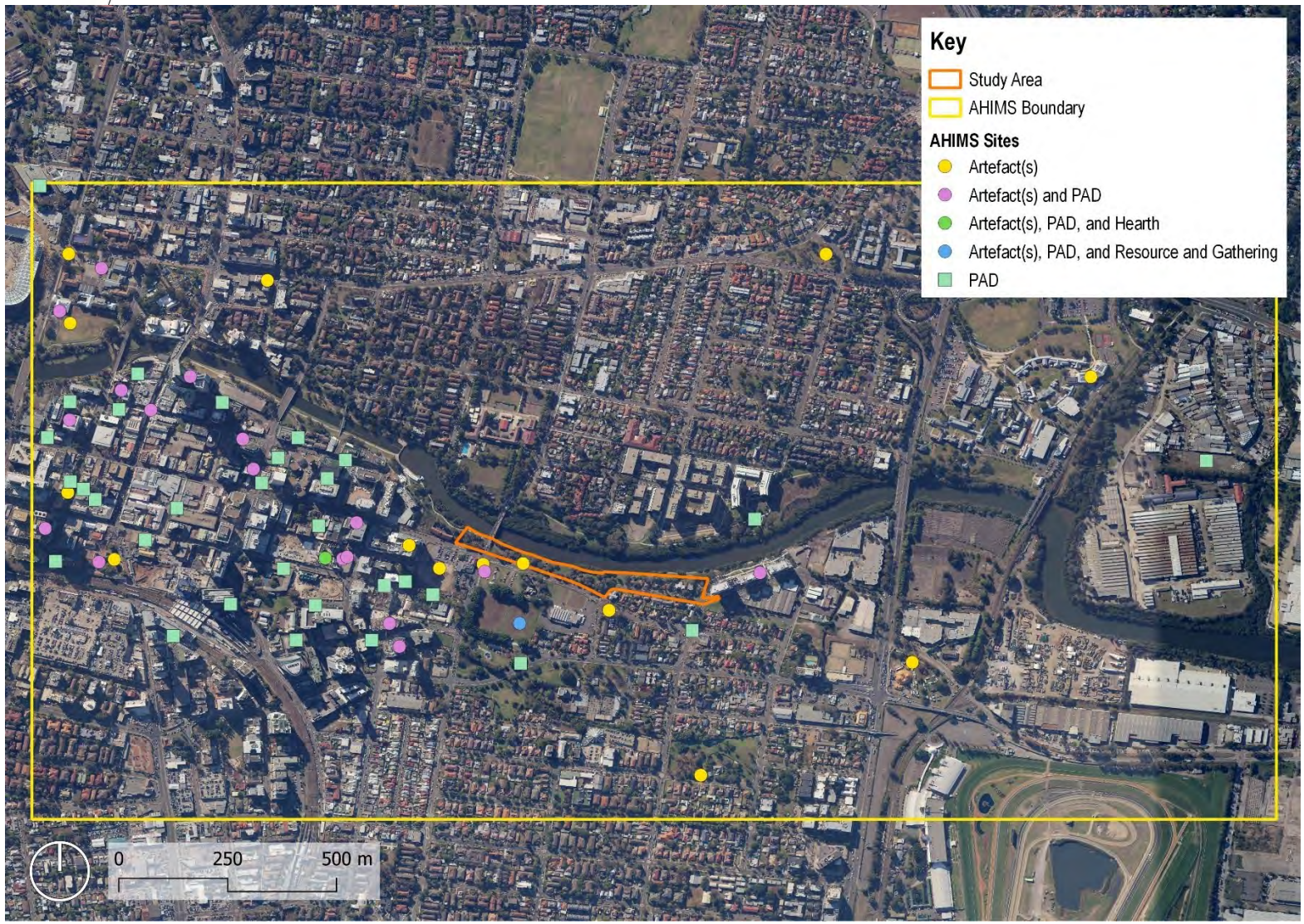

Figure 16 AHIMS within the wider Parramatta area.

Figure 17 AHIMS registered sites located within and immediately surrounding the study area.

5.5 Archaeological Survey

A site survey was undertaken across the study area on 4 August 2022 by Extent Heritage advisors (Hannah Morris, Senior Heritage Advisor, and Hayley Edmonds, Heritage Advisor). The formalisation of the study area into Queens Wharf Reserve has removed the potential for identifying Aboriginal objects on the ground surface. As a result, the aim of the site survey was primarily to understand the landscape features and any localised areas of disturbance.

Table 9. Summary of survey coverage

Survey unit	Landform	Area (m^2)	Visibility (%)	Exposure (%)	Effective coverage (m^2)	Effective coverage (%)
1	Slope	26,890	90%	90%	6,722	25%

This section provides a summary of the results of this survey:

- No Aboriginal objects were identified during the site inspection.
- DEM mapping and available contour data adequately represented the physical form of the landscape. The parkland comprises a gentle slope northward to the riverbank (Figure 18-Figure 19).
- Several cycleways and pathways run generally east to west across the study area (Figure 20-Figure 21).
- All vegetation has been previously stripped from the study area and consequently no culturally modified trees were identified.
- No sandstone outcrops were present, resulting in no potential for closed sites, art sites, or grinding grooves.
- Several modern Aboriginal art installations were present, namely metal representations of canoes and spears (Figure 22-Figure 23).
- Ground disturbance to install the HMAS memorial (Figure 24) and Gasworks Bridge (Figure 25) was noted, especially on the northern side of the feature where the ground level is cut away. The area around the Gasworks Bridge has been identified as having several metres of reclamation fill around it (GML forthcoming).
- Ground disturbance was identified along the banks of the Parramatta River, especially in the western portion of the study area. Two large services, likely water pipes, ran in parallel in an east to west alignment. These were identified by several manholes/inspection pit visible on the ground surface (Figure 26).

The site survey demonstrated that limited above ground impacts were visible due to modern landscaping of the reserve. Localised areas of disturbance, namely excavation for modern services and infrastructure, were noted. However, the extent of subsurface impacts to archaeology and earth build-up was not identifiable.

Further investigations would be required to confirm the levels of disturbance. In areas where significant reclamation fills have been deposited, the amount of disturbance may be lessened. Impacts from historical disturbance are unknown until historical excavations have been undertaken. They are anticipated to be varied across the site.

Figure 18 General landscape of QWR. Facing east.

Figure 19 General landscape of QWR. Facing east.

Figure 20 Representation of existing cycleway and footpath. Eastern portion of site.

Figure 21 Representation of existing cycleway and footpath. West of Gasworks Bridge.

Figure 22 Example of Aboriginal art.

Figure 23 Example of Aboriginal art.

Figure 24 Disturbance associated with HMAS memorial.

Figure 25 Disturbance associated with Gasworks Bridge.

Figure 26 Disturbance associated with services. Manholes/inspection pits marked with red allow demonstrating a portion of the feature's extent.

5.6 Predictive model

The location of the study area - adjacent to the Parramatta River, on its alluvial terraces, at the base of rolling hills - would have provided an abundance of resources. A variety of plants and animals would have been available within this diverse landscape for Aboriginal people to collect and use. The location next to the Parramatta River would have allowed for ease of movement over great distances and collection of a range of resources from marine, estuarine and terrestrial environments. Materials for stone tool making are available within the vicinity of the study area, including IMTC, silcrete and quartz. It is highly likely that the Parramatta River was a source of

IMT in the form of gravels. Silcrete is normally sourced from primary sources such as outcrops, but may have also been sourced from the Parramatta River.

5.6.1 Cumberland Plain Predictive Model

The Cumberland Plain Predictive Model was developed by Jo McDonald Cultural Heritage Management (JMDCHM) (White and McDonald 2010) from evidence collected in several Aboriginal archaeological excavations undertaken across the Cumberland Plain, in particular the Rouse Hill Development Area. The Cumberland Plain Predictive Model posits that the nature of Aboriginal sites across the Plain varies according to both landform and landscape. Stream order is also a significant factor as the model proposes that Aboriginal people preferred to occupy areas with more permanent and predictable water supplies. Finally, the model also considers access to additional resources such as stone, but this factor does not appear to influence artefact distribution. Further development of this aspect of the model is required. The following summary outlines factors that the model uses to predict the density of Aboriginal sites within an area of the Cumberland Plains:

General

- In any landscape location within the Cumberland Plain there exists the possibility that a background scatter of Aboriginal artefacts will exist. This refers to objects deposited as part of one-off manufacturing and/or use and does not correlate with a landform or more permanent activity area. These areas are unlikely to contain associated subsurface archaeological deposits.

Landform

- Fewest artefacts are found on upper slopes (the upper third of a slope) and ridge tops (the top of a slope, forming watersheds). Artefacts tend to be presented as sparse, discontinuous scatters.

- Artefact densities increase toward lower positions in valleys—the mid slope and lower slope (the middle and bottom third of a slope). Lower slopes associated with higher order streams produce the highest artefact densities. The density of artefacts found on mid-slopes does not significantly vary with stream order.

- Elevated terraces, especially those overlooking higher order watercourses, tend to contain high artefact densities that indicate evidence of more permanent or repeated occupation in these areas.

- Creek flats tend to show low artefact densities. As creeks flats flood, artefacts may have been lost by erosion, or these areas were not a preferred location for occupation.

Stream Order

- Small and/or ephemeral water supplies (namely first order creeks) may have been able to support only small numbers of people and/or transient occupation. Large and/or permanent water supplies may have supported large numbers of people and/or long periods of occupation indicated by continuous scatters.

- First order streams have low average artefact density and sparse artefact distribution. Archaeological evidence will present as sparse background scatters with densities of approximately one artefact per m^2 expected.

- Second order streams have a more continuous artefact distribution. Archaeological evidence will present as sparse but focused activities, including one-off camp locations or single event knapping, with artefact densities of approximately 6.5 per m^2 expected.

- Third order streams also present a more continuous artefact distribution resultig from more frequent and repeated occupation by small groups. Archaeological evidence of knapping floors that may be reused, and more concentrated activities will be present. Artefact densities of approximately 8 per m^2 will be expected.

- Fourth order streams have the highest density of artefacts. Sites will be complex and may be stratified. Artefacts associated with these sites may show less use of rationing strategies as people may have remained in the same location for several days, or even weeks. Evidence of the caching of raw materials may also be present. Artefact densities of approximately 14 per m^2 will be expected.

- Creek junctions may be a focal location for activities, with the confluence of higher order streams likely generating more dense sites.

Distance from water

- The highest artefact densities associated with fourth order landscapes were identified 51-100 m from the watercourse.

- The highest artefact densities associated with second order landscapes were identified within 50 m of the watercourse.

- First order watercourses show no significance in artefact distribution with distance from water.

Aspect

- On lower slopes associated with fourth order streams, artefact densities are higher on slopes facing north and northeast, than on slopes facing west.

- On upper slopes, aspect does not appear to significantly affect artefact distribution.

5.6.2 Parramatta Sand Body

Formation

Of note in the vicinity of the study area is the presence of deep fluvial and alluvial deposits along Parramatta River and, to a lesser extent, Clay Cliff Creek, within which highly significant and complex sites (primarily stone artefact scatters) are well -documented. The sand body's deposition process forms layered sediment contexts that are favourable to the formation of deep, stratified deposits of Aboriginal archaeology . While there has been disturbance within the study area, archaeological deposits have the potential to remain beneath surface disturbance and historical layers. The presence of subsurface Aboriginal objects in the study area is largely dependent upon the depth and intensity of disturbance, and the extent to which this disturbance has impacted or removed the sand body.

Previous studies suggest large portions of the PSS are archaeologically sterile (Extent Heritage 2019, 16). Where archaeological material has been found, two distinct occupational deposits can be discerned (JMDCHM 2005). The uppermost of these deposits (generally 0–400 mm below the PSS surface) contains the bulk of cultural material, consisting mainly of silcrete backed artefacts, ground-edge axes, and grinding stones; material from this upper deposit has been dated to the mid- to late-Holocene period. The lower deposit (generally 400–800 mm below the PSS surface) has been found to contain lower artefact densities and represents a stage where Aboriginal peoples favoured IMTC raw materials. This lower deposit has been dated to around the terminal Pleistocene.

Floodplain

Floodplains associated with the PSS have a nil to low potential for Aboriginal archaeology to be located or to survive (Groundtruth Consulting 2008, 9). The floodplain, based on the landscape during the period of European settlement, has been interpreted as covering the lower reaches of the study area (Figure 27). Mitchell posits that the floodplain is located less than 2 m above the river level. Based on Mitchell's assessment, the study area has the potential for Aboriginal archaeology.

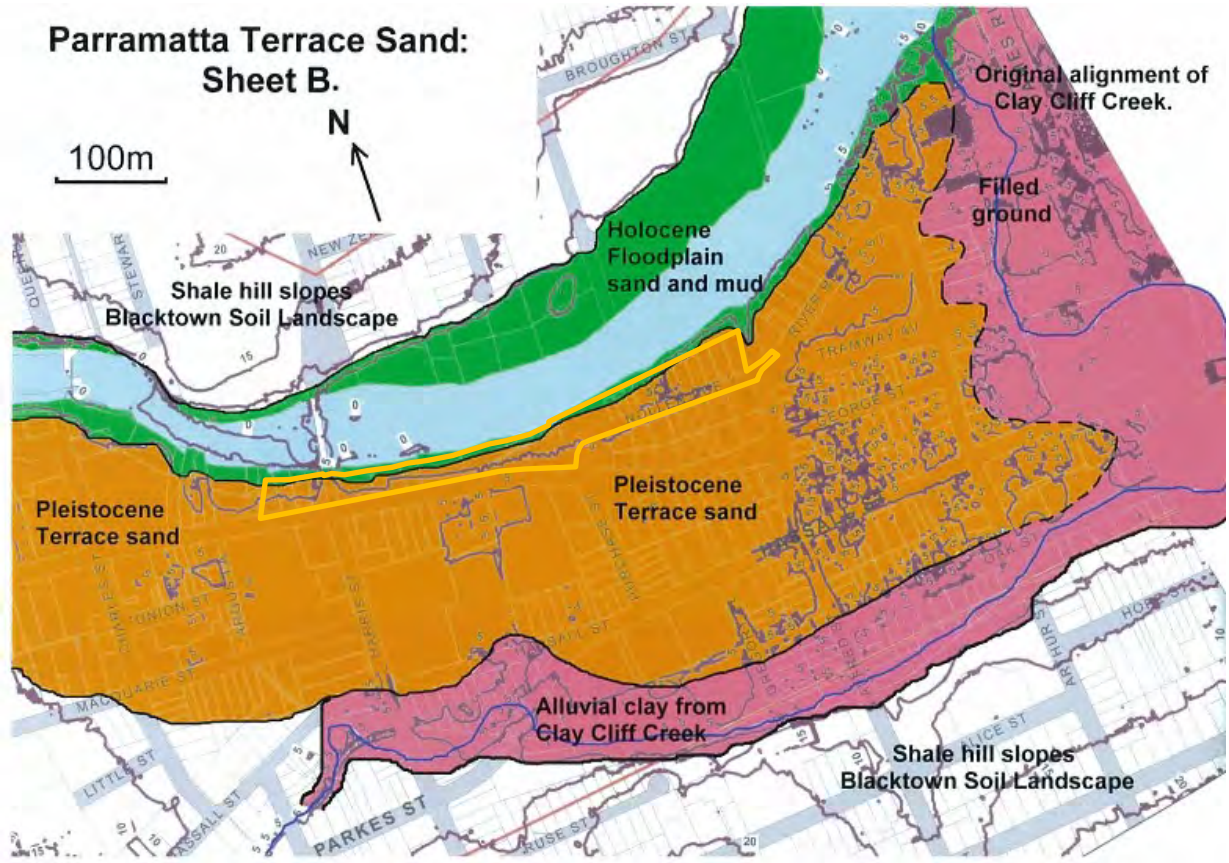

Figure 27 Indicative distribution of the different soil parent material and landscapes along the Parramatta River at the time of European settlement. Sheet B. Study area outlined in orange (Source: Groundtruth Consulting 2008, figure 5).

Geotechnical investigations

Geotechnical investigations within the study area indicate that the PSS is present across the site at varying depths (Stedinger 2016). The natural sand was encountered in six of the eight borehole locations (Stedinger 2016, 9-16). The average depth for the top of the sand sheet was 360 mm below the ground surface. The highest elevation of PSS was recovered from borehole three, which encountered natural sand at 320 mm below the surface.

5.7 Discussion

The study area is located on the Parramatta River, a fourth order waterway. Using the Cumberland Plains Predictive Model, Aboriginal lithic artefacts are most likely to be identified in an area of 51-100 m from the water to avoid impacts from flooding (White and McDonald 2010). As such, elevated terraces, especially those overlooking higher order waterways, such as the Parramatta River, would tend to have higher density artefacts due to the permanent or repeat occupation of the site.

While the study area is on a sloping riverbank, with Robin Thomas Reserve on the terrace behind, the original landscape may have been less sharp. According to the assessment made by Mitchell (Groundtruth Consulting 2008, 9), which is more specific to the study aera (see below), the flood zone is an elevation of two metres above the water level and only impacts the lower reaches of the study area (Figure 27). This suggests Aboriginal artefact sites could be located close to the water's edge, but are more likely along the southern border of the study area where the land is more protected from floods.

Archaeological and geotechnical studies within and adjacent to the study area have shown the PSS is capped by historical and modern fills. Excavations undertaken within the study area by Kelleher and Nightingale (2017) concluded that the PADs investigated did not possess any potential for cultural material. These excavations, however, did not reach the depth of the PSS, and incorrectly concluded that no PSS was located in the area.

Due to the depth of the PSS and amount of reclamation fills known to be deposited within the area, significant portions of the PSS may remain relatively intact despite historical and modern truncation. Borehole testing (Stedinger 2016) demonstrate that fill layers are up to 2 m thick, with limited archaeological potential due to the high water table, and are only 300 mm thick toward to the upper slope of the study area.

Based on these findings, any development activities toward the upper slope of the study area extending beyond a depth of approximately 300mm could potentially impact the PSS. This may cause disturbance to any underlying cultural deposits. Due to the significant depth of the PSS, and its fluvial and alluvial formation, there is an opportunity to identify stratified deposits of Aboriginal objects. In addition, isolated artefacts or discontinuous artefact scatters resulting from the intermittent occupation of mobile Aboriginal groups across the landscape might be present.

The presence of the significant early colonial development of Queens Wharf Reserve also increases the potential for 'contact period' archaeology. Archaeological evidence from Queens Wharf Reserve and Robin Thomas Reserve (GML forthcoming, Comber Consulting 2019, Extent Heritage 2020), as well as other sites in Parramatta, have revealed evidence of ceramic and glass knapped by Aboriginal people, as well as Aboriginal lithic artefacts within historical contexts.

5.8 Archaeological potential

QWR PAD 1

Based on the above information, the southern portion of the study area has the potential for subsurface Aboriginal archaeological material (Figure 28). This area is located above the 2 m flood zone and has not been clearly impacted by modern construction. A more comprehensive understanding of the archaeological record within this area of PAD (QWR PAD 1) would result from the historical archaeological excavations to be undertaken as part of this project.

Further archaeological investigations of QWR PAD 1 would be required to determine the extent, form, and significance of any Aboriginal objects located within the study area. With the knowledge that PSS is located in this PAD, archaeological test excavation is needed to comprehensively assess the Aboriginal heritage value of the area.

AHIMS ID 45-6-3131

A registered PAD exists on the eastern extent of the study area. This AHIMS site has been investigated as part of the Extent Heritage investigations at Alfred Street (2019) as part of the construction of a pedestrian bridge and cycleway across the river. Results from the testing and salvage investigations determined that the area has evidence of terminal Pleistocene and early Holocene period deposits within the Parramatta Sand Body. Approximately 80 lithics were recovered. The full extent of the registered AHIMS site boundary has the potential to contain Aboriginal archaeological remains.

Figure 28 Area of Aboriginal archaeological potential—QWR PAD 1 and AHIMS 45-6-3131.

6. Significance Assessment

6.1 Assessment criteria

While all Aboriginal objects in NSW are protected under NSW legislation, the *National Parks and Wildlife Act 1974* recognises that the destruction of sites may be necessary to allow other activities or developments to proceed. For Heritage NSW – DPC to make informed decisions on such matters, a consideration of the significance of cultural heritage places and objects is an important element of the assessment process.

An assessment of the cultural heritage significance of an item or place is required in order to form the basis of its management. The Guide (OEH 2011, 10) provides guidelines, in accordance with the Burra Charter (Australia ICOMOS 2013) for significance assessment with assessments being required to consider the following criteria:

- Social values – does the area have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Historic values – is the area important to the cultural or natural history of the local area and/or region and/or state
- Aesthetic values – is the area important in demonstrating aesthetic characteristics in the local area and/or region and/or state.
- Scientific values – does the area have the potential to yield information that will contribute to an understanding of the cultural and natural history of the local area and/or region and/or state

The Guide (OEH 2011: 10) specifies that the significant criteria above should be graded in terms that allow the significance to be described and compared, for example as ‘high’, ‘moderate’ or ‘low’, and in doing so consideration should be given to the following

- Research potential: does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state’s natural and cultural history?
- Representativeness: how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity: is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential: does the subject area contain teaching sites or sites that might have teaching potential?

It is important to note that heritage significance is a dynamic value and will be updated in consideration of the results of future investigations.

6.1 Significance assessment

6.1.1 Scientific value

The following Part will assess the significance of the PAD located within the study area. The assessment is necessary to most effectively provide recommendations and mitigation measures for managing all the sites identified across the study area. Until the PAD is investigated through archaeological excavations, any Aboriginal objects that might be present cannot be assessed for their scientific value.

The scientific value of AHIMS ID 45-6-3131 is subject to the post-excavation results from the Alfred Street Pedestrian and Cyclist Bridge Development. The untested parts of the PAD have unknown archaeological and research potential.

A summary of scientific value for the study area is provided in Table 10.

Table 10: Summary of archaeological significance.

Site name (AHIMS ID)	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
QWR PAD 1	Unknown	Unknown	Unknown	Unknown	Unknown
45-6-3131	Unknown	Unknown	Unknown	Unknown	Unknown

This section is reliant on information provided by Aboriginal stakeholder consultation. This is an ongoing process and the section will be updated following the finalisation of consultation.

6.1.1 Historic significance

The guidelines to the *Burra Charter* include the following discussion of historic significance:

> A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment. (Australia ICOMOS 2013b)

In relation to Aboriginal cultural heritage, many post-contact places and sites would have historic value. Pre-contact places and items may also be significant according to this criterion, although the association with historic figures, events, phases or activities may be more difficult to establish. Places of historic significance may include sacred or ceremonial sites, sites of resistance battles and massacres, places associated with Aboriginal communities after colonisation and the more recent past, and archaeological sites with evidence of technological developments.

Based on current research, the study area is not known to be associated with any specific people, events, or activities of historical importance to the Aboriginal community.

This section is reliant on information provided by Aboriginal stakeholder consultation. This is an ongoing process and the section will be updated following the finalisation of consultation.

6.1.1 Aesthetic value

This criterion refers to aspects of sensory perception and the ability of the site to elicit emotional responses referred to as sensory or sensory-emotional values. The guidelines to the *Burra Charter* note that assessments may include consideration of the form, scale, colour, texture and material of the item or place, as well as sounds and smells. With regard to pre-contact Aboriginal cultural heritage sites, the placement within the landscape would be considered under this criterion as would memoryscapes and the ability of the site to transmit such memories. It is important to consider that sensory-emotional values are not always equated with 'beauty'; for example, massacre sites or sites of incarceration may have value under this criterion. Individual artefacts, sites and site features may also have aesthetic significance.

The study area has been subject to the clearance of native vegetation, which has compromised the aesthetic value and some areas. It is also surrounded by significant development and infrastructure. The study area is in close proximity to the Parramatta River, a significant waterway running across the landscape. However, the aesthetic value of the study area may be considered low at this stage.

This section is reliant on information provided by Aboriginal stakeholder consultation. This is an ongoing process and the section will be updated following the finalisation of consultation.

6.1.1 Social value

In Aboriginal heritage this criterion concerns the relationship and importance of sites to the contemporary Aboriginal community. Aspects of social and spiritual significance include people's traditional and contemporary links with a place or object as well as an overall concern by Aboriginal people for sites and their continued protection. Aboriginal cultural values may partially reflect or follow on from archaeological values, historic values, aesthetic values or be tied to values associated with the natural environment. This criterion requires the active participation of Aboriginal people in the assessment process as their knowledge and values are the only information that can be used to assess an object or place's value against this criterion.

This section is reliant on information provided by Aboriginal stakeholder consultation. This is an ongoing process and the section will be updated following the finalisation of consultation.

6.1.2 Statement of significance

The scientific significance of the PAD located within the study area (QWR PAD 1) cannot be determined until further investigations are undertaken. It is anticipated that the site would have low aesthetic significance due to the extensive development along the Parramatta River. Dependent on the archaeological record and any evidence of 'contact period' archaeology, the

site may hold historical significance. Stories around the Parramatta River and the eel may demonstrate social or spiritual significance.

At this stage, the overall significance of QWR PAD 1 cannot be assessed, as it is contingent upon the results of future archaeological excavation.

This section is reliant on information provided by Aboriginal stakeholder consultation. This is an ongoing process and the section will be updated following the finalisation of consultation.

7. Impact assessment

7.1 Proposed development

Council is undertaking active transport improvements in Queens Wharf Reserve and Noller Parade in Parramatta. Several factors have informed the importance of this project, including inadequate paths for the demand for cycling and pedestrian movements as well as construction of the Parramatta Light Rail. Located along the southern side of Parramatta River between Macarthur Street and Alfred Street, the proposed active transport link will feature separated pedestrian and cyclist paths in Queens Wharf Reserve and a two-way on road cycleway at Noller Parade. Importantly, the Queens Wharf Reserve link facilitates improved infrastructure to Alfred Street Bridge (currently in construction) over the Parramatta River. This project is part of George Street East Pedestrian and Cyclist Paths, which successfully received funding through Transport for NSW's 'Get NSW Active' grant.

The works includes:

- Creation of separated pedestrian and cyclist paths in Queens Wharf Reserve;
- Provision of a two-way on road cycleway at Noller Parade;
- Improved path connections and DDA compliance;
- Removal of selected small trees and the planting of additional trees;
- Provision of new park furniture including signage, seating and bins;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works (e.g. kerb and gutter and drainage works);
- Reconstructed retaining walls;
- Improved electrical works.

The concept plan is still at draft stage, with some potential to reroute the paths based on changed design, built heritage and historical archaeological considerations. At present, the ground disturbance associated with the path comprises:

- Demolition of the existing footpath and reforming of a wider path in the same location, including excavation of approximately 250-300 mm below the ground surface,
- Installation of new path lights along the route, including the excavation of footings 500 mm by 500 mm wide and approximately 600 mm deep,
- The formation of new pathways, including excavation of approximately 250-300 mm below the ground surface,
- Auxiliary works including excavations for tree removal and planting, and removal of benches and garden beds.

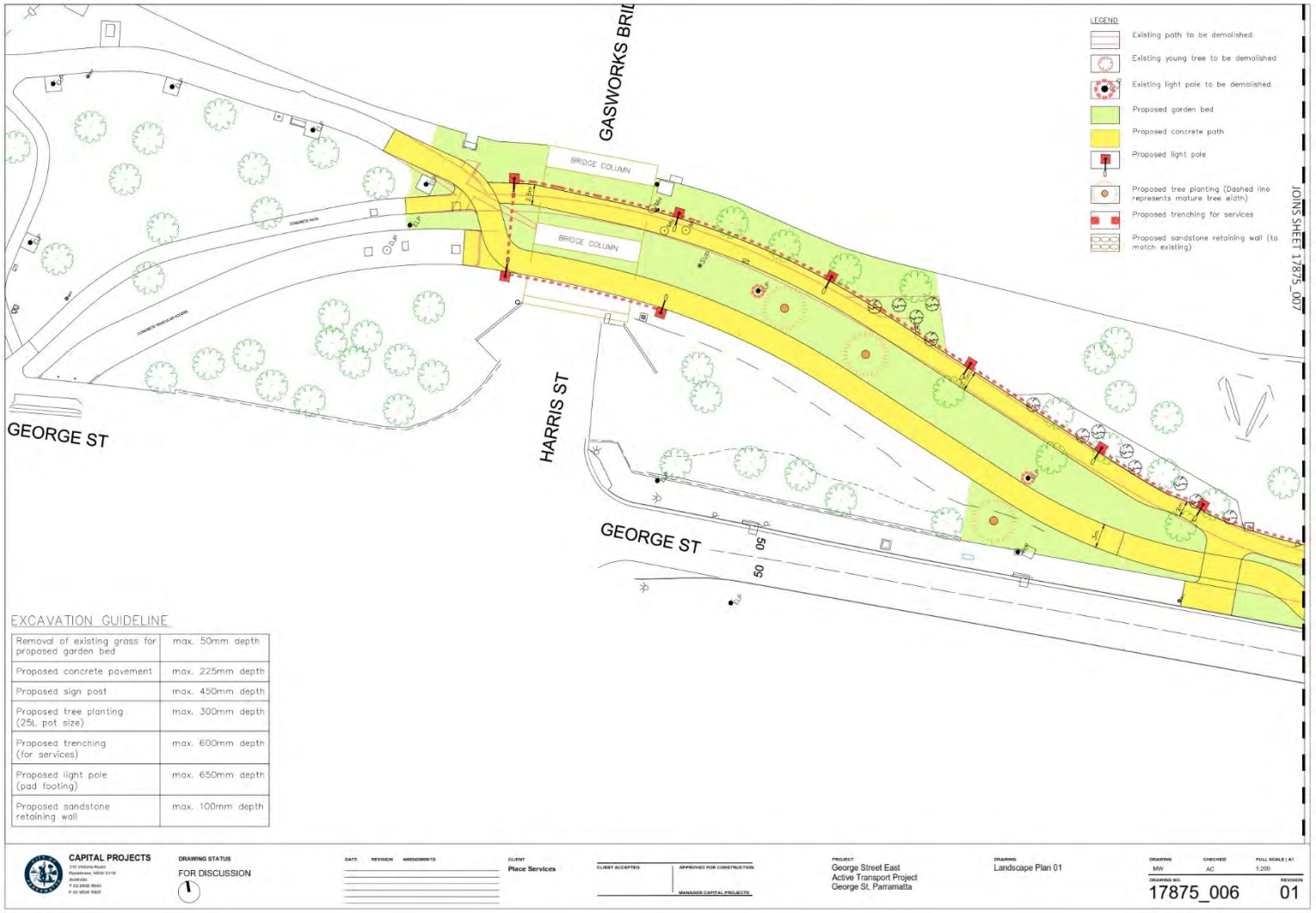

Figure 29 Draft concept plan impacts – Gasworks Bridge (source: City of Parramatta Council, 2022).

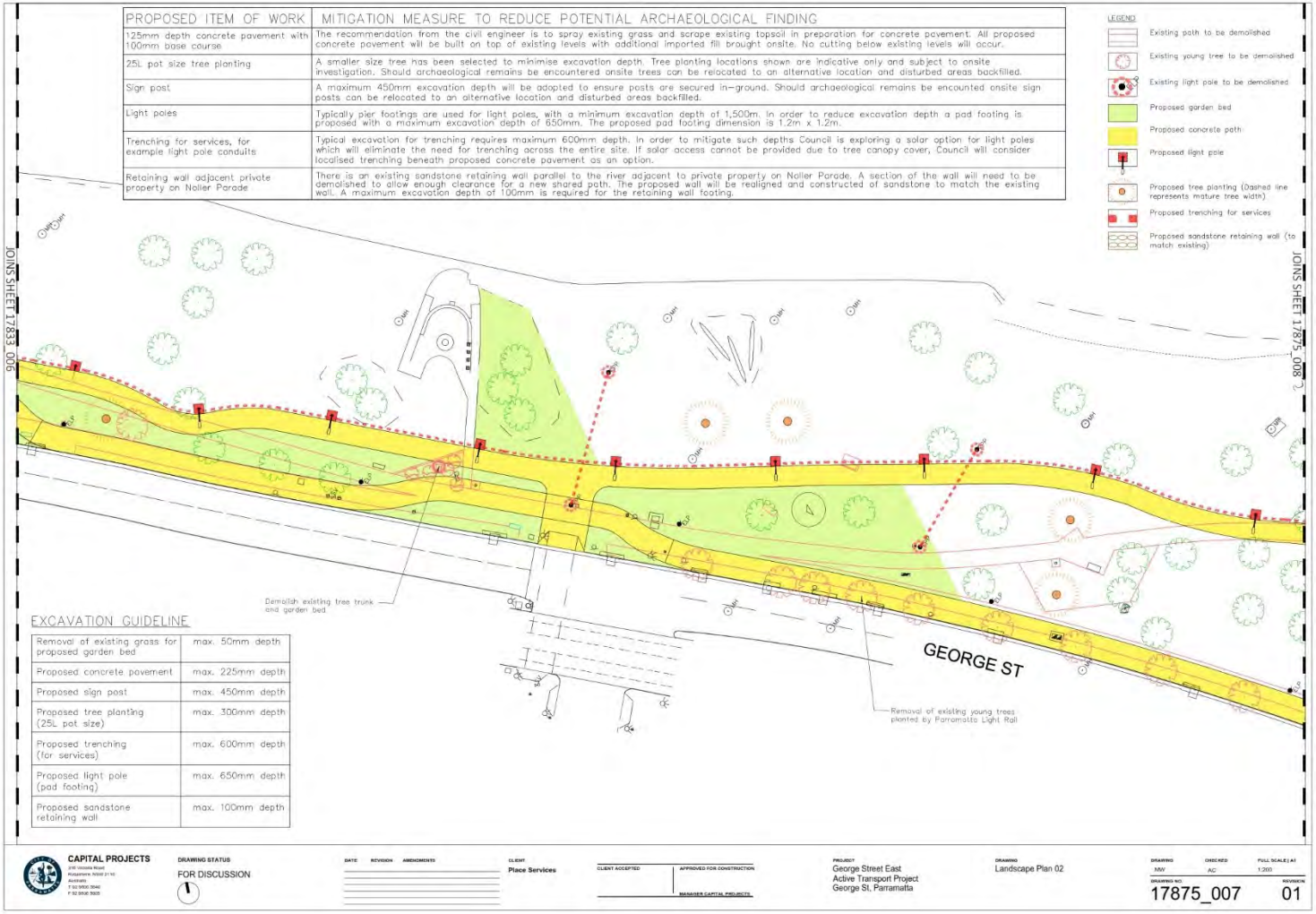

Figure 30 Draft concept plan impacts – HMAS Memorial (source: City of Parramatta Council, 2022).

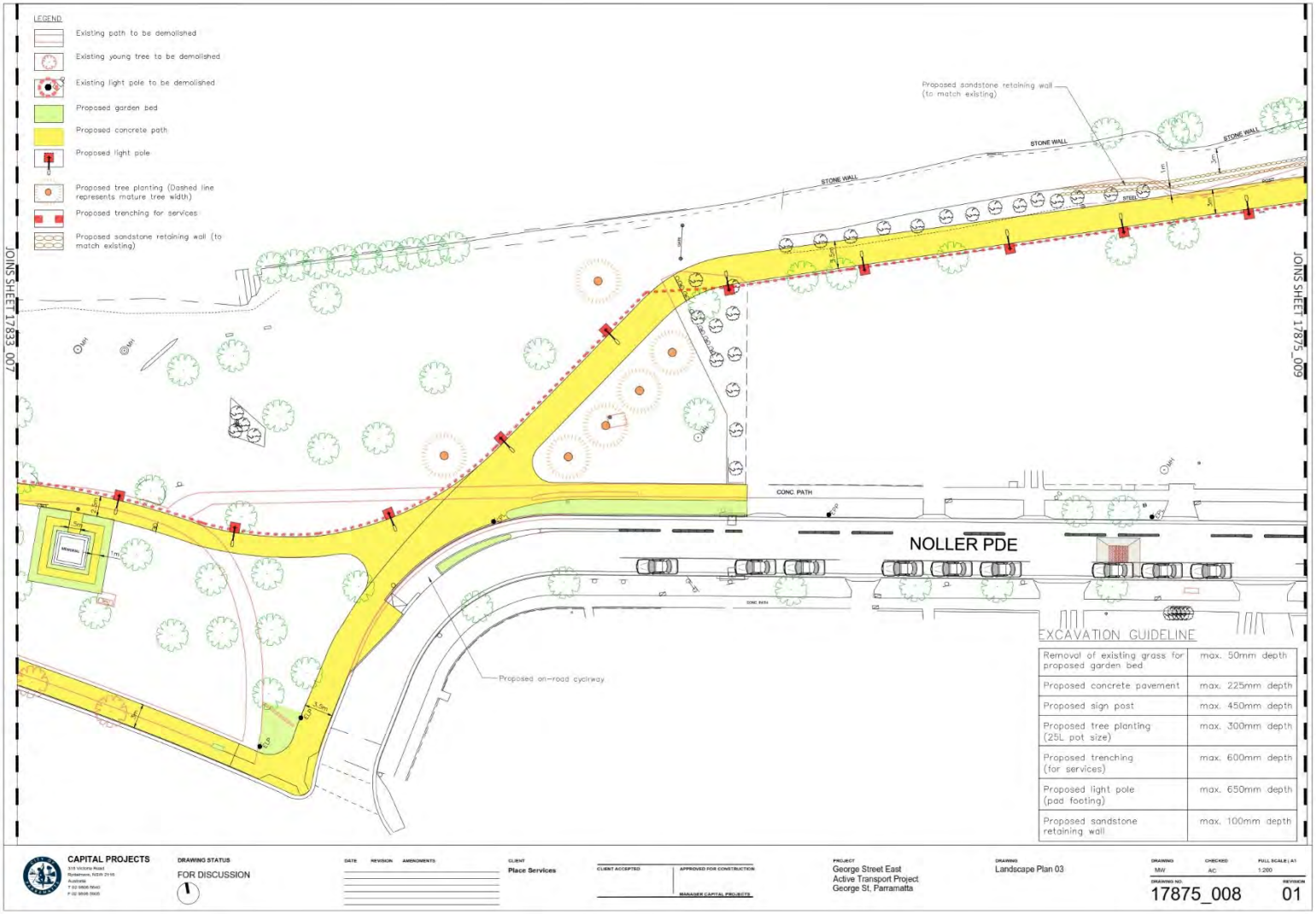

Figure 31 Draft concept plan impacts – Noller Parade-George Street intersection (source: City of Parramatta Council, 2022).

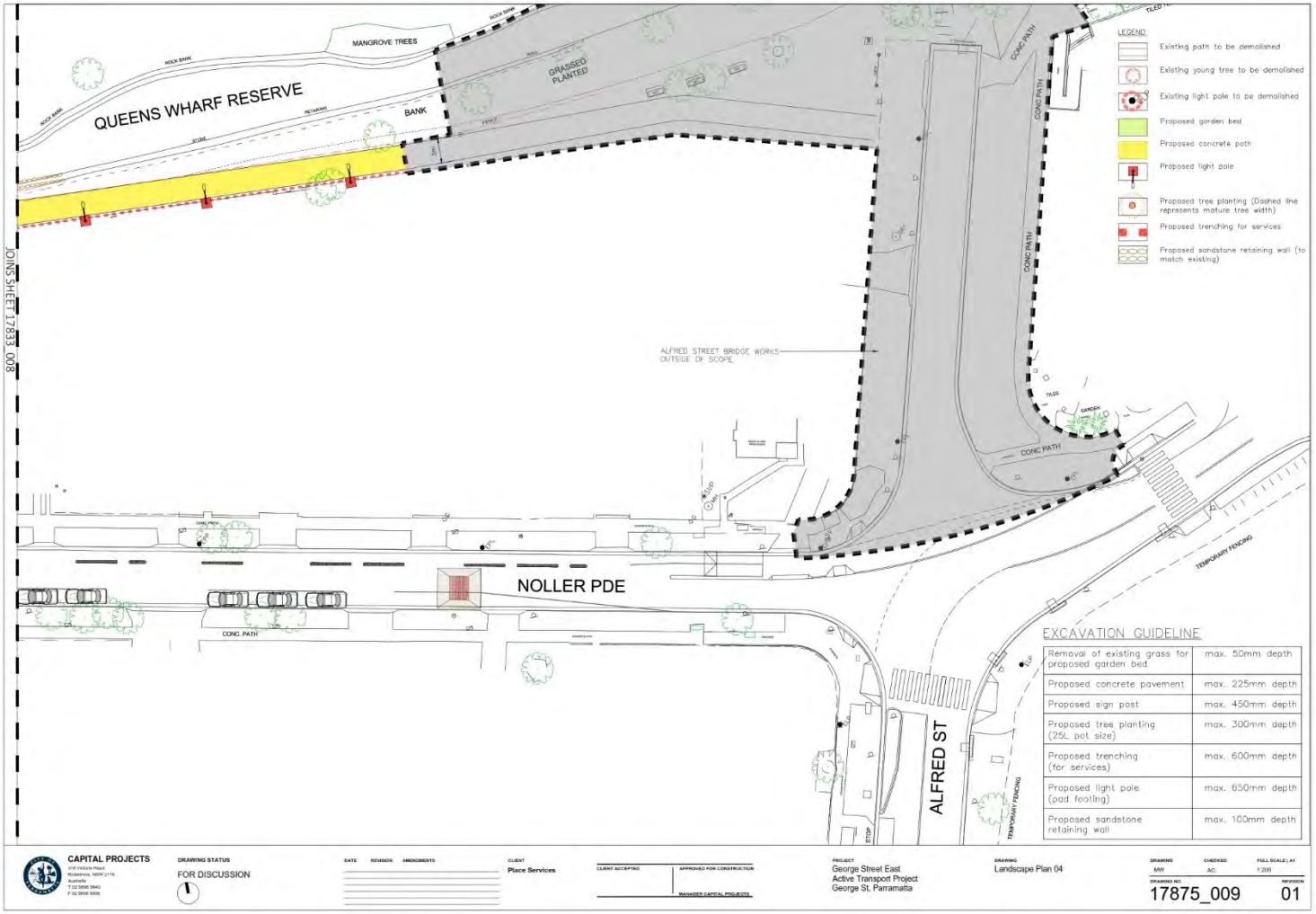

Figure 32 Draft concept plan impacts – Noller Parade-Alfred Street intersection (source: City of Parramatta Council, 2022).

7.1 Potential Aboriginal heritage impact

Based on an understanding of the depth of PSS in the area, it is likely that the excavation process would impact PSS in some locations. Works are anticipated to impact PSS within the area of shallow PSS identified by Niche (2017). In this location, the PSS has been identified as less than 600 mm below the ground surface, shallower than the depth of excavations for the works. Further impacts to PSS might be identified as works process within the study area. Further archaeological investigations would be required if additional areas of QWR PAD 1 will be impacted (see Test Excavation Methodology).

Impact to QWR PAD 1 would be partial (Figure 33-Figure 36). This may result in a partial loss of value for any associated subsurface Aboriginal objects and their associated cultural heritage values.

No impact would be made to AHIMS ID 45-6-3131, as a result there will be no loss of value. A portion of this site is subject to the conditions of AHIP 4657 and 4825.

Table 11: Summary of impacts.

Site name	Type of harm	Degree of harm	Consequence of harm
QWR PAD 1	Direct	Partial	Partial loss of value
45-6-3131	Nil	Nil	No loss of value

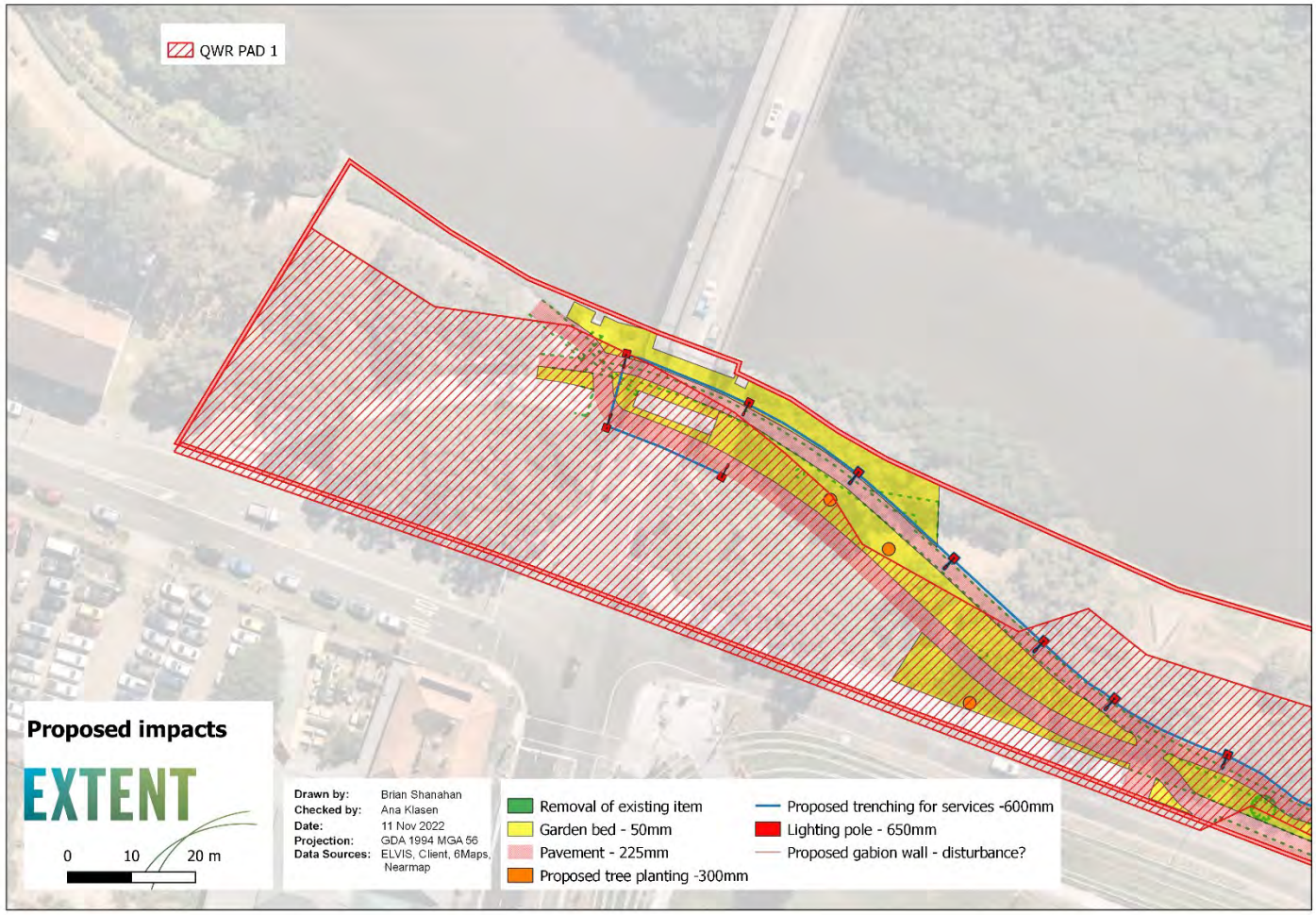

Figure 33 Impacts of proposed development on QWR PAD 1. Gasworks Bridge (source: City of Parramatta, 2022)

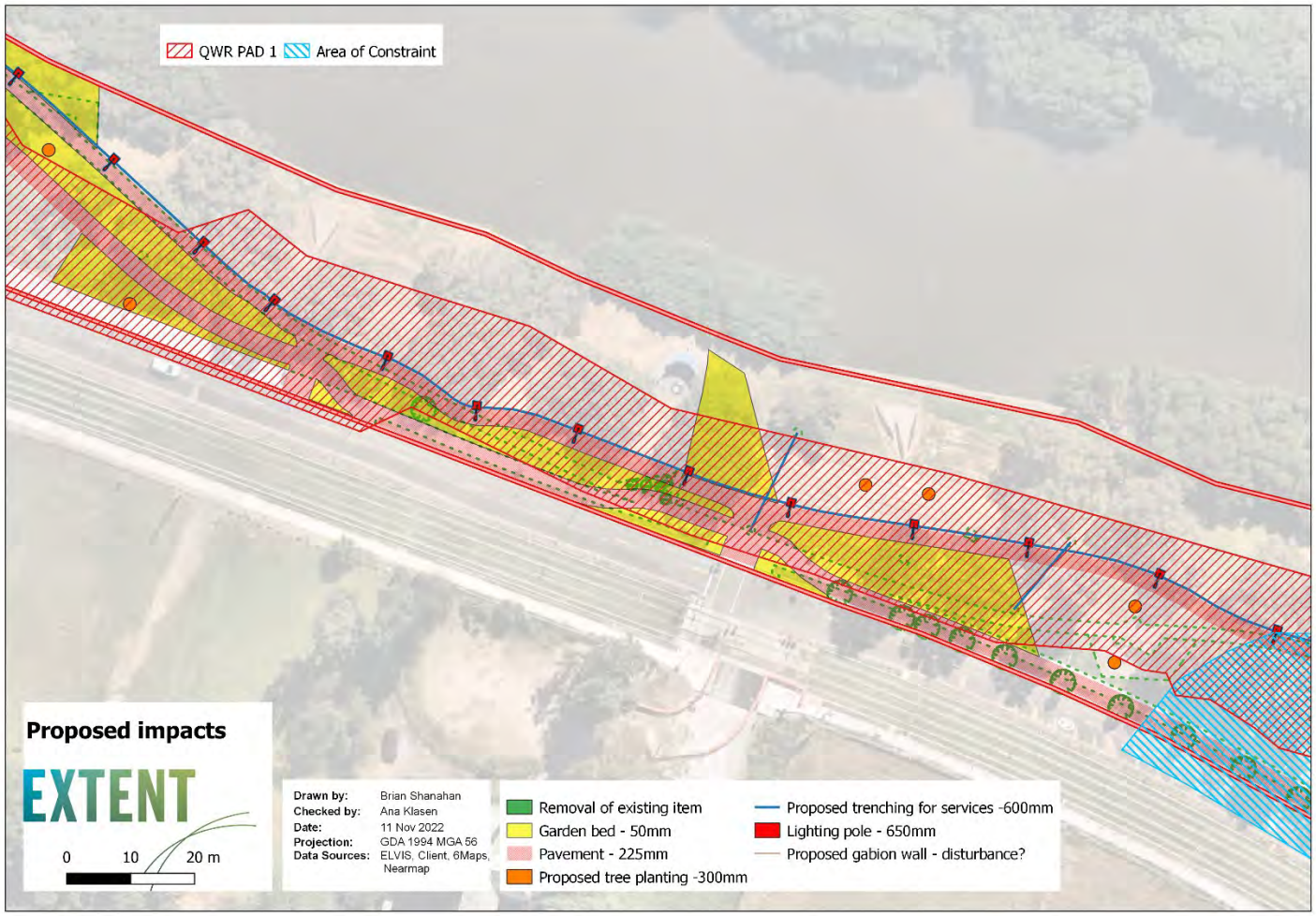

Figure 34 Impacts of proposed development on QWR PAD 1. HMAS Memorial (source: City of Parramatta, 2022)

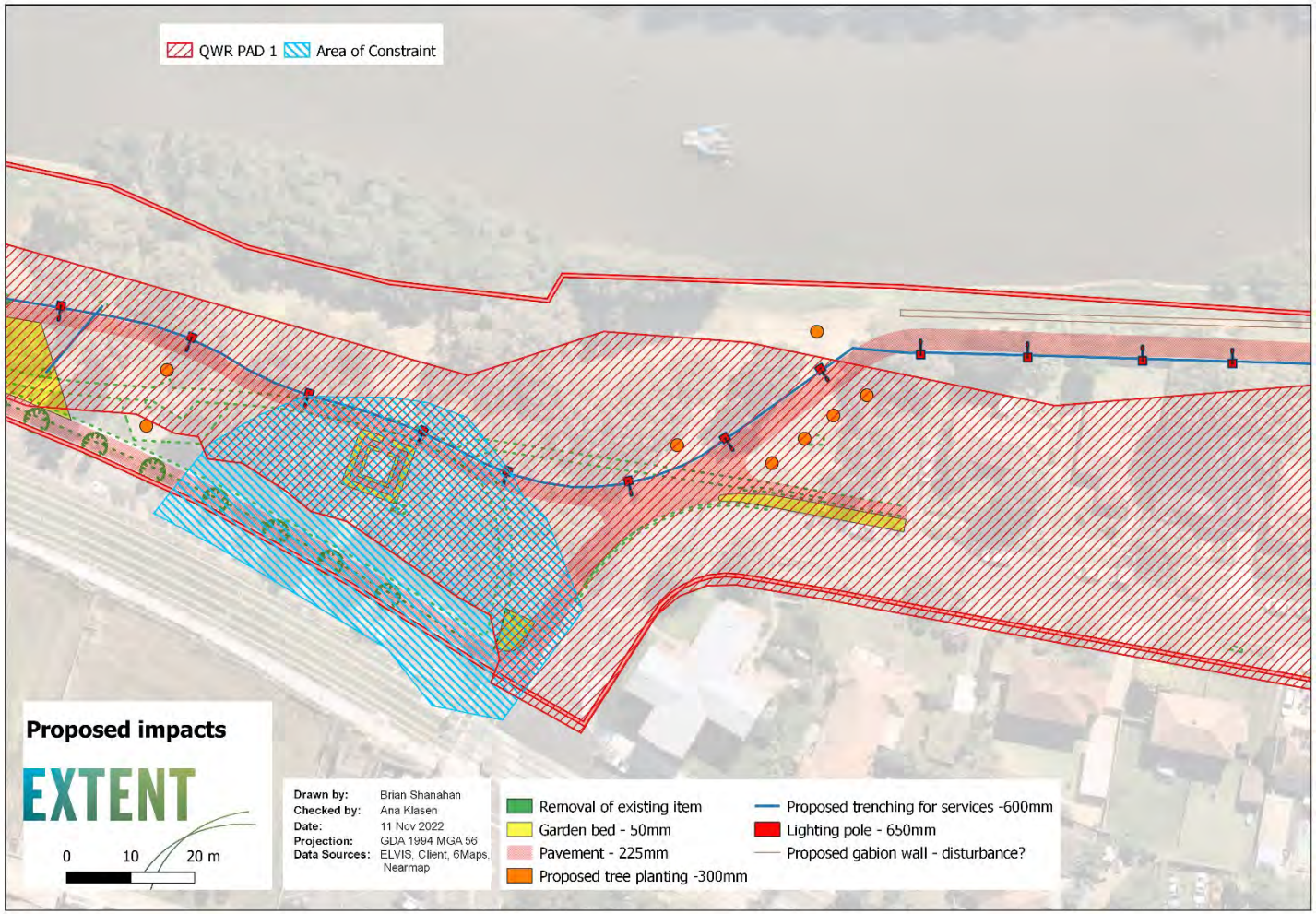

Figure 35 Impacts of proposed development on QWR PAD 1. Noller Parade-George Street intersection (source: City of Parramatta, 2022)

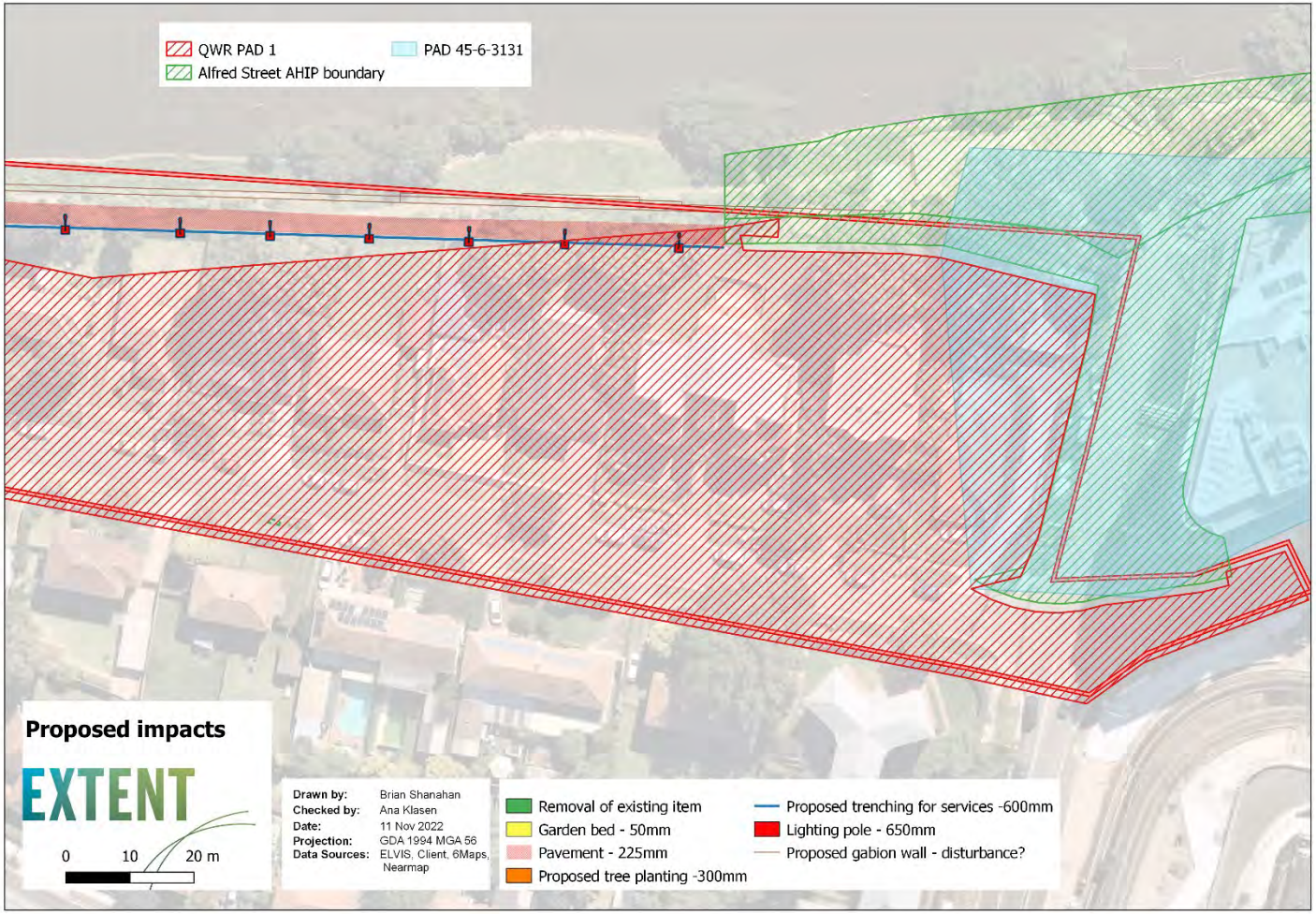

Figure 36 Impacts of proposed development on QWR PAD 1. No impacts to AHIMS ID 45-6-3131 would be undertaken. Noller Parade-Alfred Street intersection (source: City of Parramatta, 2022)

8. Management and mitigation strategy

8.1 Guiding principles

Where possible, cultural heritage should be conserved and protected *in situ*. However, where conservation is not practical, measures should be implemented to mitigate against the loss of archaeological value. These mitigation measures are based of the assessed significance of the site again the proposed impacts:

- Low significance – Conservation where possible. An AHIP would be required to impact the site before works can commence.
- Moderate significance – Conservation where possible. If conservation was not practicable further archaeological investigation would be required such as salvage excavations or surface collection under an AHIP.
- High significance – Conservation as a priority. An AHIP would be required only if other practical alternatives have been discounted. Conditions of this AHIP would depend on the nature of the site, but may include removal and preservation of scarred trees, or comprehensive salvage excavations.
- Unknown significance – Conservation where possible. Further investigation under the Code of practice will be required to assess the extent and significance of the PAD. Test excavation is not an impact mitigation measure.

8.2 Aboriginal Heritage Impact Permit

The eastern portion of the study area is subject to two AHIPs are associated with previous archaeological investigations of part of AHIMS ID 45-6-3131 (Figure 11). AHIP 4657 was issued for test excavations as part of the Alfred Street excavations. Only a very small portion of this permit falls within the study area and will not be impacted by the works (Figure 10). AHIP 4825 was issued for the salvage excavations and falls within the eastern extent of the study area. No impacts will be made to within this AHIP boundary.

No AHIP is associated with AHIMS ID 45-6-3312 by Kelleher and Nightingale (2017) as the collection and relocation of the artefact was undertaken as part of the Parramatta Light Rail Project. The Light Rail Project was a State Significant Infrastructure project and, as such, management of the site did not require an AHIP. This site remains ‘valid’ on the AHIP register but should be changed to ‘destroyed’.

An AHIP would be required to undertake test excavations within the study area due to the potential for contact-period archaeology. Additional AHIPs would be required to enable salvage excavations and impacts to Archaeological objects if required.

8.3 Management of Aboriginal objects and heritage values

It is important to the Aboriginal community that artefacts recovered from the proposed archaeological excavation program be managed appropriately. The temporary repository of any retrieved artefacts is currently in a locked cupboard on the premises of Extent Heritage (3/73 Union Road, Pyrmont, Sydney, 2009).

8.1 Discovery of human remains

If human remains or suspected human remains are discovered, the Coroners Act requires that all works must cease in the area of the find. If it is possible to do so without disturbing the find or its context further, an appropriately skilled archaeologist or physical anthropologist can be utilised to determine whether the find is human remains. If the find is confirmed to be human remains, or if this cannot be confirmed without further disturbance to the area, the NSW Police, the NSW Coroner's Office, and Heritage NSW must be contacted. The NSW Police will determine if the area represents a criminal act, and if so the NSW Police will direct proceedings, including deciding when works may continue. Aboriginal Ancestral Remains which occur outside of designated cemeteries are protected under the National Parks and Wildlife Act and must not be disturbed. If the find is Aboriginal Ancestral Remains or non-Aboriginal Ancestral Remains, Heritage NSW will direct proceedings, including when works may continue.

8.2 Unexpected finds

Unexpected finds remain protected under the NPW Act. If unforeseen Aboriginal objects are uncovered during construction, work must cease, and an archaeologist, Heritage NSW, and the Deerubbin LALC must be informed.

8.3 Ongoing consultation with Aboriginal stakeholder groups

Consultation with the registered Aboriginal stakeholders would continue throughout the life of the project, as necessary. Ongoing consultation with registered Aboriginal stakeholders will take place throughout all facets of the project, including reburial of retrieved artefacts and in the event of any unexpected Aboriginal objects being identified during works. To keep consultation current, the registered Aboriginal parties will be sent an update on the project every six months.

9. Summary of findings and recommendations

Further investigation of Aboriginal cultural heritage and the archaeological record associated with the study area is required to determine both tangible and intangible Aboriginal heritage values. Based on the findings of this assessment and the understanding of the proposed impacts, it is recommended that:

- Where possible, impacts to the PSS should be avoided.

- Where impacts cannot be avoided, further archaeological investigations are required to recover any Aboriginal objects and determine the archaeological landscape within the study area.
- As the potential for PSS is known and the soil landscape is generally understood, archaeological test excavations are recommended to further investigate the potential subsurface archaeological remains within QWR PAD 1.
- AHIMS ID 45-6-3131 will not be impacted by the proposed works.
- AHIMS ID 45-6-3312 is listed as 'valid' on the AHIMS register but should be changed to 'destroyed'. As such, it will not be impacted by the proposed test excavations or proposed development.
- An AHIP is required to authorise excavations due to the potential for contact period archaeology.
- Two AHIPs exist within the study area (AHIP 4657 and 4825) as these works are an extension of the project undertaken by City of Parramatta for the Alfred Street Pedestrian and Cyclist Bridge Development (directly east of the study area). The works associated with the Queens Wharf Reserve and Noller Parade Active Transport Link do not impact the areas of the existing AHIPs, which are also held by City of Parramatta.
- Consultation with RAPs should be completed in accordance with the Consultation Requirements to inform the development of the test excavation methodology. An excavation methodology must accompany the ACHAR and be submitted with the AHIP application.
- The results of the Aboriginal archaeological excavation program would be prepared as a standalone report that identifies any requirements for an update to this ACHAR.
- Aboriginal community consultation should continue through the life of the project to obtain cultural heritage values associated with place and any archaeology identified during the excavation program.
- A heritage interpretation strategy should be prepared for the study area in consultation with the RAPs. This strategy would include methods of incorporating identified Aboriginal heritage values into the design process.
- If changes are made to the proposed works which result in impact to locations outside of the current study area, further archaeological investigation and survey may be required.
- Works may proceed with caution within the study area, in areas outside QWR PAD 1 and AHIMS ID 45-6-3131. Further archaeological investigations and an AHIP would be required prior to any ground disturbance works within the boundary of QWR PAD 1 and AHIMS ID 45-6-3131.

- Any works undertaken within AHIP 4657 and 4825 would be subject to the conditions of these permits. Works associated with this program will not be undertaken within the AHIP boundaries.

- If suspected human remains are located during any stage of the proposed works, work should stop immediately, and the NSW police and Coroner's Office should be notified. Heritage NSW – DPC should be notified if the remains are found to be those of an Aboriginal person.

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11. Abbreviations

ACHAR	Aboriginal cultural heritage assessment report
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AHMS	Archaeological and Heritage Management Solutions
BP	Before present (AD 1950)
CHL	Commonwealth Heritage List
CRM	Cultural resource management
DCP	Development control plan
DECCW	Department of Environment, Climate Change and Water (now DPIE)
DP	Deposited plan
DPIE	Department of Planning, Industry and Environment (formerly OEH)
ERS	Eastern Regional Sequence
IMTC	Indurated mudstone/tuff/chert
ka	Abbreviation for thousands of years ago (e.g. 1 ka equals 1,000 years ago)
LALC	Local Aboriginal Land Council
LEP	Local environmental plan
LGA	Local government area
NHL	National Heritage List
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
OEH	Office of Environment and Heritage (formerly DECCW, now DPIE)
PAD	Potential archaeological deposit
PSS	Parramatta Sand Sheet
RAP	Registered Aboriginal party
REP	Regional environmental plan

SEPP	State environment planning policy
WHL	World Heritage List

12. Glossary

Aboriginal cultural heritage assessment report (ACHAR)	A document developed to assess the archaeological and cultural values of an area, generally required as part of an environmental assessment (EA).
Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010	Guidelines developed by DECCW to guide formal Aboriginal community consultation undertaken as part of an Aboriginal cultural heritage assessment report (ACHAR).
Aboriginal Heritage Impact Permit (AHIP)	The statutory instrument that the Director General of the Department of Planning, Industry and Environment (DPIE) issues under section 90 of the *National Parks and Wildlife Act 1974* (NSW) to allow the investigation (when not in accordance with certain guidelines), impact and/or destruction of Aboriginal objects. AHIPs are not required where project approval under the state-significant provisions of Part 4 (Division 4.1) of the *Environmental Planning and Assessment Act 1979* (NSW).
Aboriginal object	A statutory term defined under *the National Parks and Wildlife Act 1974* (NSW) as 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.
Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales	Guidelines developed by DECCW (2010 to inform the structure, practice and content of any archaeological investigations undertaken as part of an Aboriginal cultural heritage assessment report (ACHAR).
Department of Environment, Climate Change and Water (DECCW)	Now known as the Department of Planning, Industry and Environment (DPIE), Department of Premier and Cabinet.
Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales	Guidelines developed by DECCW, outlining the first stage of a two-stage process in determining whether Aboriginal objects and/or areas of archaeological interest are present within a study area. The findings of a due diligence assessment may lead to the development of an Aboriginal cultural heritage assessment report.
***Environmental Planning and Assessment Act 1979* (NSW)**	Statutory instrument that provides planning controls and requirements for environmental assessment in the development approval process. The Act is administered by the Department of Planning and Environment.
Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW	Guidelines developed by OEH to inform the structure and content of an Aboriginal cultural heritage assessment report (ACHAR).

Isolated find	An isolated find is usually considered a single artefact or stone tool, but can relate to any product of prehistoric Aboriginal societies. The term 'object' is used in the Aboriginal cultural heritage assessment report (ACHAR), to reflect the definitions of Aboriginal stone tools or other products in the *National Parks and Wildlife Act 1974* (NSW).
***National Parks and Wildlife Act 1974* (NSW)**	The primary piece of legislation for the protection of Aboriginal cultural heritage in New South Wales. Part 6 of this Act outlines the protection afforded to and offences relating to disturbance of Aboriginal objects. The Act is administered by DPIE
Department of Planning, Industry and Environment (DPIE)	The DPIE is responsible for managing the Aboriginal Heritage (and other) provisions of the *National Parks and Wildlife Act 1974.*
Potential archaeological deposit (PAD)	An area assessed as having the potential to contain Aboriginal objects. PADs are commonly identified on the basis of landform types, surface expressions of Aboriginal objects, surrounding archaeological material, disturbance, and a range of other factors. While not defined in the *National Parks and Wildlife Act 1974* (NSW), PADs are generally considered to retain Aboriginal objects and are therefore protected and managed in accordance with that Act.
Proponent	A corporate entity, government agency or an individual in the private sector which proposes to undertake a development project.

APPENDIX E- ABORIGINAL ARCHAELOGICAL EXCAVATION REPORT

EXTENT

HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

Queens Wharf Reserve and Noller Parade Active Transport Link—George Street East Test Excavations

Aboriginal Archaeological Test Excavation Report

Prepared for City of Parramatta

May 2024—Draft 1

Local Government Area: City of Parramatta

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Executive summary

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1. Introduction

1.1 Project background

Extent Heritage Pty Ltd has been engaged by the City of Parramatta Council (the proponent) to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) for the proposed dual pedestrian and cycleway through Queens Wharf Reserve, Parramatta NSW 2150 (Extent Heritage, in progress).

In accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (Department of Environment, Climate Change & Water [DECCW] 2010a) (Code of Practice), it was recommended that an Aboriginal Heritage Impact Permit (AHIP) be obtained to authorise subsurface investigations within areas of the study area that would be directly impacted by the proposed development. On 16 June 2023, AHIP no. 5105 was issued by Heritage NSW to authorise archaeological test excavations within pard of QWR PAD 1 (AHIMS ID 45-6-4094).

In accordance with Condition 21 of AHIP no. 5105, a Test Excavation Report must be completed and provided to Heritage NSW within 12 months of the fieldwork program being completed.

This Aboriginal Archaeological Test Excavation Report (ATER) has been commissioned to satisfy the AHIP condition.

1.2 Study area

The study area is located on the southern bank of the Parramatta River. The westernmost point of the proposed area reaches just beyond Macquarie Street (Gasworks Bridge) and the eastern most point reaches Alfred Street, Parramatta. This comprises Queens Wharf Reserve and Noller Parade. At present, the study area is a public parkland with a walking path, several mature paperbark trees, Aboriginal art sculptures, and memorials. The reserve forms part of the Parramatta Heritage Walk route.

The study area is located in the Deerubbin Local Aboriginal Land Council (LALC) boundary, Parramatta City Council Local Government Area (LGA), Parish of Saint John, and within the Cumberland County.

The study area comprises all or part of the following land parcels:

- Lot B DP 433896
- Lot 1 DP 69432
- Lot 34 DP 1107897
- Lot 56 DP 1107686
- Lots 1, 2, and 3 DP 1151643

- Lot 1 DP 909045
- Lot 1 DP 128847
- Lot A DP 444716
- Lot A DP 959111
- Lot 1 DP 126881
- Lot 1 DP 224186
- Lots 1, 3 to 11 DP 35895
- SP 46699

1.3 Proposed works

Council is undertaking active transport improvements in Queens Wharf Reserve and Noller Parade in Parramatta. Several factors have informed the importance of this project, including inadequate paths for the demand for cycling and pedestrian movements as well as construction of the Parramatta Light Rail. Located along the southern side of Parramatta River between Macarthur Street and Alfred Street, the proposed active transport link will feature separated pedestrian and cyclist paths in Queens Wharf Reserve and a two-way on road cycleway at Noller Parade. Importantly, the Queens Wharf Reserve link facilitates improved infrastructure to Alfred Street Bridge (currently in construction) over the Parramatta River. This project is part of George Street East Pedestrian and Cyclist Paths, which successfully received funding through Transport for NSW's 'Get NSW Active' grant.

1.4 Report aims and objectives

This ATER has been prepared in accordance with Condition 21 of AHIP no. 5105 and the *Code of Practice*. The aims and objectives of this report are to report on test excavations and as such:

- identify any Aboriginal objects or places within the study area;
- assess the scientific significance of any identified Aboriginal objects or places;
- evaluate and discuss the impacts of the proposed works on identified Aboriginal objects or places; and
- develop management measures for the proposed impacts to identified Aboriginal objects or places.

To satisfy the objectives of this report, the following tasks were undertaken:

- review of existing archaeological data, including assessments previously completed within the vicinity of the study area and relevant heritage databases;

- investigate the environmental context of the study area;
- synthesise background information into a predictive model to inform an assessment of archaeological potential across the study area; and
- complete a test excavation program across the study area to test the results of the predictive model and identify subsurface Aboriginal objects.

The results of these objectives are provided in full in the accompanying ACHAR produced for the site by Extent Heritage (2023).

1.5 Limitations

This report is based on existing and publicly available environmental and archaeological information, previous investigations of the study area, and the results of an archaeological test excavation. It did not include any independent verification of the results or interpretations of externally sourced reports (except where archaeological investigation indicated inconsistencies). The AHIMS data was provided by Heritage NSW. Information in the archaeological assessment report reflects the scope and the accuracy of the AHIMS site data, which in some instances is limited. This report does not consider historical archaeology or built heritage, which are the subjects of separate reports.

1.6 Authorship and acknowledgements

This report was authored by Hannah Morris (Senior Heritage Advisor) Rebekah Hawkins (Senior Heritage Advisor and lithics specialist), and contributions by Sarah Janson (Associate).

Extent Heritage would like to acknowledge the ongoing support of Michelle Wang and Adam Cook from City of Parramatta.

Figure 1. The study area.

2. Planning context

The study area is subject to several legislative acts and statutory controls that govern the management of environmental heritage. An overview of the legislation relevant to heritage matters is provided below.

Table 1. Summary of legislative context for the project

Legislation	Description	Relevant to subject area?	Details
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	Protects Aboriginal places on the world, national and commonwealth registers.	No	A search of the heritage databases was completed on 1 August 2023. A summary of register searches is outlined below: ▪ World Heritage List: No listed items are located within the study area; ▪ National Heritage List: No listed items are located within the study area; ▪ Commonwealth Heritage List: No listed items are located within the study area; and ▪ Register of the National Estate: No listed items are located within the study area.
Native Title Act 1993	Administers rights and interests over lands and waters by Aboriginal people. Often used in NSW to identify relevant stakeholders for consultation.	No	A search of the National Native Title Tribunal database was completed on 1 August 2023. There are no Native Title claims currently registered in the study area.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Protection of areas identified by Aboriginal people as of high significance and under threat.	No	The study area has not been identified as a place of high significance under this Act.
State (NSW)			
National Parks and Wildlife Act 1974	Protects blanket protection for all Aboriginal objects. Includes process and mechanisms for	Yes	An AHIP must be issued by the Chief Executive of OEH under section 90 of the Act where harm to an Aboriginal object cannot be

	development where Aboriginal objects are present.		avoided. AHIP no. 5105 was issued by Heritage NSW to authorise archaeological test excavations at QWR PAD 1 (AHIMS ID 45-6-4094).
Environmental Planning and Assessment Act 1979	Requires assessment and management of Aboriginal heritage through a range of environmental and approval contexts.	Yes	The LEP relevant to this project is the Parramatta Local Environmental Plan 2023. One item listed under schedule 5 (Environmental Heritage) of the Parramatta LEP 2011 is located within the study area, Queen's Wharf Reserve and stone wall and potential archaeological site (LEP item no. I548).
Aboriginal Land Rights Act 1983	Allows transfer of ownership of vacant crown land to a Local Aboriginal Land Council. Often used in NSW to identify relevant stakeholders for consultation.	No	The study area consists of freehold land, and cannot be subject to a claim under this Act.

3. ‘Aboriginal stakeholder consultation

3.1 Consultation process in NSW

Aboriginal stakeholder consultation for the project has been undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010. The purpose of the consultation was to identify and understand any social or intangible values that may be associated with the subject land, and to seek specific review and comment on the proposed assessment and test excavation methodology from the local Aboriginal community.

3.1.1 Identification of RAPs

Aboriginal community consultation was initiated by Extent Heritage in July 2022. This consultation process was part of an ACHAR for the study area. In accordance with Stage 4.1.2 of the Consultation Requirements, Extent Heritage corresponded with the following organisations to obtain the names of Aboriginal people who may hold cultural knowledge of the study area:

- Greater Sydney Local Land Services
- Parramatta City Council
- Native Title Service Corporation (NTSCorp)
- Parramatta LALC
- Heritage NSW (DPC)
- National Native Title Tribunal
- Office of the Registrar, *Aboriginal Land Rights Act* 1983.

In accordance with Step 4.1.3 of the Consultation Requirements, an advertisement was placed in the *dailytelegraph.com.au* on 27 July 2022 inviting Aboriginal individuals or organisations to register an interest in the project by 10 August 2022. In addition, correspondence was sent to all Aboriginal individuals and organisations identified through the completion of Step 4.1.2 on 28 July 2022, inviting them to register an interest in the project by 12 August 2022. The registration date was extended to 19 August 2022 following feedback from one stakeholder that COVID, the high number of ACHAR consultations being undertaken in Parramatta, and consultation fatigue may cause stakeholders to miss an opportunity to participate in the project. A second opportunity to register for the project was sent on 18 November 2022 as all RAPs on the Heritage NSW list (registered or not) were sent the draft ACHAR and test excavation methodology. Registrations for interest in the project were to be provided by 19 December 2022.

3.1.2 Registration

The consultation process has resulted in the identification of 26 Registered Aboriginal Parties (RAPs) (Table 2**Error! Reference source not found.**).

Table 2: List of Registered Aboriginal Parties.

Organisation	Contact
A1 Indigenous Services	Carolyn Hickey
Aragung Cultural Heritage Site Assessments	James Eastwood
Amanda Hickey Cultural Services	Amanda Hickey
Barraby Cultural Services	Lee Field
Butucarbin Aboriginal Corporation	Jennifer Beale
B.H. Heritage Consultants	Ralph Hampton
Clive Freeman	Clive Freeman
[redacted]	[redacted]
Darug Custodian Aboriginal Corporation	Justine Coplin
Darug Land Observations	Jamie and Anna Workman
Darug Ngurra Aboriginal Corporation	Dirk Schmitt (Joel Tubbs)
Deerubbin LALC	Steve Randall
Dharug Strategic Management Group	Richie Howitt
Didge Ngunawal Clan	Lilly Carroll and Paul Boyd
Freeman & Marx Pty Ltd & Burrabirang	Clive Freeman
Gunjeewong	Shayne Dickson
Gunya Aboriginal Cultural Heritage Services Pty Ltd	Adam Gunther
Kamilaroi Yankuntjatjara Working Group	Phil Khan
Koori Digs	Korri Currell
Merrigarn	Shaun Carroll
Minnamunnung	Aaron Broad
Muragadi	Jesse Johnson
[redacted]	[redacted]
Murra Bidgee Mullangari Aboriginal Corporation	Darleen and Ryan Johnson
Ngambaa Cultural Connections	
Waawaar Awaa Aboriginal Corporation	Rodney Gunther
Widescope Indigenous Group	Donna and Steven Hickey
[redacted]	[redacted]

Organisation	Contact
Woronora Plateau Gundungara Elders Council	Kayla Williamson
Wurrumay	Vicky Slater
Yurrandaali Cultural Services	Bo Field

3.1.3 Draft ACHAR and excavation methodology

The draft ACHAR and associated excavation methodology were sent to the RAPs on 18 November 2022 for review for the mandated twenty-eight-day review period. The RAPs were also asked to provide any information regarding cultural values or places of importance to the Aboriginal community within the study area for inconclusion in this ACHAR. Responses were received by 19 December 2022 As a result, Requirement 15a of the Code of Practice will have been satisfied and the methodology was developed in consultation with the RAPs.

Five RAPs provided feedback presenting support for the draft test excavation methodology:

- [redacted],
- Dide Ngunawal Clan,
- Koori Digs Services,
- Muragadi Heritage Indigenous Corporation, and
- Waawaar Awaa Aboriginal Corporation.

3.2 Distribution of AHIP

AHIP no. 5105 was issued on 16 June 2023. Condition 15 of the AHIP states that a copy of AHIP no. 5105 must be provided to all RAPs within fourteen (14) days of receipt. As the project went to a hold point for tender and the permit holder was no longer certain, the RAPs were sent a copy of the AHIP on 7 August 2023.

A second AHIP was granted to Umwelt for Visionstream/NBN installation at the intersection of George Street and Noller Parade, within QWR and the boundary of this study area. The oversight meant that works associated with AHIP no. 5105 and the Umwelt AHIP no. 4766 were both approved. The resolution with Heritage NSW was that, as Extent Heritage was not undertaking works in that portion of the study area, Umwelt would proceed with their methodology.

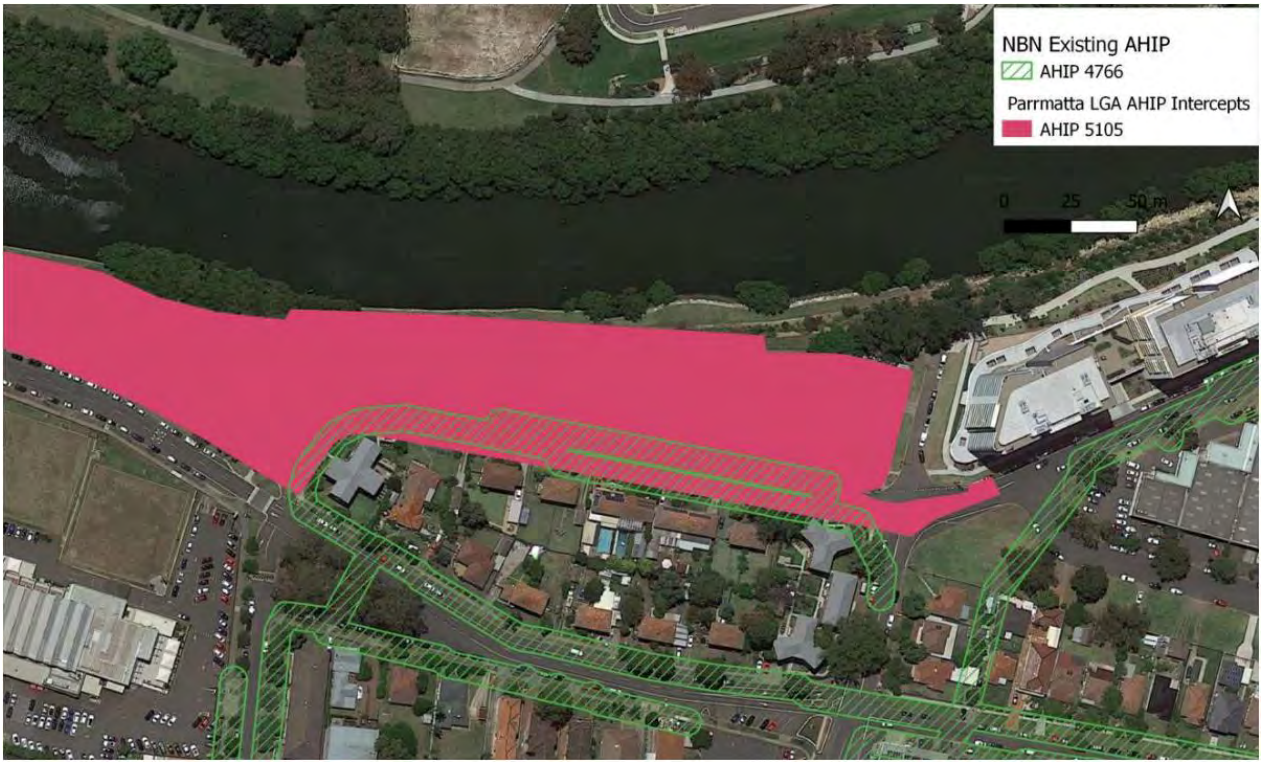

Figure 2. Location of overlapping AHIP no. 5105 and AHIP no. 4766 (source: image supplied by Umwelt).

3.3 Archaeological test excavation

Invitations to participate in fieldwork were sent out to several RAP groups on behalf of City of Parramatta. Table 3 identifies the RAP representatives who participated in the test excavations.

Table 3. RAPs participating in test excavations.

Personnel	Organisation
Belinda Jackson	Kamilaroi
Jamie Currell	Kamilaroi
Lee Carroll	Corroborree
Ethan Tremlynn	Corroborree
Peter Markovik	Freeman and Marx

4. Landscape context

An in-depth assessment of the landscape context has been provided in the accompanying ACHAR, produced by Extent Heritage (2023) in association with this report. This section includes a concise summary of the geology, soils, hydrology, vegetation, and past land use of the study area. These environmental factors are key influences in the potential types of raw material sources available, past human activities, and site formation processes that may occur in the study area. An understanding of local environmental factors and how they have changed over time is fundamental to the identification of areas of archaeological potential and their relative levels of preservation in the study area.

4.1 Geology

The Cumberland Plain is an extensive low-lying plain within the Sydney Basin bioregion. The local topography is characterised by level to gently undulating alluvial floodplains adjacent Parramatta River (Chapman et al. 2009).

With a maximum thickness of 300 m, the Wianamatta Group was deposited during the Triassic period (c.251.9–201.3Mya) and includes three major geological units: Ashfield Shale (consisting of laminate and dark grey siltstones), Bringelly Shale (consisting of shale with occasional calcareous claystone, laminate, and infrequent coal) and Minchinbury Sandstone (consisting of fine to medium-grained quartz lithic sandstone) (GAASC 2017; Office of Environment and Heritage [OEH] 2019).

4.2 Soil landscape

Soil landscape mapping of the region by the Soil Conservation Service of NSW (SCSNSW) shows the majority of the study area is located within ‘Disturbed Terrain’. As seen in Figure 3, the study also comprises a section of the Birrong landform in the western portion. Areas of Disturbed Terrain often mark locations where reclamation fills were deposited on previous swamps, estuaries, and wetlands. This includes the lower reaches of the Parramatta harbour foreshore. Despite the name, archaeological excavations across Parramatta in areas of Disturbed Terrain have repeatedly shown intact, or partially intact, pre-colonial soil profiles surviving below more recent fill units.

Figure 3. Soil landscapes associated with the study area (source: NSW Planning and Environment with Extent Heritage additions 2021).

Disturbed Terrain

Soils within Disturbed Terrain landscapes are characterised by extensive deposits of landfill, including soil, rock, building and waste material up to a depth of 1 m, and have been extensively cleared of their native vegetation (Chapman and Murphy 1989).

Birrong

The Birrong soil landscape is a fluvial deposit dominated by silt and clay alluvial material. The soil landscape forms the broad concave floodplain of watercourses, draining the Wianamatta Group shales, on the Cumberland lowlands. The dominant soil materials are a dark brown pedal silty clay loam (A1 horizon), above a bleached hardsetting clay loam (A2 horizon). The archaeologically sterile horizon (B horizon) consists of an orange mottled silty clay. This B horizon transitions to a second B horizon of light grey mottled salty heavy clay which often overlies bedrock.

Parramatta Sand Body (PSB)

The PSB is an alluvial and fluvial sand deposit extending for approximately 2.5 km along the Parramatta River, within a corridor of approximately 200 m from the bank. It is located largely on the south side of the river but with small sections on the north bank. Based on radiocarbon dating, the PSB is thought to have formed approximately 50,000 years ago (JMcDCHM 2005), although OSL dates from different locations across the deposit indicate some areas formed only at the onset of the Last Glacial Maximum (LGM) approximately 20,000 years ago (Extent Heritage 2019,

16). More recent dating of the sand sheet showed Aboriginal presence in Parramatta at 30,000 years ago (McDonald 2007).

In 2008, Peter Mitchell (Groundtruth Consulting) was engaged to investigate the soil profile of Parramatta. The aim was to provide a guide for future development by flagging the likely presence of the PSB and associated Aboriginal archaeology on the sites of future projects. The following methods were utilised to determine areas of PSB: review of historic plans, results of archaeological fieldwork, contours and landscape features, information about other soil materials and mapping of known drains, waterholes, and swamps along the River (Groundtruth Consulting 2008, 2). Archaeological investigations since then have confirmed the extensive and significant presence of the PSB and associated Aboriginal archaeology.

4.3 Topography

Topographically, the study area is situated on the edge of a terrace overlooking the Parramatta River. It is located on the riverbank and has a gentle slope northward toward the water (1.4% on the western portion of the study area and 3.5% on the eastern portion).

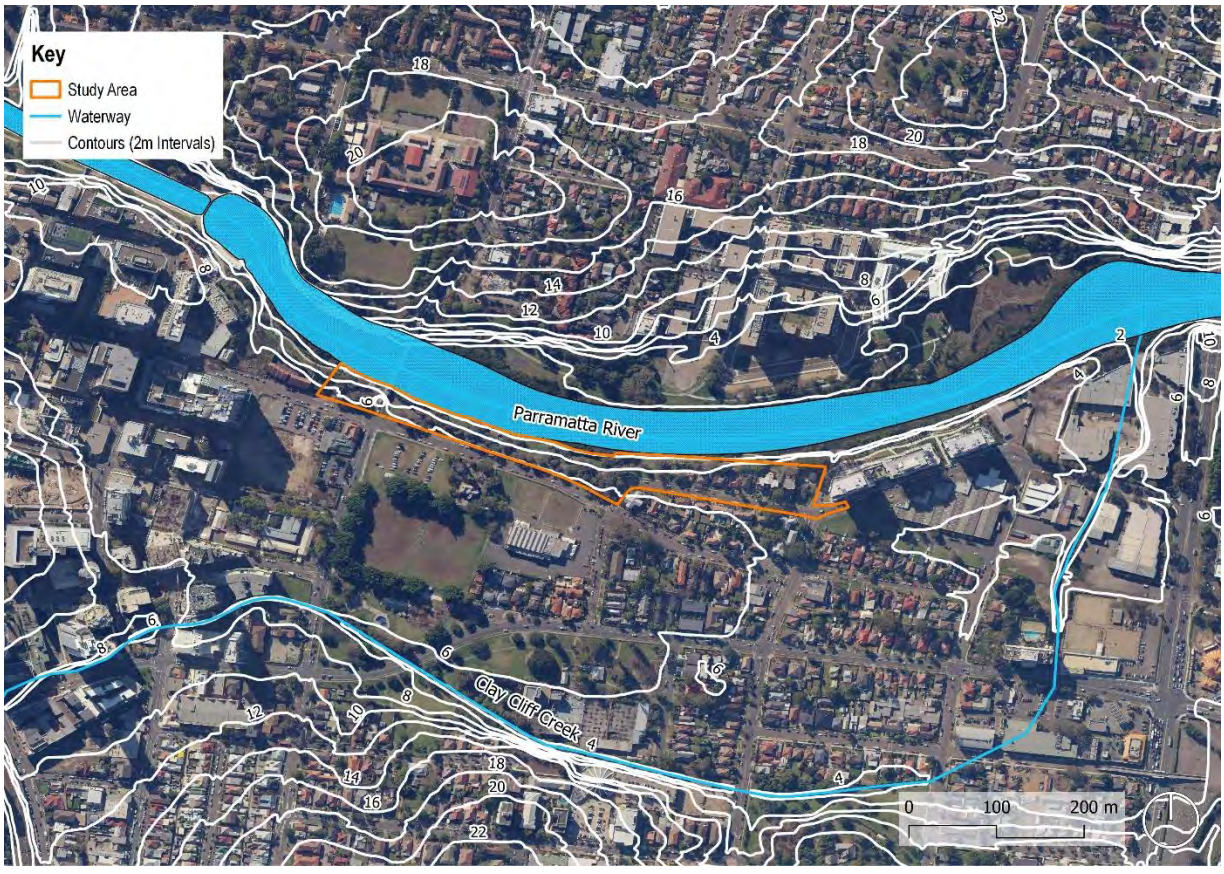

Figure 4. Topography of the study area and surrounding landscape (source: NSW Planning and Environment).

4.4 Hydrology

The study area is located on the southern bank of the Parramatta River, situated in the western section of the Sydney Metropolitan region. Parramatta is the location where tidal sea water meets the freshwater inland stream, becoming brackish. The freshwater flows into the Parramatta River from the Domain Creek, the Darling Mills Creek, and the Toongabbie Creek and is met by salt tides from Sydney Harbour.

The study area is approximately 330 m west of the confluence between Clay Cliff Creek and the Parramatta River (Figure 5). Clay Cliff Creek deposited fresh water into a lagoon that was situated approximately 115 m south of the study area, within the fields of Robin Thomas Reserve. The lagoon was quite large, measuring approximately 25 m wide and 90 m long. This lagoon is no longer present.

The study area is bordered to the north by the Parramatta River and to the south by Clay Cliff Creek, forming a resource-dense pocket of land.

Figure 5. Association of the original alignment of Clay Cliff Creek and the Parramatta River.

4.5 Past vegetation

The nature and range of natural resources that existed in the past strongly influenced the nature of past Aboriginal use and occupation. Bark from trees could be stripped to make canoes, shields, and other items (Attenbrow 2010, 85–97). The vegetation itself provided food resources such as

edible plants, fruits, and seeds, and also provided habitats for animals such as possums and birds, which could be hunted (Attenbrow 2010, 70–78).

Historically, the river corridor would have been the setting for a diverse vegetation community including Grey Box and Forest Red Gum, providing wide-ranging resources for Aboriginal exploitation and utilisation. The diverse range of food, fibre, and aquatic resources near the study area would have been very attractive for past Aboriginal occupation and use. Extensive development of the study area, however, has resulted in the loss of most, if not all, remnant vegetation (Cardno Lawson Treloar 2008, ii, 23–24). Consequently, most of the trees and bushland present in the study area today would have only been established in the last a hundred years or less.

4.6 Historical land use and disturbance

The Queens Wharf Reserve has been subject to intense development from 1788 to present, primarily involving military structures and industrial development. In 1790, the first public wharf was constructed, along with military barracks and grain store complexes. A second wharf was constructed in in 1808. In 1825, a larger Commissariat store is built just behind the stone store. Within three years of its construction the Commissariat store is converted to a military barracks.

In 1823, Howell's wind and water mill was established along the Parramatta River. This structure included the damming of the river along a natural rock formation below the modern Gasworks Bridge and was flanked to the east by affiliated buildings by the 1830s. By the 1840s, substantial structures extended from the mill to within meters of the public wharf along the George Street frontage.

In 1834-1835, the Lennox Wall (a large stone wharf) was constructed to the east of the 1808 wharf. During the 1840s, Byrnes steam flour mill was established along the river. In 1870, Howell's mill was demolished in favour of the Gasworks, including the destruction of Howell's Dam sometime between 1870-1877. The Gasworks itself was constructed between 1872-1873 with the addition of the Gasworks Bridge in 1881. Between 1883-1884, a tramline was established in the area. In the 1960s, Parramatta City Council upgraded the area to public parklands.

This intense historical development of the study area has included a range of ground impacts and disturbances including construction, demolition, service installation, vegetation clearance and planting, and landscaping. The foreshore was also built up with reclamation fills to enable construction on the riverbank.

Based on an understanding of these developments and archaeological investigations in the vicinity of the study area, it is highly likely that the upper natural soil profile was removed or heavily disturbed during the historical period. As a result, surface and shallow subsurface Aboriginal objects will have been removed or moved from their original context. Due to the depth of the PSB within the study area, there is a potential for Aboriginal objects to remain in situ. Redeposited natural sands and historical archaeological contexts may also possess Aboriginal objects.

A full site history can be found in the Historical Archaeological Assessment, and associated Archaeological Research Design, for this project (Extent Heritage 2023).

5. Ethnographic record

From an archaeological perspective, Aboriginal peoples have inhabited the Sydney Basin for at least 45,000 years. The Aboriginal population of the region, comprising several large linguistic groups consisting of smaller clans, is estimated to be between 5,000 and 8,000 individuals prior to British invasion.

The traditional lands of Parramatta belonged to the Burramattagal/Boromedegal people who spoke a dialect belonging to the Darug language group. Their land corresponds roughly with the upper reaches of the Parramatta River, and their descendants maintain a strong connection to the area today.

The Parramatta River and its tributaries, estuaries, and mangrove swamps formed critical resources for Burramattagal communities. The river itself provided a reliable supply of fresh water, as well as freshwater and estuarine fish, crayfish, mangrove crabs, and cobra (toredo) worms. Terrestrial animals from the surrounding open forest were drawn to the water and were hunted for food. Important plants and animals were also found in mangrove wetlands and the river's fertile floodplains, providing medicines, fibres, vitamins, and other food staples.

British invasion had a devastating and lasting impact on Aboriginal communities. While there were positive engagements on the early frontier such as the development of an incipient fish trade in Parramatta town, a combination of disease, dispossession, and violence (both state-sanctioned and unofficial) led to the deaths of many Aboriginal people and destroyed traditional ways of life.

A full ethnographic record including use of the environment can be found in the ACHAR for this project (Extent Heritage 2023).

6. Archaeological Background

6.1 Regional archaeological context

6.1.1 Early Aboriginal occupation and the last glacial maximum

The earliest widely accepted date identified within the Sydney region comes from a site located in the Parramatta Sand Sheet which dates to 30,735 (give or take 407 years) Before Present (BP).

The dates of these early sites fall at about the beginning of the Last Glacial Maximum (LGM) from about 30,000 to 18,000 years ago where global ice sheets were at their greatest extent. Temperatures at most parts of the globe were between 6°C and 10°C cooler and there was less rain (Clark et al. 2012). At about 21,000 years ago, areas of rainforest and tall open forest disappeared and woodland became more widespread.

The climate gradually became warmer and wetter, and sea levels rising around 15,000 BP. This marked the change from the Pleistocene to Holocene age. From the Holocene onwards, there is a more continuous archaeological record in the Sydney region.

Early occupation sites from the late Pleistocene and early Holocene are found in rock shelters, especially on the edges of large rivers like the Hawkesbury-Nepean and Parramatta River. This is because evidence of occupation of the cave is best preserved where water has built up a thick floor with layers of sand. Over time, the new surfaces caps evidence of earlier archaeology.

During this period, Aboriginal peoples likely moved along main river systems, traveling long distances between camps.

6.1.2 Intensification during the Holocene

The Holocene period began sometime between 10,000 and 12,000 years ago (Lowe 2001). At the start of this period, there was a significance rise in sea levels (about 60 metres). Because of this, Aboriginal groups living on the coast were forced to move inland. Around 3,000 years ago, the region became drier and rainfall became more inconsistent.

The changes in climate and areas where Aboriginal people were living lead to changes in the stone tools people were making. There was less use of silicified tuff and instead there became a preference for stone available locally. There also appears to be a substantial growth, and then decline, in the production and use of backed artefacts, as well as the introduction of ground-edged implements (with the peak period being approximately 4,000–1,000 BP).

There also appears to be a considerable increase in archaeological evidence of human occupation. This includes a spike in artefact accumulation rates between 9,000 and 8,000 BP. After this, there appears to be a steady increase in the number of sites being used from about 6,000 BP. Almost 80 per cent of the Sydney region's radiocarbon dates fall within the last 5,000 years BP, with the number of dated sites peaking around 2,000 years ago, and 28 per cent of regional dates falling between 2,000 and 1,000 BP (McDonald 2008, 36).

Consequently, it has been argued that the Holocene 'intensification' of cultural activity is a result of increased populations during this period. Smith et al. (2008) and Williams et al. (2010) suggest that populations were, in fact, larger in the last 2,000 years than any preceding period. Using radiocarbon data and regional studies, they demonstrated that there was an increasing use of sites in all locations during the Holocene which cannot be explained by movement of people across the landscape, but instead, points towards increasing numbers of people using more of the landscape.

It is also likely that the technological changes and possible population increase were accompanied by broad social changes. Hiscock and Attenbrow (2005) have suggested that changing climate conditions after around 3,000 BP stimulated a change in foraging practice that may have incorporated a shift towards higher mobility. On the other hand, McDonald (2008, 40) suggests that by about 4,000 BP, people occupied smaller territories and used residential bases on a more permanent basis, as well as defined foraging ranges using annual and extended cycles.

In an attempt to better understand changes in use and occupation during the Holocene period, Val Attenbrow (2006) undertook a detailed study of the Upper Mangrove Creek catchment to the north of Sydney. She found significant changes in site patterning during the Holocene in the form of a gradual increase in habitation sites during the early Holocene, followed by a dramatic increase around 2,000 BP. Sites were classified as either base camps or activity locations/transit camps based on comparative millennial artefact accumulation rates. Using these criteria, Attenbrow found that:

- very few base camps were established during the early Holocene until about 4,000 BP, where more base camps were established; at the same time, ground-edged implements appeared in the associated archaeological assemblages.
- between 3,000 and 2,000 BP, base camps numbers increased substantially with a reversal in the ratio of base camps to activity/transit camps; and
- no new base camps were established during the last two thousand years; instead, there was a dramatic increase in activity/transit camps which suggest a greater practice in residential mobility.

The research shows that the changing patterns in the distribution of different types of habitation sites indicate a re-organisation of mobility patterns at frequent intervals, particularly during the last four thousand years. Although more detailed studies are required, particularly with regards to the identification and classification of 'base camps', the Mangrove Creek investigations demonstrate at a broad level that:

- the number of occupation sites increased over time, particularly after 2,000 BP; and
- shifts in site patterning indicate periodic re-organisation of residential mobility.

A full archaeological background (with references) can be found in the ACHAR produced for this project (Extent Heritage 2023).

6.2 Aboriginal Heritage Information Management System

The AHIMS database, managed by Heritage NSW, includes spatial and compositional information of Aboriginal sites (i.e., objects, places, and declared Aboriginal Places) recorded within NSW. These sites have been identified through academic and compliance-based cultural resource management projects, often associated with modern developments.

A search of the AHIMS database was completed on 20 July 2022 for an area of land at datum GDA, zone 56, from -33.8244, 151.0009 latitude- longitude to -33.8066, 151.0318 latitude-longitude. Land surrounding the study area was included within the search parameters to gain information on the regional archaeological context and inform predictive statements regarding the archaeological potential of the study area.

The AHIMS search results identified sixty-four registered sites (Figure 7). The frequency of AHIMS site features is included in Table 4 below.

Table 4. Site features recorded in the AHIMS search area.

Site feature	Number	Percentage
Artefact	14	8.68%
Potential Archaeological Deposit (PAD)	31	19.22%
Potential Archaeological Deposit (PAD), Artefact	17	10.54%
Hearth, Potential Archaeological Deposit (PAD), Artefact	1	0.62%
Artefact, Aboriginal Resource and Gathering, Potential Archaeological Deposit (PAD)	1	0.62%
Total	**64**	**100%**

The most frequent site types identified in the database are Potential Archaeological Deposits (PADs), followed by artefacts sites (comprising isolated finds, scatters, and deposits). Significantly, most of these sites lie within the Parramatta CBD area, along the southern foreshore of the Parramatta River. This spatial imbalanced of registered Aboriginal sites between the northern and southern foreshores likely reflects the paucity of investigations on the northern foreshore and, conversely, the intensity of modern development and accompanying compliance-based archaeological research on the southern foreshore. The extensiveness of the PSB on the southern foreshore may have also impacted the distribution of sites.

Two registered AHIMS site was located within the study area:

- AHIMS ID 45-6-3312
- AHIMS ID 45-6-3131

This site, PLR ATF 1, was registered by Kelleher and Nightingale (2017) and is a ‘valid’. This location was excavated as part of the archaeological testing for the Parramatta Light Rail Project

and resulted in the recovery of a single silcrete artefact. No AHIMS site card is available on the database. Due to the project being State Significant, no AHIP was required to progress in the area. The artefact associated with this AHIMS site will have already been harmed/removed as part of the project and, as such, should be changed to 'destroyed' on the AHIMS register.

AHIMS ID 45-6-3131 is a PAD partially overlapping with the eastern edge of the study area. A portion of the PAD was Extent Heritage as part of the Alfred Street Pedestrian and Cyclist Bridge Development. The testing and salvage program recovered evidence of terminal Pleistocene and early Holocene periods. An AHIP was approved for test excavations (AHIP 4657) and salvage excavations (AHIP 4825) (Figure 7). No AHIP has been applied for the further management of artefacts.

Several site types are not located within the vicinity of the study area. Culturally modified trees are unlikely to be identified within the Parramatta CBD due to historical land clearance. Sites which require bedrock outcrops, such as closed/shelter deposits, art sites, and grinding grooves, are also absent due to geology of the area. Shell middens are also absent from the AHIMS search results. While shell middens were would have existed within the vicinity of the site, historical use of this easily accessible resource for mortar, as well as erosional factors, have likely removed evidence of this practice.

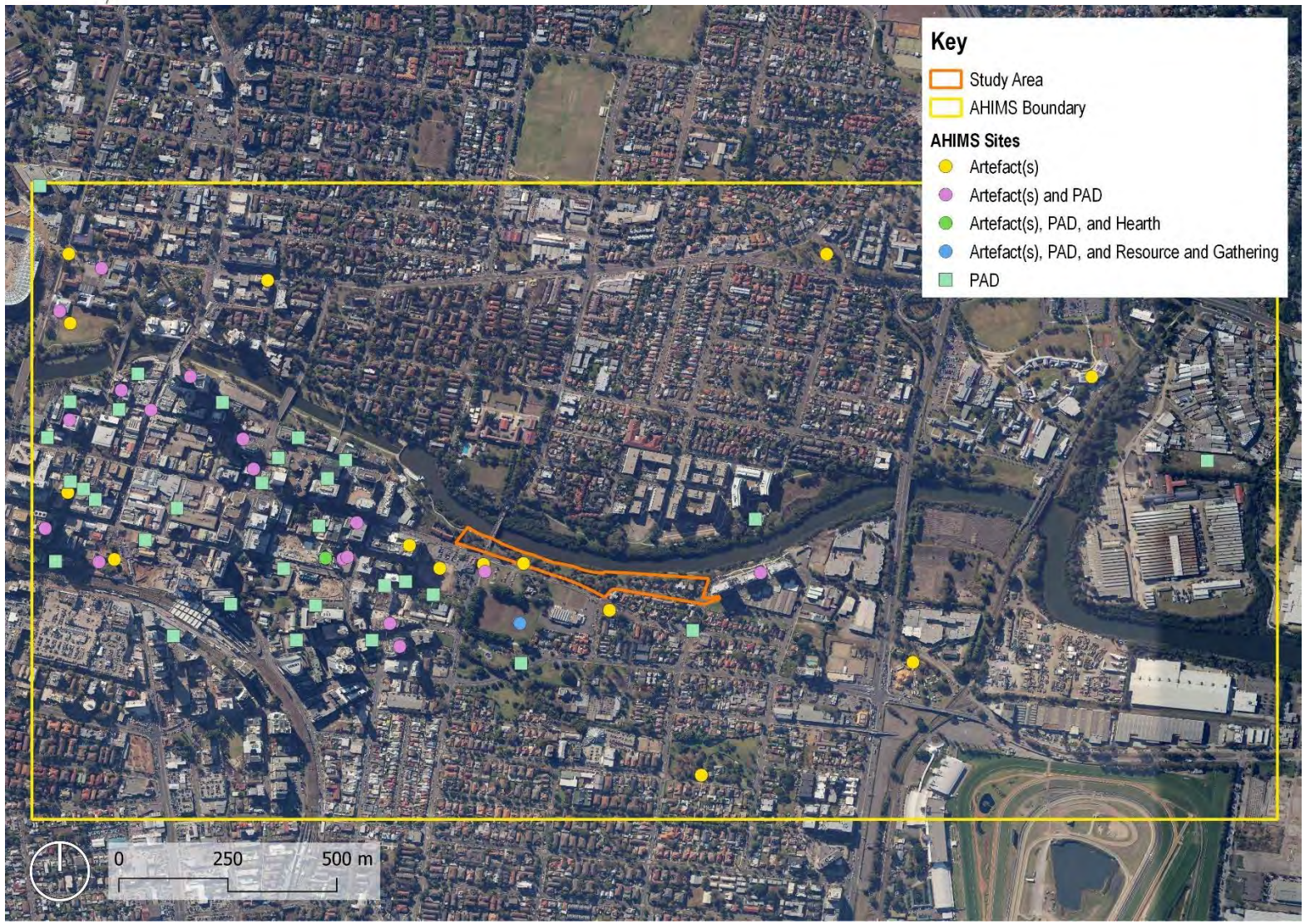

Figure 6. AHIMS within the wider Parramatta area.

Figure 7. AHIMS registered sites located within and immediately surrounding the study area.

6.3 Predictive model

Based on the findings of archaeological investigations previously completed in the Parramatta CBD and surrounds, the Parramatta Sand Body has demonstrated high potential to Aboriginal objects of significant antiquity, rarity, and archaeological research value. The Parramatta Sand Sheet mapping undertaken by Groundtruth Consulting (2008) indicate the southern half of the study area is underlain by the sand sheet. Previous archaeological excavations across the Parramatta CBD have shown the sand sheet soils have potential to contain buried subsurface cultural deposits, sometimes in high densities, such as those encountered at the George and Charles Street and the RTA sites. Studies have also found the density of cultural material is unevenly distributed across the Parramatta Sand Body, with areas of intact sand sheet containing low densities (Figure 8).

The remainder of the study area, comprising slopes and floodplain landforms underlain by Holocene sands and mud, is less likely to contain buried cultural material because these thinner soil profiles have been subject to repeated flooding of the Parramatta River, which has likely scoured away and/or heavily disturbed soil profiles. Therefore, these parts of the study area are assessed as having moderate to low archaeological potential. Portions of the study area which have been subjected to significant and direct development disturbance (e.g., the construction of a factory in the north-west) are assessed as having low-to-nil potential (Figure 8).

Aboriginal occupation along the Parramatta River is known to have occurred prior to, and after, European settlement of the area, and archaeological evidence for frequent and repeated occupation has been routinely recovered from deposits within the Parramatta Sand Sheet at various sites around the study area (Extent Heritage 2020). Where present, these Aboriginal sites comprise discrete and localised deposits of artefact scatters with varying densities and/or isolated artefacts which are of considerable antiquity (late Pleistocene to early Holocene) (Extent Heritage 2020).

To summarise, the following conclusions can be drawn regarding the potential presence, nature, and location of Aboriginal sites and objects within the study area:

- Stone artefact scatter sites, isolated finds, and PADs are the most common sites within the broader area, and can occur across most landforms, even in disturbed contexts. Hence, the study area is likely to contain these material cultural remains.
- The study area has also been cleared of its native vegetation as a result of historic development, and is unlikely to contain either remnant vegetation or vegetation species suitable for cultural modification. It is unlikely that scarred or carved trees will be present within the study area.
- As there appears to be no suitable stone resource material within the study area owing to its underlying geology, it is also unlikely that stone quarries, shelters, engravings, or grinding grooves will be present within the study area.

- While historic development and a history of cyclical flooding has caused considerable subsurface disturbance in parts of and around the study area, there remains significant potential for subsurface Aboriginal sites and objects.

- The parts of the study area underlain by remnants of the Pleistocene Parramatta Sand Sheet are likely to have high archaeological sensitivity on account of the potential density, age, and rarity of buried cultural deposits within the sand sheet soil profile.

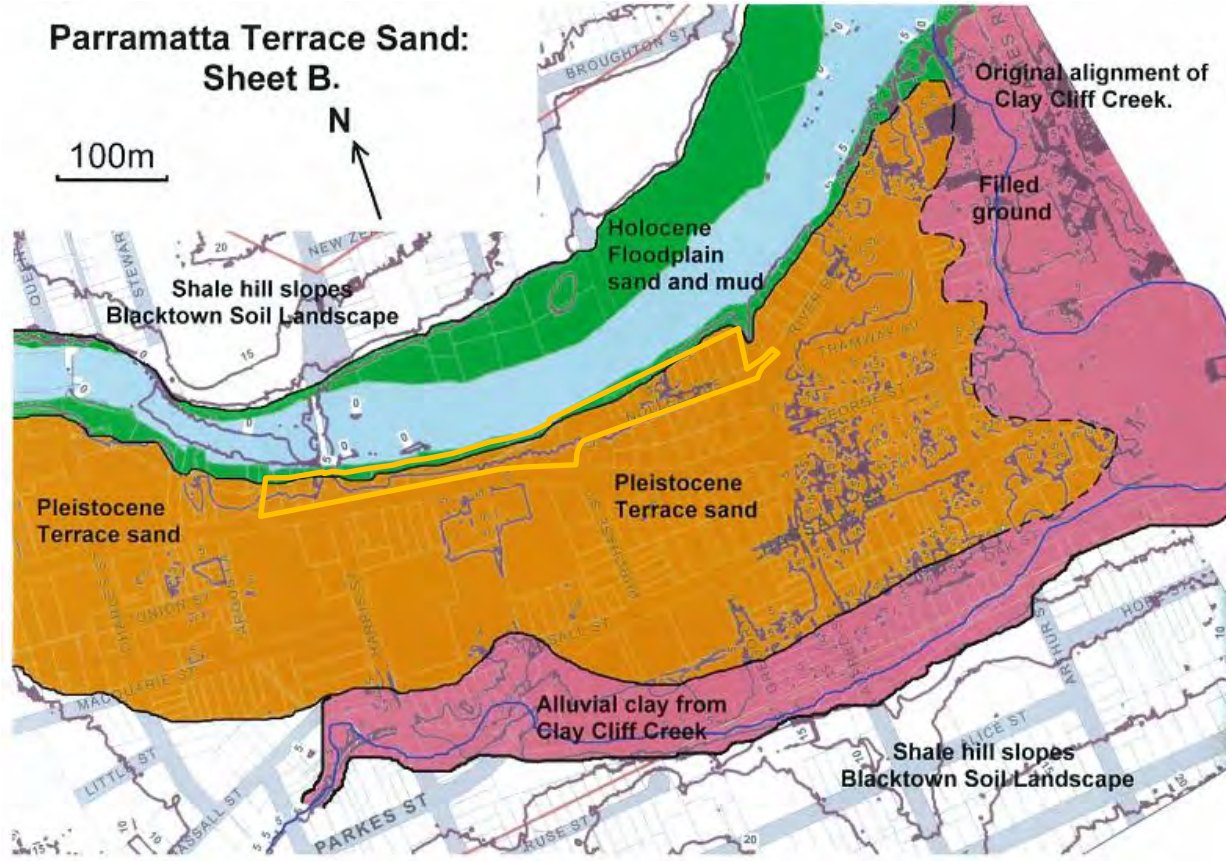

Figure 8. Indicative distribution of the different soil parent material and landscapes along the Parramatta River at the time of European settlement. Sheet B. Study area outlined in orange (source: Groundtruth Consulting 2008, figure 5).

7. Archaeological survey

A site survey was undertaken across the study area on 4 August 2022 by Extent Heritage advisors (Hannah Morris, Senior Heritage Advisor, and Hayley Edmonds, Heritage Advisor). Modifications to formalise the study area as a reserve was considered to have highly likely removed the potential for identifying Aboriginal objects on the ground surface. As a result, the aim of the site survey was primarily to understand the landscape features and any localised areas of disturbance.

Table 5. Summary of survey coverage.

Survey unit	Landform	Area (m^2)	Visibility (%)	Exposure (%)	Effective coverage (m^2)	Effective coverage (%)
1	Slope	26,890	90%	90%	6,722	25%

This section provides a summary of the results of this survey:

- No Aboriginal objects were identified during the site inspection.
- DEM mapping and available contour data adequately represented the physical form of the landscape. The parkland comprises a gentle slope northward to the riverbank.
- Several cycleways and pathways run generally east to west across the study area.
- All vegetation has been previously stripped from the study area and consequently no culturally modified trees were identified.
- No sandstone outcrops were present, resulting in no potential for closed sites, art sites, or grinding grooves.
- Several modern Aboriginal art installations were present, namely metal representations of canoes and spears.
- Ground disturbance to install the HMAS memorial (Figure 11) and Gasworks Bridge (Figure 12) was noted, especially on the northern side of the feature where the ground level is cut away. The area around the Gasworks Bridge has been identified as having several metres of reclamation fill around it (GML forthcoming).
- Ground disturbance was identified along the banks of the Parramatta River, especially in the western portion of the study area. Two large services, likely water pipes, ran in parallel in an east to west alignment. These were identified by several manholes/inspection pit visible on the ground surface.

The site survey demonstrated that limited above-ground impacts were visible due to modern landscaping of the reserve. Localised areas of disturbance, namely excavation for modern services and infrastructure, were noted. However, the extent of subsurface impacts to

archaeology and earth build-up was not identifiable. However, the extent of subsurface impacts to archaeology and earth build-up was not identifiable. The test excavations (discussed below) did not provide substantial information as to the levels of disturbance and extent of subsurface impacts to Aboriginal archaeology. As anticipated (Section 8), the entire study area was capped by historical and modern reclamation and landscaping fills and in several areas, truncation by services and historical archaeology was noted. As outlined in Section 0, in all but three trenches (ATP5, ATP6, ATP9), fills extended below the depth of impact for the construction works. As a result, works ceased at 600 mm without the identification of PSB.

Figure 9. General landscape of QWR. Facing east.

Figure 10. Representation of existing cycleway and footpath. Eastern portion of site.

Figure 11. Disturbance associated with HMAS memorial.

Figure 12. Disturbance associated with Gasworks Bridge.

8. Predictive model

The predictive models utilised to determine Aboriginal archaeological potential within the study area are outlined in Section 5 of the ACHAR.

The study area is located on the Parramatta River, a fourth order waterway. Using the Cumberland Plains Predictive Model, Aboriginal lithic artefacts are most likely to be identified in an area of 51-100 m from the water to avoid impacts from flooding (White and McDonald 2010). As such, elevated terraces, especially those overlooking higher order waterways, such as the Parramatta River, would tend to have higher density artefacts due to the permanent or repeat occupation of the site.

While the study area is on a sloping riverbank, with Robin Thomas Reserve on the terrace behind, the original landscape may have been less sharp. According to the assessment made by Mitchell (Groundtruth Consulting 2008, 9), which is more specific to the study aera (see below), the flood zone is an elevation of two metres above the water level and only impacts the lower reaches of the study area (Figure 8). This suggested Aboriginal artefact sites could be located close to the water's edge, but are more likely along the southern border of the study area where the land is more protected from floods.

Archaeological and geotechnical studies within and adjacent to the study area have shown the PSB is capped by historical and modern fills. Excavations undertaken within the study area by Kelleher and Nightingale (2017) concluded that the PADs investigated did not possess any potential for cultural material. These excavations, however, did not reach the depth of the PSB, and incorrectly concluded that no PSB would be located in the area.

Due to the depth of the PSB and amount of reclamation fills known to be deposited within the area, significant portions of the PSB were interpreted as having the potential to remain relatively intact despite historical and modern truncation. Borehole testing (Stedinger 2016) demonstrated that fill layers are up to 2 m thick, with limited archaeological potential due to the high water table, and are only 300 mm thick toward to the upper slope of the study area.

Based on these findings, any development activities toward the upper slope of the study area extending beyond a depth of approximately 300 mm had the potential to impact the PSB. This will cause disturbance to identified underlying cultural deposits. Due to the significant depth of the PSB, and its fluvial and alluvial formation, there was an opportunity to identify stratified deposits of Aboriginal objects. In addition, isolated artefacts or discontinuous artefact scatters resulting from the intermittent occupation of mobile Aboriginal groups across the landscape had the potential to be present.

The presence of the significant early colonial development of Queens Wharf Reserve also increased the potential for 'contact period' archaeology. Archaeological evidence from Queens Wharf Reserve and Robin Thomas Reserve (GML forthcoming, Comber Consulting 2019, Extent Heritage 2020), as well as other sites in Parramatta, have revealed evidence of ceramic and glass knapped by Aboriginal people, as well as Aboriginal lithic artefacts within historical contexts.

9. Archaeological potential

AHIMS ID 45-6-4094 (QWR PAD 1)

Based on the above information, the southern portion of the study area had the potential for subsurface Aboriginal archaeological material (Figure 13). This area is located above the 2 m flood zone and has not been clearly impacted by modern construction.

Further archaeological investigation of this area of PAD (QWR PAD 1 / AHIMS ID 45-6-4094) was required to determine the extent, form, and significance of any Aboriginal objects located within the study area. With the knowledge that PSB is located in this PAD, archaeological test excavation were needed to assess the Aboriginal heritage value of the area.

The test excavation program only investigated a portion of the PAD, focusing on areas of impact by the proposed development.

AHIMS ID 45-6-3131

A registered PAD exists on the eastern extent of the study area. This AHIMS site has been investigated as part of the Extent Heritage investigations at Alfred Street (2019) for the construction of a pedestrian bridge and cycleway across the river. Results from the testing and salvage investigations determined that the area has evidence of terminal Pleistocene and early Holocene period deposits within the PSB. Approximately 80 lithics were recovered. The full extent of the registered AHIMS site boundary had the potential to contain Aboriginal archaeological remains. This area will not be impacted by the proposed activity.

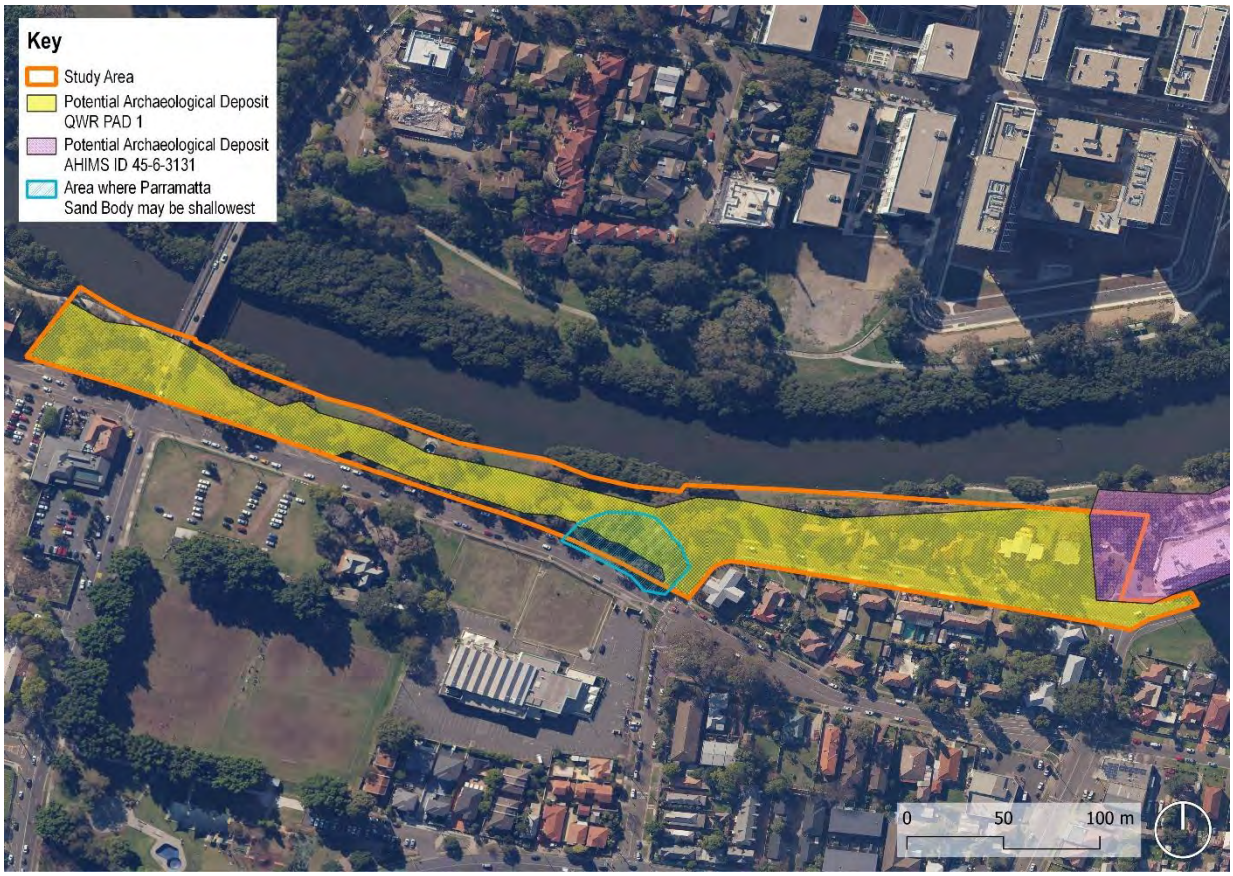

Figure 13. Area of Aboriginal archaeological potential identified pre-excavation—AHIMS ID 45-6-4094 (QWR PAD 1) and AHIMS 45-6-3131.

10. Test excavation methodology

10.1 Aims

The purpose of archaeological excavations was to investigate the sub-surface nature and distribution of Aboriginal objects within the area of AHIMS ID 45-6-4094 (QWR PAD 1) proposed to be impacted by the project. Controlled excavation consistent with the excavation procedure set out in the *Code of Practice* (DECCW 2010) was employed to investigate the context of any Aboriginal objects present, including whether there was evidence of stratification. The excavations informed an assessment of the cultural heritage significance of any Aboriginal objects and archaeological deposits that were present.

The key aims of archaeological excavations were to:

- Characterise the sub-surface soil profile and identify evidence of stratification.
- Identify and determine the content, composition, and distribution of sub-surface artefact assemblages, where present.
- Collect data that may provide information on past ways of life of the Aboriginal people who created and occupied the landscape, including diet, functional use of spaces and landforms, resource exploitation, and chronology.
- Compare the study area to relevant available archaeological and ethnographic data, in order to contribute to a greater understanding of the Aboriginal history of the local area.
- Obtain necessary information to inform the final design of proposed works and to guide development of appropriate significance-based strategies for conservation and management of the study area.

10.2 Research questions

The following questions relate to Aboriginal life, culture, and resource use here over many millennia. These questions address landscape, water, and environmental issues outlined in the previous section, but look more closely at the way in which Aboriginal people used resources here, and how they had an impact on the cultural landscape over time.

- Can we identify what Aboriginal people were processing and hunting in the study area over time? Does this change from the Pleistocene to the Holocene, and from the Holocene to the contact period?
- Is any evidence of contact period archaeology present (e.g. use of ceramic and glass by Aboriginal people, or identification of Aboriginal objects in historical archaeological contexts)?
- Are micro artefacts (e.g., debitage, charcoal and bone) present in the deposits and what does this tell us about ancient use of the site?

- Can we apply the method of 'refitting' artefacts back together to understand the reduction strategies used by Aboriginal people in the Parramatta area?
- Can fluvial or alluvial lenses be identified in the stratigraphy and do these correspond to levels of artefact deposition?

10.3 Timing and personnel

The test excavation program was completed between 16 October 2023 and 31 October 2023. The test excavation program was supervised by Hannah Morris (senior heritage advisor, Extent Heritage) with assistance from Catherine Fenech (heritage advisor, Extent Heritage). Rebekah Hawkins (Heritage Advisor, Extent Heritage) completed the lithic analysis report for the recovered assemblage. See Table 6, below, for a full list of participants.

Table 6. Participants in the test excavation program

Name	Organisation	Role
Hannah Morris	Extent Heritage	Senior Heritage Advisor, supervisor
Catherine Fenech	Extent Heritage	Heritage Advisor
Ian Ostericher	Extent Heritage	Geomorphologist
Brian Shannahan	Extent Heritage	Excavation Director, Associate and National Technical Lead
Graham Wilson	Extent Heritage	Excavation Director, Principal Heritage Advisor
Stevie Skitmore	Extent Heritage	Archaeologist
Alison Carfi	Extent Heritage	Archaeologist
Peter Woodley	Extent Heritage	Archaeologist, supervisor
Peter Malkovic	Freeman and Marx	RAP
Jamie Currell	Kamilaroi	RAP
Belinda Jackson	Kamilaroi	RAP
Lee Carroll	Corroboree	RAP
Ethan Tremlynn	Corroboree	RAP
Guy Hazel	N/A	Surveyor

10.4 Sampling strategy and excavation procedure

Based on background research, the survey results, and an understanding of ground disturbance impacts associated with the proposed development, the archaeological excavations will be conducted within the area of shallow PSB, identified on the eastern portion of the study area.

Extent Heritage proposed a holistic approach to investigating and managing Aboriginal and historical archaeology. To investigate both the historical and Aboriginal archaeology, eleven test trenches were excavated. These locations were chosen:

- to represent a comprehensive east to west cross-section of the study area (Figure 14-Figure 17) that could provide information regarding the proposed development,
- to focus on areas where there was a highest potential for PSB within AHIMS ID 45-6-4094 (QWR PAD 1) that may be impacted by the proposed development,
- the location of the area of constraint which would be impacted by the proposed development,
- in areas where proposed lighting poles will be located, as these areas have the deepest impacts at 650 mm below the ground surface, and
- in conjunction with historical investigations and test trenches to characterise the archaeology across both disciplines simultaneous and to avoid additional and unnecessary disturbance.

Figure 14-Figure 17 show the general location of test trenches across the study area. Eleven test trenches (TTs) measuring 3 m by 2 m were excavated. Six test trenches aimed to investigate areas with the potential for both Aboriginal archaeological and significant historical archaeology (TT 1, TT3, TT 7-10). Three were proposed to focus upon investigating Aboriginal archaeological potential (TT 4-6), especially where the PSB was anticipated to be shallowest. Two TTs were proposed to investigate an area with solely historical archaeological potential (TT 2 and TT 11).

In total, there were nine locations in which Aboriginal archaeological potential was anticipated. Only AHIMS ID 45-6-4094 (QWR PAD 1) was investigated during the test excavation program because there will be no anticipated impacts to AHIMS ID 45-6-3131 by the proposed development.

The study area has a high potential for State significant historical archaeology to be found above the PSB layer. As a result, in historical archaeological remains were investigated and managed prior to investigation of Aboriginal archaeology. Once historical archaeology was recorded, an appropriate location within the test trench was chosen for an Aboriginal test pit (ATP). The historical archaeology within Queens Wharf Reserve is significant and complex. There was the potential that, in some test trenches, the historical archaeology identified may not be able to be removed. As such, each ATP was excavated on 0.5 x0.5m units, in configurations dependent on the available space within trenches, or the test trench expanded to identify an appropriate location. It was the aim of Extent Heritage to affect as little heritage as possible.

Figure 7 outlines the sample strategy for test trenches and Aboriginal test pits.

Table 7. Sample strategy for test trenches and Aboriginal test pits.

Trench Number	Impact in vicinity	Trench Size	Hist/Aboriginal	Reason for trench location / Archaeological potential
1	*Light footing (650mm)* *Path (225mm)*	*One trench was proposed to capture both Aboriginal and historical remains.* *The trench would measure* ***3m x 2m.***	*Historical*	*A terrace of workers' cottages which was part of the Byrnes Mill complex is located in this area, with the light footing and path potentially impacting the verandah. The integrity of these resources was proved during excavations of the two convict huts directly to the east as part of the Alfred Street Pedestrian Bridge project.* *Archaeological remains associated with the cottages would be of local significance. This trench is crucial to understanding the depth, type, and integrity of the remains in order to propose an effective mitigation or salvage strategy if required.*
			Aboriginal	*This area was marked as part of AHIMS ID 45-6-4094 (QWR PAD 1). Excavations to the east as part of the Alfred Street Pedestrian Bridge project identified a significant number of artefacts (~80) within intact PSB.*
2	*Light footing (650mm)* *Path (225mm)*	*One trench was proposed to capture both Aboriginal and historical remains.* *The trench would measure* ***3m x 2m.***	*Historical*	*This location was within the footprint of the main Byrnes Mill building. This trench will determine if the mill building, associated occupation, or demolition rubble is located within the depth of the proposed development. Archaeological remains associated with the mill complex would be of State significance.*
			Aboriginal	***No ATP will be excavated in this location****. This area was not marked as a PAD, based on predictive models outlined in the ACHAR. Factors included the high potential for flooding due to the close proximity to the Parramatta River.*

Trench Number	Impact in vicinity	Trench Size	Hist/Aboriginal	Reason for trench location / Archaeological potential
3	*Light footing (650mm)* *Path (225mm)* *Tree planting (300mm)*	*One trench was proposed to capture both Aboriginal and historical remains.* *The trench would measure **3m x 2m.***	*Historical*	*Historical depictions indicate that an early government grain store was located in this general area. It's precise location was uncertain so this trench would determine the nature of the general stratigraphy in this area.* *Archaeological remains associated with the early grain store would be of State significance. This trench is crucial to understanding the depth, type, and integrity of the remains in order to propose an effective mitigation or salvage strategy if required.*
			Aboriginal	*The location for this trench is combined the need to determine the depth of PSB in the area and investigate any Aboriginal archaeological potential, while also investigating an area of high historical archaeological remains.*
4	*Light footing (650mm)* *Path (225mm)*	*This trench was used to identify and investigate PSB.* *The trench would measure **3m by 2m** to allow a 1m by 1m trench to be excavated.*	*Aboriginal*	*This portion of the study area was assessed as an 'area of constraint' (Niche 2017). Borehole testing (Stedinger 2016) indicated that the depth of PSB would be shallower than the proposed depths of impacts. ATPs would be placed at a higher frequency (20m spacing) in this area as a result.* *There was anticipated to be a low potential for historical archaeological remains.*
5	*Light footing (650mm)* *Path (225mm)*	*One trench was proposed to capture both Aboriginal and historical remains.* *The trench would measure **3m x 2m.***	*Historical*	*This test trench was likely to identify remains of the former tramway. The tramway has been assessed as local significance.*
			Aboriginal	*This portion of the study area was assessed as an area where PSB would be shallowest (Niche 2017). Borehole testing (Stedinger 2016) indicated that the depth of PSB would likely be shallower than the*

Trench Number	Impact in vicinity	Trench Size	Hist/Aboriginal	Reason for trench location / Archaeological potential
				proposed depths of impacts. ATPs locations would be placed at a higher frequency (20m spacing) in this area as a result.
6	*Light footing (650mm)* *Path (225mm)*	*This trench was used to identify and investigate PSB.* *The trench would measure **3m by 2m** to allow a 1m by 1m trench to be excavated.*	*Aboriginal*	*This portion of the study area was assessed as an area where PSB would be shallowest (Niche 2017). Borehole testing (Stedinger 2016) indicated that the depth of PSB would likely be shallower than the proposed depths of impacts. ATPs locations would be placed at a higher frequency (20m spacing) in this area as a result.* *There was a low potential for historical archaeological remains.*
7	*Light footing (650mm)* *Path (225mm)*	*This trench was used to identify and investigate PSB.* *The trench would measure **3m by 2m** to allow a 1m by 1m trench to be excavated.*	*Aboriginal*	*If access was available, test trench would be placed in this location to further investigate the original landscape and determine whether the PSB in this area is anticipated to be impacted by the proposed development.* *There was a low potential for historical archaeological remains.*
8	*Light footing (650mm)* *Path (225mm)*	*One trench was proposed to capture both Aboriginal and historical remains.* *The trench would measure **3m x 2m.***	*Historical*	*The proposed test trench would be located in the centre of the site of an early building. This was the site of the Emu Hotel. Archaeological remains of the hotel were uncovered during the Parramatta Light Rail works immediately to the south of the proposed development.* *The Emu Hotel occupied this site between the 1840s and 1908. Archaeological remains associated with the site would be considered of local significance.*
			Aboriginal	*If access was available, a test trench would be placed in this location to further investigate the original landscape and determine whether the PSB in this area is anticipated to be impacted by the proposed development.*

Trench Number	Impact in vicinity	Trench Size	Hist/Aboriginal	Reason for trench location / Archaeological potential
9	Light footing (650mm) Path (225mm)	One trench was proposed to capture both Aboriginal and historical remains. The trench would measure **3m x 2m.**	Historical	Several early buildings (including those on the properties of Manning and Urquahart Lockyet Kell shown on the 1844 Brownrigg plan) are located in the eastern portion of this test trench. Buildings dating between 1780 and 1820 would be considered of State significance. Due to the high congestion of potential historical archaeological remains, this trench is crucial to understanding the depth, type, and integrity of the archaeology in the area. This understanding would be necessary to propose an effective mitigation or salvage strategy, if required.
			Aboriginal	A test trench would be placed in this location to further investigate the original landscape and determine whether the PSB in this area is anticipated to be impacted by the proposed development. Due to the congested historical features in this area, the ability to excavate an ATP within this test trench is low. As a result, the TT may be expanded or the ATP may be moved to a different location.
10	Light footing (650mm) Path (225mm)	One trench was proposed to capture both Aboriginal and historical remains. The trench would measure **3m x 2m.**	Historical	This test trench is located within one of the AGL gasworks gasometers. It is also situated in the environs of earlier buildings indicated on the 1844 map. The trench will determine if intact structural elements associated with the gasworks, or any earlier structures are likely to be encountered within the depth of the proposed development. Evidence of the gasworks would be of local significance.
			Aboriginal	If access was available, a test trench would be placed in this location to further investigate the original landscape and determine whether the PSB in this area is anticipated to be impacted by the proposed development.

Trench Number	Impact in vicinity	Trench Size	Hist/Aboriginal	Reason for trench location / Archaeological potential
11	*Light footing (650mm)* *Path (225mm)*	*One trench was remains.* *The trench would measure* ***3m x 2m.***	*Historical*	*This test trench was located in the vicinity of Howell Mill, a water mill and windmill constructed on the riverbank in 1823. The site was abandoned in 1868. Howell's Mill is an example of early commercialisation in Parramatta and an example of unique technology at the time. Evidence of the mill complex would be of local significance.* *TT 11 was also in the vicinity of structures associated with the AGL gasworks which are also of local significance.*
			Aboriginal	***No ATP will be excavated in this location****. This area has not been marked as a PAD, based on predictive models outlined in the ACHAR. Factors included the high potential for flooding due to the close proximity to the Parramatta River.*

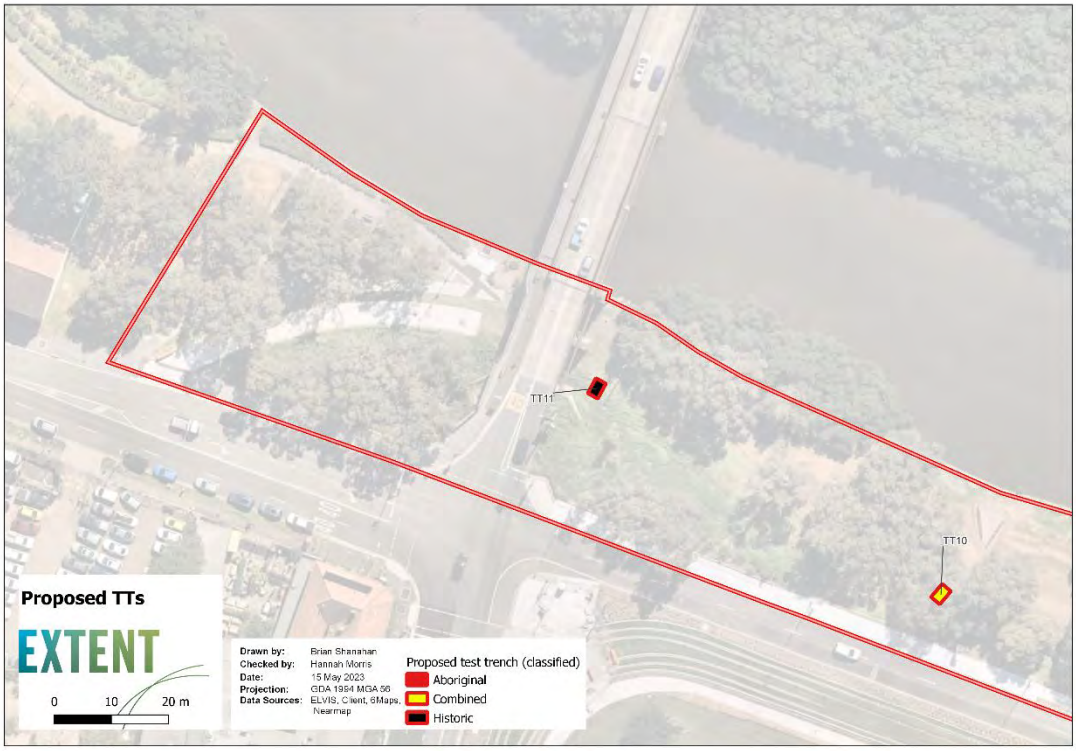

Figure 14. Anticipated test trench locations across the study area, pre-excavation. Section: Gasworks Bridge (source: City of Parramatta 2022).

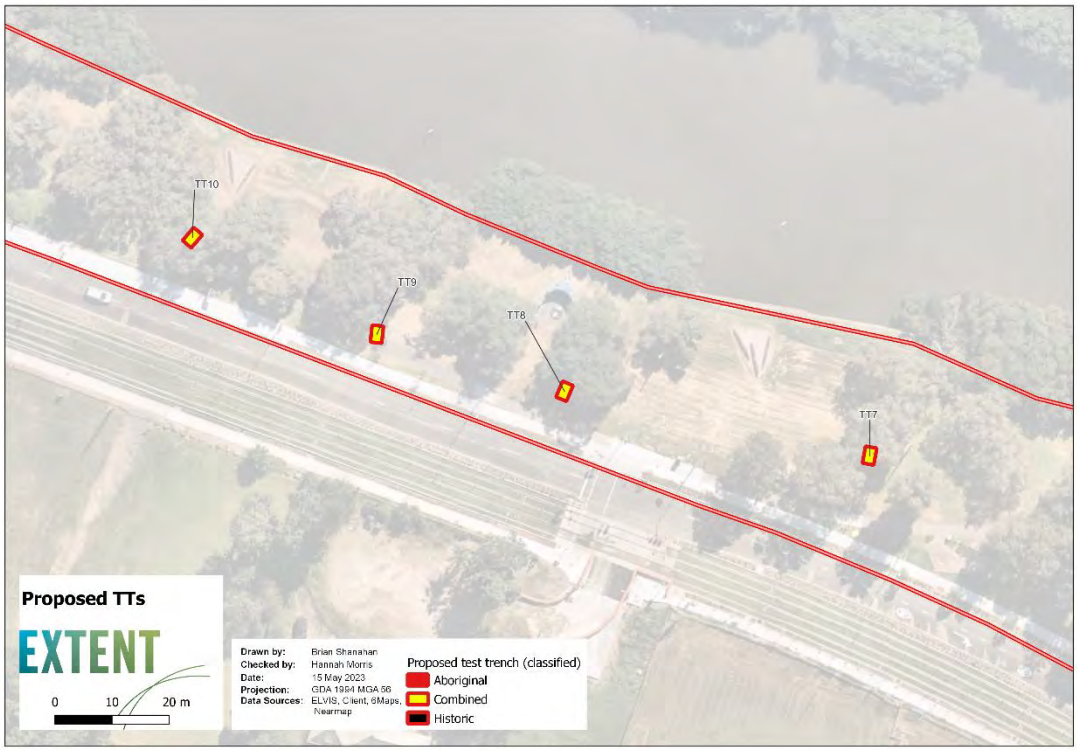

Figure 15. Anticipated test trench locations across the study area, pre-excavation. Section: HMAS Memorial (source: City of Parramatta 2022).

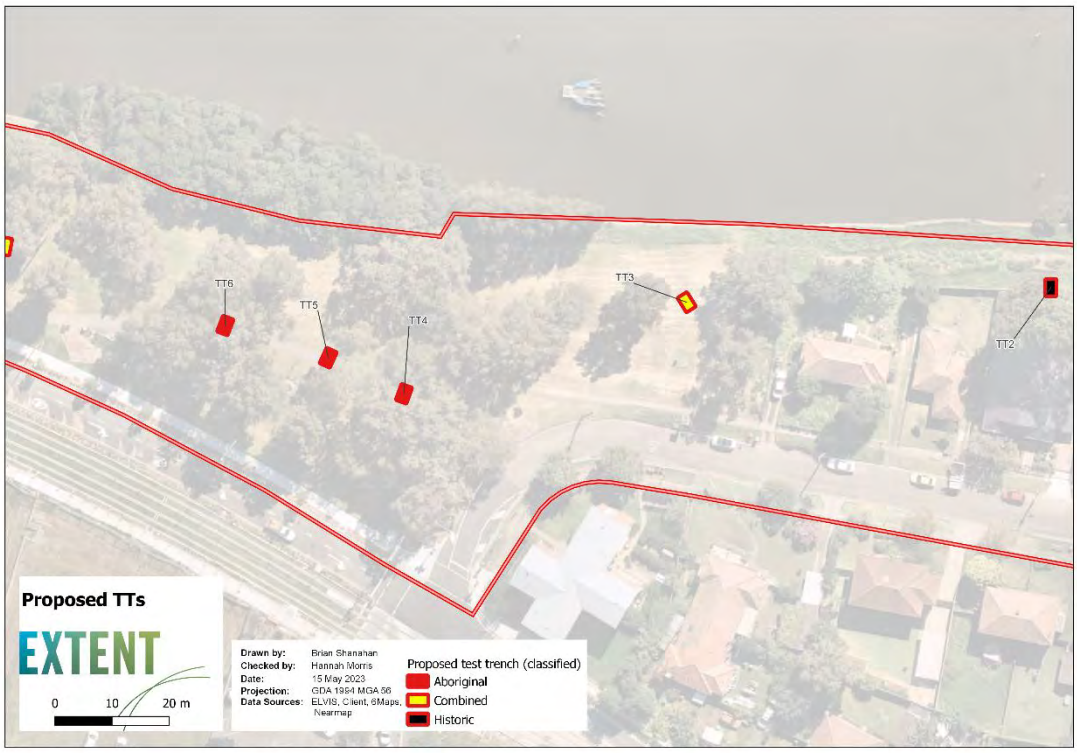

Figure 16. Anticipated test trench locations across the study area, pre-excavation. Section: Noller Parade-George Street intersection (source: City of Parramatta 2022).

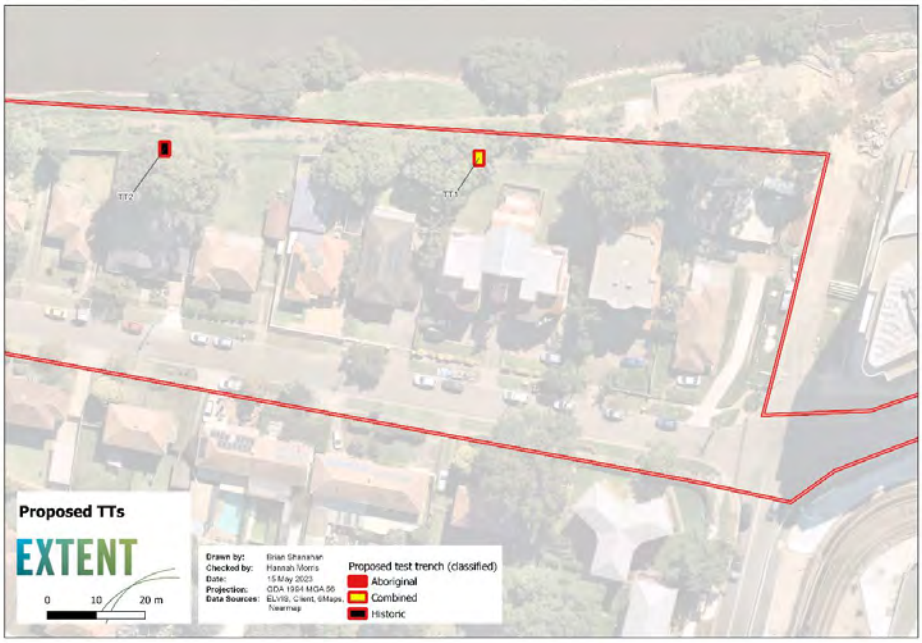

Figure 17. Anticipated test trench locations across the study area, pre-excavation Section: Noller Parade-Alfred Street intersection (source: City of Parramatta 2022).

10.5 Aboriginal objects

All suspected Aboriginal objects retrieved from the test excavation program were placed in labelled re-sealable bags and taken off-site for analysis and recording. All recovered Aboriginal objects were temporarily stored in a secure cabinet at Extent Heritage's Sydney office in Pyrmont. Long-term management of the excavated artefacts will be determined through additional consultation with the RAPs.

Options for long-term management of retrieved Aboriginal objects will be discussed with RAPs during the preparation of the ACHAR. It is anticipated that any Aboriginal objects retrieved from the excavation program will be reburied within the study area in accordance with the requirements of the *Code of Practice*. The exact location of reburial would be decided following the completion of the excavation report and assessment of site extent and scientific value. The reburial location would be outside the proposed impact zone of the project, and the location would be registered as an Aboriginal site on the AHIMS database.

11. Test excavation results

11.1 QWR PAD 1 (AHIMS ID 45-6-4094)

Overview

Only three locations of PSB shallower than 600 mm were identified across the entire study area. Consequently, only three areas were investigated for Aboriginal archaeology. These were TT5, TT6, and TT9. The excavations in the remainder of the study area uncovered historical and modern fill, mostly for landscaping, to the depth of impact. As PSB would not be disturbed by the proposed light poles in these locations, excavations for the purpose of investigating Aboriginal cultural heritage ceased.

The proposed test excavation methodology outlined that full 1 x 1m Aboriginal test pits would be excavated unless restricted by historical archaeological remains or disturbances such as services. As a result, one 50 x 50 cm ATP was excavated within the wider TT9 and similarly for TT6. TT5, however, provided an opportunity for additional exploration of the PSB and potential contact period archaeology. A total of 6m^2 was excavated to identify potential Aboriginal archaeology in two locations within the wider test trench.

Results and Soil Profiles

ATP4

TT4 was in an area of constraint where PSB was anticipated to be shallow. Historical archaeological remains were instead identified beneath landscaping fill. A gravel road surface was exposed directly above a natural B horizon (Figure 18). As the natural layer felt slightly silty, a 50 x 50 cm test pit was placed in the northwestern corner of the trench to confirm (Figure 19). Immediately upon excavation, the layer was shown to be dense clay and therefore determined to be the sterile strata.

No Aboriginal objects were recovered and no PSB was identified.

Figure 18. Overview of ATP4 showing gravel surface above B horizon clay, and location of sondage through B horizon clay, facing south.

Figure 19. Section of ATP4 into B horizon clay, facing southeast.

ATP5

ATP5 were two areas excavated within TT5. The location of TT5 was chosen due to the anticipated shallowness of PSB beneath the ground surface. Restrictions associated with the existing concrete footpath and tree roots resulted in the trench being located approximately 2 m to the south of its original location. As a result, it also intersected with historical archaeological remains. Specifically, features associated with the Commissary and original George Street road alignment were identified in the southern half of the trench, and a large cut with modern fills was exposed in the northern half of the of the trench (Figure 20). In accordance with the *Heritage Act 1977*, the historical archaeological features were not able to be impacted during the testing program.

Following the removal of the topsoil and late fills using a machine excavator, the historical archaeological remains were exposed and recorded. It was observed that PSB had been truncated by some of these historical features. In particular, the PSB in the southern extent of the trench was truncated during the construction (and deconstruction) of the Commissary wall and in the central to northern portion of the trench by the installation of a collared pipe (Figure 20). The PSB was also directly capped by the gravel surface established in 1830s, truncating the uppermost portion of the A1 of the PSB.

Two areas within TT5 where the PSB was accessible were identified to satisfy the investigation of natural soil profile (Figure 20). These areas were referred to as ATP5 North and ATP5 South.

ATP5 North was located in the centre of the trench, on both sides of the collared pipe and also through the service trench fill. It consisted of an L-shaped area comprising five 50 x 50 cm test pits. ATP5 South was located at the very southern extent of TT5, adjacent to the Commissary wall, and consisted of one 50 x 50 cm test pit (Figure 20).

A total of nine lithic artefacts were recovered from ATP5 North, with an inferred four from the intact PSB and four from the fill within the collared pipe service trench and one recovered from clean up. In ATP5 South, one ochre piece was recovered.

A clay smoking pipe was recovered from ATP5 North (Figure 26-Figure 27), however this was located in the service trench backfill.

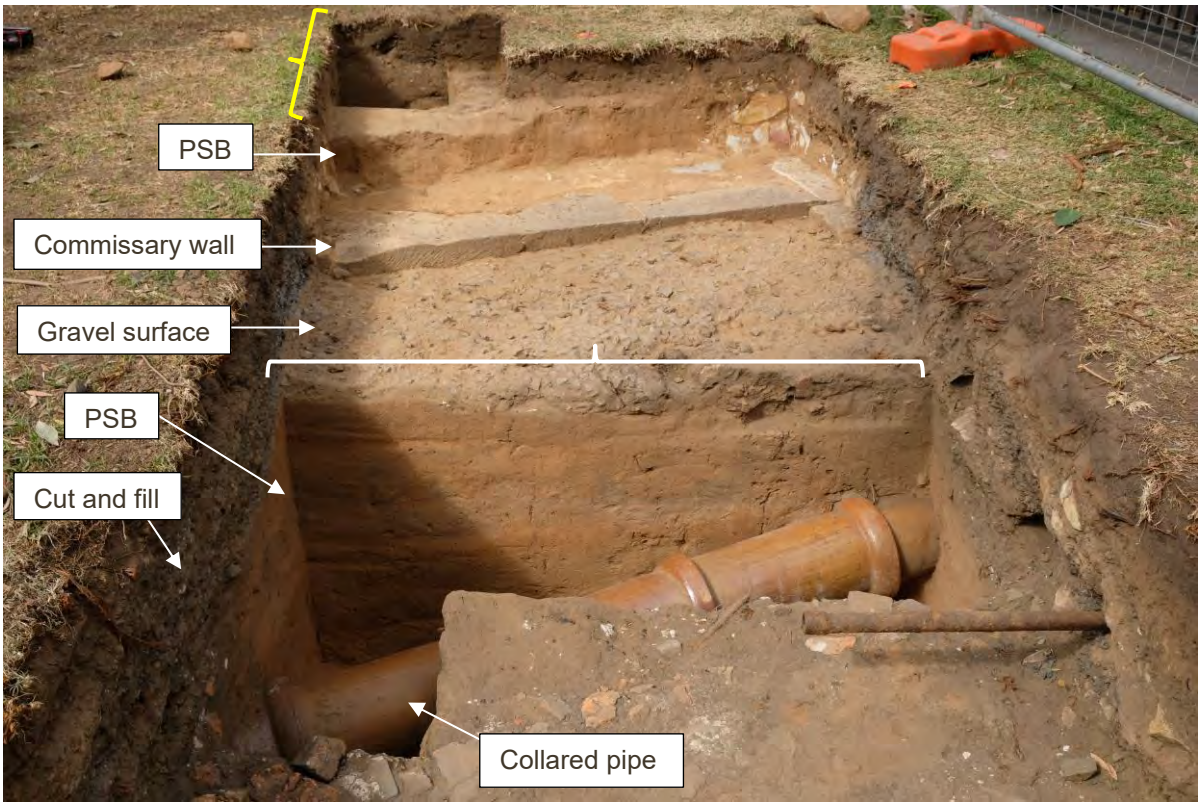

Figure 20. Location of ATP5 North (white bracket) and ATP5 South (yellow bracket) within TT5 in relation to historical feature, facing south.

ATP5: North

ATP5 North was a 2 m long, with width varying between 50 cm and 1 m area of PSB which was divided into five 50 x 50 cm test pits. The area was truncated by the installation of a service pipe and a later landscaping cut. Excavations removed and sieved soils from the intact PSB, but also the backfill of the service trench which consisted in part of redeposited PSB. Contamination between the two is likely to a degree as the service cut was not clearly defined. The stratigraphic profile comprised the following:

- A0: the ground surface of TT5 was low grass and recent topsoil.
- Fills: A large cut sloping down to the north truncated the natural soil profile (and historical archaeological features) (Figure 20; Figure 23-Figure 24). It contained several layers of fills which were excavated to a depth of 800 mm below the ground surface. This feature was extensive and no base was identified.
- Historical feature 1: The cut for a collared water pipe also truncated the PSB (Figure 20-Figure 21). The backfill consisted of redeposited PSB, although it was a dark greyish brown colouring (10 YR 2/2 very dark brown) rather than the orange of the intact PSB beside it (Figure 24-Figure 25). The fill was a very fine grained silty sand, containing small pieces of sandstone and clay throughout. The horizon between the fill and intact PSB was very

dispersed and difficult to delineate during excavations and, as a result, there was likely contamination between the two.

- Historical feature 2: Directly capping the PSB in ATP5 North was a gravel surface associated with the original George Street alignment (Figure 20). This feature was not able to be removed during the test excavations, however it was clear that the PSB continued beneath it to the south (Figure 23).

- A1: No clear A1 horizon was identified, suggesting truncation during the British occupation of the area.

- A2: The A2 comprised a dark orange very soft, medium grained sand (7.5 YR 4/6 strong brown). The same profile was found in ATP5 South. Dark patches (similar to that found in the collared pipe service cut, see historical feature 1 above) with charcoal were present throughout (5 YR 3/4 dark reddish brown).

  One horizontal layer of a lighter grey very soft medium grained sand with charcoal pieces was notable on the southern section of ATP5 North, at a depth of approximately 250-400 mm below the ground surface (Figure 23). The layer was heavily undulating and the horizons were dispersed. The feature may relate to disturbance from bioturbation.

  The natural A2 soil profile was capped directly by the gravel surface, confirming that this surface was exposed or truncated at time of British colonisation.

- B: No B horizon clay or bedrock was identified. Excavations ceased at a depth of approximately 1.25m below the ground surface due to accessibility restrictions.

Figure 21. ATP5 North showing collared pipe and PSB, facing north.

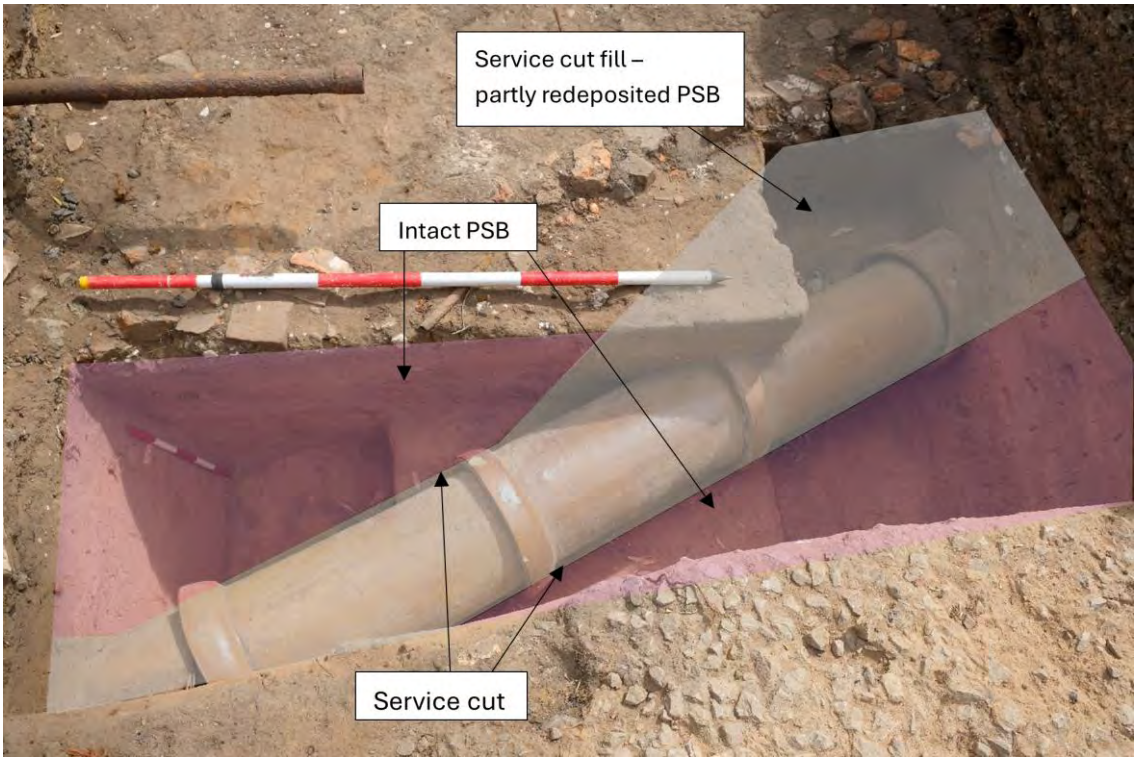

Figure 22. ATP5 North showing extent of natural PSB and backfill associated with the collared pipe, facing north.

Figure 23. Section of ATP5 North, showing gravel surface directly on PSB. Cut for collared pipe behind vertical scalebar, facing south.

Figure 24. Section of ATP5 North with eastern extent of collared pipe (pipe cut and fill marked). Also showing large landscaping cut truncating the PSB, facing east.

Figure 25. Section of ATP5 North with western extent of collared pipe (cut and fill not clearly visible). Also showing large landscaping cut truncating the PSB, facing east.

Figure 26. Clay smoking pipe identified in ATP5 North, facing south.

Figure 27. Clay smoking pipe identified in soil profile.

ATP5: South

ATP5 South was a 50 x 50 cm test pit located in the southwestern most corner of TT5. The location was chosen because a small patch of PSB was identified in this area, having been cut into by the wall of the Commissary. The historical test trench was expanded to create room for the Aboriginal test pit. Excavation proceeded in 50 mm spits, resulting in 16 spits excavated The stratigraphic profile comprised the following:

- A0: The ground surface of TT5 was low grass and recent topsoil.
- Topsoil: The topsoil was very recent and humic. It measured between 150 to 220 mm thick. It included small to medium sized roots. While not located directly overhead, the test pit was generally surrounded by trees. The topsoil layer had some patches of medium sized sandstone rubble and dry pressed bricks (mostly located in the western corner).
- Fill: A large posthole was observed to be cut into the PSB at a depth of 300mm below ground level, beneath a diffused root disturbed layer (5-250mm) underlying the topsoil [5.001] (200mm). Small undiagnostic historical artefacts (<10mm) including brick, glass and ceramic fragments were recovered throughout the upper root disturbed layer The base of the posthole cut and fill was not encountered, with excavations ceasing at a maximum depth of 1250mm below ground level, with the posthole depth measuring 800mm. The fill was brown (10 YR 5/4 brown) but became greyer as it continued down and included charcoal pieces and staining, especially around 200 mm below the top of the PSB.
- A1: The A1 was unclear, likely truncated, with some historical artefacts mixed into from the fill directly on top of it. It had some charcoal and small pieces of sandstone pressed into the surface. The layer was approximately 50 mm thick (7.5 YR 4/6), with an unclear horizon to the A2.
- A2: The A2 was a fine grained silty sand, dark orange (7.5 YR 4/6 strong brown), with very few roots. There was no transitions and the same profile was found in the entire 800 mm of depth that was excavated.
- B: No B horizon bedrock or clay was identified. Works ceased at 800 mm below the surface of the PSB (approximately 1.25m below ground surface). The disturbance from the post hole and root systems comprised the integrity of this trench and its use as a representative profile of the natural in TT5.

Figure 28. Section of ATP5 I / J with root disturbance, facing east.

Figure 29. Overview of ATP5, facing south.

ATP6

ATP6 was located within TT6. The location was chosen as there was not anticipated to be any historical archaeological remains impeding access to the PSB, and the PSB was anticipated to be shallower beneath the ground surface.

A machine excavator was used to remove 100 mm of the recent topsoil. Following the identification of PSB across the entire length of the test trench, machine excavation ceased and hand excavation commenced. Despite monitoring, the excavator overcut the PSB by 100-150 mm.

Two parallel service trenches which cut into the PSB were identified running northeast to southwest through TT6. The services were not marked on any plans, nor detected by the service locator. As a result, their function and age are unknown. The area where ATP6 could be placed within the wider test trench was confined to the narrow space between the two service trenches, and its size was limited to 50 x 50 cm. ATP6 was excavated to a depth of 900 mm below the ground surface in 50 mm spits.

Five distinct horizons were identified, separated by distinct dark red undulating parallel bands, comprising:

- A0: the ground surface of TT6 was low grass and recent topsoil, 200 mm in depth.
- A1: No clear A1 horizon was identified, suggesting its removal during historical and modern landscaping and disturbance.
- A2: Horizon 1, Band 1, 100-120 mm thick, was overcut the machine excavator (Figure 32). The PSB was a very compact dark greyish brown silty course grained sand (7.5YR 5/3 brown). The bottom of horizon 1 was defined by a thick band of ironstone staining.
- A2: Horizon 2, 100-130 mm thick, had the same colouring and matrix as band 1. It also included very small aggregate which was at a higher density than other layers in the profile (seen especially in Figure 32). The bottom of band 2 was also defined by a thick ironstone stain.
- A2: Horizon 3, 200 mm thick, had very slightly more medium-grained sand in the matrix compared to band 2. The horizon began a subtle transition from greyish orange to a darker orange colour (7.5 YR 6/5 light brown) approximately half way through.
- A2: Horizon 4, 230 mm thick, was the most distinct. Instead of being a clean sandy layer sandwiched between two thick ironstone bands, horizon 4 consisted of several thinner laminated ironstone bands (Figure 33). They were heavily undulating and overlapping, appearing almost vein-like, suggesting it related to a significantly higher amount of flooding (or even aeolian) events.
- A2: Horizon 5, 470 mm thick, was a lighter and greyer colour to the other horizons (7.5YR 5/4 brown). The matrix was a slightly finer grained sand. It included very infrequent charcoal pieces (up to 2 cm in size).
- B: No B horizon clay or bedrock was identified. Excavations ceased at a depth of 900 mm below the PSB surface due to accessibility restrictions.

Figure 30. Location of service trenches in relation to ATP6, facing west.

Figure 31. Overview of ATP6 showing horizons and ironstone banding, facing northeast.

Figure 32. *Above:* Horizons separated by ironstone banding in ATP6, facing east.

Figure 33. *Below:* Detail of lesser (thinner and more frequent) banding of horizon 4 in ATP6, facing northeast.

APT9

ATP9 was located within TT9. The trench was expected to be congested with historical archaeological features associated with several early buildings dating from 1780, with a limited opportunity to excavate an Aboriginal test pit.

Due to the presence of the existing footpath and the exposure of a service directly beneath the topsoil, TT9 was relocated approximately 2.5 m to the northeast. In its new location, TT9 was 3.6 m north to south by 3.6 m east to west. A large cut, truncating the PSB, was identified in the southern portion of the trench. To maximise the area of PSB investigated, the ATP9 was made up of four 50 x 50 cm test pits, laid out in a Z-shape (Figure 34).

A machine excavator was used to remove up to 400 mm of the topsoil and fill. Following the identification of PSB, machine excavation ceased and hand excavation commenced. The stratigraphic profile comprised the following:

- A0: the ground surface of TT9 was low grass and recent topsoil, up to 100 mm in depth.
- Fill: A layer of mixed introduced fill capped the PSB, containing charcoal, sandstone, and brick pieces throughout, 300 mm in depth.
- Fill: A large cut extending across the southern side of the trench truncated the PSB, sloping down to the south. This was seen in part of ATP9 (Figure 35; Figure 40). The fill consisted of a dark greyish brown with charcoal, sandstone and brick pieces, and gravels. The cut

horizon was very clear, although tree roots have caused some of the fill to be drawn outside of the cut in specific locations (Figure 40).

- A2: Horizon 1 was relatively consistent between 0-950 mm below the top of the PSB, consisting of a medium orange medium grained sand. There were patches which were more silty in make-up but these were not consistent across the pit (Figure 38). Evidence of bioturbation caused by insect burrows and/or tree roots were visible throughout this layer in the form of light grey/light orange horizonal streaks. This is most clearly seen in Figure 39.
- A2: Horizon 2, in the western half of ATP9 between 950 mm-1.3 m below the surface of the PSB, became distinctly greyer and looser (Figure 39 - Figure 40). The horizon between the upper orange profile and lower grey horizon was slightly dispersed, possibly mixed as a result of bioturbation. It sloped down to the north (toward the river).
- A2: Horizon 3, between 1.3-1.5 m below the surface of the PSB, was a gravel layer of loose small (up to 5 cm) angular gravels with silty sand matrix (Figure 41). Due to the inclusions, the horizon was quite sharp. The layer was only exposed on the eastern side of the trench. It likely extended across the entire trench but was not reached within the depth of works.
- B: No B horizon clay or bedrock was identified. Excavations ceased at a depth of 1.5 m below the PSB surface due to accessibility restrictions.

Figure 34. Overview of ATP9 within TT9, facing east.

Figure 35. Overview of ATP9 showing disturbance in southern extent, facing south.

Figure 36. Overview of ATP9, facing northwest.

Figure 37. Overview of ATP9 showing disturbance in southern extent, facing southeast.

Figure 38. Section of ATP9, facing west.

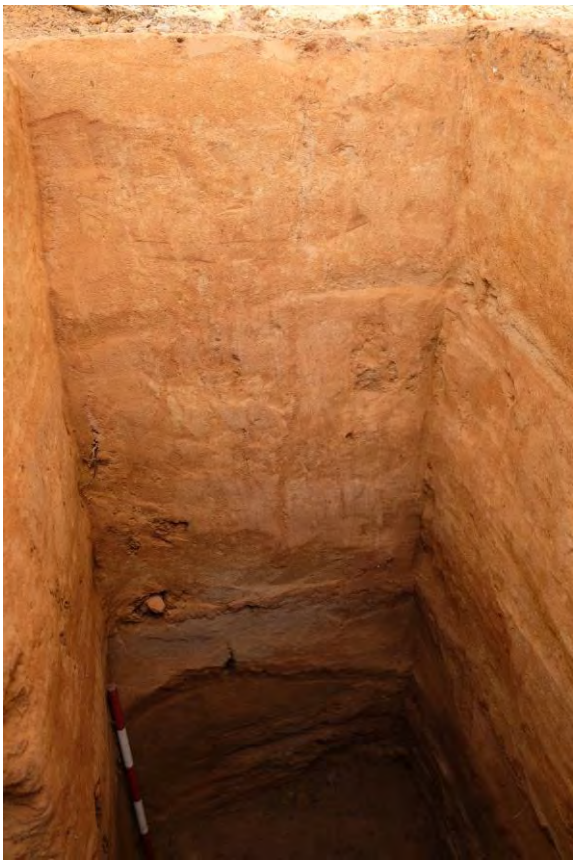

Figure 39. Section of ATP9, with grey A2 and gravel layer visible at the base of the trench, facing northwest.

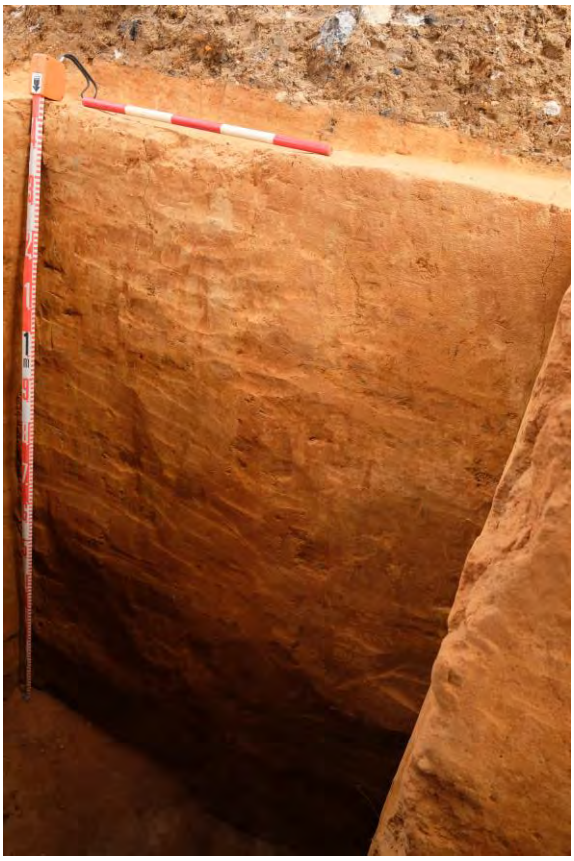

Figure 40. Section of ATP9, facing northwest.

Figure 41. Section of ATP9, facing east.

Summary

The PSB profile across the areas tested varied greatly, dependent on location of test trench in relation to the Parramatta River and relationship with historical archaeological remains and disturbances.

Of the pits excavated as part of the Aboriginal archaeological program, ATP4 was the highest in elevation and furthest from the river. Compared to the other ATPs, no A horizon sands were exposed. Instead, historical archaeological features (namely the gravel surface) were found to have been constructed directly onto B horizon clay. The PSB was likely stripped XXXX in this location.

The same historical features were also exposed in ATP5, 15 metres to the west. In this location, however, they were constructed directly onto the PSB. While the A1 horizon was found to be stripped, the A2 horizon was more than 900 mm thick. This demonstrates the substantial difference in the elevation of the sterile B horizon clay formation beneath the topsoil as it slopes downward to the north and west.

Like ATP4, ATP5 was able to demonstrate the differences in impacts to the natural soil profiles during the late nineteenth to twenty first centuries. The PSB in ATP5 North and ATP5 South was truncated by cuts for the Commissary wall, service pipe, and landscaping, as well as being

disturbed by bioturbation. Despite this, the amount exposed was able to provide an understanding of the type and depth of PSB in TT5.

ATP6 was positioned nearest to the riverbank. Four distinct horizons separated by thick undulating red ironstone stained bands were found across the trench. The bands were heavily undulated but more or less parallel to one another, sloping down to the north and toward the river band. The lines were likely created when a new ground surface was established as ironstone found within the sand profile stains red when it is exposed to sunlight. The intactness of the lines indicates that the soil integrity is high. In addition, the sand within each horizon was relatively consistent and sterile, with the exception of horizon 2 which included a small amount of introduced aggregates. These features together suggest that each horizon was created by a flooding event.

Horizon 4 was notably different to the others. Instead of a clean sand profile, the horizon was defined by a series of thin, overlapping bands. This may be reflective of short-term exposure and sand being deposited by aeolian actions rather than more substantial movements of silt during flooding events.

ATP9 was similar to that of ATP5 in the consistency of the upper layers of PSB, although the PSB in ATP9 was significantly more disturbed by bioturbation. Unlike the other trenches however, ATP9 presented a layer of gravels at approximately 1.3 m below the ground surface which was not seen in any of the other trenches.

The four areas where Aboriginal archaeological investigations were able to take place demonstrated a significantly different set of PSB attributes across the study area. In most locations, however, PSB was not identified due to the depth of impacts being too shallow. As such, a full understanding of the natural soils and any associated archaeological remains within the study area could not be ascertained.

11.2 Artefact assemblage

Nine (9) artefacts and a piece of ochre were recovered from excavations within two areas of Test Trench 5. Excavation of ATP5 was split into several areas. In the central portion of TT5, directly north of the historical gravel surface, five 50 x 50 cm Aboriginal test pits were placed. These pits were located along the extent of the collared pipe and, as a result, included the removal of sands associated with intact PSB and backfilled into the service trench cut.

Each test pit was split into two portions. Figure 42 demonstrates the lettering system that was used to indicate whether artefacts were retrieved from an in-tact or fill area of a trench. In sum, soils recovered from areas B, F, G, and K were associated with in-situ PSB, whereas soils recovered from areas A, C, D, E, H, and L were from the service cut fill.

While photographs of the section profile suggest that the boundary between the PSB and service fill was clear, this was not experienced during the physical excavation works. This was, in part, due to the backfilling of the service trench being redeposited PSB which possessed the same consistency and staining as the adjacent PSB. Although, it should be noted that the

backfilled PSB deposit also included charcoal, historical artefacts, and other gravel inclusions. As a result, conflation between the fill and natural is likely to have occurred.

Of the nine artefacts, two of these artefacts are manufactured on volcanic material and while they display attributes of working, they may have been deposited through historical disturbance activity. They are considered in this lithics report as artefactual, as it is difficult to discern.

A range of raw material types are displayed in this assemblage with indurated mudstone (n=3) quartzite (n=3), silcrete (n=1) and volcanic (n=2) present. The majority of artefacts are complete flakes (n=7) with one distal flakes and one angular fragment. One artefact (a red silcrete complete flake) was identified to have possible usewear on one margin. Cortex was only present on two artefacts, an indurated mudstone complete flake and a quartzite angular fragment. The cortex on both of these artefacts is smooth, reflecting likely procurement from a secondary source such as a waterway.

The artefacts were recovered between 0-65cm throughout the Parramatta Sand Body, with no major peaks identified. It is inferred four of the artefacts are from the intact PSB, four from the fill within the collared pipe service trench and one recovered from clean up. Flake form is generally indeterminate and platform type displayed includes crushed and uniform. No facetted platforms were identified.

The piece of ochre was recovered from a depth of 60-65cm within the PSB and is 64.9mm maximum width and weighs 67g.

One yellow silcrete medial flake with no cortex was recovered from spit 8 in ATP6.

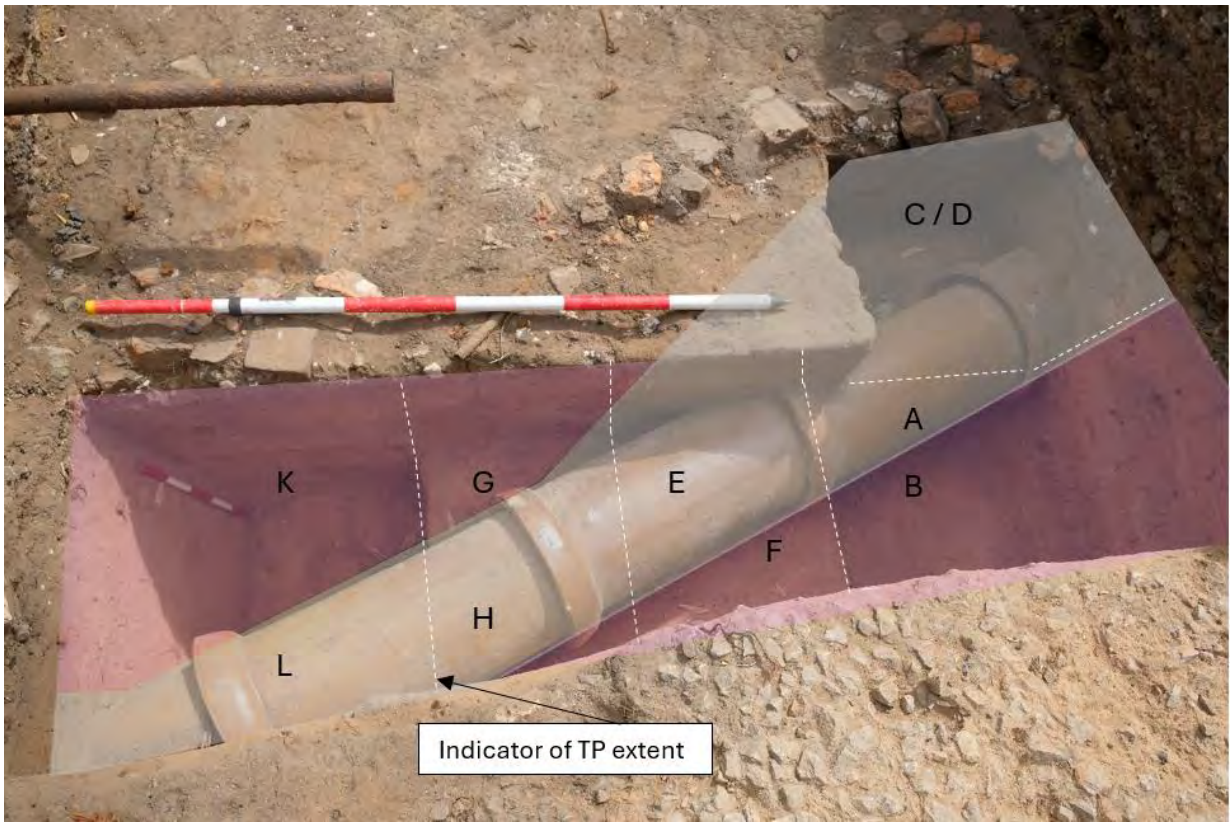

Figure 42. Location of test pits within ATP5 demonstrating soils recovered from historical fills associated with the service pipe installation (grey) and intact PSB (pink), facing north.

Table 8. Artefact analysis

ID	Trench	Test Pit	Spit	Depth (cm)	Inferred context	Artefact type	Material	Colour	Distal end	Cortex %	Cortex type	Form	External platform	Platform type	Usewear/retouch	Max. length (mm)	Max. width (mm)	Max. thickness (mm)	Length (mm)	Width (mm)	Thickness (mm)	Platform width (mm)	Platform thickness (mm)	Weight
02	5	Clean up	Clean up		Clean up	Complete flake	Volcanic	Grey	Feather	0		Indeterminate	Yes	Crushed		16.66			15.07	11.27	4.1	9.81		0.6
03	5	5 c	2c	40-45	Fill	Complete flake	Quartzite	Grey	Feather	0		Indeterminate	No	Uniform		14.45			14.43	9.7	22.4	3	2.37	0.3
05	5	5 a/b	5	55-60	Intact PSB	Complete tool	Silcrete	Red	Step	0		Indeterminate	No	Uniform	Usewear	35.65	22.91	6.92	32.4	22.91	7.4	5.46	1.79	6.1
06	5	5 a/b	5	55-60	Intact PSB	Complete flake	Indurated mudstone	Buff/yellow	Step	26-50	Smooth	Indeterminate	No	Crushed		17.18			16.85	12.31	4.93	9		1
07	5	5 e	1	35-40	Fill	Distal flake	Indurated mudstone	Red	Feather	0		Elongated				13.52								
08	6		8	50-55	Intact PSB	Distal flake	Silcrete	Yellow		0		Indeterminate				17.57								0.9
09	5	5 k	12k	55-60	Intact PSB	Complete flake	Indurated mudstone	Buff	Feather	0		Indeterminate	No	Uniform		11.64			11.33	6.84	2.4	6.37		0.1
11	5	5 k	12k	55-60	Intact PSB	Angular fragment	Quartzite	Buff		26-50	Smooth					18.4								0.6
12	5	5 c	1c	35-40	Fill	Complete flake	Quartzite	Buff	Axial	0		Elongated	No	Crushed		18.68			18.68	7.23	4.64	4.13		0.6
13	5	5 c	1c	35-40	Fill	Complete flake	Volcanic	Black	Plunge	0		Indeterminate		Uniform		15.82			12.75	15.35	4.25	10.39	2.86	0.8
14	5	5 i	13i	60-65	Intact PSB with bioturbation	Ochre	Ochre	Red								64.9	54.22	17.28						67

11.3 Geomorphological analysis

During test excavations at ATP5 and ATP6, samples of the Parramatta Sand Body (PSB) deposit were collected, including monolith block samples and a range of bulk and micromorphological samples from the relevant sections. Given the timeframes for processing and analysis of these samples, the results of analysis are ongoing and when available, will be appended to this report as required. The ongoing analysis forms a recommendation of this report as part of the mitigation measures for impacts to the PSB from the activity.

12. Analysis and discussion

12.1 Responses to research questions

- **Can we identify what Aboriginal people were processing and hunting in the study area over time? Does this change from the Pleistocene to the Holocene, and from the Holocene to the contact period?**

The small size of the assemblage limits our understanding of what people were processing and hunting in the study area.

Characteristics of change from the Pleistocene to the Holocene identified at other sites across the Cumberland Plain include Pleistocene assemblages dominated by large IMT tools whilst smaller tools (e.g. backed artefacts and thumbnail scrapers) made of a wider range of materials including silcrete, IMT and quartz, are signatures of late Holocene assemblages. These changes in reduction strategies, raw material preference and formal tool types are reflective of differences in climate, culture and environment between the late Pleistocene-early Holocene and the late Holocene.

The assemblage size precludes definitive age characterisation of the assemblage; however, the material types may be more reflective of late Pleistocene – early Holocene characteristics.

One artefact (a red silcrete complete flake) was identified to have possible usewear on one margin. Further research employing usewear and residue analysis may assist in further characterising the nature of the use wear (e.g. drilling, sawing, scraping). Research has suggested that the increase in backed artefact use, particularly the use of Eloueras, indicate higher levels of wood-working during the late Holocene (Attenbrow 2010: 155).

- **Is any evidence of contact period archaeology present (e.g. use of ceramic and glass by Aboriginal people, or identification of Aboriginal objects in historical archaeological contexts)?**

No contact-period Aboriginal objects were identified. A number of artefacts were located in the redeposited PSB within the backfill of a colonial era collared pipe, however given the disturbed context, this cannot be definitely associated or dated with contact period Aboriginal use of the site. A number of small undiagnostic glass fragments were also noted in historical archaeological excavation, however examination using Goward's classification scheme of glass artefacts in Australia (2011) indicated none fulfilled criteria to be considered of Aboriginal modification origin.

- **Are micro artefacts (e.g., debitage, charcoal and bone) present in the deposits and what does this tell us about ancient use of the site?**

A limited amount of charcoal was recovered from the upper deposits in ATP5, in and around the collared pipe and posthole. Given the historical disturbance in this trench, the integrity of

this deposits is difficult to fully ascertain. Given its presence in the upper most deposits of the Aboriginal excavation test pit, this could potentially signify a last stable surface before historical capping and subsequent site use. However, the absence of hearths or distinct layers, features, or deposits hinders our ability to draw definitive conclusions about ancient site use based solely on this finding. Furthermore, no other relevant micro artefacts were identified.

- **Can we apply the method of 'refitting' artefacts back together to understand the reduction strategies used by Aboriginal people in the Parramatta area?**

A refitting program did not result in the identification of any conjoins within the assemblage. Therefore, we obtained no additional information on the reduction strategies used by Aboriginal people in the Parramatta area. The sample of artefacts was too small to offer an opportunity to examine reduction strategies.

- **Can fluvial or alluvial lenses be identified in the stratigraphy and do these correspond to levels of artefact deposition?**

Only one ATP (ATP6) showed evidence of alluvial flooding creating clear multi-layering stratigraphy with distinct horizons evidenced by red iron staining from exposure to light. The presence of these alluvial lenses being identified in ATP6 rather than the other locations tested across the study area was likely because of its position closest to the bank of the Parramatta River which would be an area more prone to flooding. Further geomorphological analysis may provide further information. Only one artefact was identified in ATP6, therefore no comparison can be made between relative levels of artefact deposition.

12.2 Revised site extents

A majority of QWR PAD 1 (AHIMS ID 45-6-4094) was not investigated for Aboriginal archaeology as most test trenches within the PAD were not excavated deep enough to encounter the PSB located beneath the capping fills. As a result, in these areas the potential for subsurface Aboriginal archaeology remains valid.

13. Significance Assessment

13.1 Assessment criteria

While all Aboriginal objects in NSW are protected under NSW legislation, the *National Parks and Wildlife Act* recognises that some harm may be necessary to allow other activities or developments to proceed. In order for the state regulator to make informed decisions on such matters, a consideration of the significance of cultural heritage places and objects is an important element of the assessment process.

An assessment of the archaeological significance of an item or place is required in order to form the basis of its management. The *Code of Practice* requires that the assessment must reflect

the following best practice assessment processes as set out in the *Burra Charter* (Australia ICOMOS 2013):

- **Research potential**: Does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- **Representativeness:** How much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- **Rarity:** Is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- **Education potential:** Does the subject area contain teaching sites or sites that might have teaching potential?

In accordance with the National Parks and Wildlife Regulations 2019, this report only includes an assessment of the scientific values of identified Aboriginal sites. An assessment of social, aesthetic and historic significance will be included in an Aboriginal Cultural Heritage Assessment Report (ACHAR) prepared in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) (the *Guide*) and the *Consultation Requirements*.

It is important to note that heritage significance is a dynamic value and will be updated in consideration of the results of future investigations.

13.2 Archaeological significance assessment

The following Section assesses the significance of the PADs investigated through test excavations. The assessment is necessary to most effectively provide recommendations and mitigation measures for managing all the sites identified across the study area. Only scientific significance is assessed here. A full assessment of historical, aesthetic, and social significance can be found in the ACHAR (Extent Heritage 2023, Section 12).

13.2.1 QWR PAD 1 (AHIMS ID 45-6-4094)

The PSB was shown to remain relatively intact in the three areas investigated as part of test excavations, with the exception of localised disturbances associated with service and structure trenches, and cuts and fills. A total of ten stone artefacts were recovered: nine in ATP5 and one in APT6, with none recovered from the PSB of APT9.

A vast majority of QWR PAD 1 was not excavated as part of the project as the test excavation methodology focused on areas that would be directly impacted by the proposed development. Similarly, within the areas tested, the PSB was found primarily below the depth of the proposed impacts. Where the PSB was not investigated, the extent and significance of any associated subsurface archaeology remains unknown, however the testing has characterised the presence

of PSB in the area as discontinuous and undulating, and highly impacted by historical filling events. The PSB most likely existed below the fills found in the other eight test trenches, however works stopped at the depth of proposed impacts which is 600 mm below the ground surface. As a result, the specific significance of unexcavated areas remains unknown.

The site integrity, referring to its state of preservation, or condition, is considered low-moderate. A site can be disturbed through a number of factors including natural erosion processes, destructive land use practices or repeated use of a site in the past by both humans and animals. The majority of trenches investigated demonstrated historical disturbances such as services.

The site representative and rarity is considered moderate high – whilst the artefact types and material are fairly typical for the region, and are an extremely small assemblage, the limited resource of the Parramatta Sand Body as a deep deposit with potential to contain deeply stratified sites and evidence of human activity and occupation is considered highly significant. Further pressures on this resource by prior development and flood scouring increases its rarity.

Overall, the archaeological significance is considered to be moderate.

13.2.2 River Road West (AHIMS ID 45-6-3131)

Despite being within the study area, AHIMS ID 45-6-3131 was not investigated as part of the program. It was instead investigated as part of the adjacent Alfred Street Bridge Pedestrian Cycleway project undertaken by Extent Heritage (2022) on behalf of City of Parramatta.

Results of the post-excavation report for the Alfred Street Bridge project concluded AHIMS ID 45-6-3131 held high overall significance. The specific portion of AHIMS ID 45-6-3131 located within the Queens Wharf Reserve and Noller Parade Active Transport Link study area is therefore also considered to hold high significance.

13.2.3 Summary

A majority of the study area was assessed as holding archaeological potential. Only a small portion of it, however, was investigated as test excavations were confined to the zone of proposed impacts. In the parts of QWR PAD 1 which were not excavated, the integrity of the sand body and extent of subsurface archaeology remains unknown. Similarly, in most of the areas tested as part of the fieldwork program, PSB was not identified because it was capped by fills. Across both these areas, scientific significance could not be assessed.

In the three areas where PSB was identified during the test excavations, although only two of the Aboriginal test pits recovered artefacts: nine in ATP5 and one in APT6.

A summary of scientific significance for the study area is provided in Table 9 below.

Table 9. Summary of archaeological significance.

Site name (AHIMS ID)	PSB excavated	Research potential	Represent ativeness	Rarity	Education potential	Overall significance assessment
QWR PAD 1 (part) 45-6-4094	Yes	Moderate	Moderate	High (for PSB)	Moderate	Moderate
QWR PAD 1 (part) 45-6-4094	No	Unknown	Unknown	Unknown	Unknown	Unknown
River Road West 45-6-3131	Yes—as part of Alfred Street Bridge project (Extent Heritage)	High	High	High	Moderate	High

14. Impact assessment

14.1 Proposed impacts

The proposed development is the construction of a two-way on road cycleway at Noller Parade. The works includes:

- Creation of separated pedestrian and cyclist paths in Queens Wharf Reserve;
- Provision of a two-way on road cycleway at Noller Parade;
- Improved path connections and DDA compliance;
- Removal of selected small trees and the planting of additional trees;
- Provision of new park furniture including signage, seating and bins;
- Improved lighting for increased safety;
- Minor landscape and garden bed improvements;
- Minor civil infrastructure works (e.g. kerb and gutter and drainage works);
- Reconstructed retaining walls;
- Improved electrical works.

The archaeological test excavation program as described in the ARD (Extent Heritage 2023a) was based on the proposed ground disturbance impacts listed below in Table 10.

Table 10. Proposed ground disturbance impacts from previous concept design, as detailed in the HAIA (Extent Heritage 2023b) and ARD (Extent Hertiage 2023a).

Proposed development	Ground disturbance impacts
Redevelopment of existing pathway including demolition for path widening	Max. 225mm depth
Development of new pathways	Max. 225mm depth
Installation of light poles along path route	Max 650mm depth. Footing dimensions 1200mm x 1200mm.
Installation of signposts	Max. 450mm depth
Trenching for electrical services	Max. 600mm depth.
Landscaping works including tree removal and new plantings (25L pot size)	Max 300mm depth.

Removal of existing grass for proposed garden beds	Max. 50mm depth

Following the results of the archaeological investigations, Extent Heritage provided preliminary advice on areas of avoidance relating to both historical and Aboriginal archaeology to the City of Parramatta. As a result of this collaboration, City of Parramatta revised the concept design and reduced the overall proposed development impacts, ensuring the primary heritage management strategy continued to be avoidance of local and State significant archaeology. This resulted in a reduction of proposed ground disturbance impacts through using fill to build up the ground level between 100mm – 500mm along the northern side of the pathway where the light poles and electrical conduits area located. Additionally, service trenching impacts were further reduced through proposed localised trenching below the concrete pathway on the northern side. Based off the revised concept design, the proposed development will involve the following ground disturbance impacts listed below in Table 11.

Table 11. Proposed ground disturbance impacts from revised concept design.

Proposed development	**Total ground disturbance impact**	**Actual impacts to existing ground level ***
Redevelopment of existing pathway including demolition for path widening	Max. 225mm depth	0mm-125mm
Development of new pathways	Max. 225mm depth	0mm-125mm
Installation of light poles along path route	Max 650mm depth. Footing dimensions 1200mm x 1200mm.	150 mm -550mm
Installation of signposts	Max. 450mm depth	0 mm – 350mm
Trenching for electrical services below pathway	Max. 425mm depth.	0mm – 325 mm
Landscaping works including tree removal and new plantings (25L pot size)	Max 300mm depth.	0mm – 200mm
Removal of existing grass for proposed garden beds	Max. 50mm depth	

*along northern side of pathway only, where 100mm – 500mm of fill will be introduced to raise the existing ground level

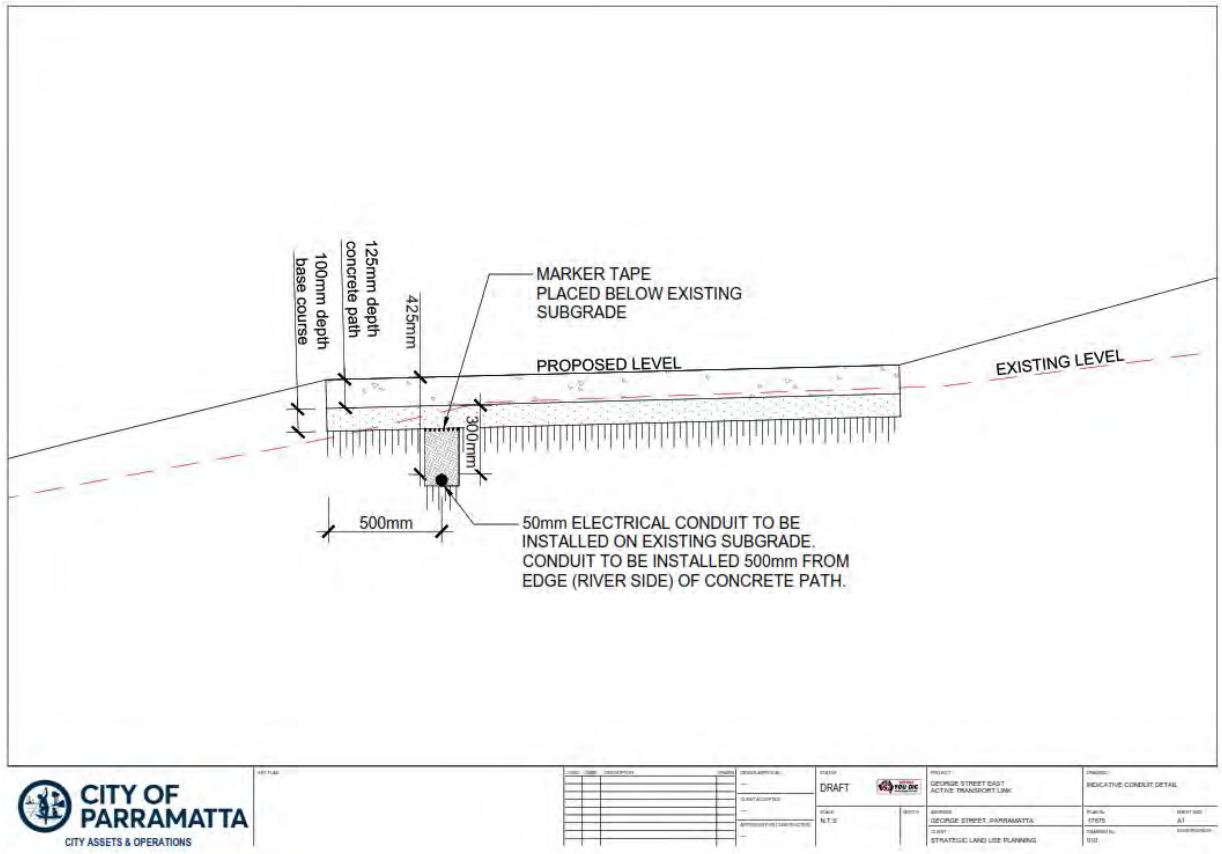

Figure 43. Indicative conduit design

14.2 Potential Aboriginal heritage impact

Investigations revealed that there is a fairly consistent layer of 100 to 200 mm of topsoil or fill present across all test trenches excavated. Furthermore, PSB deposits were identified only in three of the test pits and at depths . With the revisions made by City of Parramatta to the design to reduce pathway and electrical services depths, it is considered construction of pathways and conduits is unlikely to impact intact PSB deposits, or if so, it would be minimal and confined to minimal top layers.

The proposed light pole footings, on the other hand, may impact PSB deposits due to their discrete but deeper footprint. However, in the majority of excavated areas, and where light post footings can be placed; the PSB was not reached. Therefore, any impact on the PSB would be partial and discrete, leading to partial loss of archaeological value.

Table 12. Assessment of impact (harm) to Aboriginal sites

Site ID	Type of harm	Degree of harm	Consequence of harm
QWR PAD 1 (AHIMS ID 45-5-4094)	Direct	Partial	Partial loss of value
River Road West (AHIMS ID 45-6-3131)	None	None	None

15. Management and mitigation strategy

15.1 Guiding principles

Where possible, cultural heritage should be conserved and protected in situ. However, where conservation is not feasible, measures should be implemented to mitigate against the loss of archaeological value. These mitigation measures are based on the assessed significance of the site again the proposed impacts. In accordance with the requirements of the *Code of Practice*, this ATER report has only assessed the scientific values of identified Aboriginal sites. An assessment of social, aesthetic and historic significance would be included in an ACHAR prepared in accordance with the *Guide* and the *Consultation Requirements*.

15.2 Monitoring and salvage excavation

QWR PAD 1 (AHIMS ID 45-6-4094) has been assessed as being of moderate archaeological significance. Therefore, it is recommended that further archaeological investigations occur within the study area where in-situ conservation is not possible at the point of deep excavations of light pole footings. A programme of environmental sampling would also be proposed as part of ongoing mitigation of impacts to the PSB by record.

A specific outline of proposed mitigation and management through archaeological works would be included in a separate methodology document to be reviewed by the RAPs and appending to the supporting ACHAR.

15.3 Storage of collected Aboriginal objects

The temporary repository of any retrieved artefacts will be in a locked cupboard on the premises of the archaeological consultant. Options for the long-term management of collected Aboriginal objects will be developed in consultation with the RAPs, but is likely to include (in preferential order):

- reburial on site, in an appropriate location in the vicinity of the subject area;
- lodged with a RAP under a Care and Control Agreement; and
- deposition with the Australian Museum.

The plan for the long-term management of the collected Aboriginal objects would be outlined in the final ACHAR, for completion of consultation with the RAPs.

16. Conclusions

16.1 Key findings

- Through the completion of background research, database searches, field survey, and test excavations; it is established there are two Aboriginal sites within the study area— QWR PAD 1 (AHIMS ID 45-6-4094) and River Road West (AHIMS ID 45-6-3131)

- River Road West (AHIMS ID 45-6-3131) has been assessed as having high archaeological value. The proposed works will not impact this site. Test excavations that investigated portions of QWR PAD 1 (AHIMS ID 45-6-4094) are considered to have moderate scientific significance. Based on design information provided by the proponent, the proposed works will impact a portion of QWR PAD 1 (AHIMS ID 45-6-4094), resulting in a partial loss of value.

16.2 Recommendations

1. Where impacts to the extent of AHIMS ID 45-6-4094 cannot be avoided, an AHIP will for harm will be required. City of Parramatta has ensured minimisation of impacts where possible on the significant cultural deposits associated with QWR PAD 1 (AHIMS ID 45-6-4094).

2. An AHIP application must be supported by an ACHAR and a final Test Excavation Report.

3. Based on the assessed cultural heritage significance and likely age of the deposits identified at QWR PAD 1 (AHIMS ID 45-6-4094), impact to the Parramatta Sand Body in the locations of light footings should be preceded by archaeological salvage excavation within those footprints to ensure conservation by record.

4. Geomorphological analysis of the sediments sampled as part of test excavations should take place in order to supplement the existing record and understanding of the Parramatta Sand Body in this area.

5. Long term arrangements for the management of excavated artefacts, should be further discussed within the ACHAR.

6. To keep consultation current, the registered Aboriginal parties should be sent an update on the project everything six months, until the AHIP has been approved.

7. If changes are made to the proposed works which could impact locations outside of the current study area, further archaeological investigation may be required.

8. If suspected human remains are located during any stage of the proposed works, work should stop immediately, and the NSW police and Coroner's Office should be notified.

Heritage NSW should be notified if the remains are found to be those of an Aboriginal person.

References

Abbreviations

ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AHMS	Archaeological Heritage Management Solutions
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW [DPC])
DoE	Department of the Environment
DP	Deposited Plan
EPI	Environmental planning instruments
GPS	Global Positioning System
Heritage NSW (DPC)	Heritage NSW, part of the Department of Planning, Industry and Environment (formerly OEH)
IF	Isolated Find
ILUs	Independent Living Units
JMCHM	Jo McDonald Cultural Heritage Management Pty Ltd
ka	1,000 years ago)
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
Ma	million years ago
NHL	National Heritage List

NPW Act	National Parks and Wildlife Act 1974
OEH	Office of Environment and Heritage (formerly DECCW, now Heritage NSW [DPC])
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party
SCSNSW	Soil Conservation Service of NSW
SEPPs	State Environmental Planning Policies
SU	Survey Unit
WHL	World Heritage List

Glossary

Aboriginal cultural heritage assessment report (ACHAR)	A document developed to assess the archaeological and cultural values of an area, generally required as part of an environmental assessment (EA).
Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010	Guidelines developed by OEH to guide formal Aboriginal community consultation undertaken as part of an Aboriginal Cultural Heritage Assessment (ACHA).
Aboriginal heritage impact permit (AHIP)	The statutory instrument that the Director General of the Department of Planning, Industry and Environment (DPIE) issues under section 90 of the *National Parks and Wildlife Act 1974* (NSW) to allow the investigation (when not in accordance with certain guidelines), impact and/or destruction of Aboriginal objects. AHIPs are not required where project approval under the state-significant provisions of Part 4 (Division 4.1) of the *Environmental Planning and Assessment Act 1979* (NSW).
Aboriginal object	A statutory term defined under *the National Parks and Wildlife Act 1974* as 'any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains'.
Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales	Guidelines developed by DECCW (2010) to inform the structure, practice and content of any archaeological investigations undertaken as part of an Aboriginal cultural heritage assessment report (ACHAR).
Department of Environment, Climate Change and Water (DECCW)	Now known as the Department of Planning, Industry and Environment (DPIE), Department of Premier and Cabinet.
Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales	Guidelines developed by DECCW, outlining the first stage of a two-stage process in determining whether Aboriginal objects and/or areas of archaeological interest are present within a study area. The findings of a due diligence assessment may lead to the development of an Aboriginal cultural heritage assessment report.
Environmental Planning and Assessment Act 1979	Statutory instrument that provides planning controls and requirements for environmental assessment in the development approval process. The Act is administered by the Department of Planning and Environment.
Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW	Guidelines developed by OEH to inform the structure and content of an Aboriginal Cultural Heritage Assessment (ACHA).

Isolated find	An isolated find is usually considered a single artefact or stone tool, but can relate to any product of prehistoric Aboriginal societies. The term 'object' is used in the ACHA, to reflect the definitions of Aboriginal stone tools or other products in the *National Parks and Wildlife Act 1974.*
National Parks and Wildlife Act 1974	The primary piece of legislation for the protection of Aboriginal cultural heritage in New South Wales. Part 6 of this Act outlines the protection afforded to and offences relating to disturbance of Aboriginal objects. The Act is administered by DPIE
Department of Planning, Industry and Environment (DPIE)	The DPIE is responsible for managing the Aboriginal Heritage (and other) provisions of the *National Parks and Wildlife Act 1974.*
Potential archaeological deposit (PAD)	An area assessed as having the potential to contain Aboriginal objects. PADs are commonly identified on the basis of landform types, surface expressions of Aboriginal objects, surrounding archaeological material, disturbance, and a range of other factors. While not defined in the *National Parks and Wildlife Act 1974*, PADs are generally considered to retain Aboriginal objects and are therefore protected and managed in accordance with that Act.
Proponent	A corporate entity, Government agency or an individual in the private sector which proposes to undertake a development project.

Appendix A. Field investigation data
Appendix B. Geomorphological report

Appendix C. Aboriginal archaeology

Appendix C.1 Site type information

Aboriginal sites

Aboriginal sites are classified in several ways. At the most basic level, sites are recorded as 'closed sites' or 'open sites'. Closed sites are associated with rock shelters, and include other evidence of Aboriginal occupation that may be present, such as accumulated cultural deposit within the shelter ('potential archaeological deposit' or PAD), faunal remains (animal bone or shell), and rock art on the shelter walls (paintings or engravings). Open sites are broadly defined and encompass all other types of Aboriginal sites identified where there is no rock shelter.

The most common types of open sites found in NSW include artefacts, which can occur almost anywhere in the landscape, grinding grooves, rock art across formations, culturally modified trees, and shell deposits (middens) (OEH 2012, 7–10). The presence or absence of stone artefacts is often a defining factor, although it is worth pointing out that almost any site is likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of Aboriginal archaeology is likely to have occurred anywhere that Aboriginal people stopped or gathered for any length of time.

Any one site (or group of linked sites described as a 'site complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different Aboriginal site features in NSW is provided in Table AD-1. Other features or types of Aboriginal cultural sites that do not necessarily leave physical evidence may exist or have once existed in the landscape as well; however, such sites have not been recorded previously which reflects the archaeological focus of past studies and the loss of traditional knowledge of such places in this area. Similarly, there may be places of contemporary significance to Aboriginal people in the study area and this will require consultation with the Aboriginal community to identify such places.

Table 13. Aboriginal site feature definitions. *Source:* OEH (2012, 8-10).

Site feature	Definition
Artefact	Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people.
Potential archaeological deposit (PAD)	An area where Aboriginal objects may occur below the ground surface. The term 'potential archaeological deposit' was first applied in Sydney regional archaeology in the 1980s, and referred to rock shelters that were large enough and with enough accumulated deposit to allow archaeologists to presume that subsurface cultural material was highly likely to be present. Since then it has come to include open sites where the same prediction can be made.
Modified tree (carved or scarred)	Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc., or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.
Stone quarry	Usually a source of good quality stone which is quarried and used to produce stone tools
Burial	A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked, e.g., in caves, marked by stone cairns, in sand areas, along creek banks etc.

Stone artefacts

Aboriginal stone artefacts are important sources of archaeological information because stone is preserved for long periods of time whereas organic materials such as bone, shell, wood and plant fibres often decay. Stone artefacts provide valuable information about technology, economy, cultural change through time and settlement patterning. Stone has also been used for 'relative' dating of sites where direct methods such as radiocarbon dating cannot be applied.

A technological sequence for stone artefacts for the region was first described in the late 1940s by Fred McCarthy and has since been refined over time by Hiscock and Attenbrow (2005) into the 'Eastern Regional Sequence':

- Capertian: Distinguished by large uniface pebble tools, core tools, horse-hoof cores, scrapers and hammerstones. Backed artefacts occasionally present. Generally, dates to before 5,000 years BP.
- Early Bondaian: Aspects of the Capertian assemblage continue but backed artefacts and ground-edged artefacts increase. Artefacts during this period were predominantly made

from fine-grained siliceous stone such as silcrete and tuff. Generally dated from 5,000 BP to 2,800 BP.

- Middle Bondaian: Characterised by backed artefacts, particularly Bondi Points and ground-edged artefacts. Artefacts made from siliceous materials; however, quartz becomes more frequent. Generally dated from 2,800 BP to 1,600 BP.

- Late Bondaian: Characterised by bipolar technology, eloueras, ground-edged artefacts, and bone and shell artefacts. Bondi points are virtually absent, and artefacts are predominantly made from Quartz. Generally dated from 1,600 BP to European contact.

Preservation of the archaeological record

The following observations can be made about the nature and preservation of the archaeological record across the Cumberland subregion:

- Archaeological material is often found in areas of sub-surface exposure, such as those caused by erosion.

- Surface evidence (or the absence of surface evidence) does not necessarily indicate the potential, nature or density of sub-surface material. Extensive excavations have shown that areas with no surface evidence often contain sub-surface deposits buried beneath current ground surfaces (e.g. Kohen et al. 1984).

- Due to the limitations of surface surveys, test excavation is often required to establish the nature and density of archaeological material.

- Aboriginal cultural material is more likely to survive in areas that contain remnant portions of the pre-European soil profile, in contrast to landforms that have been impacted by historical or recent disturbances.

- The potential for survival of any archaeological sites will largely depend on the degree of past disturbance.

- Past disturbance to the soil profile can be due to European activity such as clearing, ploughing, grazing, and urban development and/or due to environmental factors such as flooding events, erosion and colluvial movement. These activities may disturb, erode or remove the natural soil profile completely.

- Aboriginal stone artefacts are more likely to survive because stone is preserved for long periods of time whereas organic materials such as bone, shell, wood and plant fibres decay.

- A major impact of more than 200 years of post-contact settlement on Aboriginal sites would have been the destruction of carved and scarred trees, which would have been removed as part of clearing for agricultural activities and the construction of infrastructure such as buildings and roads. However, there is some potential for culturally modified trees to survive in areas where there are stands of remnant native vegetation.

Appendix C.2 AHIMS Search

A copy of the results from the search for Aboriginal sites on AHIMS in the study area is provided in the following page.

APPENDIX F – ARBORICULTURAL IMPACT ASSESSMENT REPORT

ARBORICULTURAL IMPACT ASSESSMENT REPORT

Prepared for

CITY OF PARRAMATTA

Site Address

Queens Wharf Reserve & Noller Parade,

Parramatta NSW 2150

Project

Queens Wharf Reserve & Noller Parade Active Transport Link

Consulting Arborist

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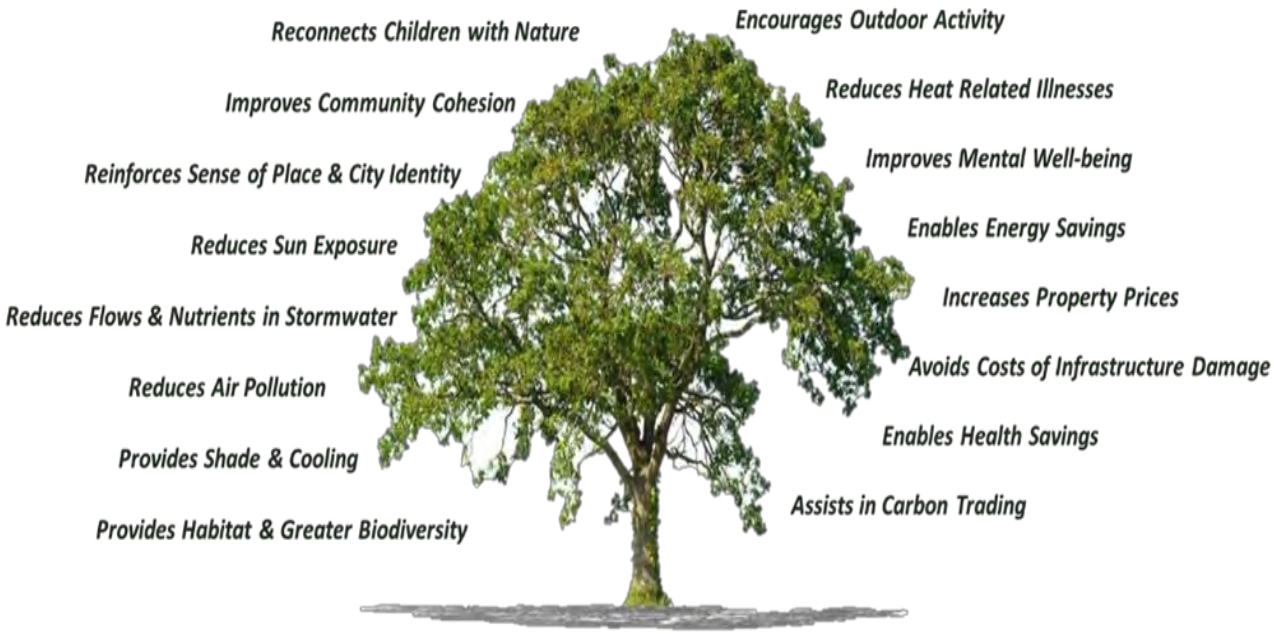
Preface

Urban tree planting, tree protection and tree maintenance has a long history and was first documented in ancient Egypt around 4000 years ago. The specific use of trees in urbanized landscapes probably began as early as the 1200s, with the term 'Arborist' first being used formerly in England 1578.

Thus, urban trees have been around for generations. However, only recently have they become valued for providing more than aesthetic and recreational value. Now the benefits of urban forests are considered to span environmental, economic, cultural and socio-political domains alike. Today communities around the world regard trees and other vegetation as critical urban infrastructure. Ergo, this 'Green Infrastructure' is considered to be as important to the day-to-day functionality of an urban locale as the roads, public transport and/or its 'Grey Infrastructure'.

However, trees grow in a delicate balance with their environment and any changes to that balance must be minimized if the tree is to remain healthy and fulfil its potential. Therefore, tree protection is of critical importance - especially when it comes to the root system. Tree roots not only physically anchor the tree to the ground but are the critical supply lines of water and minerals and are essential for both carbohydrate storage and hormonal signalling. This in turn governing tree functionality, vigour and longevity.

Ergo, the aim of this arboricultural assessment is to pragmatically guide the proposed development works around any retained trees whilst mitigating foreseeable arboricultural impact. This through the formulation and implementation of best management practice tree protection methodologies. Thereby, promoting tree resilience and vitality post development.



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1 Executive Summary

Active Green Services Pty Ltd (AGS) has been engaged by the City of Parramatta NSW to prepare an Arboricultural Impact Assessment (AIA) which includes a Tree Protection Management Plan (TPMP) pursuant to *Standards Australia AS 4970-2009 Protection of trees on development sites.* This with regards to trees and the ensuing impact of earthworks associated with the construction of a Shared Footpath and additional infrastructure installation in Queens Wharf Reserve and Noller Parade, Parramatta. Hence, on the 28th of March 2022, seventy-four (74) individual Visual Tree Assessments (VTA) were carried out within the specified survey area by a suitably qualified (AQF Level 5) AGS arborist.

The abovementioned site-specific tree assessment data collected includes tree maturity, dimensions, estimated life expectancy, vitality, ecophysiology, biomechanics, pedology, root morphology, landscape significance, and retention value *in situ*. This tree data provides the necessary arboricultural fundamentals required to calculate foreseeable arboricultural impact, its pragmatic mitigation and tree viability post development. For ease of identification all of the assessed trees have been GPS located, aerial mapped, photographed and individually numbered with a physical tree tag.

With regards to the abovementioned tree assessment data collected, all seventy-four (74) subject trees were assessed with regards to foreseeable development encroachment and impact per the supplied City of Parramatta Design Plans. On review of this tree data, it was calculated that the proposed development works will encroach on the Tree Protection Zones[1] (TPZ) of sixty-four (64) trees. Ten (10) of these TPZ encroachments are calculated as *'Minor'*[2]; and fifty-four (54) TPZ encroachments calculated as *'Major'*[3]. Of arboricultural concern is that thirty-nine (39) of the *'Major'* encroachments are calculated to be within the Structural Root Zone[4] (SRZ).

With regards to the Major encroachments three (3) trees will not remain viable under the current design and therefore will need to be removed. However, with regards to remaining identified trees, it is of a 'reasonable arboricultural belief' that with the adoption of a pre-determined tree sensitive design methodology, initial Non-Destructive Root Exploration and the provided site-specific TPMP these trees will remain viable and can be retained.

The detail supporting this summary follows.

---

[1] *AS 4970-2009 – Protection of trees on development sites s1.4.7*, Tree Protection Zone (TPZ): A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

[2] *AS 4970-2009: Minor encroachment (<10%): If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and be contiguous with the TPZ.*

[3] *AS 4970-2009: Major- Viable encroachment (>10%):* If the proposed encroachment is greater than 10% (total area) of the TPZ, the project arborist must demonstrate that the tree(s) remain viable. The area lost to this encroachment should be compensated for elsewhere and be contiguous with the TPZ. Tree sensitive construction techniques may be used for minor works within this area providing no structural roots are likely to be impacted, and the project arborist can demonstrate that the tree(s) remain viable. Root investigation by non-destructive methods may be required for proposed works within this area. All work within the TPZ must be carried out under the supervision of the project arborist.

[4] *AS 4970-2009*: The SRZ is the area of the root system used for stability, mechanical support, and anchorage of the tree. Severance of structural roots (>50 mm in diameter) within the SRZ is not recommended as it may lead to the destabilisation and/or serious decline of the tree.

2 Introduction

i. AGS has been commissioned by the City of Parramatta to prepare an AIA and TPP with regards to trees and the construction of a Shared Footpath and infrastructure works in Queens Wharf Reserve and Noller Parade, Parramatta. This AIA will:

- Identify trees within the development site that are likely to be impacted upon by any of the proposed works per the supplied Design Plans.
- Assess the vitality and retention value of these foreseeably impacted trees *in situ*.
- Assess, calculate and discuss the impacts with regards to tree retention and foreseeable viability.
- Put forward best practice management recommendations as to effective tree protection and development impact pursuant *to Standards Australia AS4970-2009 Protection of trees on development sites.*

2.1 Objective

i. The purpose of this AIA is to provide all parties with standing an objective and unbiased arboricultural assessment of the tree population within the designated survey area with regards to tree viability and the ensuing impact of the proposed development works per the supplied Design Plans.

2.2 Limitations

i. All arboricultural reasonings that have been discussed and provided are based on extensive empirical arboricultural knowledge, the internationally recognised Visual Tree Assessment (VTA) methodology (Mattheck and Breloer, 1994), (Matheny and Clark, 1998), the recognised Institute of Australian Consulting Arboriculturists (IACA) Significance of a Tree, Assessment Rating System (STARS), and Australian Standards *AS 4970-2009 Protection of trees on development sites*.

ii. Whilst this arboricultural assessment is thorough it should be noted that trees are dynamic living organisms exposed to both unforeseeable biotic and abiotic variables which on occasion can be harsh and severe. Therefore, this arboricultural assessment will consider on the balance of probabilities the most likely outcome(s) as opposed to those which could, may or fancifully occur.

2.3 Report References

i. As a progressive arboricultural company AGS keeps abreast of research data relating to all aspects of arboriculture and urban forestry. Hence the following arboricultural observations, reasonings, conclusions and recommendations are founded on industry standards and extensive empirical arboricultural knowledge. The science-based arboricultural survey methodologies and references used can be found in the Appendix.

ii. Please note that additional educational material has been appended to promote the urban forest through understanding and knowledge.

2.4 Scope of Works

i. A Shared Footpath (Pedestrian and Cyclist Path), infrastructural works and landscaping (hard and soft) are proposed for Queens Wharf Reserve and Noller Parade, Parramatta. A full set of Design Concept Plans are available upon request from the City of Parramatta design team.

2.5 Study Area

Site Location: Noller Street & Queens Wharf Reserve, Parramatta

2.6 Mapping Methodology

i. With regards to assessing and calculating arboricultural impact the subject tree population within the above survey area was mapped, divided into four (4) sub-map areas and numbered as per the satellite Master-map provided below.

ii. All trees within the four (4) sub-maps which were identified as being of particular interest and/or relevance regarding the development works were GPS located using the Collector Esri Application and given a unique physical tree tag number.

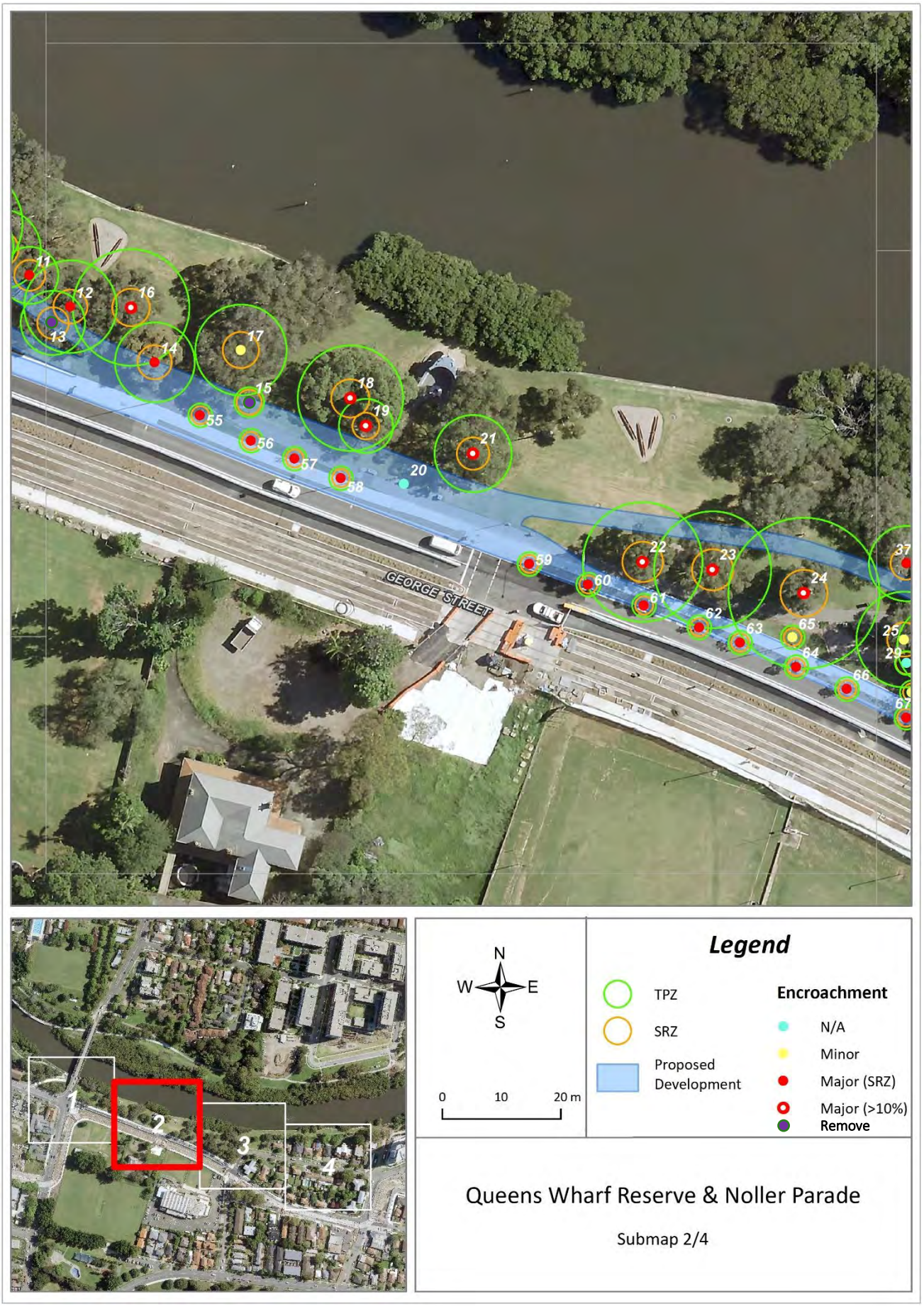
iii. A CSV File accompanies this Report with the following tree data.

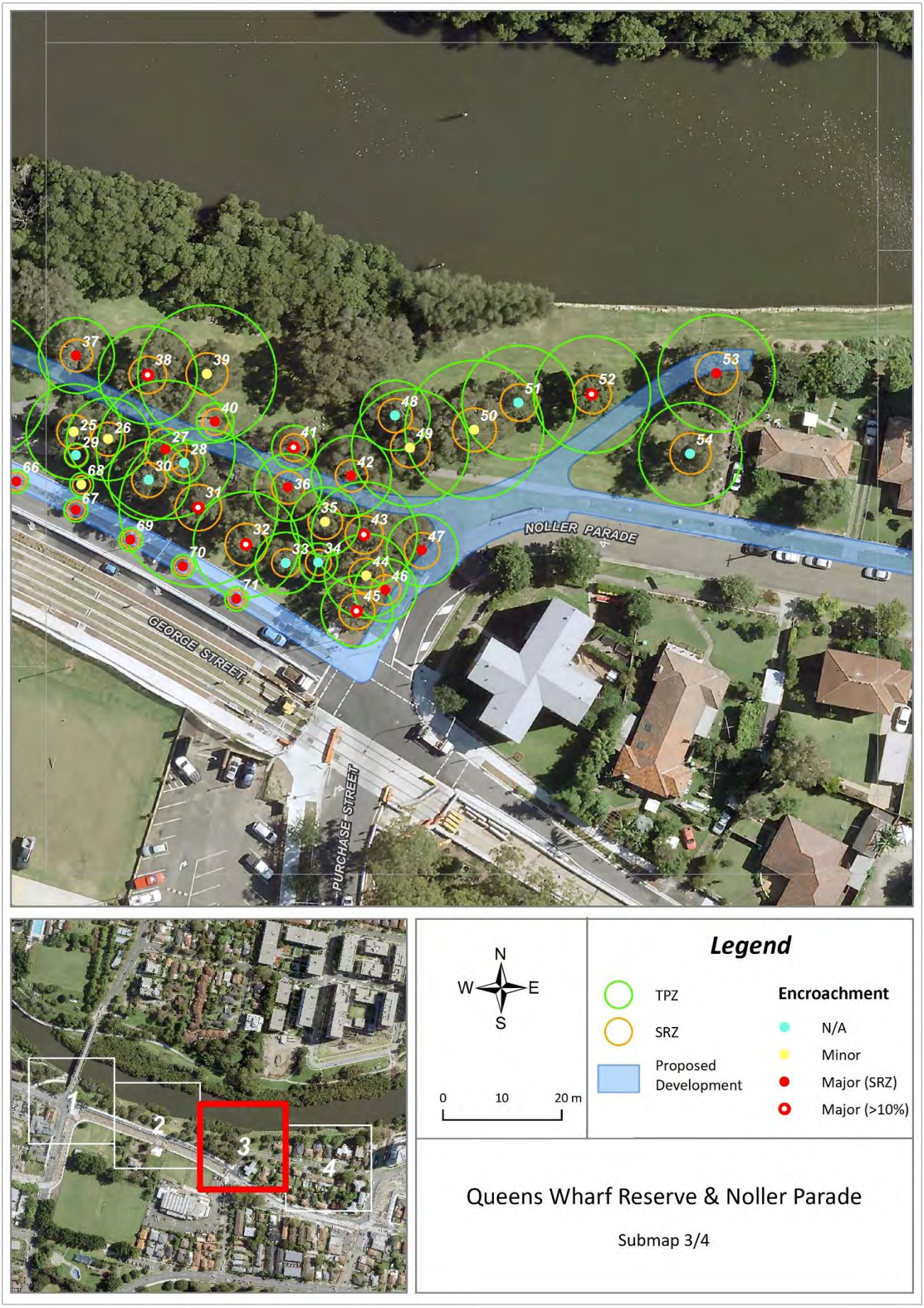
2.7 Tree Locations

i. Please find below a Master-map and Sub-maps with the indicative locations of the assessed trees.

ii. For convenience the calculated development works root zone encroachments are colour-coded per *AS4970-2009 - Minor* or *Major.*

Queens Wharf Reserve & Noller Parade Active Tranport Link Project Master-map





N
W E
S

0 10 20 m

Legend

TPZ
SRZ
Proposed Development

Encroachment

N/A
Minor
Major (SRZ)
Major (>10%)
Remove

Queens Wharf Reserve & Noller Parade

Submap 4/4

3 Arboricultural Methodology

3.1 Visual Tree Assessment

i. A Visual Tree Assessment (VTA) consistent with modern arboricultural practices (Mattheck and Breloer, 1994) was conducted by a suitably qualified and experienced (AQF Level 8) AGS arborist on the subject tree on the 28th of March 2022. This assessment was carried out at ground level and therefore classified as *Level 2: Basic Assessment* (Dunster et al., 2013). The VTA method is an internationally used and acknowledged method for tree inspection. Hazard symptoms are construed, defects are confirmed, measured and criteria of failure are assessed. A VTA provides science-based information about the body language and the biomechanics of a tree and if deemed necessary can recommend further dendrological diagnostic testing.

ii. The tools used onsite to gather the necessary VTA data were a nylon percussion hammer, mobile phone, and an I-pad. The total tree height(s) and canopy spread(s) were recorded using a digital laser range finder (Nikon Forestry Pro). The trunk diameter and DBH height measurements were made by using a forestry DBH measuring tape.

iii. For ease of identification all of the subject trees that will be foreseeably impacted upon have been mapped, photographed and individually tree tagged. No soil analysis, tissue sampling and/or geological investigations were carried out at that time.

3.2 Visual Tree Assessment Parameters

i. The following information outlines the basic parameters used to assess the subject trees. These parameters relate to the Tree Assessment data in *Table 1* below. Comprehensive definitions of the following descriptors are in the Appendix.

Tree Vitality is categorised through a visual determination using:

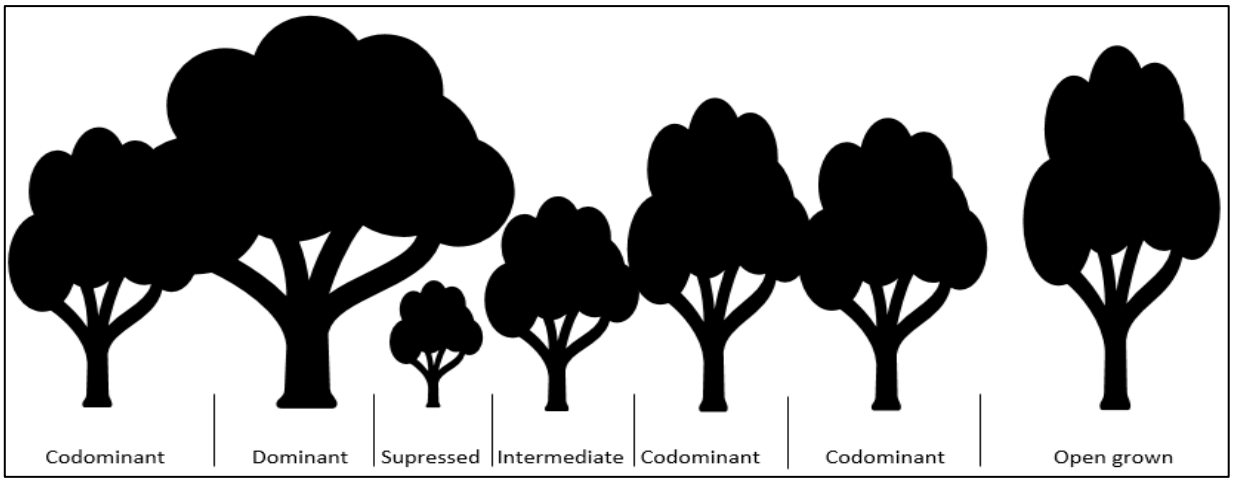
- leaf, twig or needle size, shape, and colour
- seasonal growth rates
- reaction wood development
- foliage density
- foliage coverage throughout the crown
- branch-tip dieback
- typical branch senescence.

For example, a tree assessed to have an average or fair vitality rating would generally have irregular [minor] leaf or needle shape and/or colour and/or size; and/or irregular [minor] foliage density, distribution and/or average growth indicators and/or some tip dieback.

Tree Form is an indication of crown shape. Crown shapes are influenced by their surroundings, light availability and branch loss, which can have varying impacts on their symmetry. The trees have generally been assessed on their individual crown shape, however, as the tree may be growing within a group environment, this could lead to the individual shape being assessed further down the scale. Although a

poor rating may be attributed to the tree, the tree's contribution to the setting may be high through association within the group canopy. This can be generally recognised through the Crown Class rating.

Crown Class rating provides an indication on the tree's relationship with the surrounding tree environment. The categories used include Dominant, Codominant, Intermediate, Suppressed and Open grown, as shown in the below diagram.



Indicative Crown Class

Biomechanics & Limb Structure: is a general evaluation on the branch union formation, weight balance, growth formation and foliage loss (that may affect branch weight and/or mass damping). This assessment is derived on typical structure of the species and its typical branch formation.

Trunk Form: assesses the flare at the base, taper, decay and cavities, formation of multi-stems that develop near or at ground level, girdling roots and growing angles.

Rootzone: visually assesses the general soil health, soil compaction and growth impediments. For example, growing environments with a high percentage of impervious seal or compaction are likely to be categorised as poor, notwithstanding the health of the tree.

Amenity Value: considers the appropriateness and value of the tree in the setting, any cultural and/or heritage significance and general ornamental value. In a group setting, it assesses the tree's value to the group and the adverse effects to the amenity of the group if the tree were to be removed. For example, the removal of a small, suppressed tree from a group setting may have a negligible adverse effect on the group's amenity value, therefore it is likely to be assessed as 'Little value' (*Very Poor*).

Function: of the tree assesses the usefulness of the tree in its setting. For example, does the tree contribute to soil retention on the side of a bank? The provision of stormwater attenuation? The amenity of the site, the provisions of microclimates/cooling during summer months and contribution to wildlife (roosting, perching and habitat). This is weighed up against any negative issues the trees may be causing, for example: conflict and damage to structures, the value of the structure is considered, the tree's growing location – is it the correct tree for the setting's use, etc.

Impediments: (rootzone and canopy) are structures that impede or supress normal tree development and/or function. This can include hard impervious surfaces within the rootzone or powerlines and other structures within or adjacent to the canopy.

Estimated Life Expectancy: An Estimated Life Expectancy (ELE) rating was determined by using the adapted Safe Useful Life Expectancy (SULE) and Tree AZ methodologies (Barrell. 1996, 2000). The aim of these two systems is to convert what amounts to a relatively complex Arboricultural assessment into a few broad categories that are more logically understood. An ELE rating provides an estimate of a tree's expected remaining lifespan after considering the current condition, vigour, and vitality of the subject tree(s) *in situ*. Ultimately the main aim is the establishment of a tree Retention Value. The objective of a ELE assessment is to contribute to the relative value of individual trees for the purpose of informing future management options. This calculated ELE rating will be inserted into the above-mentioned STARS Matrix (please refer to the Appendix section for further information).

Retention Value: Significance of a Tree, Assessment Rating System (STARS) provides the Retention Value of a tree and/or group of trees by balancing a combination of environmental, cultural, physical, amenity and social values. The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the Retention Value for a tree. A tree retention assessment has been undertaken in accordance with the *Institute of Australian Consulting Aboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS)*. The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the Retention Value can be determined congruent with the trees' abovementioned Estimated Life Expectancy (ELE). Further details and the assessment criteria are in the Appendix.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed per *Standards Australia AS 4970 Protection of trees on development sites*.

3.3 Root Zone Encroachment

i. Root depth and extension can be severely limited and highly irregular in urban settings. When root restrictions are minimal, root spread shows a strong relationship with trunk diameter, which is a more reliable predictor than canopy diameter ('drip-line') or tree height (Day et al., 2010). Therefore, all arboricultural recommendations and conclusions contained in this AIA with regards to tree root protection/retention were based upon and determined in accordance with the Australian Standards *AS 4970-2009 Protection of Trees on Development Sites.*

ii. A diagram indicative of a calculated TPZ and SRZ with regards to encroachment is included below to aid in the visualisation of the 'No-Dig' zones and where initial Non-Destructive Root Exploration must be carried out under the direct supervision of a Project Arborist. This diagram can be used to indicatively

portray a SRZ and TPZ of any tree within close proximity to works and thus the necessary 'stair-step' tree protection methodology can be adopted per the Construction Encroachment Descriptors & Categories Table below.

Diagram 1: Queens Wharf Reserve (Tree 41) Corymbia macculata – Diagrammatical calculated zones

Please note that whilst working within the Tree Protection Zone (TPZ) of any tree all 'Major' encroachments must be undertaken by initial Non-Destructive Root Exploration through the use of Hand-digging and/or Air -Spade under the guidance of the onsite Project Arborist.

Construction Encroachment Descriptors & Categories Table: A Stair-step Approach

LEVEL	IMPACT CATEGORY	DESCRIPTION
1	*Removal*	The design and tree encroach each other to a point that either the design must be modified, or the tree removed.
2	*Major: Non- Viable*	The construction proposal design has an encroachment of greater than 10% of the Tree Protection Zone and/or impacts the Structural Root Zone. The tree does require immediate removal, though under the current design proposal, the works are expected to impact the tree significantly enough that it is expected to die or fail in the future due to resultant works. In order to retain the tree, designs modifications are required to reduce construction footprint on tree to an acceptable level. Unless non-destructive root exploration can identify minimal root distribution in area.
3	*Major: Viable under design constraints*	The construction proposal designs have an encroachment of greater of 10% of Tree Protection Zone or impacts the Structural Root Zone. These trees can remain viable if the following is applied: • Tree sensitive construction methods are utilised. • Any works in SRZ are undertaken after non-invasive root exploration. • Exploratory root excavation findings are documented and made available to necessary parties for review. • Pre / during/ post inspections are carried out by Project Arborist, on all trees onsite and adjoining properties. • All underground services are diverted around TPZ, with the exception of underground boring.
4	*Major: Viable*	The construction proposal designs have an encroachment of greater than 10% of Tree Protection Zone and outside the Structural Root Zone. These trees can remain viable if the following applies: • Alternative tree sensitive design methods are implored. • Site conditions have limited root growth in specific area. • The species is tolerant to development impacts. • Non-destructive root exploration is undertaken and demonstrates minimal root area in TPZ. The tree requires a TPZ erected prior to construction or demolition phase of works. Compensation for lost TPZ area should be added.
5	*Minor*	The construction proposal designs have an encroachment of less than 10% of Tree Protection Zone. The tree is expected to remain viable. A TPZ is be erected prior to construction or demolition phase.

4 Visual Tree Assessment Data

i. Initial Non-Destructive Root Exploration (NDRE) is the most reliable way to locate tree roots post development (Matheny and Clark, 1998). To err on the side of caution, all excavations that are calculated as a *'Major'* Encroachment within the TPZ must initially be undertaken by Hand-digging, Hydro-Vac, and/or Air -Spade under the guidance of the Project Arborist.

ii. However, at the discretion of the appointed Project Arborist in specific circumstances initial NDRE will be permitted to be carried out by pre-approved machinery. This specified machinery and its operation is only to be used within the TPZ whilst under the direct supervision of the Project Arborist concurrent with strict adherence to the site-specific Tree Protection Plan. Further machine excavations will only be permitted within the TPZ if and when the Project Arborist is satisfied that the excavation envelope is free of any significant root biomass.

Table 1: Visual Tree Assessment Data (28/03/2022). Full details of the abovementioned descriptors and arboricultural methodologies used can be found in the Appendix section of this document.

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
1	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:8 NS:7	0.63	0.79	7.56	3.00	Fair	Poor	Long	High	No	No	0%	N/A
2	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:7 NS:7	0.56	0.58	6.72	2.63	Fair	Fair	Long	High	Yes	Yes	12%	MAJOR + SRZ
3	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:6 NS:7	0.59	0.66	7.08	2.78	Fair	Fair	Long	High	Yes	Yes	41%	MAJOR + SRZ
4	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:9 NS:7	0.55	0.71	6.60	2.87	Fair	Fair	Long	High	Yes	Yes	27%	MAJOR + SRZ
5	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:7 NS:7	0.56	0.73	6.72	2.90	Fair	Fair	Long	High	Yes	Yes	23%	MAJOR + SRZ
6	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:9 NS:10	0.67	0.98	8.04	3.28	Fair	Fair	Long	High	No	Yes	18%	MAJOR
7	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:9 NS:8	0.69	0.95	8.28	3.24	Fair	Fair	Long	High	Yes	Yes	38%	MAJOR + SRZ

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
8	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:11 NS:7	0.79	0.93	9.48	3.21	Fair	Fair	Long	High	Yes	Yes	33%	MAJOR + SRZ
9	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:10 NS:8	0.79	0.81	9.48	3.03	Fair	Fair	Long	High	Yes	Yes	19%	MAJOR + SRZ
10	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:9 NS:8	0.56	0.77	6.72	2.97	Fair	Fair	Long	High	Yes	Yes	24%	MAJOR + SRZ
11	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:7 NS:8	0.40	0.56	4.80	2.59	Fair	Fair	Long	High	Yes	Yes	27%	MAJOR + SRZ
12	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:9 NS:8	0.65	0.70	7.80	2.85	Fair	Fair	Long	High	Yes	Yes	24%	MAJOR + SRZ
13	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:6 NS:7	0.45	0.59	5.40	2.65	Fair	Fair	Long	High	Yes	Yes	46%	Remove (Non-Viable)
14	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:7 NS:7	0.56	0.71	6.72	2.87	Fair	Good	Long	High	Yes	Yes	52%	MAJOR + SRZ
15	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	6	EW:6 NS:6	0.21	0.34	2.52	2.10	Fair	Poor	Medium	Medium	Yes	Yes	71%	Remove (Non-Viable)
16	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:10 NS:11	0.82	0.91	9.84	3.18	Fair	Good	Long	High	No	Yes	11%	MAJOR
17	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:11 NS:12	0.64	0.82	7.68	3.04	Fair	Fair	Long	High	No	Yes	2%	MINOR
18	*Eucalyptus robusta* Swamp Mahogany	Mature	12	EW:10 NS:16	0.74	0.94	8.88	3.22	Poor	Fair	Medium	Medium	No	Yes	11%	MAJOR
19	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:6 NS:8	0.38	0.40	4.56	2.25	Fair	Fair	Medium	Medium	No	Yes	18%	MAJOR
20	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	1	EW:1 NS:1	0.98	1.05	0.00	0.00	Poor	Dead	Dead	Remove	No	No	N/A	Stump - Remove & Grind

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
21	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	8	EW:10 NS:9	0.54	0.63	6.48	2.73	Fair	Fair	Long	High	No	Yes	10%	MAJOR
22	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	14	EW:9 NS:9	0.84	1.07	10.08	3.40	Fair	Good	Long	High	No	Yes	32%	MAJOR
23	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	12	EW:13 NS:10	0.82	1.12	9.84	3.47	Fair	Fair	Long	High	No	Yes	24%	MAJOR
24	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	14	EW:9 NS:9	1.06	1.52	12.72	3.95	Fair	Good	Long	High	No	Yes	21%	MAJOR
25	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	12	EW:8 NS:8	0.67	0.70	8.04	2.85	Fair	Fair	Medium	High	No	Yes	5%	MINOR
26	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:9 NS:9	0.58	0.67	6.96	2.80	Fair	Good	Long	High	No	Yes	8%	MINOR
27	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	12	EW:13 NS:10	0.97	1.17	11.64	3.53	Fair	Fair	Long	High	Yes	Yes	15%	MAJOR + SRZ
28	*Corymbia maculata* Spotted Gum	Mature	17	EW:6 NS:6	0.28	0.37	3.36	2.18	Good	Good	Long	High	No	No	0%	N/A
29	*Melaleuca quinquenervia* Broad-leaved Paperbark	Semi Mature	7	EW:2 NS:2	0.15	0.26	2.00	1.88	Poor	Poor	Short	Low	No	No	0%	N/A
30	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	12	EW:8 NS:7	0.57	0.73	6.84	2.90	Fair	Poor	Medium	High	No	No	0%	N/A
31	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	14	EW:10 NS:10	1.11	1.45	13.32	3.87	Fair	Good	Long	High	No	Yes	20%	MAJOR
32	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	14	EW:8 NS:8	0.74	1.17	8.88	3.53	Fair	Fair	Long	High	No	Yes	10%	MAJOR
33	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:6 NS:6	0.43	0.45	5.16	2.37	Fair	Fair	Long	High	No	No	0%	N/A

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
34	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:5 NS:5	0.27	0.36	3.24	2.15	Fair	Fair	Long	High	No	No	0%	N/A
35	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	11	EW:8 NS:9	0.48	0.74	5.76	2.92	Good	Fair	Long	High	No	Yes	7%	MINOR
36	*Eucalyptus moluccana* Grey Box	Mature	18	EW:9 NS:9	0.47	0.64	5.64	2.74	Good	Good	Long	High	Yes	Yes	29%	MAJOR + SRZ
37	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:10 NS:9	0.53	0.62	6.36	2.71	Fair	Good	Long	High	Yes	Yes	23%	MAJOR + SRZ
38	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:12 NS:10	0.69	0.89	8.28	3.15	Fair	Good	Long	High	No	Yes	15%	MAJOR
39	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	11	EW:9 NS:9	0.97	1.16	11.64	3.52	Fair	Good	Long	High	No	Yes	7%	MINOR
40	*Eucalyptus tereticornis* Forest Red Gum	Mature	9	EW:7 NS:5	0.26	0.37	3.12	2.18	Fair	Very Poor	Short	Low	Yes	Yes	13%	MAJOR + SRZ
41	*Corymbia maculata* Spotted Gum	Mature	12	EW:8 NS:7	0.31	0.43	3.72	2.32	Fair	Good	Long	Medium	No	Yes	11%	MAJOR
42	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:9 NS:10	0.56	0.61	6.72	2.69	Fair	Fair	Long	High	Yes	Yes	26%	MAJOR + SRZ
43	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	13	EW:10 NS:10	0.74	0.92	8.88	3.20	Fair	Good	Long	High	No	Yes	15%	MAJOR
44	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:7 NS:7	0.59	0.75	7.08	2.93	Fair	Fair	Long	High	No	Yes	8%	MINOR
45	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:9 NS:9	0.50	0.79	6.00	3.00	Fair	Good	Long	High	No	Yes	17%	MAJOR
46	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:7 NS:9	0.44	0.52	5.28	2.51	Fair	Fair	Long	High	Yes	Yes	34%	MAJOR + SRZ

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
47	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:8 NS:8	0.50	0.77	6.00	2.97	Fair	Good	Long	High	Yes	Yes	50%	MAJOR + SRZ
48	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	7	EW:8 NS:9	0.49	0.70	5.88	2.85	Fair	Fair	Long	High	No	No	0%	N/A
49	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:8 NS:10	0.82	1.01	9.84	3.32	Fair	Good	Long	High	No	Yes	5%	MINOR
50	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	14	EW:11 NS:12	0.97	1.26	11.64	3.65	Fair	Good	Long	High	No	Yes	4%	MINOR
51	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:8 NS:8	0.80	0.85	9.60	3.09	Fair	Fair	Long	High	No	No	0%	N/A
52	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	10	EW:9 NS:9	0.82	0.92	9.84	3.20	Fair	Good	Long	High	No	Yes	18%	MAJOR
53	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:9 NS:10	0.82	1.19	9.84	3.56	Fair	Good	Long	High	Yes	Yes	19%	MAJOR + SRZ
54	*Melaleuca quinquenervia* Broad-leaved Paperbark	Mature	9	EW:7 NS:8	0.72	1.10	8.64	3.44	Fair	Good	Long	High	No	No	0%	N/A
55	*Lophostemon confertus* Queensland Box	Young	3	EW:1 NS:1	0.05	0.07	2.00	1.50	Poor	Fair	Medium	Low	Yes	Yes	100%	MAJOR + SRZ Transplant*
56	*Lophostemon confertus* Queensland Box	Young	3	EW:1 NS:1	0.05	0.07	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	100%	MAJOR + SRZ Transplant*
57	*Lophostemon confertus* Queensland Box	Young	3	EW:1 NS:1	0.05	0.06	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	100%	MAJOR + SRZ Transplant*
58	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.04	0.05	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	100%	MAJOR + SRZ Transplant*
59	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.04	0.06	2.00	1.50	Good	Good	Medium	Low	Yes	Yes	69%	MAJOR + SRZ Transplant*

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
60	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.04	0.07	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	73%	MAJOR + SRZ Transplant*
61	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.04	0.07	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	69%	MAJOR + SRZ (Transplant)
62	*Lophostemon confertus* Queensland Box	Young	3	EW:1 NS:1	0.05	0.07	2.00	1.50	Fair	Fair	Medium	Low	Yes	Yes	69%	MAJOR + SRZ Transplant*
63	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.06	0.07	2.00	1.50	Poor	Fair	Medium	Low	Yes	Yes	78%	MAJOR + SRZ Transplant*
64	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.10	0.07	2.00	1.50	Good	Fair	Medium	Low	Yes	Yes	78%	MAJOR + SRZ Transplant*
65	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.03	0.04	2.00	1.50	Good	Fair	Medium	Low	No	Yes	5%	MINOR
66	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.07	0.09	2.00	1.50	Good	Fair	Medium	Low	Yes	Yes	82%	MAJOR + SRZ Transplant*
67	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.06	0.08	2.00	1.50	Good	Fair	Medium	Low	Yes	Yes	83%	MAJOR + SRZ Transplant*
68	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.04	0.06	2.00	1.50	Fair	Fair	Medium	Low	No	Yes	3%	MINOR
69	*Lophostemon confertus* Queensland Box	Young	2	EW:1 NS:1	0.03	0.04	2.00	1.50	Poor	Fair	Medium	Low	Yes	Yes	75%	MAJOR + SRZ Transplant*
70	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.07	0.09	2.00	1.50	Good	Fair	Medium	Low	Yes	Yes	84%	MAJOR + SRZ Transplant*
71	*Lophostemon confertus* Queensland Box	Young	3	EW:2 NS:2	0.07	0.09	2.00	1.50	Good	Fair	Medium	Low	Yes	Yes	78%	MAJOR + SRZ Transplant*
72	*Callistemon viminalis* Weeping Bottlebrush	Mature	5	EW:4 NS:5	0.29	0.33	3.48	2.08	Fair	Fair	Medium	Medium	Yes	Yes	69%	MAJOR + SRZ

Tree No.	Botanical & Common Name	Age Class	Height (m)	Canopy Spread (m)	DBH (m)	DRC (m)	TPZ (m)	SRZ (m)	Structure	Vitality	ELE	Retention Value	SRZ Enc	TPZ Enc	Enc%	Encroachment
73	*Callistemon viminalis* Weeping Bottlebrush	Mature	5	EW:4 NS:5	0.29	0.33	3.48	2.08	Fair	Fair	Medium	Medium	Yes	Yes	70%	MAJOR + SRZ
74	*Prunus avium* Wild Cherry	Mature	4	EW:5 NS:4	0.22	0.46	2.64	2.39	Poor	Fair	Medium	Medium	Yes	Yes	92%	Remove (Non-Viable)

KEY

- **DBH (Diameter at Breast Height) & DRC (Diameter above Root Collar), TPZ, SRZ & Encroachment %** calculated per *Qld Arboricultural Association & ProofSafe Calculators.*
- **Structure & Vitality** per *International Society of Arboriculture (ISA)Tree Condition Rating System (2015) descriptors & (Coder, 2021)*
- ***Transplant:** Young trees that are suitable for relocation.
- **Canopy Spread**: estimation of canopy spread to the four (4) cardinal points. (North-South) & (East-West).
- **Estimated Life Expectancy (ELE):** adapted per *(Barrell, 1996) & (Barrell, 2000).*
- **Retention Value:** *Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia (2010).*
  - **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
  - **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
  - **High:** These trees are considered important for retention and should be retained and protected. Initial Non-Destructive Root Exploration (Root Mapping) should be implemented. Tree Sensitive Design modification and/or re-location of building/s should be considered to accommodate the setbacks as prescribed per *Standards Australia AS 4970 Protection of trees on development sites*.

5 Arboricultural Summary

5.1 Arboricultural Impact

i. With regards to the calculated arboricultural impact, it was calculated that:

- Ten (10) trees have encroachments less than 10% *(Minor)* – On ther balance of probabilities these trees will remain viable. Therefore, they are to be retained and afforded protection per the Tree Protection Plan.
- Trees 13, 15 & 74 will not remain viable under the current design due to significant encroachment. Therefore, these trees will need to be removed and Compensatory Replanting adopted.
- Fifty-one (51) trees have encroachments greater than 10% *(Major).* These trees do not require immediate removal. However, as per *AS 4970-2009 Major encroachments – 'it must be demonstrated that the trees will remain viable'*. Therefore, initial Non-Destructive Root Exploration[5] (hand-digging and/or Air-Vac) will need to be carried out under the supervision of an appointed Project Arborist and/or tree design design modifications incorporated into the current design with regards to determining tree viability and subsequent retention. Of note being, at the discretion of the Tree Manager/Owner, fifteen (15) of these trees may be transplanted per s5.4.

5.2 Tree Retention Value

i. A tree with a calculated *'High'* Retention Value per the above-mentioned *STARS* criteria is desirable for retention. As abovementioned, additional Landscape Significance considerations were also factored into the adjudged Retention Value. These considerations included the combination of discernible Social, Amenity, Environmental and Heritage elements. (These categories and the indicia are listed in the Appendix).

ii. Specific considerations given to these subject trees was their location which is of *'Heritage Significance'*, the increased *Urban Heat Island*[6] footprint associated with this Project and the mature age class of the majority of the subject trees – i.e., the benefit of tree increases exponentially with size and the increase in leaf area (McPherson et.al, 2006).

[5] Initial Non-Destructive Root Exploration (NDRE) is the most reliable way to locate tree roots post development (Matheny and Clark, 1998). To err on the side of caution, all excavations that are calculated as a 'Major' Encroachment within the TPZ must initially be undertaken by Hand-digging, Hydro-Vac, and/or Air -Spade under the guidance of the Project Arborist concurrent with strict adherence to a site-specific Tree Protection Plan. Further machine excavations should only be permitted within the TPZ if and when the Project Arborist is satisfied that the excavation envelope is free of any significant root biomass.

[6] Urban Heat islands are urbanized areas that experience higher temperatures than outlying areas. As opposed to natural landscapes such as forests and water bodies, hard surfaces in the urban environment such as concrete, brick, glass, asphalt and roofing, have a high thermal mass, collecting the sun's heat during the day and re-radiating it slowly back into the atmosphere. This contributes to a rise in ambient temperature in cities, creating large, stable masses of hot air (urban heat islands), especially during periods of calm, still weather. This increase in heat particularly if combined with low soil moisture contributes to the decline of certain tree species and trees already 'stressed' (McPherson et. al. 2006).

5.3 Non-Destructive Root Exploration (Root Mapping)

i. As aforementioned initial Non-Destructive Root Exploration (Root Mapping) is the most reliable way to locate tree roots pre-development and therefore should be implemented where a tree is to be retained. Therefore, all excavations that are calculated as a *'Major'* Encroachment within the TPZ of a *High Retention* tree should initially be undertaken by Non-Destructive Root Exploration through the use of Hand-digging and/or Air -Spade under the guidance of the Project Arborist. Whereby, Root Mappings will provide an accurate root location and cogent morphological data, which in turn will provide the opportunity to explore and/or implement tree sensitive modifications with regards to Plant Health Care (PHC), tree viability and pragmatic tree retention.

ii. Please note that the abovementioned Root Mapping findings will ultimately determine foreseeable tree viability and whether tree sensitive design modifications and/or tree removal will need to be undertaken on this Project. All findings will be documented by the appointed Project Arborist and made available to all parties with *locus standii* upon request.

5.4 Transplanting

i. A row of young *Lophostemon confertus* (QLD Brush Box) are growing along George Street. Whereby:

- Trees 55-58 retain *in situ* and afford protection per the Tree Protection Plan.
- Trees 59 -64, 66, 67, 69 -71: To mitigate arboricultural impact and offset canopy loss it is recommended that these trees are considered for transplanting. This tree species has shown to transplant relatively well with good results recorded. However, tree transplanting can be relatively costly, and success (tree viability and longevity) is never guaranteed. Therefore, the option of transplanting these trees should discussed candidly on a case by case basis with a suitably qualified horticulturist/arborist, with the final decision made objectively at the discretion of the Tree Manager/Tree Owner.

Trees 55-71 Lophostemon confertus along George Street. Possible transplanting opportunities at the the discretion of the Tree Manager

5.5 Tree Sensitive Design Options

i. With regards to the location, widening and construction of the Shared Footpath a commonsensical tree sensitive design methodology is recommended. Firstly, the path location is amended where pragmatically possible to reduce TPZ impact and/or the required footpath excavations are limited to a maximum depth of 200mm in an endeavour to minimise root impact. However, if the mandated initial Non-Destructive Root Exploration (Root Mapping) unearths a 'significant root' (>50mm in diameter), the level of the Path can be pragmatically raised. This reducing the required depth of the excavations and thus the necessitation of root severance. (A *'build-over'* methodology can be adopted). With regards to utilities and infrastructure, other Tree Sensitive Design options can be considered. These alternatives include Directional Drilling/Boring, Screw Piling, Cantilevers, Structural Confinement Cells, raised paths and Porous Paving may be incorporated with regards to reducing arboricultural impact.

5.6 Future Development

i. Trees grow in a delicate balance with their environment and any changes to that balance must be minimized if the tree is to remain healthy and fulfil its potential. It is rarely possible to repair stressed and injured trees, so damage needs to be avoided during all stages of development and construction. However, recent research both clinical and empirical has shown that healthy trees such as these usually remain in good health when best management practice guidelines and arboricultural standards are adhered to on development sites per *AS4970-2009 Protection of trees on development sites* whilst under the guidance of a suitably qualified arborist. Thus, for trees to be retained and their requirements met, procedures must be in place to protect trees at every stage of the development process.

ii. Therefore, it is recommended that the following Tree Protection Plan which is pursuant to *AS4970-2009 Protection of trees on development sites* is adopted pre-development for this Project moving forward.

Harris Park Heritage Walk - Queens Wharf Reserve, Parramatta

6 Tree Protection Management Plan

6.1 Disclaimer

i. The following site-specific Tree Protection Management Plan (TPMP) is to be used throughout the duration of the abovementioned Project. Although the framework includes monitoring controls operated by the appointed Project Arborist, compliance to the TPMP is the responsibility of the 'Client,' and as such AGS cannot accept liability for any adverse effects arising from 'non-compliance' to documented controls and/or any subsequent changes to the scope or methods documented in the TPMP provided to the 'Client.'

6.2 Overview

i. Trees are dynamic living organisms and therefore are susceptible to development impact either direct and/or indirect, biotic and/or abiotic. Arboricultural impact due to development encroachment, especially within the calculated Tree Protection Zone (TPZ), causes 'dendrological stress' in varying degrees. This stress has the potential to heavily impact upon tree vitality and thus tree longevity (Boddy. 1983). Therefore, the Australian Standard *AS4970-2009 Protection of trees on development sites* must always be adhered to. The objective of this Standard is to provide guidance through the use of a science-based methodology to arborists and others concerned with the care and protection of trees; and all others interested in the integration between trees and construction. Hence safeguarding community tree assets.

ii. This Tree Protection Management Plan (TPMP) includes both activity specific controls as well as a range of generic tree protection controls. The control framework pre-dominantly focuses on identifying and mitigating aspects of the design and construction process that can adversely affect tree vitality, stability and/or useful life expectancy. In addition, it includes preventative controls (designed to prevent adverse outcomes), directive controls (designed to promote desired outcomes) and detective controls (designed to monitor compliance with any statutory requirements and the agreed control framework). The engagement of a Project Arborist is a key element of the control framework and is a multi-faceted control, in terms of preventing damage, providing direction, and detecting areas of non-compliance/improvement.

6.3 Project Arborist Site Inspection Schedule

i. In accordance with the Australian Standard *AS4970-2009 Protection of Trees on Development Sites,* inspections must be conducted by the appointed Project Arborist at the following key project stages:

- Prior to any work commencing on-site (including demolition, earthworks, or site clearing) and following the installation of tree protection.
- During any excavations, building works, and any other activities carried out within the Tree Protection Zone (TPZ) of any tree to be retained and protected.

- A minimum of once per month during the construction phase.
- After all major construction has ceased, following the Remove of tree protection. It shall be the responsibility of the project manager to notify the project arborist prior to any works within the TPZ of any protected tree at a minimum of forty-eight (48) hours' notice. To ensure the tree protection plan is implemented, hold points have been specified in the following table.

Development Stage	Hold Point	Description
Pre-Construction	1	• Appoint a Project Arborist (minimum AQF Level 5) • Prior to any development works, any tree for Remove is to be marked clearly (tape, paint, tag etc.) by the Project Arborist
	2	• Scheduled *'Pre-Start'* meeting. • Tree Protection for any retained tree(s) will be installed prior to demolition and/or site establishment. The appointed arborist will inspect and certify the tree protection per the Tree Protection Management Plan. A Tree Protection Compliance Memorandum issued.
During Construction	3	• Monthly scheduled site inspections of the retained tree population will be conducted (if works are outside the TPZ) and memorandum provided.
	4	• The appointed Project Arborist will oversee, and document all works carried out within the TPZ of any retained tree. A weekly Works Memorandum to be provided.
	5	• Visual tree inspection by the appointed arborist of the retained tree population once the major works have been completed and the tree protection has been removed.
Post Construction	6	• Final Visual Tree Inspection of the retained tree population and a Completion of Arboricultural Works Memorandum provided. • Ongoing Monthly Inspections & Memorandums issued at the discretion of the Project Arborist.
Plant Health Care (PHC) *(Recommended s.9)*	7	• Top dressing of Organic Mulch – where applicable. • Liquid solution of Organic nutrients (Botanicals). • PHC Memorandum provided.

6.4 Summary

i. A Pre-commencement of Work ('Pre-Start') onsite meeting must be held with the appointed Project Arborist and all other parties deemed to have *locus standii.*

ii. Proactive canopy modifications (pruning) options with regards to the facilitation of machinery and/or pedestrian access should be considered, discussed and if deemed necessary scheduled prior to the commencement of the main development works.

iii. Tree Protection Fencing is to be erected around any tree within five (5) metres of the development works; and temporary hard surfaces are to be made readily available and on site whilst working within close proximity of any trees calculated Tree Protection Zone (i.e., rumble boards & track-mats).

iv. The appointed onsite Project Arborist is to guide/supervise any works within close proximity of the tree(s) Tree Protection Zone. Whilst working within the Tree Protection Zone (TPZ) of any tree, the excavations must be undertaken by initial Non-Destructive Root Exploration through the use of Hand-digging, Air - Spade, Air- Vac or a combination thereof under the direct supervision/guidance of the appointed onsite Project Arborist.

v. The Project Arborist is to author and issue a Completion of Arboricultural Works Memorandum at the end of the works/project.

vi. A Plant Health Care regimen is to be undertaken post-development and a memorandum issued.

vii. The caveat for the abovementioned project proceeding and its continuance is that the site-specific Tree Protection Management Plan provided must be strictly adhered to at all times.

6.5 General Comments

i. All construction work within the TPZ of any retained tree must be authorised & supervised by the appointed Project Arborist and/or the Tree Manager/Owner.

ii. The use of 'strip-style' excavation adjacent to and/or within the TPZ of any retained tree is strictly prohibited.

iii. When removing an existing surface (concrete or similar hardscape), excavation must occur from above the existing surface; the Remove work is to be carried out with a straight batter bucket; a 'lifting motion' is to be adopted; and the machinery is to move in a backward direction toward the extremity of the trees TPZ. In addition, all due care must be taken to ensure that the TPZ of any adjacent tree(s) are isolated and protected from vehicular entry (both above and below ground); and soil compaction is minimised within the TPZ by utilising ground protection as outlined in the Tree Protection Installation protocols.

iv. On completion of the hardscape Remove, the onsite Project Arborist is to document any significant root observations; and where applicable carry out NDRE (root mapping) with regards to future construction, arboricultural impact. TSUD options and alternatives are also to be provided where applicable.

v. With regards to the reinstatement of ground, the addition and application of any new soil (or replanting mediums) must be carried out with all due care (e.g., root collar, topography and hydrology considerations), and with prior express consent from the Project Arborist. All new mediums are to comply with *AS4454-2003 Composts, soil conditioners and mulches*.

vi. Where fencing is to be replaced, it is preferable to use existing post holes when they located within TPZs. New pier holes are to be hand dug or by air-vac excavation under the supervision/guidance of the Project Arborist.

vii. It is imperative that TPZ fencing, or main stem, branch and ground protection measures are installed for the protection of all retained trees prior to the commencement of the future Construction Phase, and that it remains *in situ* for the duration and until completion of proposed construction works.

viii. TPZ fencing and other measures must be fixed so that they cannot be moved either by accidental physical impact or other inadvertent means. There shall be no entry within any TPZ by any construction crew or other persons during the construction phase without authorisation and/or attendance of the Project Arborist. That includes, no storage of builders' materials, machinery, pedestrian traffic, disposal of waste paints, fuels etc as listed below.

6.6 Restricted activities within the Tree Protection Zone

i. As per *AS4970-2009 Protection of trees on development sites* - Activities generally excluded from the TPZ include but are not limited to are as follows:

a) Machine excavation including trenching.
b) Cultivation.
c) Storage.
d) Preparation of chemicals, including preparation of cement products.
e) Parking of vehicles and plant.
f) Refuelling.
g) Dumping of waste.
h) Wash down and cleaning of equipment.
i) Placement of fill.
j) Soil level changes.
k) Temporary or permanent installation of utilities and signs, and
l) Physical damage to the tree.

7 Tree Protection Control Framework

7.1 Compliance and Reporting

i. The generic tree protection controls in this section are designed to be used in conjunction with the recommendations of this site-specific Arboricultural Report.

ii. All relevant standards, specifications, policies, and resource conditions of consent are incorporated into the TPMP.

iii. The Project Arborist will undertake scheduled and unscheduled site visits to monitor compliance with all aspects of the TPMP.

iv. Any deviations from the TPMP must be approved by the Council Arborist. Non-compliance issues must be reported to the Project Management immediately.

v. An Arboricultural Completion Memorandum must be prepared by the Project Arborist including but not limited to comments and observations about any root pruning/root retention and compliance to the TPMP.

vi. The TPMP must always be available on site and be included in site inductions and 'toolbox' sessions.

vii. Any damage to tree protection fencing or trees must be reported to the Project Arborist immediately (including damage not caused by activities associated with the project).

viii. Non-compliance issues must be documented and addressed at daily pre-start meetings/toolbox sessions.

7.2 Root Protection

i. Root pruning should be kept to the absolute minimum and should only be completed by the Project Arborist. All root pruning assessments should be made initially by the Project Arborist, and the Council Arborist contacted where approval is required. All roots larger than 25mm in diameter are to be retained in an undamaged state and protected, unless the Council Arborist gives permission for them to be pruned. Irrespective of size, any roots which have a significant effect on the health and stability of a tree shall not be removed without the prior approval of the Council's Arborist, and this may include tree roots that are less than 25mm in diameter.

ii. Roots must be severed using a sharp pruning saw/tool to create a clean cut that is flush with the face of the completed excavations.

iii. Retained roots and cut surfaces should be protected from desiccation and physical/frost damage. The method will depend on the seasonal weather conditions and length of time expected between completing the excavations and reinstatement works and should be determined by the Project Arborist. Typically, retained roots must be wrapped in a suitable wool much or hessian product that is secured in place using bio-degradable string and kept moist, however supplementary watering may be required depending on the weather conditions based on the Project Arborist's discretion.

7.3 Soil Protection

i. All machines shall only operate from either formed surfaces, surfaces that will be excavated or from an appropriate load bearing protective matting. The area covered by the protective matting shall be sufficient to allow ground protection for all vehicle movements, including the turning of any vehicles. (Please refer to Branch, Trunk & Ground Protection in the Appendix).

ii. No chemicals, re-fueling operations, spoil, fill, soil, materials of any kind, or equipment will be stored,

emptied, disposed of, or temporarily placed in areas that the tree's root system could be utilizing unless approved by the Project Arborist and this is on an existing hard impermeable surface.

iii. Water used for washing down machinery must not be allowed to runoff and contaminate soil volumes/water sources that are either currently or are likely to be utilised by the tree.

iv. The risk of soil borne infections being introduced to the site from equipment, tools and footwear must be assessed by the Project Arborist and mitigated as necessary (mitigation will typically involve cleaning the equipment before it is used on the site with a sterilizing agent, such as Trigene or Sterigene).

7.4 Canopy Modifications

i. Trees are complex living organisms and the intervention in the natural growth of a tree should only occur where the biology and the physiology of the organism are understood to such a level that intervention will have clear and predictably beneficial outcomes.

ii. However, pruning may be required to accommodate construction, plant & equipment and/or vehicles. Thus, any pruning assessments pertaining to the development must be visually made by an AQF Level 5 arborist; and if pruning is deemed necessary a Pruning Specifications Report is to be authored *per AS4373-2007 Pruning of amenity trees* by an AQF Level 5 arborist and provided to the relevant Tree Manager/Owner and Council representative.

iii. Once the Pruning Specifications Report is formerly approved by the appropriate authority the requested the pruning can be carried out by a minimum AQF Level 3 arborist pursuant to *AS4373-2007 Pruning of amenity trees.*

iv. In addition, the risk of damaging agents being introduced from pruning saws/tools must be assessed by the Project Arborist and mitigated as necessary (mitigation will typically involve cleaning the equipment before it is used on the site with a sterilizing agent, such as Trigene or Sterigene). It may be necessary to clean pruning tools during work on the site if there is the potential of transmitting a damaging biotic agent between trees on the same site.

7.5 Tree Protection Zones

i. Tree Protection Zones are also Exclusion Zones and must be created using tree protection fencing that is consistent with the requirements of *AS4970-2009 Protection of trees on development sites.* The position of the fencing will be determined by the Project Arborist and once positioned shall not be altered without the prior consent from the Project Arborist.

ii. If it is not pragmatic to use the abovementioned tree protection fencing then individual trunk, branch and ground protection must be installed to any retained tree located within five (5) metres of any proposed work zone. (Please refer to the diagram in the appendix).

iii. Tree protection zones must be clearly labelled displaying the words 'Tree Protection Zone'. Signs will be placed on fencing of individual trees or every 10 linear metres on groups of trees.

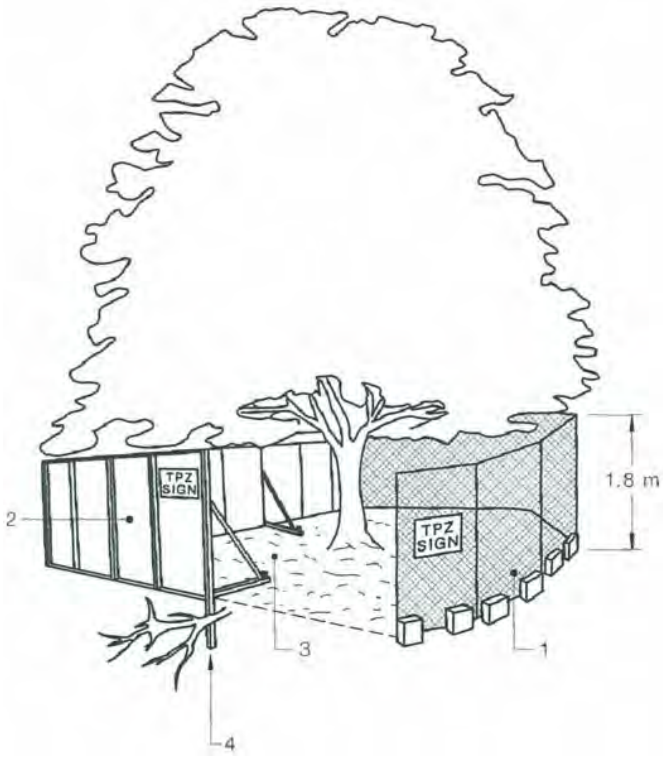
iv. Where the work site is only on one side of the tree, the barrier may be erected along the face of the tree adjacent to the work site.

v. Tree Protection Barriers must be erected before any site works commence and shall not be removed or moved closer to the trunk of the tree, until after site works are complete. No person, vehicle or machinery may enter the Tree Protection Zone unless otherwise authorised to do so by the Project Arborist.

vi. Operating plant must be positioned to avoid the expellant of exhaust fumes and radiant operating heat damaging the physiological functions of the tree.

7.6 Tree Protection Installations

i. Tree Protection is to be erected around any tree within five (5) metres of development per *AS4970-2009 Protection of trees on development sites.*



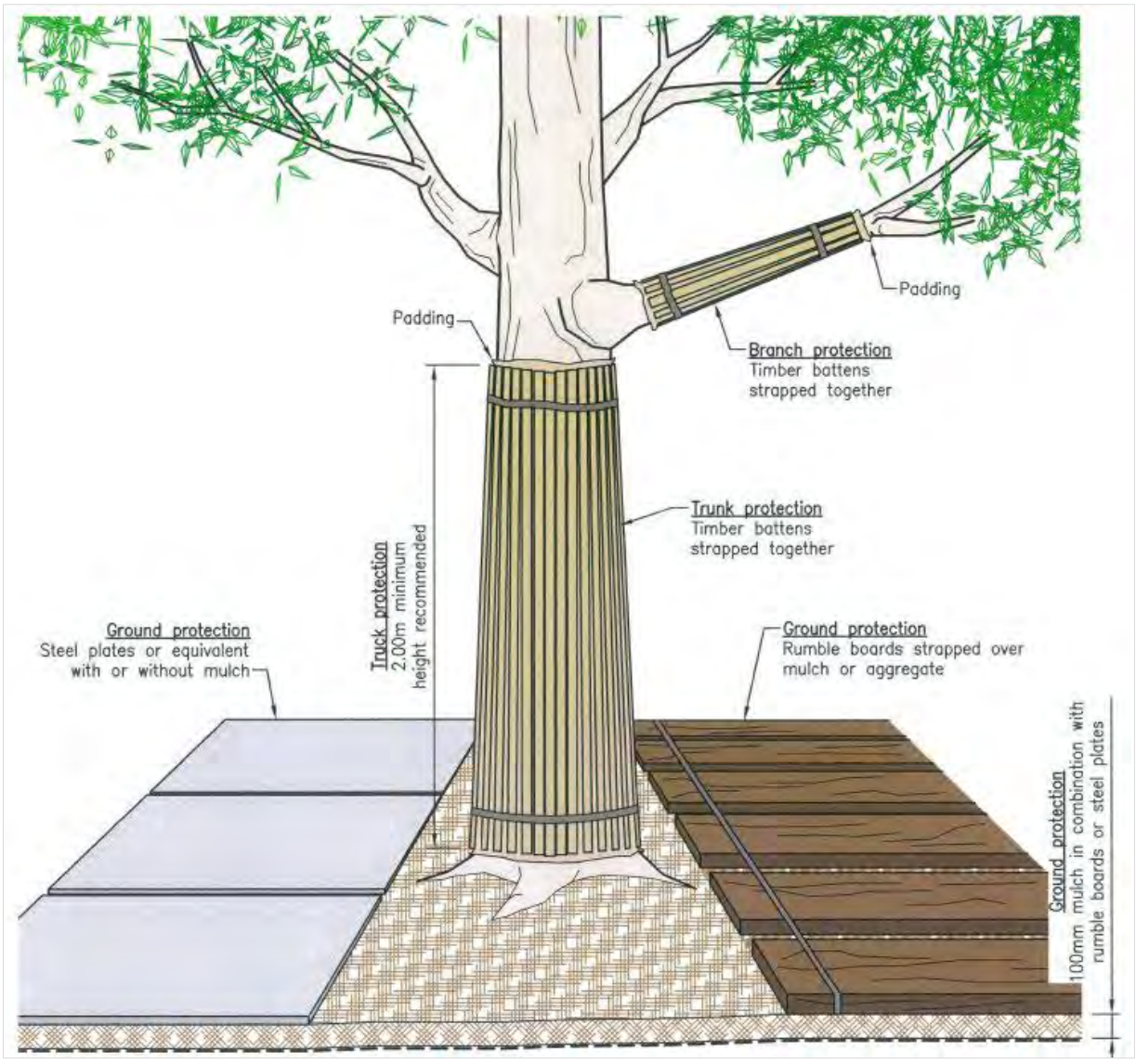
LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Alternative Trunk, Branch & Ground Protection

i. When tree protection fencing cannot be installed or requires temporary Remove, other tree protection measures should be used. Where necessary, install protection to the trunk and branches of trees as pictured below.

ii. The materials and positioning of protection are to be specified by the Project Arborist and are to include:

- For the trunk and branch protection use boards and padding that will prevent damage to the bark. For the trunk boards a minimum height of two (2) metres is recommended. Boards are to be strapped to trees, not nailed or screwed. Do not attach temporary powerlines, stays or guys to the tree.
- If temporary access for machinery is required within the Tree Protection Zone (TPZ) such as site access, ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards. (These measures may be applied to root zones beyond the TPZ).
- Rumble boards should be of a suitable thickness to prevent soil compaction and root damage and a top dressing of Organic Mulch (60mm-70mm deep) is to be applied where pragmatically possible.



8 Plant Health Care

8.1 Overview

i. It is well documented that even minor encroachments due to urban development and construction pressures can 'stress' a tree, which in turn can result in a reduced useful life expectancy (Watson, 2014). Therefore, it is strongly recommended that a proactive species-specific Plant Health Care Plan is formulated and implemented with regards to any development and tree vitality. Plant Health Care (PHC) is a holistic approach to best management practice with regards to urban tree care and the understanding of the various interactions within the environment in which they grow. The core objectives being the management and enhancement of the tree(s) biological, physiological, and aesthetic traits whilst maintaining and/or improving the surrounding landscape's appearance. As PHC is science-based it involves routine arboricultural monitoring, proactive soil, and plant treatments, along with the identification and mitigation of foreseeable arboricultural risks to person, property and/or the environment.

8.2 Post Development Plant Health Care Recommendations

i. With an educated understanding of the functions of tree roots and the potentially negative effects of development impact it is strongly recommended that a post-development Plant Health Care regimen is formulated by the Project Arborist and enacted. This should include:

a) *An application of Organic Botanicals:* Organic materials are essential components which stimulate vitality leading to root development and thus development of new tissue. This whilst enacting a tree's defence system improving resistance to disease and increasing defence responses and capabilities.

b) *Top-dressing of Organic Mulch:* It is strongly recommended that a top-dressing of organic composted mulch or woodchips is applied to the TPZ of all retained trees post-development. This layer should be added to a depth of 60-70mm (Urban. 2008). A composted mulch application will:

- Prevent soil compaction and minimise future root damage.
- Amend soil structure to improve the water-holding capacity and fertility by affecting both texture, porosity and structure.
- Reduces soil moisture loss through lower temperatures & supress undesirable plant species.
- Promote root generation & increase soil organic matter and avail nutrients to the tree.
- Stimulate soil microflora and micro fauna activity and assist in the survival of affected tree(s) maintaining and ensuring optimum vitality and structural stability so as to maximize its ability to resist pest and diseases (Watson et. al. 2014).

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10 Glossary

The following definitions are stated in the Glossary of Arboricultural Terms, International Society of Arboriculture 2011, unless otherwise stated.

Abiotic: plant ailment caused by non-living, environmental, or man-made agents

Adaptive Growth: or Response Growth is new wood produced in response to damage or loads, which compensates for higher strain (deformation) in marginal fibres; it includes reaction wood (compression & tension) and wound wood.

Age class: Described as Young, Semi-Mature, Mature, Over Mature or Veteran. All these dimensions should be determined by species and site factors.

Barrier Zone: chemically defended tissue formed by the still living cambium, after a tree is wounded or invaded by pathogens to inhibit the spread of decay into new annual growth rings. Wall 4 in CODIT model. Contrast with reaction zone

Bifurcation: Natural division of a branch or stem into two or more stems or parts

Biotic: pertaining to non-human living organism/ biotic agent: a living organism capable of causing disease/ biotic disorder: disorder caused by a living organism.

Bracket: British English term for fruiting body of a decay fungus. See *Conk*.

Codominant Structure: Stems or trunks of about the same size originating from the same position from the main stem52. When the stem bark ridge turns upward the union is strong; when the ridge turns inward the union is weak, a likely point of failure in storm or windy weather conditions or where increasing weight causes undue stress on the defective union.

CODIT: acronym for Compartmentalisation of Decay/Disease In Trees (refer Compartmentalisation).

Compartmentalisation: Dynamic tree defence process involving protection features that resist the spread of pathogens and decay causing organisms. Natural defence process in trees by which chemical and physical boundaries are created that act to limit the spread of disease and decay organisms.

Compaction: Results from loads or stress forces applied to the soil as well as shear forces. Both foot traffic and vehicle traffic exert both forces on soils. Vehicle traffic may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). The degree of compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling, and transporting also tend to lead to the breakdown of soil structure and thus to compaction. Vibration as a result of frequent traffic or adjacent construction activities will also compact soils.

Compression wood: (1) in mechanics, the action of forces to squeeze, crush or push together any material (s) or substance(s): contrast with tension. (2) the ability of an internal combustion engine to contain or pressurized a combustible fuel - air mixture.

Conk: Fruiting body or non-fruiting body (sterile conk) of a fungus. Often associated with decay.

Crown: Portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Crown/Canopy: The main foliage bearing section of the tree, these terms are interchangeable.

Crown damage: The canopy of trees can be directly or indirectly damaged. Incorrect techniques of pruning such as lopping or flush cutting may produce wounds that are susceptible to infection by wood decay organisms. Similarly, mechanical damage to branches by machinery, etc. will also create wounds. Trees automatically respond to wounding and in doing so use stored sugars. Any wound places an additional load on trees that will inevitably be stressed during construction.

Damping: Damping occurs where energy is dissipated. In trees, damping occurs naturally in three main ways with aerodynamic damping of the leaves, internal damping in the wood and root zones, and with mass damping of the branches.

Deadwood: Dead branches within the canopy of tree. Deadwood is a naturally occurring feature of most tree species and comprises dead or decaying branches within the canopy of a tree. Deadwood may have habitat value and require removal only according to the considered risk of its location, i.e. high use pedestrian area or damage to adjacent infrastructure.

Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard. Consideration of the need for deadwood removal should take into account the occupancy of the target zone, i.e. high use pedestrian area or presence

of infrastructure, possible damage to the tree during its removal as well as its conservation for habitat value. In some instances, retention of a reduced tree structure for habitat purposes maybe considered appropriate, especially when hollows are present.

Further reference: *Principles of Tree Hazard Assessment. Lonsdale, David. TSO, (2009).*

Dead wooding: (Crown cleaning): The removal of dead branches60. Recommendation to remove deadwood is for removal of all dead branches within tree canopy > 30mm diameter in trees which overhang pedestrian or vehicular areas and removal of all dead branches within tree canopy > 50mm diameter if trees are located in a Parkland or similar area.

Decay: The process of degradation of woody tissues by micro-organisms.

Desiccation: Severe drying out. Dehydration.

Drip Line: Is the imaginary perimeter line at soil surface level which is directly below the outermost edge of the tree's foliage or canopy.

Estimated Life Expectancy (ELE): Assessed on trees of particular species in the urban environment, including health and structural conditions which may exist.

Epicormic bud: Latent or adventitious bud located at the cambium and concealed by the bark.

Epicormic shoots: Shoots produced from epicormic buds at the cambium of trunks or branches.

Field Capacity: Maximum soil moisture content following the drainage of water due to the force of gravity.

Hollow: is a semi-enclosed cavity which has naturally formed in the trunk or branch of a tree.

Included bark: Inwardly formed bark within the junction of branches or codominant stems.

Kino: Dark red to brown resin-like substance produced by trees in the genera Eucalyptus, Pterocarpus and Butea and related genera. Kino forms in the barrier zones. Large kino veins form in some tree in response to injury and infection.

Leaves: The main function of leaves is photosynthesis, that is, the production of sugars and oxygen. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

Non-woody part of tree: 'organs that increase the surface area of vascular plants, thereby capturing more solar energy for photosynthesis'. … maybe classified as microphylls (usually spine-shaped leaves with a single vein) or megaphylls (leaves with a highly branched vascular system). Needles and leaves are major energy trapping organs of a tree. Flowers are modified leaves …. as they fit the definition of an organ (*Shigo.2003).*

Macropore: Relatively larger space between soil particles that is usually air-filled and allows for water movement and root penetration. Contrast with micropore.

Mature: Trees are close to their full height and crown size.

Micropore: Space between soil particles that is relatively small and likely to be water filled.

Mortality Spiral: Sequence of stressful events or conditions causing the decline and eventual death of a tree. Once in a mortality spiral trees are more likely to succumb to any further or additional stress factors such as drought, pest infestation or disease. (See definition Stress)

Necrosis: Localised death of tissue in a living organism.

Occlusion (See wound): Shut in or out. Occlusion is the process of trees forming callus and clear wood over wounds.

Over Mature: Associated with crown retrenchment.

Pathogen: A disease-causing organism.

Pipe: Mud filled channel extending upwards from root/ stem zone of tree.

Phototropism: Influence of light on the direction of plant growth. Tendency of plants to grow towards light.

Phloem: Plant vascular tissue that transports photosynthates and growth regulators. Situated on the inside of the bark, just outside the cambium. Is bidirectional (transports up and down). Contrast with xylem.

Photosynthesis: Process in green plants (and in algae and some bacteria) by which light energy is used to form glucose (chemical energy) from water and carbon dioxide.

Reaction wood: Wood forming in leaning or crooked stems or on lower or upper sides of branches as a means of counteracting the effects of gravity. See compression wood and tension wood.

Semi-mature: Trees are between 1/3 and 2/3 of expected mature height.

Shrub: A woody plant similar to a tree except it is usually several-stemmed and smaller than a tree.

Significance: The quality of being worthy of attention; importance.

Stem / Trunk: Organ which supports branches, leaves, flowers and fruit; may also be referred to as 'the trunk'.

Stress: In Plant Health Care, (1) a factor that negatively affects the health of a plant; a factor that stimulates a response. (2) mechanics, a force per unit area.

Stress – acute: Disorder or disease that occurs suddenly and over a short period of time.

Stress – chronic: Disorder or disease occurring over a longer time.

Tree: Long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks. A tree has 3 major organs – roots, stem and leaves.

Vigour: Ability of a tree to sustain its life processes. The term 'vigour' in this document is synonymous with commonly used terms such as 'health' and 'vitality'. Inherent genetic capacity of a plant to deal with stress. Physical strength and health. A tree with good vigour has the ability to sustain life processes and synonymous with good health.

Visual Tree Inspection (VTA): Is a detailed visual inspection of a tree and surrounding site.

Vitality: Ability of plant to deal effectively with stress.

Watersprouts/ Epicormic growth (Usually multiple shoots): Shoots produced from epicormic buds at the cambium of trunks or branches. Grows 'from the stub ends and only grows from the outermost living tissue layer of that year's growth. They are weakly attached and prone to falling out or being blown off with the risk increasing markedly as they increase in size. When epicormic shoots arise from stub ends that are decaying, the chances of them falling out are significantly greater'.

Wound: An opening that is created when the bark is cut, removed, or injured.

NOTE: Pruning a live branch always creates a wound, even when the cut is properly made.

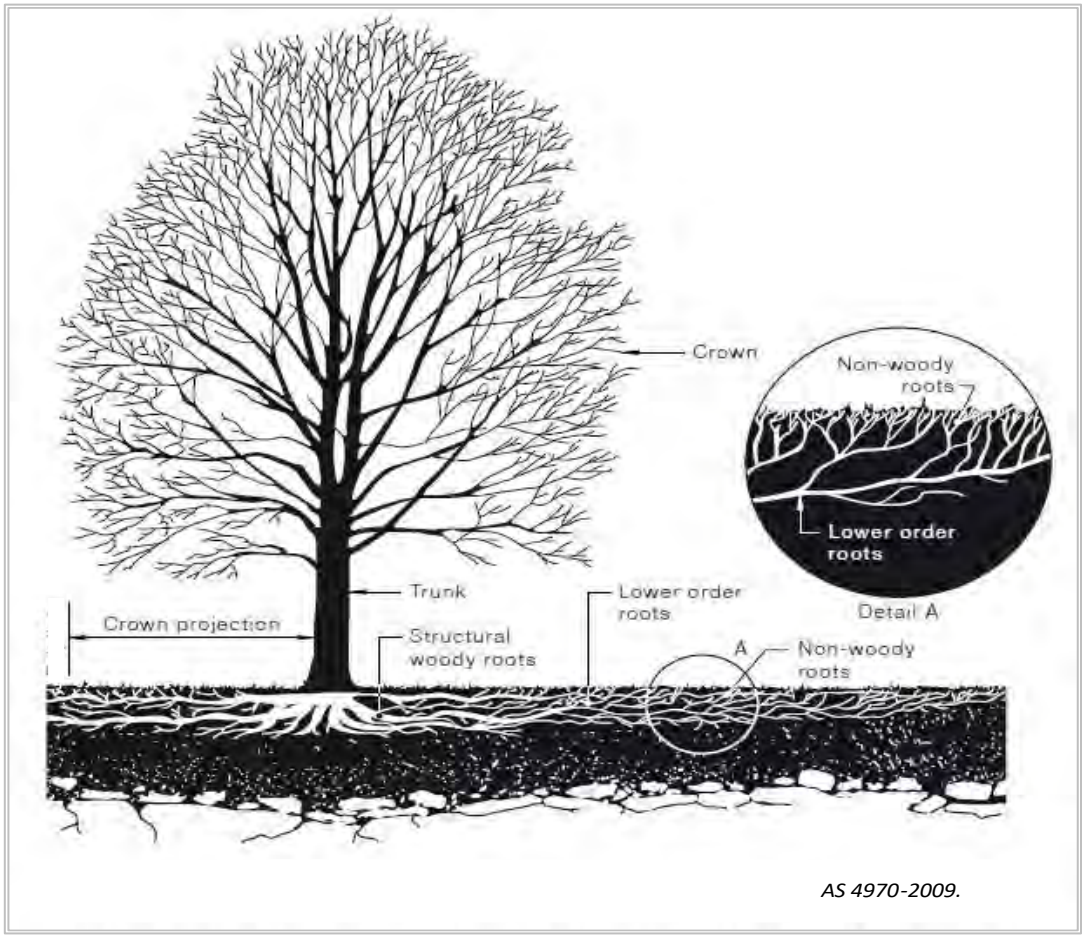
Xylem: Main water and mineral-conducting (unidirectional, up only) tissue in trees and other plants. Provides structural support. Arises (inward) from the cambium and becomes wood after lignifying. Contrasted with phloem.

Young: Trees have not yet reached 1/3 of their expected mature height. They are generally growing vigorously and have high apical dominance.

Zone of *Rapid Taper*: The area within 1–2m of the trunk on larger trees is frequently referred to as the *'Zone of Rapid Taper'* because structural roots found there often exhibit considerable secondary thickening- not present on roots farther from the trunk (*Wilson 1964*). *Wilson (1964)* additionally reviews the development of this zone and its relation to mechanical stability.

11 Appendix

11.1 Root Morphology Considerations



Indicative Root System and Rhizosphere of a Healthy Tree.

i. The main functions of roots include the uptake of water and nutrients, anchorage, storage of sugar reserves and the production of some plant hormones required by the shoots. For roots to function, they must be supplied with oxygen from the soil. The root system of trees consists of several 'types' of roots found in different parts of the soil and is generally much more extensive than commonly thought. The importance of roots is easily overlooked because they are not visible, that is 'out of sight, out of mind'. Damage to the root system is a common cause of tree decline and death and is the most common form of damage associated with development sites (Matheny et. al, 1998).

ii. Root systems consist of three main parts: (Sutton and Tinus, 1983).

- The structural woody roots (anchorage, storage and transport);
- Lower order roots (anchorage, storage and transport); and
- Non-woody roots (absorption of water and nutrients, extension, synthesis of amino acids and growth regulators) (please refer to Drawing 1 above).

iii. In addition to lateral root spread being underestimated, root depth in trees has also been grossly exaggerated. Deep root systems or taproots are the exception rather than the rule (Perry, 1982) (Watson and Neely, 1994).

iv. Most roots of most trees are found in the very top of the soil. The vast majority of these roots are small non-woody absorbing roots which grow upward into the very surface layers of the soil and leaf litter. This delicate, non-woody system, because of its proximity to the surface, is very vulnerable to injury (Watson et. al, 2014).

11.2 Tree Protection descriptors

Tree Protection Zone (TPZ):

The TPZ is the optimal combination of crown and root area (as defined by *AS 4970-2009*) that requires protection during the construction process so that the tree can remain viable. The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs into this zone. Tree sensitive construction measures must be implemented if work is to proceed within the Tree Protection Zone.

Diameter at Breast Height (DBH) measured at 1.4m above ground level. DBH is the circumference divided by π.* Measurement taken by Standard issue DBH Tape.

Tree Protection Zone (TPZ) = DBH x 12 (The radius of the TPZ is calculated for each tree by multiplying its DBH × 12) Note: TPZ - minimum area is 2.0m / maximum area is 15m.

Please Note: The TPZ figure is expressed as a radius measurement which is to be taken from the centre of the stem at ground level and applied in an outwards direction towards the extremities of the branches for the entire circumference of the tree/s.

Structural Root Zone (SRZ):

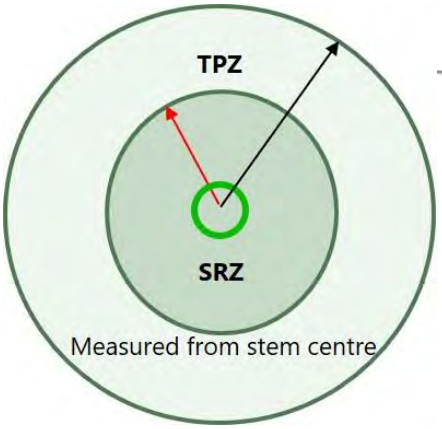
The SRZ is the area of the root system (as defined by *AS 4970-2009*) used for stability, mechanical support and anchorage of the tree. Severance of structural roots (>50 mm in diameter) within the SRZ is not recommended as it may lead to the destabilisation and/or serious decline of the tree.

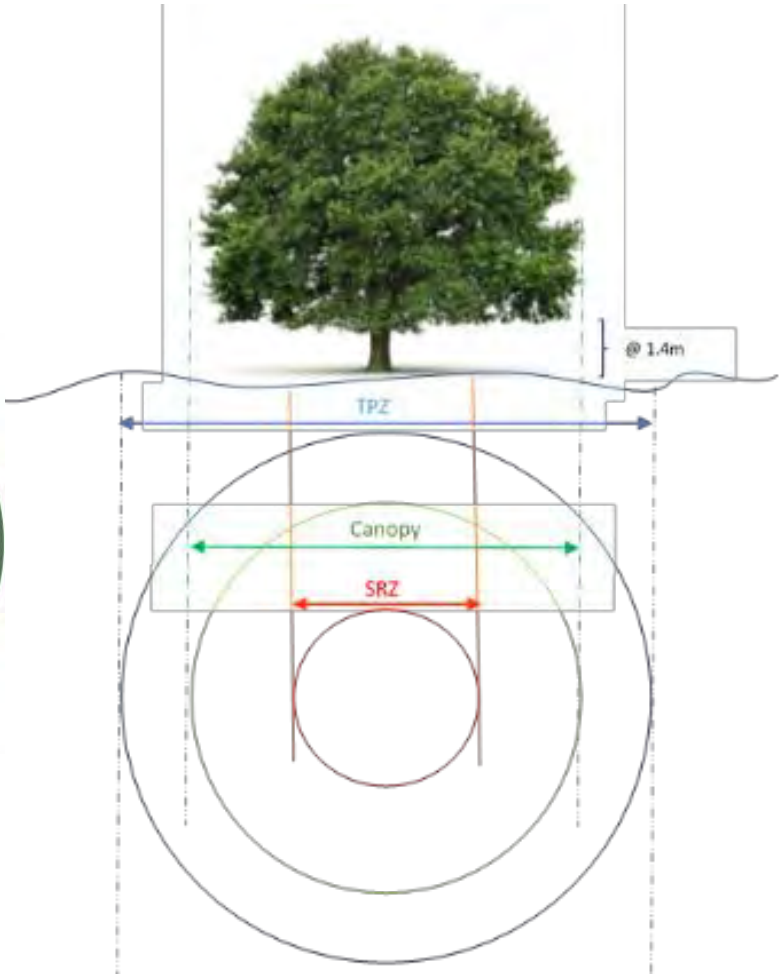
Root Investigation:

When assessing the potential impacts of encroachment within the TPZ, consideration will need to be given to the location and distribution of the roots, including above or below ground restrictions affecting root growth. Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as air spade and manual excavation. Root investigation is used to determine the extent and location of roots within the zone of conflict. Root investigation does not guarantee the retention of the tree.

Tree Protection Zone (TPZ) & Structural Root Zone (SRZ).

The Australian Standard *AS 4970-2009 - Protection of trees on development sites* is used for the allocation of tree protection zones. This method provides a TPZ that addresses both tree stability and growth requirements. TPZ distances are measured as a radius from the centre of the trunk at ground level.



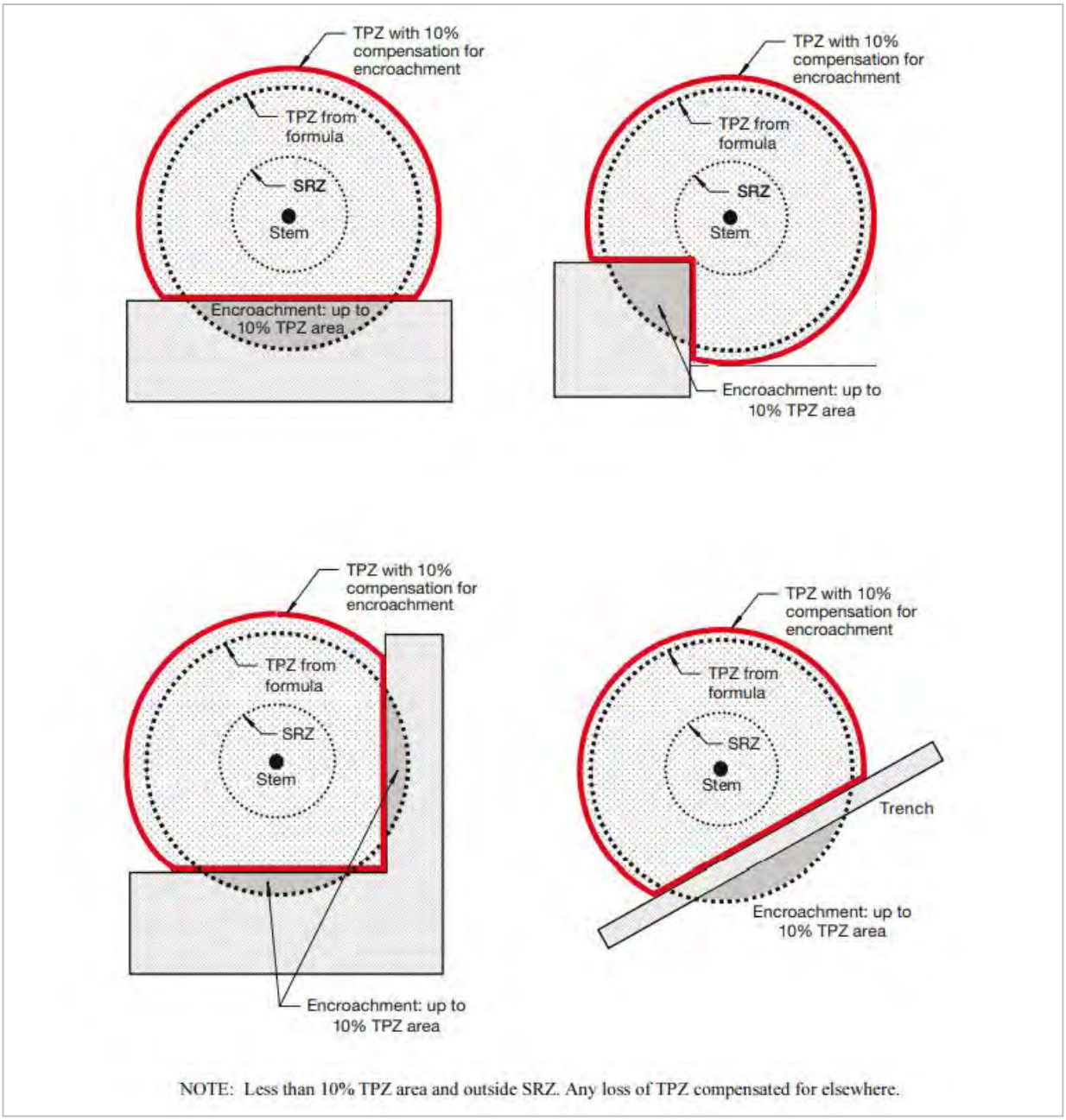


- AS4970-2009, s3: The radius of the TPZ is calculated for each tree by multiplying its Diameter @ Breast Height measured @ 1.4m from ground level (DBH × 12 = TPZ). (DBH = Trunk Girth @ 1.4m ÷ π).
- To calculate the SRZ: Radius SRZ = **D**iameter **A**bove **R**oot **C**rown (**DRC** x 50) ^ 0.42 x 0.64. If the DRC is less than 0.15m the SRZ will be 1.5m.
- Note: A TPZ should not be less than 2m or more than 15m from the tree stem.

You do not need to calculate the TPZ of palms, cycads and tree ferns. For these plants, the TPZ should not be less than 1m outside the crown.

Compensation for Tree Protection Zone Encroachment

Encroachment into the Tree Protection Zone (TPZ) is sometimes unavoidable. The images above are analogous to the abovementioned works scenario and indicate how encroachment within the tree protection zone can be compensated for elsewhere per *AS 4970-2009 Protection of Trees on Development Sites.*



11.3 Descriptors: Age, Vitality & Structure

(Per International Society of Arboriculture guidelines)

TREE AGE CLASS

Young Juvenile or recently planted approximately 1-7 years.
Semi-mature Tree actively growing in size and yet to achieve the expected size *in situ.*
Maturing Tree is approaching the expected size or has reached the expected size *in situ.*
Senescent Tree is over mature and has started to decline.

TREE VITALITY

Excellent: The tree is demonstrating excellent or exceptional growth. The tree should exhibit a full canopy of foliage and be free of pest and disease problems.
Good: Foliage of tree is entire, with good colour, very little sign of pathogens and of good density. Growth indicators are good i.e. Extension growth of twigs and wound wood development. Minimal or no canopy dieback (deadwood).
Fair: Tree is showing one or more of the following symptoms: <25% dead wood, minor canopy dieback, foliage generally with good colour though some imperfections may be present. Minor pathogen damage present, with growth indicators such as leaf size, canopy density and twig extension growth typical for the species in this location.
Poor: Tree is showing one or more of the following symptoms of decline; >25% deadwood, canopy dieback is observable, discoloured or distorted leaves. Pathogens present, stress symptoms are observable as reduced leaf size, extension growth and canopy density.
Very Poor: The tree appears to be in a state of decline. The tree is not growing to its full capacity. The canopy may be very thin and sparse. A significant volume of deadwood may be present in the canopy and/or pest and disease problems may be causing a severe decline in tree vitality.
Dead or dying: Tree is in severe decline; >55% deadwood, very little foliage, possibly Epicormic shoots and minimal extension growth.
Dead: The tree is completely dead and exhibits no new growth or live tissue.

***Please note that tree vitality cannot be measured directly, hence growth and physiological parameters that indicate tree vitality are used. Health or Vitality of a tree is evidenced by the general appearance of crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion including pathogens and presence of dieback in crown at the time of inspection. Vigour may vary according to seasonal weather patterns and rainfall received (Dobbertin, 2005).*

***Tree Condition: The assessment of a tree(s) condition evaluates factors of tree vitality, form and structure. These descriptors of vitality, form and structure attributed to a tree evaluate the individual specimen to what could be reasonably considered by the arborist as typical for that species growing in situ. It is well documented that specific tree species can display inherently poor biomechanics, such as acute branch attachments with included bark, co-dominant leaders and other poor branch and root architecture. Whilst these 'structural defects' may be deemed arboriculturally flawed, they are typical for the species and my not constitute a foreseeable increased risk. These trees may be assigned a 'structural rating' of 'fair-poor' (as opposed to poor) at the arborist's discretion.*

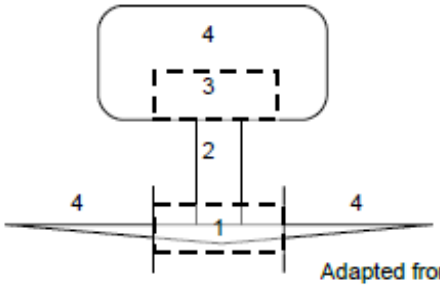
TREE STRUCTURE

Good: Trunk and scaffold branches show good taper and attachment with minor or no structural defects. Tree is a good example of species with well-developed form showing no obvious root problems or pests and diseases.
Fair/Fair-Poor: Tree shows minor structural defects or minor damage to trunk e.g. bark missing, there could be cavities present. Minimal damage to structural roots. Tree could be seen as typical for this species.
Poor/Very Poor: There are major structural defects, damage to trunk or bark missing. Co-dominant stems could be present with likely points of failure. Girdling or damaged roots obvious. Tree is structurally problematic.
Hazardous: Tree is immediate hazard with potential to fail, this should be rectified as soon as possible.

Tree Structure Matrix

Descriptor	Zone 1 - Root plate & lower stem	Zone 2 - Trunk	Zone 3 - Primary branch support	Zone 4 - Outer crown and roots
Good	No damage, disease or decay; obvious basal flare / stable in ground	No damage, disease or decay; well tapered	Well formed, attached, spaced and tapered	No damage, disease, decay or structural defect
Fair	Minor damage or decay. Basal flare present.	Minor damage or decay	Typically formed, attached, spaced and tapered	Minor damage, disease or decay; minor branch end-weight or over-extension
Fair to Poor	Moderate damage or decay; minimal basal flare	Moderate damage or decay; approaching recognised thresholds	Weak, decayed or with acute branch attachments; previous branch failure evidence	Moderate damage, disease or decay; moderate branch end-weight or over-extension
Poor	Major damage, disease or decay; fungal fruiting bodies present. Excessive lean placing pressure on root plate	Major damage, disease or decay; exceeds recognised thresholds; fungal fruiting bodies present. Acute lean. Stump resprout	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; altered exposure; failure probable	Excessive damage, disease or decay; cavities. Excessive lean. Stump resprout	Decayed, cavities or branch attachments with active split; failure imminent	Excessive damage, disease or decay; excessive branch end-weight or over-extension

Diagram 2: Tree structure zones
1. Root plate & lower stem
2. Trunk
3. Primary branch support
4. Outer crown & roots



Adapted from Coder (1996)

Structure ratings will also take into account general tree architecture which considers aspects of stem taper, live crown ratio, branch distribution or crown bias and position such as a tree being suppressed amongst more dominant trees.

11.4 Descriptors: Estimated Life Expectancy (ELE)

The ELE is adapted from (*Barrell, 2001)*. The objective of a ELE assessment is to determine the relative value of individual trees for the purpose of informing future management options.

Estimated Life Expectancy – Assessment Criteria			
Dead	Short	Medium	Long
Trees with a high level of risk that would need removing within the next 5 years. Dead trees. Trees that should be removed within the next 5 years. Dying or suppressed or declining trees through disease or inhospitable conditions. Dangerous trees through instability or recent loss of adjacent trees. Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form. Damaged trees that considered unsafe to retain. Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. Trees that will become dangerous after removal of other trees for the reasons.	Trees that appear to be retainable with an acceptable level of risk for 5-15 years. Trees that may only live between 5 and 15 more years. Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for 15-40 years. Trees that may only live between 15 and 40 more years. Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for more than 40 years. Structurally sound trees located in positions that can accommodate future growth. Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery. Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention

11.5 IACA Significance of Tree, Assessment Rating System (STARS)

Institute of Australian Consulting Arboriculturists (IACA) Significance of a Tree, Assessment Rating System (STARS) *The tree is to have a minimum of 3 criteria in a category to be classified in that group*		
Low	**Medium**	**High**
The tree is in fair-poor condition and good or low vigour. The tree has form atypical of the species. The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings. The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area. The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen. The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions. The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms. The tree has a wound or defect that has the potential to become structurally unsound. ENVIRONMENTAL PEST/NOXIOUS WEED The tree is an environmental pest species due to its invasiveness and/or poisonous/allergenic, properties/ declared noxious weed. HAZRADOUS / IRREVERSIBLE DECLINE The tree is structurally unsound unstable and considered potentially dangerous. The tree is dead or in irreversible decline with the potential to fail/collapse.	The tree is in fair to good condition. The tree has form typical or atypical of the species. The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area. The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street. The tree provides a fair contribution to the visual character and amenity of the local area. The tree's growth is Mediumly restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.	The tree is in good condition and good vigour. The tree has a form typical for the species. The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age. The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on councils' significant/notable tree register. The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity. The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values. The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.

(STARS) Tree Retention Value - Priority Matrix

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia 2010

		Landscape Significance				
		1.High	2.Medium	3.Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest/Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1.Long **>40 Years**					
	2.Medium **15-40 Years**					
	3.Short **<1-15 Years**					
	Dead					

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard *AS 4970 Protection of trees on development sites.* Tree sensitive construction measures must be implemented (pier and beam cantilever, Structural Confinement Cells etc if works are to proceed within the TPZ).
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

11.6 Assumptions and Limiting Conditions

1) Active Green Services Pty Ltd (herein after referred to as AGS) contracts with you on the basis that you promise that all legal information which you provide, including land title and ownership of other property, are correct. AGS is not responsible for verifying or ascertaining any of these issues.
2) AGS contracts with you on the basis that your promise that all affected property complies with all applicable statutes and subordinate legislation.
3) AGS will take all reasonable care to obtain necessary information from reliable sources and to verify data. However, AGS neither guarantees nor is responsible for the accuracy of information provided by others.
4) If, after delivery of this report, you later require a representative of AGS to attend court to give evidence or to assist in the preparation for a hearing because of this report, you must pay an additional hourly fee at our then current rate for expert evidence.
5) Alteration of this report invalidates the entire report.
6) AGS retains the copyright in this report. Possession of the original or a copy of this report does not give you or anyone else any right of reproduction, publication or use without the written permission of AGS.
7) The contents of this report represent the professional opinion of the consultant. AGS consultancy fee for the preparation of this report is in no way contingent upon the consultant reporting a particular conclusion of fact, nor upon the occurrence of a subsequent event.
8) Sketches, diagrams, graphs and photographs in this report are intended as visual aids, are not to scale unless stated to be so, and must not be construed as engineering or architectural reports or as surveys.
9) Unless expressly stated otherwise:
    a. The information in this report covers only those items which were examined and reflects the condition of those items at the time of the inspection.
    b. Our inspection is limited to visual examination of accessible components without dissection, excavation or probing. There is no warranty or guarantee, express or implied, that even if they were not present during our inspection, problems or defects in plants or property examined may not arise in the future.
10) This Report supersedes all prior discussions and representations between AGS and the client on the subject.

11.7 AGS Quality Control

Document control

File reference	File type	Modifications	Date
JN 82009	AR	Original document Amended	05/04/2022 03/10/2024

Documents reviewed

Date	Title	Author	Company
N/A	N/A	N/A	N/A

Communication register

Date	Type	From	To	Description
N/A	N/A	N/A	N/A	N/A

Review register

Date	File reference	Reviewer	Qualification	Company
06/04/2022 03/10/2024	JN82009 Arboricultural Impact Assessment Report	I.Dunsmuir O.Meekins	Arborist (AQF 5) Arborist (AQF 8)	Active Green Services Active Green Services

APPENDIX G - PRELIMINARY CONTAMINATION SCREENING

ENVIRONMENTAL INVESTIGATION SERVICES

11/07/2016
Report Ref: E29205Klet-WC

Tract Consultants
Level 8, 80 Mount Street
North Sydney, NSW, 2060

Attention: Julie Lee
Email: jlee@tract.net.au

PRELIMINARY CONTAMINATION SCREENING AND WASTE CLASSIFICATION ASSESSMENT (SOIL)
PROPOSED NEW CYCLEWAY DEVELOPMENT
QUEENS WHARF PARK, PARRAMATTA, NSW

1 INTRODUCTION

Tract Consultants ('the client') commissioned Environmental Investigation Services (EIS)[1] to assign a waste classification to the in-situ soil located at Queens Wharf Park, Parramatta, NSW ('the site').

The site location is shown on Figure 1 and sampling for the screening was confined to the in-situ soil in the investigation area as shown on Figure 2 attached in the appendices.

The investigation was undertaken generally in accordance with an EIS proposal (Ref: EP9718K) of 11 February 2016 and written acceptance from Tract Consultants Pty Ltd of 23 February 2016.

The purpose of this screening was to identify any potential contamination within the proposed cycleway area and provide a waste classification for the off-site disposal of the material in accordance with the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014[2]).

A geotechnical investigation was undertaken in conjunction with the waste classification assessment by JK Geotechnics[3] and the results are presented in a separate report (Ref. 29205V, dated 11/07/2016).

[1] Environmental consulting division of Jeffery & Katauskas Pty Ltd (J&K)

[2] NSW EPA, (2014), *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

[3] Geotechnical consulting division of J&K

Postal Address: PO Box 976, North Ryde BC NSW 1670
Tel: 02 9888 5000 ● Fax: 9888 5004
EIS is a division of Jeffery and Katauskas Pty Ltd ● ABN 17 003 550 801

1.1 Proposed Development Details

The proposed development includes the construction of a 3.0-3.5m concrete path with light poles as part of a new cycleway. The excavation for the pathway will be to a maximum depth of 0.15m and the light poles to 0.55m.

2 SITE INFORMATION

2.1 Site Description

The site consists of the section for Queens Wharf Park between Macarthur Street and Alfred Street. The regional topography is sloping towards the east and the site topography generally slopes north towards the Parramatta River.

At the time of the investigation, the site consisted of a concrete cycleway between Macarthur Street and Noller Parade within a grassed area and surrounding trees, the concrete cycleway appeared in good condition based on a cursory inspection. The section of the site between No. 11 Noller Parade and Alfred Street consists of two grassed terraced areas; divided by grassed batters and a sandstone retaining wall up to 2.5m high; with a sandstone sea wall running along the river edge.

2.2 Regional Geology

The geological map of Sydney (1983[4]) indicates the site to be underlain by Ashfield Shale of the Wianamatta Group, which typically consists of black to dark grey shale and laminite.

2.3 Acid Sulfate Soil (ASS) Risk

A review of the ASS risk maps prepared by Department of Land and Water Conservation (1997[5]) indicates that the site is located in an area classed as 'disturbed terrain'.

The 'disturbed terrain' classification is adopted in large scale filled areas which often occur during reclamation of low lying swamps for urban development, in areas which may have been mined or dredged or have undergone heavy ground disturbance through general urban development or the construction of dams and levees. The majority of landforms within these areas are not expected to encounter PASS. However, localised occurrences may be found at depth. Disturbance of these materials will result in a risk that will vary with elevation and depth of disturbance. Soil investigation is required to assess these areas for PASS.

[4] *1:100,000 Geological Map of Sydney (Series 9130),* Department of Mineral Resources (1983) [now Department of Primary Industries]

[5] Department of Land and Water Conservation, (1997), *1:25,000 Acid Sulfate Soil Risk Map (Series 9130N3, Ed 2).*

3 ASSESSMENT CRITERIA

3.1 NSW EPA Waste Classification Guidelines

Off-site disposal of fill, contaminated material, stockpiled soil, natural soil, rock excavated as part of the proposed development works is regulated by the Protection of the Environment Operations Act (1997[6]) and associated regulations and guidelines including the NSW EPA Waste Classification Guidelines - Part 1: Classifying Waste (2014[7]).

Soils are classed into the following categories based on the chemical contaminant criteria outlined in the guidelines:

Table 3-1: Waste Categories

Category	Description
General Solid Waste (non-putrescible) (GSW)	• If Specific Contaminant Concentration (SCC) ≤ Contaminant Threshold (CT1) then Toxicity Characteristics Leaching Procedure (TCLP) not needed to classify the soil as GSW; and • If TCLP ≤ TCLP1 and SCC ≤ SCC1 then treat as GSW.
Restricted Solid Waste (non-putrescible) (RSW)	• If SCC ≤ CT2 then TCLP not needed to classify the soil as RSW • If TCLP ≤ TCLP2 and SCC ≤ SCC2 then treat as RSW
Hazardous Waste (HW)	• If SCC > CT2 then TCLP not needed to classify the soil as HW • If TCLP > TCLP2 and/or SCC > SCC2 then treat as HW
Virgin Excavated Natural Material (VENM)	Natural material (such as clay, gravel, sand, soil or rock fines) that meet the following: • That has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial mining or agricultural activities; • That does not contain sulfidic ores or other waste; and • Includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the NSW Government Gazette.

[6] NSW Government, (1997), *Protection of Environment Operations Act.* (POEO Act 1997)

[7] NSW EPA, (2014), *Waste Classification Guidelines, Part 1: Classifying Waste.* (referred to as Waste Classification Guidelines 2014)

3.2 Acid Sulfate Soils (ASS)

The ASS Manual present 'action criteria' for the interpretation of laboratory results. The 'action criteria' define the need to prepare a management plan and are based on the percentage of oxidisable sulfur (or equivalent Total Potential Acidity [TPA]) for broad categories of soil types. Where disturbance of greater than 1,000 tonnes of ASS is proposed, the action criteria for 'coarse textured soils' apply to all soil types.

3.2.1 Action Criteria

The following action criteria are presented in the ASS Manual:

Table 3-2: ASS Action Criteria

Category	Description	Criteria
Coarse Textured Soils	Sands to loamy sands	• pH - less than 5; • Total Actual Acidity (TAA)/Total Sulfide Acidity (TSA)/ Total Potential Acidity (TPA) (pH5.5) – greater than 18mol H^+/tonne; and • S_{pos} – greater than 0.03% sulfur oxidisable.
Medium Textured Soils	Sandy loams to light clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 36mol H^+/tonne; and • S_{pos} – greater than 0.06% sulfur oxidisable.
Fine Textured Soils	Medium to heavy clays and silty clays	• pH - less than 5; • TAA/TSA/TPA (pH5.5) – greater than 62mol H^+/tonne; and • S_{pos} – greater than 0.1% sulfur oxidisable.

3.2.2 Site Specific Action Criteria

The action criteria for medium textured soils has been adopted for this assessment. This is based on the predominant soil type encountered at the sampling locations (i.e. silty sand).

4 INVESTIGATION PROCEDURE

4.1 Subsurface Investigation and Soil Sampling

Field work for this investigation was undertaken on 16/06/2016. Soil samples were obtained from 8 boreholes drilled for the JK geotechnical investigation. The sampling locations are shown on Figure 2 attached in the appendices.

The sample locations were drilled using a four-wheel-drive (4wd) mounted hydraulically push tube rig. Soil samples were obtained from disposable polyethylene push tube samplers.

Soil samples were collected from the fill and natural profiles encountered during the investigation. Additional fill samples were obtained when relatively deep fill (>0.5m) was encountered. Samples were also obtained when there was a distinct change in lithology or based on the observations made during the investigation. All samples were recorded on the borehole logs attached in the appendices.

Samples were placed in glass jars with plastic caps and Teflon seals with minimal headspace. Samples for asbestos analysis were placed in zip-lock plastic bags. Sampling personnel used disposable nitrile gloves during sampling activities. The samples were labelled with the job number, sampling location, sampling depth and date.

4.2 Screening for Volatile Organic Compounds (VOCs)

A portable Photoionisation Detector (PID) was used to screen the samples for the presence of VOCs and to assist with selection of samples for further analysis for petroleum hydrocarbons.

The sensitivity of the PID is dependent on the organic compound and varies for different mixtures of hydrocarbons. Some compounds give relatively high readings and some can be undetectable even though present in identical concentrations. The portable PID is best used semi-quantitatively to compare samples contaminated by the same hydrocarbon source.

The PID is calibrated before use by measurement of an isobutylene standard gas. All the PID measurements are quoted as parts per million (ppm) isobutylene equivalents.

PID screening for VOCs was undertaken on soil samples using the soil sample headspace method. VOC data was obtained from partly filled zip-lock plastic bags following equilibration of the headspace gases.

4.3 Sample Preservation

Soil samples were preserved by immediate storage in an insulated sample container with ice in accordance with AS4482.1-2005 and AS4482.2-1999[8] as summarised in the following table:

[8] *Guide to the Sampling and Investigation of Potentially Contaminated Soil Part2: Volatile Substances,* Standards Australia, 1999 (AS 1999)

Table 4-1: Soil sample preservation and storage

Analyte	Preservation	Storage
Heavy metals	Unpreserved glass jar with Teflon lined lid	Store at <4°, analysis within 28 days (mercury and Cr[VI]) and 180 days (other metals).
Hydrocarbons, pesticides and other organics	As above	Store at <4°, analysis within 14 days
Asbestos	Sealed plastic bag	None

On completion of the fieldwork, the samples were delivered in the insulated sample container to a NATA registered laboratory for analysis under standard Chain of Custody (COC) procedures.

4.4 Laboratory Analysis

Eight selected in-situ fill soil samples were analysed for the following contaminants of concern (CoPC):

- Heavy metals including: arsenic, cadmium, chromium (total), copper, lead, mercury, nickel and zinc;
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Total Recoverable Hydrocarbons (TRH) including monocyclic aromatic hydrocarbons (BTEXN);
- Organochlorine pesticides (OCPs);
- Organophosphate pesticides (OPPs);
- Polychlorinated biphenyls (PCBs);
- Asbestos; and
- Selected TCLP leachate analysis on heavy metals and PAHs.

Four selected in-situ natural soil samples were analysed for the following CoPC:

- Heavy metals (as above);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Total Recoverable Hydrocarbons (TRH) including monocyclic aromatic hydrocarbons (BTEXN);
- Organochlorine pesticides (OCPs);
- Organophosphate pesticides (OPPs); and
- Polychlorinated biphenyls (PCBs).

Four selected natural soil samples obtained from the site were analysed for PASS using the sPOCAS analytical methods detailed in AS4969-2008/09.

Samples were analysed by Envirolab Services (NATA Accreditation Number – 2901) using the analytical methods detailed in the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013[9]).

Reference should be made to the laboratory reports (Ref: 148581 and 148581-A) attached in the appendices for further information.

5 RESULTS OF THE INVESTIGATION

5.1 Subsurface Conditions

The subsurface conditions encountered generally consisted of grass cover underlain by fill material to a maximum depth of 2.0m, underlain by clayey sand or silty clay to the termination depth of the boreholes at approximately 3.0m. The fill material typically consisted of silty sand or silty clay with inclusions of igneous gravel, sandstone gravel, brick fragments and ash.

5.2 VOC Screening

The PID results ranged from 0.5ppm to 2.2ppm equivalent isobutylene. These results indicate PID detectable volatile organic contaminants. Samples with elevated PID readings were analysed for TRH and BTEXN.

5.3 Laboratory Results

The soil laboratory results were assessed against the guidelines adopted for the investigation. The results are presented in the report tables attached in the appendices. A summary of the results is presented below.

Table 5-1: Summary of soil laboratory results

Analyte	Results Compared to Waste Classification Guidelines
Heavy Metals	Samples BH4 (0-0.2), BH6 (0-0.2) and BH7 (0-0.2) contained lead concentrations above the CT1 concentration of 100mg/kg. TCLP leachates were prepared from the three samples and analysed for lead. The results were less than the TCLP1criteria. All remaining results were less than the CT1 criteria.
TRH	All results were less than the CT1 criteria.
BTEXN	All results were less than the CT1 criteria.

[9] National Environment Protection Council (NEPC), (2013), *National Environmental Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013).* (referred to as NEPM 2013)

Analyte	Results Compared to Waste Classification Guidelines
PAHs	Samples BH1 (0-0.2) and BH2 (0-0.2) contained concentrations of Benzo(a)Pyrene above the CT1 concentration of 0.8mg/kg. TCLP leachates were prepared from the two samples and analysed for PAHs. The results were less than the TCLP1 criteria. All remaining results were less than the CT1 criteria.
OCPs & OPPs	All results were less than the CT1 criteria.
PCBs	All results were less than the CT1 criteria.
Asbestos	All results were below the laboratory reporting limit.

Table 5-2: Summary of ASS Results

Analyte	Results Compared to ASS Guidelines
pH_{kcl} and pH_{ox}	The pH_{KCl} results ranged from 4.5 to 7.3. The results indicate that prior to oxidation the pH values of the soil suspended in potassium chloride solution ranged from strongly acidic to neutral. Following oxidation, the pH_{ox} results for the samples ranged from 4.4 to 7.4. These results are generally strongly acidic to slightly alkaline. The pH of the samples typically dropped by 0.1 or more units following oxidation.
Acid Trail	• TAA results ranged from less than the PQL to 10mol H^+/tonne. None of the results were above the action criteria of 36mol H^+/tonne; • TPA results were all less than the PQL; and • TSA results were all less than PQL.
Sulfur Trail	The S_{pos}% results ranged from less than the PQL 0.01%. All results were below the action criterion of 0.06% as shown on Table C.
Liming Rate	The liming rate required for neutralisation ranged from <0.75 $kgCaCO_3$/tonne to 1.2 $kgCaCO_3$/tonne.
pH (1:5-soil:water)	The pH results ranged from 5.5 to 7.9. The results indicate strongly acidic to moderately alkaline conditions.

6 CONCLUSION

6.1 Waste Classification

Table 6-1: Waste Classification

Material	Classification	Disposal Option
Fill material in the investigation area	General Solid Waste (non-putrescible) (GSW)	A NSW EPA landfill licensed to receive the waste stream. The landfill should be contacted to obtain the required approvals prior to commencement of excavation. Alternatively, the fill material is considered to be suitable for re-use on the subject site only provided it meets geotechnical and earthwork requirements.
Natural silty clay and silty sand in the investigation area	Due to the elevated CoPC encountered in the overlying fill, additional testing of the underlying natural soil will be required to demonstrate that the natural soil is VENM.	VENM is considered suitable for re-use on-site, or alternatively, the information included in this report may be used to assess whether the material is suitable for beneficial reuse at another site as fill material. Alternatively, the natural material can be disposed of as VENM to a facility licensed by the NSW EPA to receive the waste stream.

6.2 Recommendations

In the event that unexpected finds are encountered such as stained or odorous materials, EIS should be immediately contacted for advice. EIS should also be contacted if any fibre cement materials are discovered during excavation.

Following removal of the fill material additional tests should be undertaken on the natural soil underlying the contaminated fill material in order to classify the material as VENM.

sPOCAS results for the four samples identified acidic conditions greater than the action criteria, however these results are considered to be indicative of mildly acidic soils associated with organic/humic material rather than PASS as no significant concentrations of oxidisable sulfur above the action criteria were encountered in the samples. As such, PASS conditions are not considered to be present at the site (to a depth of 3.0m) and are not likely to be disturbed during the proposed development works.

Based on this information, preparation of an ASSMP is not considered necessary for the proposed development.

6.3 General Information

The fill material must be disposed of to a NSW EPA licensed facility. It is the responsibility of the receiving facility to ensure that the material meets their EPA license conditions. EIS accepts no liability whatsoever for illegal or inappropriate disposal of material.

Fill and contaminated soil disposal costs are significant and may affect project viability. These costs should be assessed at an early stage of the project development to avoid significant future unexpected additional costs.

Material classed as VENM must not be mixed with any fill material (including building rubble) as this will invalidate the VENM classification. Where doubt exists about the difference between fill and VENM material an environmental/geotechnical engineer should be contacted for advice.

Section 143 of the POEO Act 1997 states that if waste is transported to a place that cannot lawfully be used as a waste facility for that waste, then the transporter and owner of the waste are each guilty of an offence. The transporter and owner of the waste have a duty to ensure that the waste is disposed of in an appropriate manner. EIS accepts no liability whatsoever for the unlawful disposal of any waste from any site.

7 LIMITATIONS

The report limitations are outlined below:

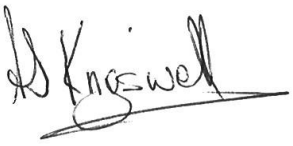
- EIS accepts no responsibility for any unidentified contamination issues at the site. Any unexpected problems/subsurface features that may be encountered during development works should be inspected by an environmental consultant as soon as possible;
- This report has been prepared based on site conditions which existed at the time of the investigation; scope of work and limitation outlined in the EIS proposal; and terms of contract between EIS and the client (as applicable);
- The conclusions presented in this report are based on investigation of conditions at specific locations, chosen to be as representative as possible under the given circumstances, visual observations of the site and immediate surrounds and documents reviewed as described in the report;
- Subsurface soil and rock conditions encountered between investigation locations may be found to be different from those expected. Groundwater conditions may also vary, especially after climatic changes;
- The investigation and preparation of this report have been undertaken in accordance with accepted practice for environmental consultants, with reference to applicable environmental regulatory authority and industry standards, guidelines and the assessment criteria outlined in the report;
- Where information has been provided by third parties, EIS has not undertaken any verification process, except where specifically stated in the report;

- EIS has not undertaken any assessment of off-site areas that may be potential contamination sources or may have been impacted by site contamination, except where specifically stated in the report;
- EIS accept no responsibility for potentially asbestos containing materials that may exist at the site. These materials may be associated with demolition of pre-1990 constructed buildings or fill material at the site;
- EIS have not and will not make any determination regarding finances associated with the site;
- Additional investigation work may be required in the event of changes to the proposed development or landuse. EIS should be contacted immediately in such circumstances;
- Material considered to be suitable from a geotechnical point of view may be unsatisfactory from a soil contamination viewpoint, and vice versa;
- This report has been prepared for the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose;
- Copyright in this report is the property of EIS. EIS has used a degree of care, skill and diligence normally exercised by consulting professionals in similar circumstances and locality. No other warranty expressed or implied is made or intended. Subject to payment of all fees due for the investigation, the client alone shall have a licence to use this report;
- If the client, or any person, provides a copy of this report to any third party, such third party must not rely on this report except with the express written consent of EIS; and
- Any third party who seeks to rely on this report without the express written consent of EIS does so entirely at their own risk and to the fullest extent permitted by law, EIS accepts no liability whatsoever, in respect of any loss or damage suffered by any such third party.

If you have any questions concerning the contents of this letter please do not hesitate to contact us.

Kind Regards

Harry Leonard
Environmental Scientist



Adrian Kingswell
Principal

Appendices:

Appendix A: Report Figures
Appendix B: Laboratory Summary Tables
Appendix C: Borehole / Test pit Logs
Appendix D: Laboratory Report/s & COC Documents

Appendix A: Report Figures

AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
AERIAL IMAGE ©: 2015 GOOGLE INC.

This plan should be read in conjunction with the EIS geotechnics report.

Title: **SITE LOCATION PLAN**

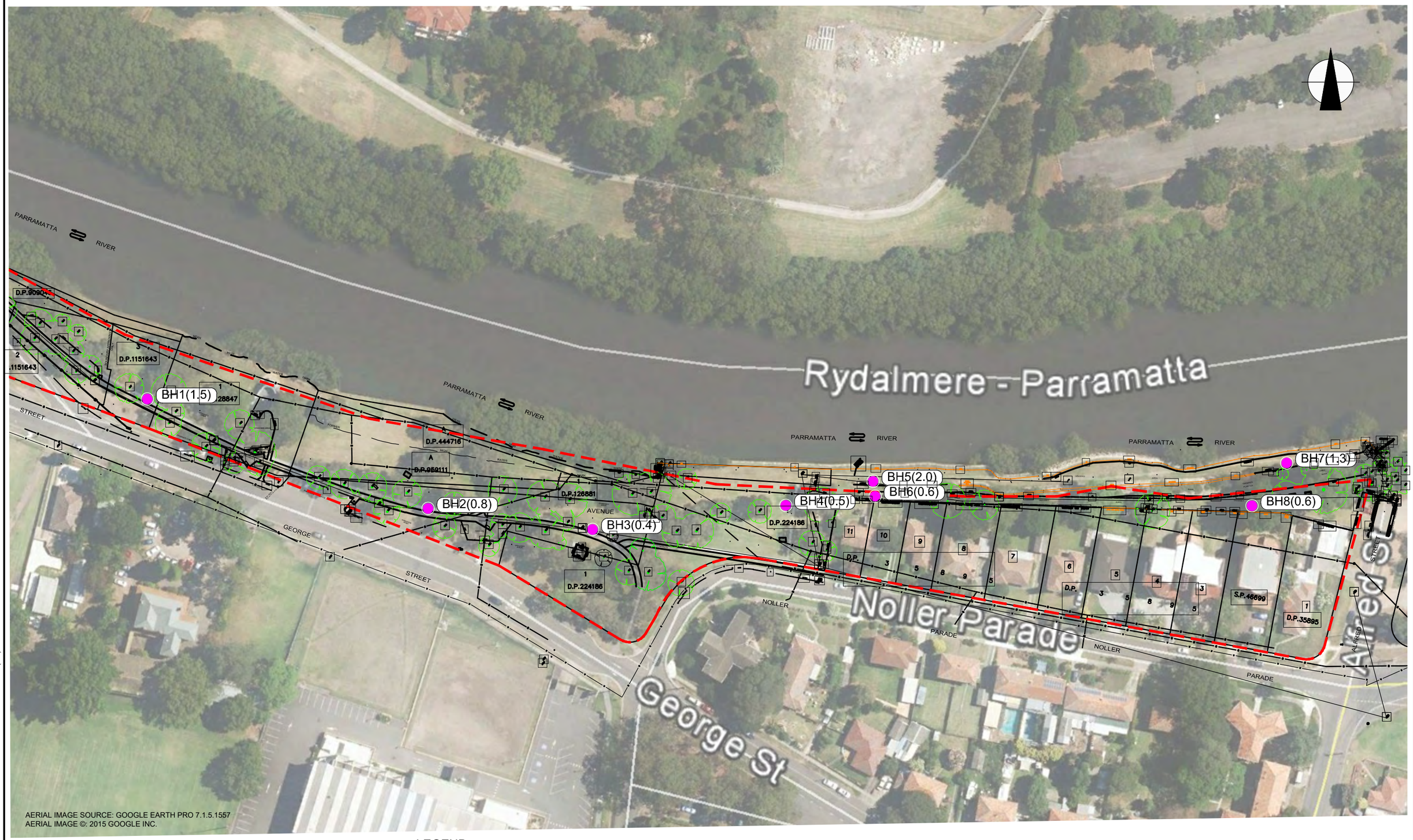
Location: QUEENS WHARF PARK
PARRAMATTA, NSW

Report No: E29205K

Figure No: 1

ENVIRONMENTAL INVESTIGATION SERVICES

PLOT DATE: 29/06/2016 3:45:14 PM DWG FILE: S:\5 EIS\5C EIS JOBS\29000'S\E29205K PARRAMATTA (WC)\CAD\E29205K.DWG



AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
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LEGEND

APPROXIMATE SITE BOUNDARY

BH (Fill Depth) BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

0 12 24 36 48 60
SCALE 1:1200 @A3 METRES

This plan should be read in conjunction with the JK Geotechnics report.

Title: **BOREHOLE LOCATION PLAN**

Location: QUEENS WHARF PARK
PARRAMATTA, NSW

Report No: E29205K

Figure No: **2**

ENVIRONMENTAL INVESTIGATION SERVICES

EIS

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Appendix B: Laboratory Summary Tables

EIS

TABLE A
SOIL LABORATORY RESULTS COMPARED TO WASTE CLASSIFICATION GUIDELINES (2014)
All data in mg/kg unless stated otherwise

			HEAVY METALS								PAHs		OC/OP PESTICIDES				Total PCBs	TRH					BTEX COMPOUNDS				ASBESTOS FIBRES
			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Total PAHs	B(a)P	Total Endosulfans	Chloropyrifos	Total Moderately Harmful [2]	Total Scheduled [3]		C_6-C_9	C_{10}-C_{14}	C_{15}-C_{28}	C_{29}-C_{36}	Total C_{10}-C_{36}	Benzene	Toluene	Ethyl benzene	Total Xylenes	
PQL - Envirolab Services			4	0.4	1	1	1	0.1	1	1	-	0.05	0.1	0.1	0.1	0.1	0.1	25	50	100	100	250	0.2	0.5	1	3	100
General Solid Waste CT1 [1]			100	20	100	NSL	100	4	40	NSL	200	0.8	60	4	250	<50	<50	650		NSL		10,000	10	288	600	1,000	-
General Solid Waste SCC1 [1]			500	100	1900	NSL	1500	50	1050	NSL	200	10	108	7.5	250	<50	<50	650		NSL		10,000	18	518	1,080	1,800	-
Restricted Solid Waste CT2 [1]			400	80	400	NSL	400	16	160	NSL	800	3.2	240	16	1000	<50	<50	2600		NSL		40,000	40	1,152	2,400	4,000	-
Restricted Solid Waste SCC2 [1]			2000	400	7600	NSL	6000	200	4200	NSL	800	23	432	30	1000	<50	<50	2600		NSL		40,000	72	2,073	4,320	7,200	-
Sample Reference	**Sample Depth**	**Sample Description**																									
BH1	0-0.2	Fill: silty sand	4	LPQL	15	42	74	0.1	18	97	8.8	**0.82**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH1	1.6-1.8	Silty sand	LPQL	LPQL	6	6	6	LPQL	3	13	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH2	0-0.2	Fill: silty sand	LPQL	LPQL	15	33	76	LPQL	22	81	33	**3.8**	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	150	150	300	LPQL	LPQL	LPQL	LPQL	Not Detected
BH3	0-0.2	Fill: silty sand	LPQL	LPQL	12	14	64	0.1	7	53	4.7	0.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH4	0-0.2	Fill: silty sand	LPQL	LPQL	12	15	**150**	0.4	6	130	5.2	0.5	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH5	1.0-1.2	Fill: silty sand	4	LPQL	7	9	12	LPQL	4	15	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH5	2.1-2.3	Silty clay	LPQL	LPQL	2	5	8	LPQL	1	3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH6	0-0.2	Fill: silty sand	77	LPQL	13	28	**240**	1	8	160	7.1	0.64	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH6	0.8-1.0	Clayey sand	4	LPQL	9	8	10	LPQL	4	15	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
BH7	0-0.2	Fill: silty sand	5	LPQL	17	20	**140**	0.7	8	110	3	0.3	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH8	0-0.2	Fill: silty sand	6	LPQL	13	11	28	LPQL	3	18	0.83	0.09	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	Not Detected
BH8	0.6-0.8	Clayey sand	LPQL	LPQL	7	3	6	LPQL	1	6	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	NA
Total Number of samples			12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	8
Maximum Value			77	LPQL	17	42	240	1	22	160	33	3.8	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	150	150	300	LPQL	LPQL	LPQL	LPQL	NC

Explanation:

[1] - NSW EPA Waste Classification Guidelines (2014)

[2] - Assessment of Total Moderately Harmful pesticides includes: Dichlorovos, Dimethoate, Fenitrothion, Ethion, Malathion and Parathion

[3] - Assessment of Total Scheduled pesticides include: HBC, alpha-BHC, gamma-BHC, beta-BHC, Heptachlor, Aldrin, Heptachlor Epoxide, gamma-Chlordane, alpha-chlordane, pp-DDE, Dieldrin, Endrin, pp-DDD, pp-DDT, Endrin Aldehyde

Concentration above the CT1 **VALUE**
Concentration above SCC1 **VALUE**
Concentration above the SCC2 **VALUE**

Abbreviations:

PAHs: Polycyclic Aromatic Hydrocarbons
B(a)P: Benzo(a)pyrene
PQL: Practical Quantitation Limit
LPQL: Less than PQL
PID: Photoionisation Detector
PCBs: Polychlorinated Biphenyls
UCL: Upper Level Confidence Limit on Mean Value
NA: Not Analysed
NC: Not Calculated
NSL: No Set Limit
SAC: Site Assessment Criteria
TRH: Total Recoverable Hydrocarbons
CT: Contaminant Threshold
SCC: Specific Contaminant Concentration
HILs: Health Investigation Levels
NEPM: National Environmental Protection Measure
BTEX: Monocyclic Aromatic Hydrocarbons

TABLE B

SOIL LABORATORY TCLP RESULTS

All data in mg/L unless stated otherwise

			Arsenic	Cadmium	Chromium	Lead	Mercury	Nickel	B(a)P
PQL - Envirolab Services			0.05	0.01	0.01	0.03	0.0005	0.02	0.001
TCLP1 - General Solid Waste [1]			5	1	5	5	0.2	2	0.04
TCLP2 - Restricted Solid Waste [1]			20	4	20	20	0.8	8	0.16
TCLP3 - Hazardous Waste [1]			>20	>4	>20	>20	>0.8	>8	>0.16
Sample Reference	**Sample Depth**	**Sample Description**							
BH1	0-0.2	Fill: silty sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH2	0-0.2	Fill: silty sand	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL	LPQL
BH4	0-0.2	Fill: silty sand	LPQL	LPQL	LPQL	0.03	LPQL	LPQL	LPQL
BH6	0-0.2	Fill: silty sand	0.07	LPQL	LPQL	0.1	LPQL	LPQL	NA
BH7	0-0.2	Fill: silty sand	LPQL	LPQL	LPQL	0.05	LPQL	LPQL	NA
Total Number of samples			5	5	5	5	5	5	3
Maximum Value			0.07	LPQL	LPQL	0.1	LPQL	LPQL	LPQL

Explanation:

1 - NSW EPA Waste Classification Guidelines (2014)

General Solid Waste	**VALUE**
Restricted Solid Waste	**VALUE**
Hazardous Waste	**VALUE**

Abbreviations:

PQL: Practical Quantitation Limit

LPQL: Less than PQL

B(a)P: Benzo(a)pyrene

NC: Not Calculated

NA: Not Analysed

TCLP: Toxicity Characteristics Leaching Procedure

TABLE C

SUMMARY OF LABORATORY RESULTS - ACID SULFATE SOILS ANALYSIS (sPOCAS)

		Analysis	pH_{KCL}	TAA	pH_{ox}	TPA	TSA	S_{POS}	S_{Cr}	Liming Rate
				pH 6.5		pH 6.5	pH 6.5	%w/w	%w/w	kg $CaCO_3$/tonne
Action Criteria[1]:		Coarse Textured Soil	pH 5.0	18molH+/ tonne	pH 5.0	18molH+/ tonne	18molH+/ tonne	0.03% w/w	0.03% w/w	
Sample Reference	**Sample Depth (m)**	**Sample Description**								
BH2	1.2-1.4	Silty sand	7.3	LPQL	7.4	LPQL	LPQL	LPQL	NA	LPQL
BH4	2.5-2.7	Clayey sand	4.5	10	4.4	LPQL	LPQL	0.01	NA	1.2
BH5	2.8-3.0	Silty clay	6.3	LPQL	6.1	LPQL	LPQL	LPQL	NA	LPQL
BH8	2.3-2.45	Clayey sand	5.0	7	6.8	LPQL	LPQL	LPQL	NA	LPQL
Total Number of Samples			4	4	4	4	4	4	0	4
Minimum Value			4.5	7	4.4	LPQL	LPQL	0.01	NA	1.2
Maximum Value			7.3	10	7.4	LPQL	LPQL	0.01	NA	1.2

Explanation:

[1] The Action criteria have been adopted from the Acid Sulfate Soil Manual (1998).

Values Exceeding Action Criteria **VALUE**

Abbreviations:

pH_{KCL} : pH of filtered 1:20, 1M KCL extract, shaken overnight

TAA pH 6.5 : Total Actual Acidity in 1M KCL extract titrated to pH6.5

pH_{ox} : pH filtered 1:20 1M KCl after peroxide digestion

TPA : Total Potential Acidity, 1M KCL peroxide digest titrated to pH6.5

TSA: Total Sulfide Acidity

S_{POS}: Peroxide oxidisable Sulfur (SP - SKCL)

Appendix C: Borehole Logs

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BOREHOLE LOG

Borehole No. 1
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 5.4m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION					REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine grained, dark grey, trace of medium grained igneous gravel and ash.	M			GRASS COVER APPEARS POORLY COMPACTED
						0.5			FILL: Silty sand, fine to medium grained, grey and yellow brown, trace of fine grained igneous and ironstone gravel and brick fragments.				
						1							
						1.5		SM	SILTY SAND: fine grained, yellow brown and brown.	M	L		
						2					MD		
						2.5							
									END OF BOREHOLE AT 2.6m				
						3							
						3.5							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. **2** 1/1

Client: TRACT CONSULTANTS

Project: PROPOSED CYCLEWAY

Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 5.2m

Date: 16-6-16 **Datum:** AHD

Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine grained, dark brown.	M			GRASS COVER APPEARS WELL COMPACTED
						0.5			FILL: Silty sand, fine to medium grained, grey and brown.				
	■					1		SM	SILTY SAND: fine to medium grained, brown and yellow brown.	M	L		
	■					1.5					MD		
						2							
				■		2.5		CL	SANDY CLAY: medium plasticity, dark grey and brown.	MC>PL	VSt	250 270 300	
						3			END OF BOREHOLE AT 2.8m				
						3.5							

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BOREHOLE LOG

Borehole No. 3
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 4.3m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine to medium grained, grey, trace of fine grained igneous gravel.	M			GRASS COVER APPEARS WELL COMPACTED
	■					0.5		SM	SILTY SAND: fine grained, yellow brown and brown.	M	L-MD		
						1					MD		
						1.5		SC	CLAYEY SAND: fine to medium grained, brown and grey mottled red brown.	W			
						2					D		
						2.5			END OF BOREHOLE AT 2.5m				
						3							
						3.5							

JK Geotechnics
GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 4
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 2.9m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine grained, dark grey.	M			GRASS COVER APPEARS MODERATELY COMPACTED
									FILL: Silty sand, medium grained, grey, trace of brick fragments.				
						0.5		SM	SILTY SAND: fine grained, brown.	M	VL		POSSIBLY FILL
	■					1		CH	SILTY CLAY: high plasticity, grey mottled brown, with sand, trace of medium grained sandstone gravel.	MC>PL	VSt	280 240 220	
		■		■		1.5							
						2		CL-CH	SANDY CLAY: medium to high plasticity, dark grey.				
						2.5							
						3			END OF BOREHOLE AT 2.8m				
						3.5							

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BOREHOLE LOG

Borehole No. **5** 1/1

Client: TRACT CONSULTANTS

Project: PROPOSED CYCLEWAY

Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 1.7m

Date: 16-6-16 **Datum:** AHD

Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine grained, dark grey, trace of fine to medium grained igneous and sandstone gravel.	M			GRASS COVER APPEARS WELL COMPACTED
						0.5							APPEARS POORLY COMPACTED
	■								FILL: Silty clay, high plasticity, light grey mottled yellow brown.	MC>PL			
						1							
						1.5			FILL: Sandy clay, medium to high plasticity, light grey brown, trace of brick fragments.	MC>PL	St		APPEARS WELL COMPACTED
▼	■					2		CH	SILTY CLAY: high plasticity, light grey.	MC≈PL	VSt		
									END OF BOREHOLE AT 2.3m				
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. 6
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 2.8m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
					REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine to medium grained, dark grey, trace of fine to medium grained sandstone gravel.	M			GRASS COVER APPEARS POORLY COMPACTED
						0.5		SC	CLAYEY SAND: fine to medium grained, light grey mottled yellow brown.	M	VL		
▼						1							
						1.5					MD		
						2				W			
						2.5					D		
						3			END OF BOREHOLE AT 3.0m				
						3.5							

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GEOTECHNICAL AND ENVIRONMENTAL ENGINEERS

BOREHOLE LOG

Borehole No. 7
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 1.2m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine grained, dark grey.	M			GRASS COVER APPEARS WELL COMPACTED
						0.5			FILL: Silty clay, high plasticity, grey and brown mottled red brown, trace of fine to medium grained sandstone gravel and medium grained sand.	MC>PL			
						1							
						1.5			END OF BOREHOLE AT 1.3m				PROBE REFUSAL ON INFERRED SANDSTONE BLOCK
						2							
						2.5							
						3							
						3.5							

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BOREHOLE LOG

Borehole No. 8
1/1

Client: TRACT CONSULTANTS
Project: PROPOSED CYCLEWAY
Location: QUEENS WHARF PARK, PARRAMATTA, NSW

Job No. 29205V **Method:** EZIPROBE **R.L. Surface:** ≈ 5.3m
Date: 16-6-16 **Datum:** AHD
Logged/Checked by: M.S./F.V.

Groundwater Record	SAMPLES ES	SAMPLES U50	SAMPLES DB	SAMPLES DS	Field Tests	Depth (m)	Graphic Log	Unified Classification	DESCRIPTION	Moisture Condition/ Weathering	Strength/ Rel. Density	Hand Penetrometer Readings (kPa.)	Remarks
DRY ON COMPLETION	■				REFER TO DCP TEST RESULTS	0			FILL: Silty sand, fine to medium grained, dark grey and brown, trace of clay and fine grained igneous gravel.	M			GRASS COVER APPEARS POORLY TO MODERATELY COMPACTED
	■					0.5		SC	CLAYEY SAND: fine to medium grained, light grey mottled yellow brown.	M	L		
		■				1					MD		
						1.5					D		
						2							
						2.5			END OF BOREHOLE AT 2.45m				PROBE REFUSAL ON INFERRED IRONSTONE GRAVEL
						3							
						3.5							

Appendix D: Laboratory Report/s & COC Documents

SAMPLE AND CHAIN OF CUSTODY FORM

TO:
ENVIROLAB SERVICES PTY LTD
12 ASHLEY STREET
CHATSWOOD NSW 2067
P: (02) 99106200
F: (02) 99106201

Attention: Aileen

EIS Job Number: E29205K
Date Results Required: STANDARD
Page: 1 of 1

FROM:
ENVIRONMENTAL INVESTIGATION SERVICES
REAR OF 115 WICKS ROAD
MACQUARIE PARK, NSW 2113
P: 02-9888 5000 F: 02-9888 5001
Attention: Harry Leonard

Location: Parramatta
Sampler: HL/MS

Sample Preserved in Esky on Ice
Tests Required

	Date Sampled	Lab Ref:	Sample Number	Depth (m)	Sample Container	PID	Sample Description	Combo 2	Combo 3a	Combo 6	Combo 6a	sPOCAS	pH (1:5 water)	TCLP 6 metals & PAHs					
1	16/6/16		BH1	0-0.2	G, A	0.5	sand F				X			X					
2			BH1	1.6-1.8	G	0.0	sand			X									
3			BH2	0-0.2	G, A	2.2	sand F				X			X					
4			BH2	1.0-1.2	G	0.0	sand												
5			BH3	0-0.2	G, A	0.0	sand F				X								
6			BH3	0.5-0.8	G	0.0	sand												
7			BH4	0-0.2	G, A	0.3	sand F				X			X					
8			BH4	1.3-1.5	G	0.0	sand												
9			BH5	0-0.2	G, A	0.0	sand F												
10			BH5	1.0-1.2	G, A	0.0	sand F				X								
11			BH5	2.1-2.3	G	0.0	sand			X									
12			BH6	0-0.2	G, A	0.0	sand F				X								
13			BH6	0.8-1.0	G	0.0	sand			X									
14			BH7	0-0.2	G, A	0.0	sand F				X								
15			BH8	0-0.2	G, A	0.0	sand F				X								
16			BH8	0.6-0.8	G	0.0	sand			X									
17			BH2	1.2-1.4	P	—	sand					X	X						
18			BH4	2.5-2.7	P	—	sand					X	X						
19			BH6	2.8-3.0	P	—	sand					X	X						
20			BH8	2.3-2.45	P	—	sand					X	X						

ENVIROLAB
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 148581
Date Received: 17/6/2016
Time Received: 14:00
Received by: LN
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Remarks (comments/detection limits required):

Sample Containers:
G - 250mg Glass Jar
A - Ziplock Asbestos Bag
P - Plastic Bag

Relinquished By:	Date:	Time:	Received By:	Date:
HL	17/6/2016			17/6/16

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 148581

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Harry Leonard

Sample log in details:

Your Reference:	**E29205K, Parramatta**
No. of samples:	20 soils
Date samples received / completed instructions received	17/06/16 / 17/06/16

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	24/06/16 / 24/06/16
Date of Preliminary Report:	Not Issued

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Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	---------- -	BH1	BH1	BH2	BH3	BH4
Depth	----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	97	92	96	93	88

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	---------- -	BH5	BH5	BH6	BH6	BH7
Depth	----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	99	83	96	79	85

vTRH(C6-C10)/BTEXN in Soil			
Our Reference:	UNITS	148581-15	148581-16
Your Reference	----------	BH8	BH8
Depth	- ----------	0-0.2	0.6-0.8
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
TRHC$_6$ - C$_9$	mg/kg	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	81	99

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	---------- -	BH1	BH1	BH2	BH3	BH4
Depth	----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	150	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	150	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	220	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	87	75	77	74	74

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	---------- -	BH5	BH5	BH6	BH6	BH7
Depth	----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	140	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Surrogate o-Terphenyl	%	89	83	82	84	85

svTRH (C10-C40) in Soil			
Our Reference:	UNITS	148581-15	148581-16
Your Reference	----------	BH8	BH8
	-		
Depth	----------	0-0.2	0.6-0.8
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
$TRHC_{10}$ - C_{14}	mg/kg	<50	<50
$TRHC_{15}$ - C_{28}	mg/kg	<100	<100
$TRHC_{29}$ - C_{36}	mg/kg	<100	<100
$TRH>C_{10}$-C_{16}	mg/kg	<50	<50
$TRH>C_{10}$ - C_{16} less Naphthalene (F2)	mg/kg	<50	<50
$TRH>C_{16}$-C_{34}	mg/kg	<100	<100
$TRH>C_{34}$-C_{40}	mg/kg	<100	<100
Surrogate o-Terphenyl	%	86	84

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-1 BH1 0-0.2 16/06/2016 SOIL	148581-2 BH1 1.6-1.8 16/06/2016 SOIL	148581-3 BH2 0-0.2 16/06/2016 SOIL	148581-5 BH3 0-0.2 16/06/2016 SOIL	148581-7 BH4 0-0.2 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Naphthalene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	0.5	<0.1	1.3	0.2	0.5
Anthracene	mg/kg	0.2	<0.1	0.4	0.1	0.1
Fluoranthene	mg/kg	1.6	<0.1	5.2	0.8	0.9
Pyrene	mg/kg	1.5	<0.1	5.3	0.8	0.9
Benzo(a)anthracene	mg/kg	0.8	<0.1	3.0	0.4	0.4
Chrysene	mg/kg	0.7	<0.1	2.9	0.4	0.4
Benzo(b,j+k)fluoranthene	mg/kg	1	<0.2	6.0	0.8	0.8
Benzo(a)pyrene	mg/kg	0.82	<0.05	3.8	0.5	0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.1	2.4	0.3	0.3
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	0.5	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	0.5	<0.1	2.3	0.3	0.3
Benzo(a)pyrene TEQ calc (zero)	mg/kg	1.1	<0.5	5.4	0.6	0.6
Benzo(a)pyrene TEQ calc(half)	mg/kg	1.1	<0.5	5.4	0.7	0.7
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	1.2	<0.5	5.4	0.7	0.7
Total Positive PAHs	mg/kg	8.8	NIL (+)VE	33	4.7	5.2
Surrogate p-Terphenyl-d14	%	89	92	91	88	93

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-10 BH5 1.0-1.2 16/06/2016 SOIL	148581-11 BH5 2.1-2.3 16/06/2016 SOIL	148581-12 BH6 0-0.2 16/06/2016 SOIL	148581-13 BH6 0.8-1.0 16/06/2016 SOIL	148581-14 BH7 0-0.2 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Naphthalene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	0.4	<0.1	0.2
Anthracene	mg/kg	<0.1	<0.1	0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	1.2	<0.1	0.6
Pyrene	mg/kg	<0.1	<0.1	1.1	<0.1	0.6
Benzo(a)anthracene	mg/kg	<0.1	<0.1	0.6	<0.1	0.3
Chrysene	mg/kg	<0.1	<0.1	0.7	<0.1	0.3
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	1	<0.2	0.5
Benzo(a)pyrene	mg/kg	<0.05	<0.05	0.64	<0.05	0.3
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	0.4	<0.1	0.2
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	0.4	<0.1	0.2
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	0.9	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	0.9	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	1	<0.5	<0.5
Total Positive PAHs	mg/kg	NIL (+)VE	NIL (+)VE	7.1	NIL (+)VE	3.0
Surrogate p-Terphenyl-d14	%	93	92	95	91	92

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-15 BH8 0-0.2 16/06/2016 SOIL	148581-16 BH8 0.6-0.8 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	0.3	<0.1
Pyrene	mg/kg	0.2	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	0.09	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Total Positive PAHs	mg/kg	0.83	NIL (+)VE
Surrogate p-Terphenyl-d14	%	96	91

Organochlorine Pesticides in soil						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	----------	BH1	BH1	BH2	BH3	BH4
Depth	- ----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	94	91	85	93

Organochlorine Pesticides in soil						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	----------	BH5	BH5	BH6	BH6	BH7
Depth	- ----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	93	91	92	89

Organochlorine Pesticides in soil			
Our Reference:	UNITS	148581-15	148581-16
Your Reference	----------	BH8	BH8
	-		
Depth	----------	0-0.2	0.6-0.8
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Surrogate TCMX	%	94	92

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-1 BH1 0-0.2 16/06/2016 SOIL	148581-2 BH1 1.6-1.8 16/06/2016 SOIL	148581-3 BH2 0-0.2 16/06/2016 SOIL	148581-5 BH3 0-0.2 16/06/2016 SOIL	148581-7 BH4 0-0.2 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	94	94	91	85	93

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-10 BH5 1.0-1.2 16/06/2016 SOIL	148581-11 BH5 2.1-2.3 16/06/2016 SOIL	148581-12 BH6 0-0.2 16/06/2016 SOIL	148581-13 BH6 0.8-1.0 16/06/2016 SOIL	148581-14 BH7 0-0.2 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	92	93	91	92	89

Organophosphorus Pesticides Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	148581-15 BH8 0-0.2 16/06/2016 SOIL	148581-16 BH8 0.6-0.8 16/06/2016 SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Surrogate TCMX	%	94	92

PCBs in Soil						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	----------	BH1	BH1	BH2	BH3	BH4
Depth	- ----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	94	94	91	85	93

PCBs in Soil						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	----------	BH5	BH5	BH6	BH6	BH7
Depth	- ----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	92	93	91	92	89

PCBs in Soil			
Our Reference:	UNITS	148581-15	148581-16
Your Reference	----------	BH8	BH8
	-		
Depth	----------	0-0.2	0.6-0.8
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	94	92

Acid Extractable metals in soil						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	---------- -	BH1	BH1	BH2	BH3	BH4
Depth	----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Arsenic	mg/kg	4	<4	<4	<4	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	15	6	15	12	12
Copper	mg/kg	42	6	33	14	15
Lead	mg/kg	74	6	76	64	150
Mercury	mg/kg	0.1	<0.1	<0.1	0.1	0.4
Nickel	mg/kg	18	3	22	7	6
Zinc	mg/kg	97	13	81	53	130

Acid Extractable metals in soil						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	---------- -	BH5	BH5	BH6	BH6	BH7
Depth	----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Arsenic	mg/kg	4	<4	77	4	5
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	7	2	13	9	17
Copper	mg/kg	9	5	28	8	20
Lead	mg/kg	12	8	240	10	140
Mercury	mg/kg	<0.1	<0.1	1	<0.1	0.7
Nickel	mg/kg	4	1	8	4	8
Zinc	mg/kg	15	3	160	15	110

Acid Extractable metals in soil				
Our Reference:	UNITS	148581-15	148581-16	148581-21
Your Reference	---------- -	BH8	BH8	BH8 - TRIPLICATE
Depth	----------	0-0.2	0.6-0.8	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016
Arsenic	mg/kg	6	<4	7
Cadmium	mg/kg	<0.4	<0.4	<0.4
Chromium	mg/kg	13	7	13
Copper	mg/kg	11	3	13
Lead	mg/kg	28	6	40
Mercury	mg/kg	<0.1	<0.1	<0.1
Nickel	mg/kg	3	1	6
Zinc	mg/kg	18	6	26

Moisture						
Our Reference:	UNITS	148581-1	148581-2	148581-3	148581-5	148581-7
Your Reference	---------- -	BH1	BH1	BH2	BH3	BH4
Depth	----------	0-0.2	1.6-1.8	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	21/06/2016	21/06/2016	21/06/2016	21/06/2016	21/06/2016
Moisture	%	20	8.0	20	12	18

Moisture						
Our Reference:	UNITS	148581-10	148581-11	148581-12	148581-13	148581-14
Your Reference	---------- -	BH5	BH5	BH6	BH6	BH7
Depth	----------	1.0-1.2	2.1-2.3	0-0.2	0.8-1.0	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	21/06/2016	21/06/2016	21/06/2016	21/06/2016	21/06/2016
Moisture	%	14	14	12	14	11

Moisture			
Our Reference:	UNITS	148581-15	148581-16
Your Reference	---------- -	BH8	BH8
Depth	----------	0-0.2	0.6-0.8
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016
Date analysed	-	21/06/2016	21/06/2016
Moisture	%	16	11

Asbestos ID - soils						
Our Reference:	UNITS	148581-1	148581-3	148581-5	148581-7	148581-10
Your Reference	---------- -	BH1	BH2	BH3	BH4	BH5
Depth	----------	0-0.2	0-0.2	0-0.2	0-0.2	1.0-1.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL	SOIL
Date analysed	-	22/06/2016	22/06/2016	22/06/2016	22/06/2016	22/06/2016
Sample mass tested	g	Approx. 25g	Approx. 40g	Approx. 60g	Approx. 40g	Approx. 50g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils				
Our Reference:	UNITS	148581-12	148581-14	148581-15
Your Reference	---------- -	BH6	BH7	BH8
Depth	----------	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL
Date analysed	-	22/06/2016	22/06/2016	22/06/2016
Sample mass tested	g	Approx. 70g	Approx. 75g	Approx. 30g
Sample Description	-	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected

Metals in TCLP USEPA1311				
Our Reference:	UNITS	148581-1	148581-3	148581-7
Your Reference	----------	BH1	BH2	BH4
	-			
Depth	----------	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016
pH of soil for fluid# determ.	pH units	6.4	6.5	6.3
pH of soil TCLP (after HCl)	pH units	4.8	4.7	4.7
Extraction fluid used	-	1	1	1
pH of final Leachate	pH units	5.0	4.9	5.0
Arsenic in TCLP	mg/L	<0.05	<0.05	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01	<0.01
Lead in TCLP	mg/L	<0.03	<0.03	0.03
Mercury in TCLP	mg/L	<0.0005	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02	<0.02

PAHs in TCLP (USEPA 1311)				
Our Reference:	UNITS	148581-1	148581-3	148581-7
Your Reference	----------	BH1	BH2	BH4
	-			
Depth	----------	0-0.2	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL
Date extracted	-	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016
Naphthalene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthylene in TCLP	mg/L	<0.001	<0.001	<0.001
Acenaphthene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluorene in TCLP	mg/L	<0.001	<0.001	<0.001
Phenanthrene in TCLP	mg/L	<0.001	<0.001	<0.001
Anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Fluoranthene in TCLP	mg/L	<0.001	<0.001	<0.001
Pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(a)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Chrysene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(bjk)fluoranthene in TCLP	mg/L	<0.002	<0.002	<0.002
Benzo(a)pyrene in TCLP	mg/L	<0.001	<0.001	<0.001
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	<0.001	<0.001	<0.001
Dibenzo(a,h)anthracene in TCLP	mg/L	<0.001	<0.001	<0.001
Benzo(g,h,i)perylene in TCLP	mg/L	<0.001	<0.001	<0.001
Total +ve PAH's	mg/L	NIL (+)VE	NIL (+)VE	NIL (+)VE
Surrogate p-Terphenyl-d14	%	105	70	84

Misc Inorg - Soil					
Our Reference:	UNITS	148581-17	148581-18	148581-19	148581-20
Your Reference	----------	BH2	BH4	BH5	BH8
	-				
Depth	----------	1.2-1.4	2.5-2.7	2.8-3.0	2.3-2.45
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016
pH 1:5 soil:water	pH Units	7.9	7.2	7.1	5.5

sPOCAS Our Reference: Your Reference	UNITS ----------	148581-17 BH2	148581-18 BH4	148581-19 BH5	148581-20 BH8
	-				
Depth	----------	1.2-1.4	2.5-2.7	2.8-3.0	2.3-2.45
Date Sampled		16/06/2016	16/06/2016	16/06/2016	16/06/2016
Type of sample		SOIL	SOIL	SOIL	SOIL
Date prepared	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016
Date analysed	-	20/06/2016	20/06/2016	20/06/2016	20/06/2016
pH kcl	pH units	7.3	4.5	6.3	5.0
TAA pH 6.5	moles H^+/t	<5	10	<5	7
s-TAA pH 6.5	%w/w S	<0.01	0.02	<0.01	0.01
pH Ox	pH units	7.4	4.4	6.1	6.8
TPA pH 6.5	moles H^+/t	<5	<5	<5	<5
s-TPA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
TSA pH 6.5	moles H^+/t	<5	<5	<5	<5
s-TSA pH 6.5	%w/w S	<0.01	<0.01	<0.01	<0.01
ANCE	% $CaCO_3$	0.14	<0.05	<0.05	0.12
a-ANCE	moles H^+/t	27	NA	NA	25
s-ANCE	%w/w S	<0.05	<0.05	<0.05	<0.05
SKCl	%w/w S	<0.005	<0.005	<0.005	0.01
SP	%w/w	<0.005	0.01	<0.005	0.01
SPOS	%w/w	<0.005	0.01	<0.005	<0.005
a-SPOS	moles H^+/t	<5	6	<5	<5
CaKCl	%w/w	0.08	0.006	0.06	0.06
CaP	%w/w	0.07	0.006	0.06	0.06
CaA	%w/w	<0.005	<0.005	<0.005	<0.005
MgKCl	%w/w	0.006	0.023	0.022	0.044
MgP	%w/w	0.008	0.020	0.023	0.044
MgA	%w/w	<0.005	<0.005	<0.005	<0.005
SHCl	%w/w S	[NT]	<0.005	[NT]	[NT]
SNAS	%w/w S	<0.005	<0.005	<0.005	<0.005
a-SNAS	moles H^+/t	[NT]	<5	[NT]	[NT]
s-SNAS	%w/w S	<0.01	<0.01	<0.01	<0.01
Fineness Factor	-	1.5	1.5	1.5	1.5
a-Net Acidity	moles H^+/t	<10	16	<10	<10
Liming rate	kg $CaCO_3$/t	<0.75	1.2	<0.75	<0.75
a-Net Acidity without ANCE	moles H^+/t	<10	[NT]	[NT]	[NT]
Liming rate without ANCE	kg $CaCO_3$/t	<0.75	[NT]	[NT]	[NT]

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 deg C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.
Org-012	Leachates are extracted with Dichloromethane and analysed by GC-MS.

Method ID	Methodology Summary
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013.
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS.
Inorg-064	sPOCAS determined using titrimetric and ICP-AES techniques. Based on Acid Sulfate Soils Laboratory Methods Guidelines, Version 2.1 - June 2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
TRHC6 - C9	mg/kg	25	Org-016	<25	148581-1	<25 || <25	LCS-1	115%
TRHC6 - C10	mg/kg	25	Org-016	<25	148581-1	<25 || <25	LCS-1	115%
Benzene	mg/kg	0.2	Org-016	<0.2	148581-1	<0.2 || <0.2	LCS-1	114%
Toluene	mg/kg	0.5	Org-016	<0.5	148581-1	<0.5 || <0.5	LCS-1	101%
Ethylbenzene	mg/kg	1	Org-016	<1	148581-1	<1 || <1	LCS-1	116%
m+p-xylene	mg/kg	2	Org-016	<2	148581-1	<2 || <2	LCS-1	121%
o-Xylene	mg/kg	1	Org-016	<1	148581-1	<1 || <1	LCS-1	115%
naphthalene	mg/kg	1	Org-014	<1	148581-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	103	148581-1	97 || 93 || RPD: 4	LCS-1	106%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
TRHC10 - C14	mg/kg	50	Org-003	<50	148581-1	<50 || <50	LCS-1	89%
TRHC15 - C28	mg/kg	100	Org-003	<100	148581-1	<100 || 100	LCS-1	83%
TRHC29 - C36	mg/kg	100	Org-003	<100	148581-1	<100 || <100	LCS-1	77%
TRH>C10-C16	mg/kg	50	Org-003	<50	148581-1	<50 || <50	LCS-1	89%
TRH>C16-C34	mg/kg	100	Org-003	<100	148581-1	<100 || 120	LCS-1	83%
TRH>C34-C40	mg/kg	100	Org-003	<100	148581-1	<100 || <100	LCS-1	77%
Surrogate o-Terphenyl	%		Org-003	79	148581-1	87 || 79 || RPD: 10	LCS-1	90%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Naphthalene	mg/kg	0.1	Org-012	<0.1	148581-1	<0.1 || <0.1	LCS-1	88%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	148581-1	0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	148581-1	<0.1 || <0.1	LCS-1	88%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	148581-1	0.5 || 0.4 || RPD: 22	LCS-1	105%
Anthracene	mg/kg	0.1	Org-012	<0.1	148581-1	0.2 || 0.1 || RPD: 67	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	148581-1	1.6 || 1.3 || RPD: 21	LCS-1	86%
Pyrene	mg/kg	0.1	Org-012	<0.1	148581-1	1.5 || 1.2 || RPD: 22	LCS-1	80%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	148581-1	0.8 || 0.6 || RPD: 29	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	148581-1	0.7 || 0.6 || RPD: 15	LCS-1	93%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	148581-1	1 || 1 || RPD: 0	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	148581-1	0.82 || 0.70 || RPD: 16	LCS-1	98%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	148581-1	0.5 || 0.4 || RPD: 22	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	148581-1	0.5 || 0.4 || RPD: 22	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	93	148581-1	89 || 88 || RPD: 1	LCS-1	112%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
HCB	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	92%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	88%
Heptachlor	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	88%
delta-BHC	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	87%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	91%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	93%
Dieldrin	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	91%
Endrin	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	85%
pp-DDD	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	92%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	LCS-1	87%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	96	148581-1	94 || 92 || RPD: 2	LCS-1	111%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	92%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	92%
Dimethoate	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	96%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	96%
Malathion	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	88%
Parathion	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	96%
Ronnel	mg/kg	0.1	Org-008	<0.1	148581-1	<0.1 || <0.1	LCS-1	95%
Surrogate TCMX	%		Org-008	96	148581-1	94 || 92 || RPD: 2	LCS-1	94%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	LCS-1	99%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	148581-1	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	96	148581-1	94 || 92 || RPD: 2	LCS-1	94%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-1	20/06/2016
Arsenic	mg/kg	4	Metals-020	<4	148581-1	4 || 4 || RPD: 0	LCS-1	104%
Cadmium	mg/kg	0.4	Metals-020	<0.4	148581-1	<0.4 || <0.4	LCS-1	101%
Chromium	mg/kg	1	Metals-020	<1	148581-1	15 || 12 || RPD: 22	LCS-1	101%
Copper	mg/kg	1	Metals-020	<1	148581-1	42 || 40 || RPD: 5	LCS-1	104%
Lead	mg/kg	1	Metals-020	<1	148581-1	74 || 63 || RPD: 16	LCS-1	98%
Mercury	mg/kg	0.1	Metals-021	<0.1	148581-1	0.1 || 0.1 || RPD: 0	LCS-1	111%
Nickel	mg/kg	1	Metals-020	<1	148581-1	18 || 19 || RPD: 5	LCS-1	97%
Zinc	mg/kg	1	Metals-020	<1	148581-1	97 || 92 || RPD: 5	LCS-1	98%
QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-W1	20/06/2016
Date analysed	-			20/06/2016	148581-1	20/06/2016 || 20/06/2016	LCS-W1	20/06/2016
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	148581-1	<0.05 || <0.05	LCS-W1	109%
Cadmium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	148581-1	<0.01 || <0.01	LCS-W1	110%
Chromium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	148581-1	<0.01 || <0.01	LCS-W1	106%
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	148581-1	<0.03 || <0.03	LCS-W1	100%
Mercury in TCLP	mg/L	0.0005	Metals-021 CV-AAS	<0.0005	148581-1	<0.0005 || <0.0005	LCS-W1	88%
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	148581-1	<0.02 || <0.02	LCS-W1	104%

QUALITY CONTROL PAHs in TCLP (USEPA 1311)	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			20/06/2016	[NT]	[NT]	LCS-W1	20/06/2016
Date analysed	-			20/06/2016	[NT]	[NT]	LCS-W1	20/06/2016
Naphthalene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	72%
Acenaphthylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Acenaphthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluorene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	75%
Phenanthrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	87%
Anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Fluoranthene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	72%
Pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	76%
Benzo(a)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Chrysene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	79%
Benzo(bjk)fluoranthene in TCLP	mg/L	0.002	Org-012	<0.002	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	LCS-W1	79%
Indeno(1,2,3-c,d)pyrene - TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene in TCLP	mg/L	0.001	Org-012	<0.001	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	101	[NT]	[NT]	LCS-W1	82%

QUALITY CONTROL Misc Inorg - Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			[NT]	[NT]	[NT]	LCS-1	20/06/2016
Date analysed	-			[NT]	[NT]	[NT]	LCS-1	20/06/2016
pH 1:5 soil:water	pH Units		Inorg-001	[NT]	[NT]	[NT]	LCS-1	101%
QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			20/06/2016	[NT]	[NT]	LCS-1	20/06/2016
Date analysed	-			20/06/2016	[NT]	[NT]	LCS-1	20/06/2016
pH_{kcl}	pH units		Inorg-064	[NT]	[NT]	[NT]	LCS-1	97%
TAA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS-1	99%
s-TAA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NR]	[NR]
pH_{Ox}	pH units		Inorg-064	[NT]	[NT]	[NT]	LCS-1	104%
TPA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	LCS-1	74%
s-TPA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NR]	[NR]
TSA pH 6.5	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
s-TSA pH 6.5	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NR]	[NR]
ANC_E	% $CaCO_3$	0.05	Inorg-064	<0.05	[NT]	[NT]	[NR]	[NR]
a-ANC_E	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
s-ANC_E	%w/w S	0.05	Inorg-064	<0.05	[NT]	[NT]	[NR]	[NR]
S_{KCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
S_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
S_{POS}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
a-S_{POS}	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
Ca_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
Ca_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
Ca_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
Mg_{KCl}	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
Mg_P	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
Mg_A	%w/w	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
S_{HCl}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
S_{NAS}	%w/w S	0.005	Inorg-064	<0.005	[NT]	[NT]	[NR]	[NR]
a-S_{NAS}	moles H^+/t	5	Inorg-064	<5	[NT]	[NT]	[NR]	[NR]
s-S_{NAS}	%w/w S	0.01	Inorg-064	<0.01	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL sPOCAS	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Fineness Factor	-	1.5	Inorg-064	<1.5	[NT]	[NT]	[NR]	[NR]
a-Net Acidity	moles H^+/t	10	Inorg-064	<10	[NT]	[NT]	[NR]	[NR]
Liming rate	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NR]	[NR]
a-Net Acidity without ANCE	moles H^+/t	10	Inorg-064	<10	[NT]	[NT]	[NR]	[NR]
Liming rate without ANCE	kg $CaCO_3$/t	0.75	Inorg-064	<0.75	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
$TRHC_6$ - C_9	mg/kg	148581-15	<25 || <25	148581-2	94%
$TRHC_6$ - C_{10}	mg/kg	148581-15	<25 || <25	148581-2	94%
Benzene	mg/kg	148581-15	<0.2 || <0.2	148581-2	82%
Toluene	mg/kg	148581-15	<0.5 || <0.5	148581-2	77%
Ethylbenzene	mg/kg	148581-15	<1 || <1	148581-2	99%
m+p-xylene	mg/kg	148581-15	<2 || <2	148581-2	105%
o-Xylene	mg/kg	148581-15	<1 || <1	148581-2	100%
naphthalene	mg/kg	148581-15	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	148581-15	81 || 91 || RPD: 12	148581-2	82%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
$TRHC_{10}$ - C_{14}	mg/kg	148581-15	<50 || <50	148581-2	78%
$TRHC_{15}$ - C_{28}	mg/kg	148581-15	<100 || <100	148581-2	70%
$TRHC_{29}$ - C_{36}	mg/kg	148581-15	<100 || <100	148581-2	74%
$TRH>C_{10}$-C_{16}	mg/kg	148581-15	<50 || <50	148581-2	78%
$TRH>C_{16}$-C_{34}	mg/kg	148581-15	<100 || <100	148581-2	70%
$TRH>C_{34}$-C_{40}	mg/kg	148581-15	<100 || <100	148581-2	74%
Surrogate o-Terphenyl	%	148581-15	86 || 86 || RPD: 0	148581-2	75%

QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Naphthalene	mg/kg	148581-15	<0.1 || <0.1	148581-2	110%
Acenaphthylene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	148581-15	<0.1 || <0.1	148581-2	110%
Phenanthrene	mg/kg	148581-15	0.1 || <0.1	148581-2	122%
Anthracene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	148581-15	0.3 || <0.1	148581-2	108%
Pyrene	mg/kg	148581-15	0.2 || <0.1	148581-2	104%
Benzo(a)anthracene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	148581-15	0.1 || <0.1	148581-2	116%
Benzo(b,j+k)fluoranthene	mg/kg	148581-15	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	148581-15	0.09 || <0.05	148581-2	122%
Indeno(1,2,3-c,d)pyrene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	148581-15	96 || 91 || RPD: 5	148581-2	120%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
HCB	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	148581-15	<0.1 || <0.1	148581-2	95%
gamma-BHC	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	148581-15	<0.1 || <0.1	148581-2	94%
Heptachlor	mg/kg	148581-15	<0.1 || <0.1	148581-2	88%
delta-BHC	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	148581-15	<0.1 || <0.1	148581-2	90%
Heptachlor Epoxide	mg/kg	148581-15	<0.1 || <0.1	148581-2	93%
gamma-Chlordane	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	148581-15	<0.1 || <0.1	148581-2	91%
Dieldrin	mg/kg	148581-15	<0.1 || <0.1	148581-2	96%
Endrin	mg/kg	148581-15	<0.1 || <0.1	148581-2	93%
pp-DDD	mg/kg	148581-15	<0.1 || <0.1	148581-2	95%
Endosulfan II	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	148581-15	<0.1 || <0.1	148581-2	90%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Methoxychlor	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%	148581-15	94 || 92 || RPD: 2	148581-2	94%
QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Azinphos-methyl (Guthion)	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	148581-15	<0.1 || <0.1	148581-2	87%
Chlorpyriphos-methyl	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	148581-15	<0.1 || <0.1	148581-2	88%
Dimethoate	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	148581-15	<0.1 || <0.1	148581-2	91%
Fenitrothion	mg/kg	148581-15	<0.1 || <0.1	148581-2	85%
Malathion	mg/kg	148581-15	<0.1 || <0.1	148581-2	75%
Parathion	mg/kg	148581-15	<0.1 || <0.1	148581-2	81%
Ronnel	mg/kg	148581-15	<0.1 || <0.1	148581-2	89%
Surrogate TCMX	%	148581-15	94 || 92 || RPD: 2	148581-2	92%
QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Aroclor 1016	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	148581-15	<0.1 || <0.1	148581-2	95%
Aroclor 1260	mg/kg	148581-15	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	148581-15	94 || 92 || RPD: 2	148581-2	92%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Date analysed	-	148581-15	20/06/2016 || 20/06/2016	148581-2	20/06/2016
Arsenic	mg/kg	148581-15	6 || 5 || RPD: 18	148581-2	93%
Cadmium	mg/kg	148581-15	<0.4 || <0.4	148581-2	98%
Chromium	mg/kg	148581-15	13 || 11 || RPD: 17	148581-2	97%
Copper	mg/kg	148581-15	11 || 12 || RPD: 9	148581-2	102%
Lead	mg/kg	148581-15	28 || 43 || RPD: 42	148581-2	92%
Mercury	mg/kg	148581-15	<0.1 || <0.1	148581-2	110%
Nickel	mg/kg	148581-15	3 || 5 || RPD: 50	148581-2	94%
Zinc	mg/kg	148581-15	18 || 29 || RPD: 47	148581-2	96%

QUALITY CONTROL sPOCAS	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
Date prepared	-	148581-17	20/06/2016 || 20/06/2016
Date analysed	-	148581-17	20/06/2016 || 20/06/2016
pH $_{kcl}$	pH units	148581-17	7.3 || 7.3 || RPD: 0
TAA pH 6.5	moles H^+/t	148581-17	<5 || <5
s-TAA pH 6.5	%w/w S	148581-17	<0.01 || <0.01
pH $_{Ox}$	pH units	148581-17	7.4 || 7.4 || RPD: 0
TPA pH 6.5	moles H^+/t	148581-17	<5 || <5
s-TPA pH 6.5	%w/w S	148581-17	<0.01 || <0.01
TSA pH 6.5	moles H^+/t	148581-17	<5 || <5
s-TSA pH 6.5	%w/w S	148581-17	<0.01 || <0.01
ANC_E	% $CaCO_3$	148581-17	0.14 || 0.17 || RPD: 19
a-ANC_E	moles H^+/t	148581-17	27 || 35 || RPD: 26
s-ANC_E	%w/w S	148581-17	<0.05 || 0.06
S_{KCl}	%w/w S	148581-17	<0.005 || <0.005
S_P	%w/w	148581-17	<0.005 || <0.005
S_{POS}	%w/w	148581-17	<0.005 || <0.005
a-S_{POS}	moles H^+/t	148581-17	<5 || <5
Ca_{KCl}	%w/w	148581-17	0.08 || 0.07 || RPD: 13
Ca_P	%w/w	148581-17	0.07 || 0.07 || RPD: 0
Ca_A	%w/w	148581-17	<0.005 || <0.005
Mg_{KCl}	%w/w	148581-17	0.006 || 0.005 || RPD: 18
Mg_P	%w/w	148581-17	0.008 || 0.008 || RPD: 0
Mg_A	%w/w	148581-17	<0.005 || <0.005
S_{NAS}	%w/w S	148581-17	<0.005 || <0.005

QUALITY CONTROL sPOCAS	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD
s-S_{NAS}	%w/w S	148581-17	<0.01 || <0.01
Fineness Factor	-	148581-17	1.5 || 1.5 || RPD: 0
a-Net Acidity	moles H^+/t	148581-17	<10 || <10
Liming rate	kg $CaCO_3$/t	148581-17	<0.75 || <0.75
a-Net Acidity without ANCE	moles H^+/t	148581-17	<10 || <10
Liming rate without ANCE	kg $CaCO_3$/t	148581-17	<0.75 || <0.75

Report Comments:

Acid Extractable Metals in Soil: The laboratory RPD acceptance criteria has been exceeded for 148581-15 for Ni. Therefore a triplicate result has been issued as laboratory sample number 148581-21.

Asbestos ID was analysed by Approved Identifier: Paul Ching
Asbestos ID was authorised by Approved Signatory: Paul Ching

INS: Insufficient sample for this test
NR: Test not required
<: Less than
PQL: Practical Quantitation Limit
RPD: Relative Percent Difference
>: Greater than
NT: Not tested
NA: Test not required
LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Aileen Hie

From: Harry Leonard <HLeonard@jkgroup.net.au>
Sent: Friday, 1 July 2016 2:17 PM
To: Aileen Hie
Subject: RE: Results for Registration 148581 E29205K, Parramatta
Attachments: 148581-[R00].PDF; 148581.Excel.xlsx; 148581-coc.pdf

Hi Aileen,

Could you please undertake the following TCLP analysis on a **Standard turnaround:**

1) Sample BH6 (0-0.2) – TCLP for 6 metals; - 12
2) Sample BH7 (0-0.2) – TCLP for 6 metals. - 14

148581-A
Due 8/7

Any issues, please let me know. Thank you.

Regards,

Harry Leonard
Environmental Scientist
HLeonard@jkgroup.net.au
www.jkgroup.net.au

Environmental Investigation Services
CONSULTING ENVIRONMENTAL ENGINEERS AND SCIENTISTS
PO Box 976, North Ryde BC NSW 1670
115 Wicks Rd, Macquarie Park NSW 2113
T: +612 9888 5000 F: +612 9888 5001

From: Alexander Maclean [mailto:AMaclean@envirolab.com.au]
Sent: Friday, 24 June 2016 3:55 PM
To: Harry Leonard <HLeonard@jkgroup.net.au>
Subject: Results for Registration 148581 E29205K, Parramatta

Please refer to attached for:
a copy of the Certificate of Analysis
a copy of the Invoice
a copy of the COC
an excel file containing the results

Please note that a hard copy will not be posted.

Enquiries should be made directly to:
sydney@envirolab.com.au

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 148581-A

Client:

Environmental Investigation Services
PO Box 976
North Ryde BC
NSW 1670

Attention: Harry Leonard

Sample log in details:

Your Reference:	**E29205K, Parramatta**
No. of samples:	20 soils
Date samples received / completed instructions received	01/07/16 / 01/07/16

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	8/07/16 / 8/07/16
Date of Preliminary Report:	Not Issued

NATA accreditation number 2901. This document shall not be reproduced except in full.
Accredited for compliance with ISO/IEC 17025. **Tests not covered by NATA are denoted with *.**

Results Approved By:

David Springer
General Manager

Metals in TCLP USEPA1311			
Our Reference:	UNITS	148581-A-12	148581-A-14
Your Reference	----------	BH6	BH7
	-		
Depth	----------	0-0.2	0-0.2
Date Sampled		16/06/2016	16/06/2016
Type of sample		SOIL	SOIL
Date extracted	-	04/07/2016	04/07/2016
Date analysed	-	04/07/2016	04/07/2016
pH of soil for fluid# determ.	pH units	6.1	6.7
pH of soil TCLP (after HCl)	pH units	1.5	1.6
Extraction fluid used	-	1	1
pH of final Leachate	pH units	4.9	4.9
Arsenic in TCLP	mg/L	0.07	<0.05
Cadmium in TCLP	mg/L	<0.01	<0.01
Chromium in TCLP	mg/L	<0.01	<0.01
Lead in TCLP	mg/L	0.1	0.05
Mercury in TCLP	mg/L	<0.0005	<0.0005
Nickel in TCLP	mg/L	<0.02	<0.02

Method ID	Methodology Summary
Inorg-004	Toxicity Characteristic Leaching Procedure (TCLP) using in house method INORG-004.
EXTRACT.7	Toxicity Characteristic Leaching Procedure (TCLP).
Inorg-001	pH - Measured using pH meter and electrode in accordance with APHA latest edition, 4500-H+. Please note that the results for water analyses are indicative only, as analysis outside of the APHA storage times.
Metals-020 ICP-AES	Determination of various metals by ICP-AES.
Metals-021 CV-AAS	Determination of Mercury by Cold Vapour AAS.

QUALITY CONTROL Metals in TCLP USEPA1311	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			04/07/2016	[NT]	[NT]	LCS-W1	04/07/2016
Date analysed	-			04/07/2016	[NT]	[NT]	LCS-W1	04/07/2016
Arsenic in TCLP	mg/L	0.05	Metals-020 ICP-AES	<0.05	[NT]	[NT]	LCS-W1	88%
Cadmium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	[NT]	[NT]	LCS-W1	92%
Chromium in TCLP	mg/L	0.01	Metals-020 ICP-AES	<0.01	[NT]	[NT]	LCS-W1	94%
Lead in TCLP	mg/L	0.03	Metals-020 ICP-AES	<0.03	[NT]	[NT]	LCS-W1	90%
Mercury in TCLP	mg/L	0.0005	Metals-021 CV-AAS	<0.0005	[NT]	[NT]	LCS-W1	84%
Nickel in TCLP	mg/L	0.02	Metals-020 ICP-AES	<0.02	[NT]	[NT]	LCS-W1	91%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

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Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Document Set ID: 313669
Version: 1, Version Date: 10/12/2024

APPENDIX H- CONTAMINATED LAND RECORDS

Search results

Your search for: LGA: CITY OF PARRAMATTA COUNCIL

Matched 174 notices relating to 27 sites.

Search Again | Refine Search

Suburb	Address	Site Name	Notices related to this site
AUBURN	Jamieson STREET	Department of Corrective Services land adjacent to the former Auburn Landfill	1 former
CAMELLIA	12 Grand AVENUE	Bitumen Manufacturer	2 current and 11 former
CAMELLIA	37A and 39 Grand AVENUE	Former Asciano Properties	9 current and 4 former
CAMELLIA	Durham STREET	Former Shell Clyde Refinery	3 current and 2 former
CAMELLIA	14 Grand AVENUE	Hymix Concrete	1 current and 2 former
CAMELLIA	1 Grand AVENUE	James Hardie Factory (former, eastern portion)	1 former
CAMELLIA	41 Grand AVENUE	Sydney Water	3 former
CAMELLIA	37 Grand AVENUE	Veolia	7 current and 3 former
CAMELLIA	13 Grand AVENUE	Wrigg	1 current
HOMEBUSH BAY	No specific Street OTHER	Homebush Bay General Area	2 former
HOMEBUSH BAY	25 Bennelong ROAD	Timber Treatment Plant	4 former
ROSEHILL	2 Ritchie STREET	2 Ritchie Street, Rosehill	2 former
ROSEHILL	4 Grand AVENUE	Former Akzo Nobel site	3 current and 21 former
ROSEHILL	8 and 10 Colquhoun Street and 5 Devon STREET	James Hardie Australia and former James Hardie lands	4 current and 10 former
RYDALMERE	348 Victoria ROAD	Mitsubishi Electric	2 current and 10 former
RYDALMERE	1 Alan STREET	Rheem Australia	5 former
SILVERWATER	Carnarvon ROAD	Former Silverwater Landfill	1 current and 6 former
SILVERWATER	54-58 Derby STREET	Storage Facility	2 current
SYDNEY OLYMPIC PARK	Shane Gould AVENUE	Aquatic Centre Carpark Landfill	1 current and 8 former
SYDNEY OLYMPIC PARK	Bicentennial DRIVE	Bicentennial Park	1 current and 2 former

1 2

Search results

Your search for: LGA: CITY OF PARRAMATTA COUNCIL

Matched 174 notices relating to 27 sites.

Search Again | Refine Search

Suburb	Address	Site Name	Notices related to this site
SYDNEY OLYMPIC PARK	Jamieson STREET	Blaxland Common Landfill	1 current and 3 former
SYDNEY OLYMPIC PARK	Sarah Durack AVENUE	Former Golf Driving Range Landfill	2 current and 6 former
SYDNEY OLYMPIC PARK	At Kronos Hill, Kevin Coombes AVENUE	Haslams Creek South Area 3	1 current and 3 former
SYDNEY OLYMPIC PARK	Kevin Coombes AVENUE	Kronos Hill Landfill	1 current and 13 former
SYDNEY OLYMPIC PARK	Newington ROAD	Wilson Park (Former oil gas plant site)	1 current and 9 former
SYDNEY OLYMPIC PARK	Hill ROAD	Woo-la-ra Landfill	1 current and 4 former
YENNORA	Pine ROAD	19 Pine Road, Yennora	2 current

1 2

https://app.epa.nsw.gov.au/prclmapp/searchresults.aspx?LGA=4&Suburb=&Notice=&Name=&Text=&DateFrom=&DateTo=

APPENDIX I - APPLICABLE STRATEGIC PLANS

The following strategic plans have been reviewed:

- Greater Sydney Region Plan
- Central City District Plan
- Parramatta Local Strategic Planning Statement

Greater Sydney Region Plan

The Greater Sydney Region Plan (Region Plan) outlines how Greater Sydney will manage growth and change in social, economic and environmental contexts. It sets the vision and strategy for Greater Sydney, to be implemented locally through District Plans. The overriding vision for Greater Sydney in the Region Plan is to rebalance Sydney into a metropolis of three unique but connected cities:

- the established Eastern Harbour City
- the developing Central River City
- the emerging Western Parkland City

Historically, Greater Sydney's jobs and transport have been focused to the east, requiring many people to make long journeys to and from work and other services. The Three Cities vision allows opportunities and resources to be shared more equitably while enhancing the local character we value in our communities. By integrating land use, transport links and infrastructure across the three cities, more people will have access within 30 minutes to jobs, schools, hospitals, and services. The following objectives are relevant to this proposal:

Objective	Consistency
Objective 12: Great places that bring people together	The indicator associated with this objective is increased access to open space. The proposal facilitates an enhanced park suitable for the increasing residential densities within the CoP. Further, the enhanced park will ensure that more residents and visitors can enjoy this location whether for recreation or active transport activities, regardless of age or physical ability.
Objective 27: Biodiversity is protected, urban bushland and remnant vegetation is enhanced	The proposal has no impact on nearby mangrove habitat.
Objective 30: Urban tree canopy cover is increased	With replacement tree plantings and gardens, local habitat is enhanced, particularly through the use of native species endemic to the CoP LGA.

Objective 31: Public open space is accessible, protected and enhanced	The park remains highly accessible and usable for residents of the CoP and those transiting or visiting the area. The proposed works outlined in this REF enhance the active transport network within park, along with its landscape qualities. This satisfies the intent of the objective.

Central City District Plan

The Central City District Plan sets out the priorities and actions for this District, structured around the same key themes as presented in the Greater Sydney Region Plan. A key action of the District Plan is the resilient and sustainable communities to ensure that future residents enjoy a healthy and liveable city.

The proposed works are consistent with the directions, planning priorities and actions of the Central City District Plan.

Priorities and Actions of the Central City District Plan are translated into the Local Strategic Planning Statement for local implementation.

	DIRECTION	PLANNING PRIORITY	ACTIONS
Infrastructure and Collaboration	A city supported by infrastructure	C1 Planning for a city supported by infrastructure	6. Maximise the utility of existing infrastructure assets and consider strategies to influence behaviour changes, to reduce the demand for new infrastructure, including supporting the development of adaptive and flexible regulations to allow decentralised utilities.
LIVEABILITY	A city for people	C3 Providing services and social infrastructure to meet people's changing needs	9. Optimise the use of available public land for social infrastructure
		C4 Fostering healthy, creative, culturally rich and socially connected communities	10. Deliver healthy, safe, and inclusive places for people of all ages and abilities that support active, resilient and socially connected communities by: a. providing walkable places at a human scale with active street life b. prioritising opportunities for people to walk, cycle and use public transport c. co-locating schools, health, aged care, sporting and cultural facilities. d. promoting local access to healthy fresh food and supporting local fresh food production.

SUSTAINABILITY	A city in its landscape	C15 Protecting and enhancing bushland, biodiversity and scenic and cultural landscapes	65. Protect and enhance biodiversity by: a. supporting landscape-scale biodiversity conservation and the restoration of bushland corridors b. managing urban bushland and remnant vegetation as green infrastructure c. c. managing urban development and urban bushland to reduce edge effect impacts.
		C16 Increasing urban tree canopy cover and delivering Green Grid connections	68. Expand urban tree canopy in the public realm.
		C17 Delivering high quality open space	71. Maximise the use of existing open space and protect, enhance and expand public open space by: a. providing opportunities to expand a network of diverse, accessible, high quality open spaces that respond to the needs and values of communities as populations grow b. investigating opportunities to provide new open space so that all residential areas are within 400 metres of open space and all high density residential areas (over 60 dwellings per hectare) are within 200 metres of open space c. requiring large urban renewal initiatives to demonstrate how the quality of, or access to, high quality and diverse local open space is maintained or improved d. planning new neighbourhoods with a sufficient quantity and quality of new open space e. delivering shared and co-located sports and recreational facilities including shared school grounds and repurposed golf courses f. delivering or complementing the Greater Sydney Green Grid g. g. providing walking and cycling links for transport as well as leisure and recreational trips

The proposed activity satisfies relevant actions and priorities of District Plan.

Parramatta Local Strategic Planning Statement

The Parramatta Local Strategic Planning Statement (LSPS) came into effect on 31 March 2020, and this document sets out the 20-year vision for land use planning for the City of Parramatta. The LSPS implements the priorities and actions of the Region Plan and Central City District Plan, based on local characteristics and opportunities. The LSPS seeks to rebalance opportunities and deliver economic and social benefits more equitably across the metropolitan area.

	PRIORITIES	POLICY	ACTION
LOCAL	PP6: Expand Parramatta's economic role as the Central City of Greater Sydney	P19: Finalise the Community Infrastructure Strategy to identify priorities for future community infrastructure and guide decision making about planning, funding, delivering and negotiating for community.	A35 Identify opportunities to provide new open space and new and upgraded amenities for sportsgrounds to meet the needs of diverse, growing communities. A36 Prioritise improvements to open space for future Capital Works Programs.
LIVEABILITY	PP10: Improve active walking and cycling infrastructure and access to public and shared transport	P33: Create a high quality and safe walking and cycling network across the LGA to cater for and encourage short trips (up to 2km) to local centres, jobs, public and shared transport services, schools, local open space, Green Grid and other trip generators. P36 Promote and prioritise expansion of recreational opportunities and spaces with a focus on the Green Grid, Parramatta Ways Walking Strategy, and the Parramatta River.	A62 Prepare a detailed Schedule of Works for infrastructure needs across the LGA.
SUSTAINABILITY	PP14: Protect and enhance our trees and green infrastructure to improve liveability and ecological health	P53: Protect and increase tree canopy cover and vegetation across public and private land. P56 Provide for a diversity of green spaces to support different community needs such as for recreation, relaxation and enjoyment.	A63 Work with State government to progress the implementation of the Parramatta Ways Walking Strategy (Figure 14), CBD Pedestrian Strategy and Parramatta Bike Plan, including investigating land acquisition reservations in planning controls.

The proposed activity satisfies relevant actions and priorities of the LSPS.

APPENDIX J - 10.7 PLANNING CERTIFICATES

PLANNING CERTIFICATE

CERTIFICATE UNDER SECTION 10.7

Environmental Planning and Assessment Act, 1979 as amended

Certificate No: 2023/4098

Fee: $156.00

Issue Date: 21 June 2023

Receipt No: 7188048

Applicant Ref: TROY PLANNING CERT:197294

DESCRIPTION OF LAND

Address: Queens Wharf Park (R89369)
198 George Street
PARRAMATTA NSW 2150

Lot Details: Lot A DP 959111 Lot A DP 444716 Lot 1 DP 126881 Lot 1 DP 909045 Lot 1 DP 128847 Lot 1 DP 1151643 Lot 2 DP 1151643 Lot 3 DP 1151643

SECTION A

The following Environmental Planning Instrument to which this certificate relates applies to the land:

Parramatta Local Environmental Plan 2023

For the purpose of **Section 10.7(2)** it is advised that as the date of this certificate the abovementioned land is affected by the matters referred to as follows:

The land is zoned: RE1 Public Recreation PLEP2023

Zone RE1 Public Recreation (Parramatta Local Environmental Plan 2023)

Issued pursuant to Section 10.7 of the Environmental Planning and Assessment Act, 1979. NOTE: This table is an excerpt from Parramatta Local Environmental Plan 2023 and must be read in conjunction with and subject to the other provisions of that instrument, and in force at that date.

Zone RE1 Public Recreation

1 Objectives of zone
• To enable land to be used for public open space or recreational purposes.
• To provide a range of recreational settings and activities and compatible land uses.
• To protect and enhance the natural environment for recreational purposes.
• To conserve, enhance and promote the natural and cultural heritage value of parks and open space in the zone.
• To create opportunities to use riverfront land for public recreation.

2 Permitted without consent
Environmental protection works; Flood mitigation works

3 Permitted with consent
Aquaculture; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Community facilities; Environmental facilities; Information and education facilities; Jetties; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Restaurants or cafes; Roads; Take away food and drink premises; Water recreation structures

4 Prohibited
Any development not specified in item 2 or 3

SECTION B
State Policies and Regional Environmental Plans
The land is also affected by the following State Environmental Planning Policies (SEPP) and Regional Environmental Plans (SREP):

State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021
State Environmental Planning Policy (SEPP) (Planning Systems) 2021
State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021
State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021
State Environmental Planning Policy (SEPP) (Precincts—Central River City) 2021
State Environmental Planning Policy (SEPP) (Housing) 2021
State Environmental Planning Policy (SEPP) (Resources and Energy) 2021
State Environmental Planning Policy (SEPP) (Primary Production) 2021
State Environmental Planning Policy (SEPP) No.65 – Design Quality of Residential Flat Development.
State Environmental Planning Policy (SEPP) (Building Sustainability Index: BASIX) 2004
State Environmental Planning Policy (SEPP) (Exempt and Complying Development Codes) 2008
State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 –Chapter 2 Coastal management

DRAFT State Environmental Planning Policy to amend State Environmental Planning Policy (SEPP) (Sydney Region Growth Centres) 2006 – Amendment to include the Greater Parramatta Priority Growth Area as a Growth Centre
DRAFT State Environmental Planning Policy (Draft SEPP) – Environment

N.B. All enquiries as to the application of Draft State Environmental Planning Policies should be directed to The NSW Department of Planning, Industry and Environment.

Draft Local Environmental Plan
The land is not affected by a Draft Local Environmental Plan which is or has been subject to community consultation or public exhibition under the Act, that will apply to the carrying out of development on the land.

Development Control Plan
The land is affected by Parramatta Development Control Plan 2011.

Draft Parramatta Development Control Plan (DCP)

Draft Late Night Trading Development Control Plan (DCP)

Development Contribution Plan
The City of Parramatta (Outside CBD) Development Contributions Plan 2021 Amendment 1 applies to the land.

Heritage Item/Heritage Conservation Area
The land is identified as containing a Heritage Item in the Parramatta Local Environmental Plan 2023.

The land is not located in a heritage conservation area.

Road Widening
The land is not affected by road widening or road realignment under:
(a) Division 2 of Part 3 of the Roads Act 1993.
(b) Any Environmental Planning Instrument.
(c) Any Resolution of Council.

Land Reservation Acquisition
The land is not affected by Land Reservation Acquisition in Parramatta Local Environmental Plan 2023.

Site Compatibility Certificate (Affordable Rental Housing)
At the date of issue of this certificate Council is not aware of any
a. Site compatibility certificate (affordable rental housing),
in respect to the land.

Contamination
Matters contained in Clause 59(2) as amended in the Contaminated Land Management Act 1997 – as listed:

Clause 59(2)(a) - is the land to which the certificate relates is significantly contaminated land?
NO

Clause 59(2)(b) - is the land to which the certificate relates is subject to a management order?
NO

Clause 59(2)(c) - is the land to which the certificate relates is the subject of an approved voluntary management proposal?
NO

Clause 59(2)(d) - is the land to which the certificate relates is subject to an ongoing maintenance order?
NO

Clause 59(2)(e) - is the land to which the certificate relates is the subject of a site audit statement?
NO

Tree Preservation
The land is subject to Section 5.4 Preservation of Trees or Vegetation in Parramatta Development Control Plan 2011.

Council has not been notified of an order under the Trees (Disputes Between Neighbours) Act 2006 to carry out work in relation to a tree on the land.

Coastal Protection
Has the owner (or any previous owner) of the land been consented in writing to the land being subject to annual charges under section 496B of the Local Government Act 1993 for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act)?
NO

Council Policy
Council has not adopted a policy to restrict the development of the land by reason of the likelihood of projected sea level rise (coastal protection), tidal inundation, subsidence or any other risk.

Council has adopted a policy covering the entire City of Parramatta to restrict development of any land by reason of the likelihood of flooding.

Council has adopted by resolution a policy on contaminated land that applies to all land within the City of Parramatta. The Policy will restrict the development of the land if the circumstances set out in the policy prevail. A copy of the policy is available on Councils website at www.cityofparramatta.nsw.gov.au or from the Customer Service Centre.

NSW Rural Fire Service Guidelines entitled 'Planning for Bushfire Protection 2019' applies to land within the City of Parramatta. Development subject to bushfire risk will be required to address the requirements in these guidelines and can be downloaded off the RFS web site www.rfs.nsw.gov.au

Please note: this is a statement of Council policy and not a statement on whether or not the property is affected by bushfire. That question is answered in the Bushfire Land section of this certificate.

Mine Subsidence
The land is not affected by the Coal Mine Subsidence Compensation Act 2017 proclaiming land to be a Mine Subsidence District.

Bushfire Land
The land is not bushfire prone land.

Threatened Species
NSW Office of Environment and Heritage mapping indicates this site may contain 'native vegetation' or is included on the 'Biodiversity Values Map' which are subject to Part 7 of the Biodiversity Conservation Act 2016.

Biodiversity certified land
The land is not biodiversity certified land under Part 8 of the Biodiversity Conservation Act 2016.

Note. *Biodiversity certified land includes land certified under Part 7AA of the Threatened Species Conservation Act 1995 that is taken to be certified under Part 8 of the Biodiversity Conservation Act 2016.*

Biodiversity stewardship sites
The Chief Executive of the Office of Environment and Heritage has not notified the Council if the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the Biodiversity Conservation Act 2016.

Note: Biodiversity stewardship agreements include biobanking agreements under Part 7A of the Threatened Species Conservation Act 1995 that are taken to be biodiversity stewardship agreements under Part 5 of the Biodiversity Conservation Act 2016.

Property vegetation plans
Council has not been notified of the existence of the property vegetation plan approved under Part 4 of the Native Vegetation Act 2003 on the land.

Paper Subdivision information
The land is not subject to any development plan adopted by a relevant authority or that is proposed to be subject to a consent ballot. A subdivision order does not apply to the land.

Note: Words and expressions used in this section have the same meaning as in the Environmental Planning and Assessment Regulation 2021, Part 10 and the Environmental Planning and Assessment Act 1979, Schedule 7.

Western Sydney Aerotropolis
Under State Environmental Planning Policy (Precincts—Western Parkland City) 2021, Chapter 4 the land:

(a) is not in an ANEF or ANEC contour of 20 or greater, as referred to in that Chapter, section 4.17,
(b) is not shown on the Lighting Intensity and Wind Shear Map,
(c) is not shown on the Obstacle Limitation Surface Map,
(d) is not in the "public safety area" on the Public Safety Area Map,
(e) is not in the "3 kilometre wildlife buffer zone" or the "13 kilometre wildlife buffer zone" on the Wildlife Buffer Zone Map.

Loose-Fill Asbestos Register
Council has not been notified by NSW Fair Trading of the property being listed on the loose-fill asbestos insulation register maintained by the Secretary of NSW Fair Trading.

Affected Building Notices and Building Product Rectification Orders
Council is not aware of whether there is any affected building notice, building product rectification order or notice of intention to make a building product rectification order that is in force in respect of the land.

Note: ***affected building notice*** has the same meaning as in the *Building Products (Safety) Act 2017.* ***building product rectification order*** has the same meaning as in the *Building Products (Safety) Act 2017.*

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

Exempt Development Codes

Clause 1.12 State Environmental Planning Policy (Exempt and Complying Development Codes) 2008
The land **is not** land where the exempt development codes are varied under Clause 1.12 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

Clauses 1.16(1)(b1)–(d) or Clause 1.16A of State Environmental Planning Policy (Exempt and Complying Development Codes)

The following information only addresses whether or not the land is land on which exempt development may be carried out under each of the codes for exempt development because of the provisions of **Clauses 1.16(1)(b1)–(d) or Clause 1.16A** of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. It is not a statement that exempt development is permissible on the land.

Other land exemptions within State Environmental Planning Policy (Exempt and Complying Development Codes) 2008 may also apply. Furthermore, other provisions within the relevant Local Environmental Plan or a State Environmental Planning Policy which restrict exempt development on the land may also apply.

It is your responsibility to ensure that you comply with the relevant exempt development provisions for the land.

Exempt Development pursuant to the exempt development codes **may** be carried out on the land under **Clauses 1.16(1)(b1)–(d) or Clause 1.16A** of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Complying Development Codes

Note: This does not constitute a Complying Development Certificate under section 4.27 of the Environmental Planning and Assessment Act 1979

Clause 1.12 State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

The land is not land where the complying development codes are varied under Clause 1.12 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008.

Clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1)(c3) and 1.19 of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

The following information only addresses whether or not the land is land on which complying development may be carried out under each of the codes for complying development because of the provisions of **Clauses 1.17A (1) (c) to (e), (2), (3) and (4), 1.18 (1)(c3) and 1.19** of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. It is not a statement that complying development is permissible on the land.

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It is your responsibility to ensure that you comply with the relevant complying development provisions for the land. Failure to comply with these provisions may mean that a Complying Development Certificate is invalid.

Housing Code; Low Rise Housing Diversity Code; Rural Housing Code

Complying Development pursuant to the Housing Code, Low Rise Housing Diversity Code and Rural Housing Code **may not** be carried out on the land or part of the land. The land is affected by specific land exemptions under **Clause 1.17A or Clause 1.18 (1) (c3) or Clause 1.19** of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. The land exemptions are:

- All of the land comprises, or contains an item of environmental heritage (that is listed on the State Heritage Register **or** that is subject to an interim heritage order under the Heritage Act 1977 **or** is identified as an item of environmental heritage in an environmental planning instrument),
  (Land Exemption Clause 1.17A of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008)

- All of the land is within an environmentally sensitive area
  (Land Exemption Clause 1.17A of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008)

Commercial and Industrial (New Buildings and Additions) Code

Complying Development pursuant to Commercial and Industrial (New Buildings and Additions) Code **may not** be carried out on the land or part of the land. The land is affected by specific land exemptions under **Clause 1.17A or Clause 1.18 (1) (c3) or Clause 1.19** of State Environmental Planning Policy (Exempt and Complying Development Codes) 2008. The land exemptions are:

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Housing Alterations Code; General Development Code; General Commercial and Industrial (Alterations) Code; Container Recycling Facilities Code; Subdivision Code; Demolition Code; Fire Safety Code

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Flood related development controls - 9(1) - *flood planning area*
The land or part of the land is within the flood planning area and subject to flood related development controls.

*'**Flood planning area**' has the same meaning as in the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005, available at https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Floodplains/floodplain-development-manual.pdf.*

Flood related development controls – 9(2) - *probable maximum flood*
The land or part of the land is between the flood planning area and the probable maximum flood and subject to flood related development controls.

*'**Flood planning area**' and '**probable maximum flood**' have the same meaning as in the Floodplain Development Manual (ISBN 0 7347 5476 0) published by the NSW Government in April 2005, available at https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Water/Floodplains/floodplain-development-manual.pdf.*

SPECIAL NOTES
The land is identified as Class 4 on the Acid Sulfate Soils map. Refer to Clause 6.1 of Parramatta Local Environmental Plan 2023.

Applicants for Sections 10.7 Certificates are advised that Council does not hold sufficient information to fully detail the effect of any encumbrances on the title of the subject land. The information available to Council is provided on the basis that neither Council nor its servants hold out advice or warrant to you in any way its accuracy, nor shall Council or its servants, be liable for any negligence in the preparation of that information. Further information should be sought from relevant Statutory Departments.

SECTION C
The following additional information is issued under Section 10.7(5)
Pursuant to S10.7(5) the Council supplies information as set out below on the basis that the Council takes no responsibility for the accuracy of the information. The information if material should be independently checked by the applicant.

Parramatta Local Environmental Plan 2023
On 2 March 2023 the Parramatta Local Environmental Plan 2023 was notified in the NSW Government Gazette. The Parramatta Local Environmental Plan replaced five (5) existing Local Environmental Plans where they applied to land within the Parramatta LGA. These include:

- *Auburn Local Environmental Plan 2010*
- *Holroyd Local Environmental Plan 2013*
- *Hornsby Local Environmental Plan 2013*
- *Parramatta Local Environmental Plan 2011*
- *Parramatta (former The Hills) Local Environmental Plan 2012*

The Parramatta Local Environmental Plan 2023 commenced on 2 March 2023.

Parramatta Local Environmental Plan 2023 – Minimum Lot Size Control for Dual Occupancy and Manor House Developments
The Parramatta Local Environmental Plan 2023 includes a minimum lot size of 600m^2 and a minimum frontage to a public road of 15 metres development standards for Dual Occupancies and Manor Houses where they are permitted with development consent in the Parramatta Local Environmental Plan 2023.

Employment zones reform - *translation of existing Business and Industrial zones into the new Employment zones*
The Parramatta Local Environmental Plan 2023 has replaced existing Business and Industrial zones with Employment zones.

Please see *https://www.planningportal.nsw.gov.au/employment-zones* for more information.

Draft Parramatta Development Control Plan (DCP)
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting the Draft Parramatta Development Control Plan (DCP).

The Draft Parramatta Development Control Plan (DCP) affects all land within the City of Parramatta Local Government Area, excluding Sydney Olympic Park. Further information about the Draft DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Homebush Bay West DCP 2004
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting administrative 'non-policy' changes to the Homebush Bay West DCP 2004.

Further information about the DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Wentworth Point DCP 2014
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting administrative 'non-policy' changes to the Wentworth Point DCP 2014.

Further information about the DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Draft Late Night Trading Development Control Plan (DCP)
Between Monday, 6 December 2021 to Monday, 31 January 2022, Council is exhibiting the Draft Late Night Trading Development Control Plan (DCP).

Further information about the Draft DCP can be found at https://participate.cityofparramatta.nsw.gov.au/late-night-trading-DCP or by contacting Council.

Aboriginal Sensitivity Map - Parramatta Development Control Plan (DCP) 2011
Aboriginal Heritage – High Sensitivity – potential to contain items of Aboriginal heritage. Contact Council's Customer Service/Duty Planner (02) 9806 5050 for more information.

Flood Information
The land is affected by a 100 year Average Recurrence Interval flood as indicated by Council's current flooding information. As such Council is required to take that into account when determining any development application made in respect of the land.

Further information is available at the Catchment Management Section within Council's City Assets and Environment Unit.

Additional advice should be also sought from an appropriately qualified person as to the extents and potential hazards associated with the likely flooding of the land. The names of qualified persons may be obtained from the Institution of Engineers Australia.

State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 – Chapter 2 Coastal management
Mapping associated with Chapter 2 Coastal management of State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 identifies the land as containing Coastal Wetlands and/or is within a Proximity Area for Coastal Wetlands.

Note: Advisory Information regarding Combustible Cladding
External combustible cladding on multi-storey buildings has been identified in local government areas including the City of Parramatta. Combustible cladding is a material that is capable of readily burning.

You should make your own enquiries as to the type of materials that have been used to construct the building. It is recommended that the purchaser obtain a building report from an appropriately qualified person to determine if any cladding type material may pose a risk to the building's occupants. Council may issue orders to rectify a building where combustible cladding is found.

Properties that have combustible cladding on buildings are listed in the NSW Government Combustible Cladding Register. Please refer to https://www.claddingregistration.nsw.gov.au/ or call 1300 305 695 for further information regarding the NSW Government Combustible Cladding Register.

There is potential for combustible cladding to be present on buildings that are not listed on the Register.

Note: Advisory Information regarding Loose-Fill asbestos Insulation
Research undertaken by the Loose-Fill Asbestos Insulation Taskforce has determined that there is a potential for loose-fill asbestos insulation to be found in residential dwellings constructed prior to 1980 in 28 local government areas including the City of Parramatta.

Some residential homes located in the City of Parramatta may contain loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation.

You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants.

Please Contact NSW Fair Trading for further information.

This information has been provided pursuant to section 10.7(5) of the Environmental Planning and Assessment Act, 1979 as amended.

Gail Connolly
Chief Executive Officer

per

dated 21 June 2023

PLANNING CERTIFICATE

CERTIFICATE UNDER SECTION 10.7

Environmental Planning and Assessment Act, 1979 as amended

Certificate No: 2023/4094

Fee: $156.00

Issue Date: 21 June 2023

Receipt No: 7188044

Applicant Ref: 1/224186:197293

DESCRIPTION OF LAND

Address: Queens Wharf Park
2A Noller Parade
PARRAMATTA NSW 2150

Lot Details: Lot 1 DP 224186

SECTION A

The following Environmental Planning Instrument to which this certificate relates applies to the land:

Parramatta Local Environmental Plan 2023

For the purpose of **Section 10.7(2)** it is advised that as the date of this certificate the abovementioned land is affected by the matters referred to as follows:

The land is zoned: RE1 Public Recreation PLEP2023

Zone RE1 Public Recreation (Parramatta Local Environmental Plan 2023)

Issued pursuant to Section 10.7 of the Environmental Planning and Assessment Act, 1979. NOTE: This table is an excerpt from Parramatta Local Environmental Plan 2023 and must be read in conjunction with and subject to the other provisions of that instrument, and in force at that date.

Zone RE1 Public Recreation

1 Objectives of zone
• To enable land to be used for public open space or recreational purposes.
• To provide a range of recreational settings and activities and compatible land uses.
• To protect and enhance the natural environment for recreational purposes.
• To conserve, enhance and promote the natural and cultural heritage value of parks and open space in the zone.
• To create opportunities to use riverfront land for public recreation.

2 Permitted without consent
Environmental protection works; Flood mitigation works

3 Permitted with consent
Aquaculture; Boat launching ramps; Boat sheds; Building identification signs; Business identification signs; Community facilities; Environmental facilities; Information and education facilities; Jetties; Kiosks; Markets; Recreation areas; Recreation facilities (indoor); Recreation facilities (major); Recreation facilities (outdoor); Restaurants or cafes; Roads; Take away food and drink premises; Water recreation structures

4 Prohibited
Any development not specified in item 2 or 3

SECTION B
State Policies and Regional Environmental Plans
The land is also affected by the following State Environmental Planning Policies (SEPP) and Regional Environmental Plans (SREP):

State Environmental Planning Policy (SEPP) (Biodiversity and Conservation) 2021
State Environmental Planning Policy (SEPP) (Planning Systems) 2021
State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021
State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021
State Environmental Planning Policy (SEPP) (Precincts—Central River City) 2021
State Environmental Planning Policy (SEPP) (Housing) 2021
State Environmental Planning Policy (SEPP) (Resources and Energy) 2021
State Environmental Planning Policy (SEPP) (Primary Production) 2021
State Environmental Planning Policy (SEPP) No.65 – Design Quality of Residential Flat Development.
State Environmental Planning Policy (SEPP) (Building Sustainability Index: BASIX) 2004
State Environmental Planning Policy (SEPP) (Exempt and Complying Development Codes) 2008
State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 –Chapter 2 Coastal management

DRAFT State Environmental Planning Policy to amend State Environmental Planning Policy (SEPP) (Sydney Region Growth Centres) 2006 – Amendment to include the Greater Parramatta Priority Growth Area as a Growth Centre

DRAFT State Environmental Planning Policy (Draft SEPP) – Environment

N.B. All enquiries as to the application of Draft State Environmental Planning Policies should be directed to The NSW Department of Planning, Industry and Environment.

Draft Local Environmental Plan
The land is not affected by a Draft Local Environmental Plan which is or has been subject to community consultation or public exhibition under the Act, that will apply to the carrying out of development on the land.

Development Control Plan
The land is affected by Parramatta Development Control Plan 2011.

Draft Parramatta Development Control Plan (DCP)

Draft Late Night Trading Development Control Plan (DCP)

Development Contribution Plan
The City of Parramatta (Outside CBD) Development Contributions Plan 2021 Amendment 1 applies to the land.

Heritage Item/Heritage Conservation Area
The land is identified as containing a Heritage Item in the Parramatta Local Environmental Plan 2023.

The land is not located in a heritage conservation area.

Road Widening
The land is not affected by road widening or road realignment under:

(a) Division 2 of Part 3 of the Roads Act 1993.
(b) Any Environmental Planning Instrument.
(c) Any Resolution of Council.

Land Reservation Acquisition
The land is not affected by Land Reservation Acquisition in Parramatta Local Environmental Plan 2023.

Site Compatibility Certificate (Affordable Rental Housing)
At the date of issue of this certificate Council is not aware of any
a. Site compatibility certificate (affordable rental housing),
in respect to the land.

Contamination
Matters contained in Clause 59(2) as amended in the Contaminated Land Management Act 1997 – as listed:

Clause 59(2)(a) - is the land to which the certificate relates is significantly contaminated land?
NO

Clause 59(2)(b) - is the land to which the certificate relates is subject to a management order?
NO

Clause 59(2)(c) - is the land to which the certificate relates is the subject of an approved voluntary management proposal?
NO

Clause 59(2)(d) - is the land to which the certificate relates is subject to an ongoing maintenance order?
NO

Clause 59(2)(e) - is the land to which the certificate relates is the subject of a site audit statement?
NO

Tree Preservation
The land is subject to Section 5.4 Preservation of Trees or Vegetation in Parramatta Development Control Plan 2011.

Council has not been notified of an order under the Trees (Disputes Between Neighbours) Act 2006 to carry out work in relation to a tree on the land.

Coastal Protection
Has the owner (or any previous owner) of the land been consented in writing to the land being subject to annual charges under section 496B of the Local Government Act 1993 for coastal protection services that relate to existing coastal protection works (within the meaning of section 553B of that Act)?
NO

Council Policy
Council has not adopted a policy to restrict the development of the land by reason of the likelihood of projected sea level rise (coastal protection), tidal inundation, subsidence or any other risk.

Council has adopted a policy covering the entire City of Parramatta to restrict development of any land by reason of the likelihood of flooding.

Council has adopted by resolution a policy on contaminated land that applies to all land within the City of Parramatta. The Policy will restrict the development of the land if the circumstances set out in the policy prevail. A copy of the policy is available on Councils website at www.cityofparramatta.nsw.gov.au or from the Customer Service Centre.

NSW Rural Fire Service Guidelines entitled 'Planning for Bushfire Protection 2019' applies to land within the City of Parramatta. Development subject to bushfire risk will be required to address the requirements in these guidelines and can be downloaded off the RFS web site www.rfs.nsw.gov.au

Please note: this is a statement of Council policy and not a statement on whether or not the property is affected by bushfire. That question is answered in the Bushfire Land section of this certificate.

Mine Subsidence
The land is not affected by the Coal Mine Subsidence Compensation Act 2017 proclaiming land to be a Mine Subsidence District.

Bushfire Land
The land is not bushfire prone land.

Threatened Species
NSW Office of Environment and Heritage mapping indicates this site may contain 'native vegetation' or is included on the 'Biodiversity Values Map' which are subject to Part 7 of the Biodiversity Conservation Act 2016.

Biodiversity certified land
The land is not biodiversity certified land under Part 8 of the Biodiversity Conservation Act 2016.

Note. *Biodiversity certified land includes land certified under Part 7AA of the Threatened Species Conservation Act 1995 that is taken to be certified under Part 8 of the Biodiversity Conservation Act 2016.*

Biodiversity stewardship sites
The Chief Executive of the Office of Environment and Heritage has not notified the Council if the land is a biodiversity stewardship site under a biodiversity stewardship agreement under Part 5 of the Biodiversity Conservation Act 2016.

Note: Biodiversity stewardship agreements include biobanking agreements under Part 7A of the Threatened Species Conservation Act 1995 that are taken to be biodiversity stewardship agreements under Part 5 of the Biodiversity Conservation Act 2016.

Property vegetation plans
Council has not been notified of the existence of the property vegetation plan approved under Part 4 of the Native Vegetation Act 2003 on the land.

Paper Subdivision information
The land is not subject to any development plan adopted by a relevant authority or that is proposed to be subject to a consent ballot. A subdivision order does not apply to the land.

Note: Words and expressions used in this section have the same meaning as in the Environmental Planning and Assessment Regulation 2021, Part 10 and the Environmental Planning and Assessment Act 1979, Schedule 7.

Western Sydney Aerotropolis
Under State Environmental Planning Policy (Precincts—Western Parkland City) 2021, Chapter 4 the land:

(a) is not in an ANEF or ANEC contour of 20 or greater, as referred to in that Chapter, section 4.17,
(b) is not shown on the Lighting Intensity and Wind Shear Map,
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(e) is not in the "3 kilometre wildlife buffer zone" or the "13 kilometre wildlife buffer zone" on the Wildlife Buffer Zone Map.

Loose-Fill Asbestos Register
Council has not been notified by NSW Fair Trading of the property being listed on the loose-fill asbestos insulation register maintained by the Secretary of NSW Fair Trading.

Affected Building Notices and Building Product Rectification Orders
Council is not aware of whether there is any affected building notice, building product rectification order or notice of intention to make a building product rectification order that is in force in respect of the land.

Note: ***affected building notice*** has the same meaning as in the *Building Products (Safety) Act 2017.* ***building product rectification order*** has the same meaning as in the *Building Products (Safety) Act 2017.*

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Flood related development controls – 9(2) - *probable maximum flood*
The land or part of the land is between the flood planning area and the probable maximum flood and subject to flood related development controls.

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SPECIAL NOTES
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Applicants for Sections 10.7 Certificates are advised that Council does not hold sufficient information to fully detail the effect of any encumbrances on the title of the subject land. The information available to Council is provided on the basis that neither Council nor its servants hold out advice or warrant to you in any way its accuracy, nor shall Council or its servants, be liable for any negligence in the preparation of that information. Further information should be sought from relevant Statutory Departments.

SECTION C
The following additional information is issued under Section 10.7(5)
Pursuant to S10.7(5) the Council supplies information as set out below on the basis that the Council takes no responsibility for the accuracy of the information. The information if material should be independently checked by the applicant.

Parramatta Local Environmental Plan 2023
On 2 March 2023 the Parramatta Local Environmental Plan 2023 was notified in the NSW Government Gazette. The Parramatta Local Environmental Plan replaced five (5) existing Local Environmental Plans where they applied to land within the Parramatta LGA. These include:

- *Auburn Local Environmental Plan 2010*
- *Holroyd Local Environmental Plan 2013*
- *Hornsby Local Environmental Plan 2013*
- *Parramatta Local Environmental Plan 2011*
- *Parramatta (former The Hills) Local Environmental Plan 2012*

The Parramatta Local Environmental Plan 2023 commenced on 2 March 2023.

Parramatta Local Environmental Plan 2023 – Minimum Lot Size Control for Dual Occupancy and Manor House Developments
The Parramatta Local Environmental Plan 2023 includes a minimum lot size of 600m^2 and a minimum frontage to a public road of 15 metres development standards for Dual Occupancies and Manor Houses where they are permitted with development consent in the Parramatta Local Environmental Plan 2023.

Employment zones reform - *translation of existing Business and Industrial zones into the new Employment zones*
The Parramatta Local Environmental Plan 2023 has replaced existing Business and Industrial zones with Employment zones.

Please see *https://www.planningportal.nsw.gov.au/employment-zones* for more information.

Draft Parramatta Development Control Plan (DCP)
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting the Draft Parramatta Development Control Plan (DCP).

The Draft Parramatta Development Control Plan (DCP) affects all land within the City of Parramatta Local Government Area, excluding Sydney Olympic Park. Further information about the Draft DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Homebush Bay West DCP 2004
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting administrative 'non-policy' changes to the Homebush Bay West DCP 2004.

Further information about the DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Wentworth Point DCP 2014
On 13 March 2023 for a period of 50 days concluding 1 May 2023, Council is exhibiting administrative 'non-policy' changes to the Wentworth Point DCP 2014.

Further information about the DCP can be found at https://participate.cityofparramatta.nsw.gov.au/ or by contacting Council.

Draft Late Night Trading Development Control Plan (DCP)
Between Monday, 6 December 2021 to Monday, 31 January 2022, Council is exhibiting the Draft Late Night Trading Development Control Plan (DCP).

Further information about the Draft DCP can be found at https://participate.cityofparramatta.nsw.gov.au/late-night-trading-DCP or by contacting Council.

Aboriginal Sensitivity Map - Parramatta Development Control Plan (DCP) 2011
Aboriginal Heritage – High Sensitivity – potential to contain items of Aboriginal heritage. Contact Council's Customer Service/Duty Planner (02) 9806 5050 for more information.

Flood Information
The land is affected by a 100 year Average Recurrence Interval flood as indicated by Council's current flooding information. As such Council is required to take that into account when determining any development application made in respect of the land.

Further information is available at the Catchment Management Section within Council's City Assets and Environment Unit.

Additional advice should be also sought from an appropriately qualified person as to the extents and potential hazards associated with the likely flooding of the land. The names of qualified persons may be obtained from the Institution of Engineers Australia.

State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 – Chapter 2 Coastal management
Mapping associated with Chapter 2 Coastal management of State Environmental Planning Policy (SEPP) (Resilience and Hazards) 2021 identifies the land as containing Coastal Wetlands and/or is within a Proximity Area for Coastal Wetlands.

Note: Advisory Information regarding Combustible Cladding
External combustible cladding on multi-storey buildings has been identified in local government areas including the City of Parramatta. Combustible cladding is a material that is capable of readily burning.

You should make your own enquiries as to the type of materials that have been used to construct the building. It is recommended that the purchaser obtain a building report from an appropriately qualified person to determine if any cladding type material may pose a risk to the building's occupants. Council may issue orders to rectify a building where combustible cladding is found.

Properties that have combustible cladding on buildings are listed in the NSW Government Combustible Cladding Register. Please refer to https://www.claddingregistration.nsw.gov.au/ or call 1300 305 695 for further information regarding the NSW Government Combustible Cladding Register.

There is potential for combustible cladding to be present on buildings that are not listed on the Register.

Note: Advisory Information regarding Loose-Fill asbestos Insulation
Research undertaken by the Loose-Fill Asbestos Insulation Taskforce has determined that there is a potential for loose-fill asbestos insulation to be found in residential dwellings constructed prior to 1980 in 28 local government areas including the City of Parramatta.

Some residential homes located in the City of Parramatta may contain loose-fill asbestos insulation, for example in the roof space. NSW Fair Trading maintains a Register of homes that are affected by loose-fill asbestos insulation.

You should make your own enquiries as to the age of the buildings on the land to which this certificate relates and, if it contains a building constructed prior to 1980, the council strongly recommends that any potential purchaser obtain advice from a licensed asbestos assessor to determine whether loose fill asbestos is present in any building on the land and, if so, the health risks (if any) this may pose for the building's occupants.

Please Contact NSW Fair Trading for further information.

This information has been provided pursuant to section 10.7(5) of the Environmental Planning and Assessment Act, 1979 as amended.

Gail Connolly
Chief Executive Officer

per

dated 21 June 2023

APPENDIX K – CITY OF PARRAMATTA CONSULATION OUTCOMES REPORT

CITY OF PARRAMATTA

GEORGE STREET EAST PEDESTRIAN AND CYCLIST PATHS REF

Engagement Evaluation and Key Findings

November 2023

cityofparramatta.nsw.gov.au

CITY OF PARRAMATTA

George Street East Pedestrian and Cyclist Paths REF

Engagement Evaluation and Key Findings

November 2023

cityofparramatta.nsw.gov.au

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1. INTRODUCTION

In September and October 2023, Council placed a Review of Environmental Factors (REF) for George Street East Pedestrian and Cyclist Paths on public exhibition.

The REF assesses the potential environmental impacts associated with the construction, operation and maintenance of the proposed project at Queens Wharf Reserve. The significance of the impact has been determined, and appropriate mitigation measures have been recommended.

Overall, it has been determined that the environmental impacts associated with the proposed activity are not likely to be significant. The project is expected to result in long-term benefits to the Parramatta LGA. It is consistent with the relevant planning strategies developed by State and Local Governments.

To improve access to the CBD from the east along the river, Council will deliver:

- a combination of shared path and exclusive pedestrian and cyclist paths through Queens Wharf Reserve between Alfred Street and George Street, Parramatta
- a raised pedestrian and cyclist crossing over River Road West east of Alfred Street is proposed
- two speed humps and a contraflow bike lane on the northern side of Noller Parade, Parramatta.

Construction is expected to begin in 2024.

This report contains the engagement data and submissions relating to this public exhibition.

2. EXECUTIVE SUMMARY

This exhibition was promoted to local residents and visitors to Queens Wharf Reserve, on Council's Participate Parramatta website and via Council's Participate Parramatta newsletter.

Four hundred and sixty people visited the Participate Parramatta page and **10 submissions** were received and reviewed by Council staff.

The REF document was **downloaded 265 times**, indicating the project is relevant and of interest to the local community.

- Eight of ten submissions indicated support for Review of Environmental Factors (REF).
- Feedback emphasised minimising disturbance of native species, removing exotics and weeds and increasing the tree canopy.
- Feedback also included concerns regarding lighting of the paths, preservation of trees and traffic in neighbouring streets.

3. ENGAGEMENT EVALUATION

Overall, the opportunity to share feedback was presented on 16,641 occasions, resulting in 751 views of the project page, 265 document downloads, 7 online submissions, 2 email submissions and one mailed submission.

3.1. Resources

- Letters/flyers were placed in the letterboxes of all apartments and houses fronting Noller Parade (41 in total)
- Signage
- QR code
- Promotion in Council's Participate Parramatta newsletters
- Participate Parramatta

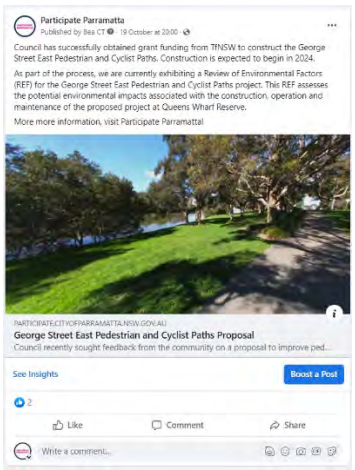
3.2. Social Media Campaign

Organic campaign results:

Paid Advertisements	Benchmarks
Impressions	**40**
Reach	**34**
Link clicks	**2**
Post Engagements	**2**

- **Onsite signs and notification by letter were the primary methods of promotion of this exhibition.**

Top performing ads:



Electronic Direct Notification

Channel	List	Open rate	Project clicks
Participate Parramatta newsletter 10 October 2023	**16,601**	**47%**	**52**

3.3. PARTICIPATE Parramatta

Promotion of the engagement directed community members to the Participate Parramatta website The project page generated 7 online contributions.

Project Page Events	
Views	**751**
Visitors	**460**
Visits where at least 1 contribution was made	**7**
Total contributions	**7**

Engagement highlights:

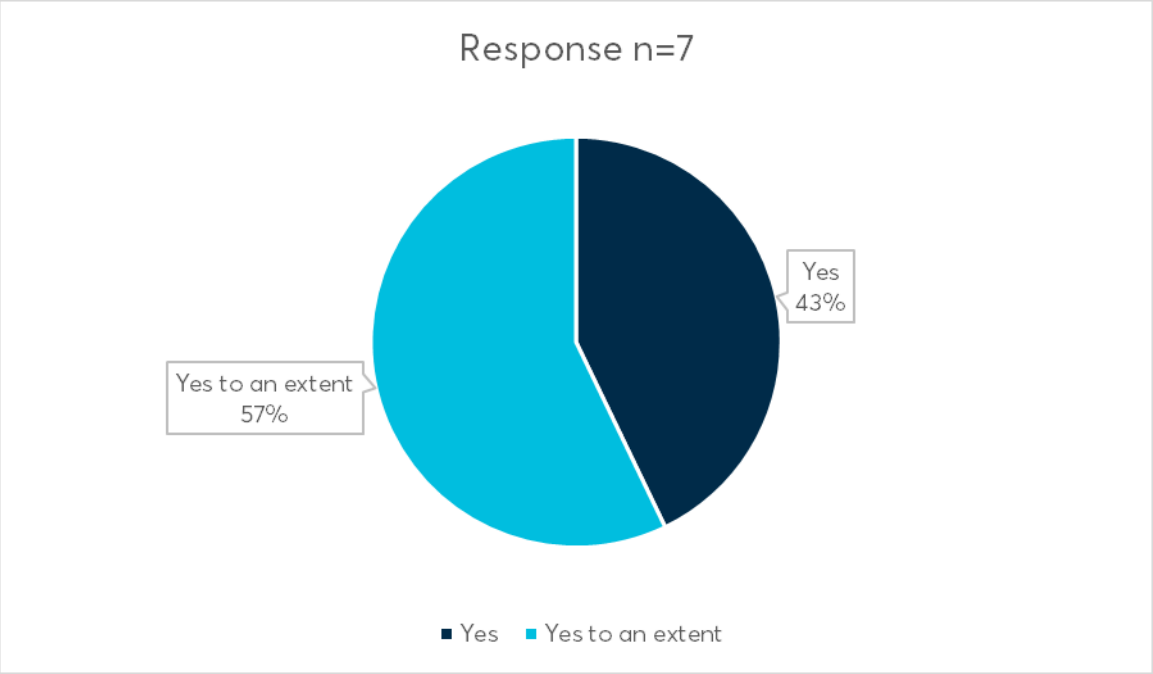
- There were 265 document downloads indicating the subject was relevant and of interest to the community.

4. KEY FINDINGS

4.1. Participate Parramatta Survey

4.1.1. The survey captured the following answers to questions about the draft concept plan.

Q1 ask 'Do you support the Review of Environmental Factors prepared for the George St East Pedestrian and Cyclist Paths project?'



Answer choice	Percent	Count
Yes	43%	3
Yes to an extent	57%	4
Unsure	-	0
No	-	0
Total	**100%**	**7**

Q2 asked 'Do you have any comments in relation to the Review of Environmental Factors prepared for the George St East Pedestrian and Cyclist Paths project?

Comments fell into two categories:

1. Those that referenced environmental concerns: 1
2. Those that referenced other matters: 6

Environmental comments covered: minimising impact on native species and trees; removing exotics and weeds; increasing the canopy. Other matters included: Traffic management on Noller Parade.

Please see the appendix for comments in full.

Q3 asked for the residential address of participants.

Q4 was an invitation to join Participate Parramatta.

This was the end of the survey.

4.2. Email

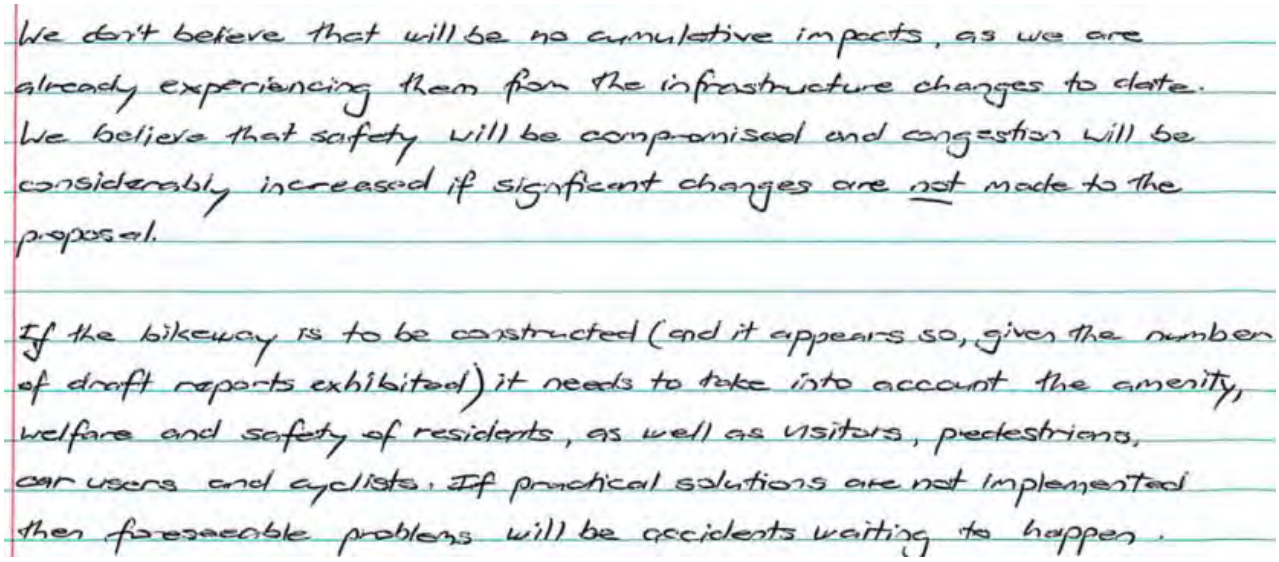
There were two (2) email submissions for this project which can be found in the appendix.

The first raised concerns about the speed of traffic in Noller Parade considering increased use by cyclists and pedestrians and suggested a reduction to 30-40 km/hour.

The second offered positive feedback on the Review of Environmental factors, and raised maintenance issues which were referred by Council staff.

4.3. Written submissions

A written submission was received with reference to lighting, preservation of trees and as a separate issue, impacts experienced by local residents trying to drive in and out of local streets since construction of the light rail infrastructure (see extract below).



We don't believe that will be no cumulative impacts, as we are already experiencing them from the infrastructure changes to date. We believe that safety will be compromised and congestion will be considerably increased if significant changes are not made to the proposal.

If the bikeway is to be constructed (and it appears so, given the number of draft reports exhibited) it needs to take into account the amenity, welfare and safety of residents, as well as visitors, pedestrians, car users and cyclists. If practical solutions are not implemented then foreseeable problems will be accidents waiting to happen.

It is recommended Council respond to the issues raised in the full submission (attached).

5. RECOMMENDATIONS

This report presents and analyses the key findings from public exhibition of the George Street East Pedestrian and Cyclist Paths Review of Environmental Factors.

Careful consideration should be given to all the feedback (including the comments in the appendix) and data presented in this report before a decision is made.

Council should respond to each concern and suggestion raised.

A summary of findings should also be reported back to the community (when appropriate but in a timely manner), highlighting how community feedback has influenced the project. The final decision and reasons why should be made public and reported back to those who provided feedback.

These recommendations are in line with Council's engagement principles and commitments outlined in the Community Engagement Strategy and Community and Stakeholder Engagement Policy.

> ***"We make our decisions in an open and transparent way and provide feedback to our stakeholders in order to explain our decisions and let them know how their input has been considered".***

6. APPENDIX

6.1. De-identified answers to Comment question:

Survey comments
I think this cycle and walking path should be built, as shown in the concept plans. The connection from the ferry wharf to the new Alfred street Bridge is a no brainer. Efforts should be made to have low impact on existing native vegetation. And efforts should also be made to eradicate exotic species and weeds from the river foreshore. Trees should be planted in areas that have reduced canopy cover. I also want to stress that Parramatta council should not consider building public pathways in Stewart Street Reserve above the new escarpment boardwalk. Lots of native planting have been regenerating there for the first time and it would be destructive to this area to build a public pathway on the northern side of the Parramatta river (between Stewart and Macarthur streets)
As a commuter into parramatta, I fully support the increased focus on and investment in pedestrian and rider infrastructure. This reduces car dependency, traffic, pollution and parking concerns, while increasing the physical activity of the local population. Well done to the city of parramatta !
Strongly support the decision to separate pedestrian and bike paths where possible. This is best practice, and avoids conflicts except in limited locations.
The treatment for cyclists for Noller Parade Westbound needs further resolution. Speed limits for vehicles need to be set at 30. If possible, other means of slowing vehicles down is ideal. Consider the environment created on little eveleigh st in Redfern as part of the new concourse as a potential precedent. Overall strong support for this link, just needs to better prioritise the modes that create the most benefit: walking and cycling.
Looks great, but why try to force the cycle path towards Purchase St and into a tight right angle turn. Give the option for bikes to continue in a straight line (heading west off Noller Parade). Give people the freedom to go which way they want.
Separating pedestrians, cyclists, and private motor vehicle traffic from each other is important and should be done where practical.
Love it! Build it please!
Email comments
I believe the speed limit in Noller imay be 50 Km/h. You may want to re-acess that (possibly 30-40km) for a road cycle environment. Noller is sometimes used for speed brake testing by nearby automobile service business and a quick short-cut for car not wanting to use James ruse drive /Hassall street intersection. Additionally a small percentage of traffic assume it is a 2 way street and may confuse cyclists./ So some new clear signage may be required.
Saw the REF and it's impressive to see the amount work that goes into it. Looking forward to it. Best [Name supplied] On 12 Sep 2023, at 8:13 am, Transport Planning <TransportPlanning@cityofparramatta.nsw.gov.au>

wrote:
Hi [Name supplied]

Thanks for getting in touch.

I have passed on no 2 and 3 to our assets team, and have advised Transport for New South Wales about the audio.

Regarding the George Street Paths, we are still awaiting the go ahead from Heritage before we tender the project for construction.

Hoping to start early next year tho!

[Name & Position supplied]

-----Original Message-----
From: [Name supplied]
Sent: Wednesday, September 6, 2023 9:06 AM
To: Transport Planning <transportplanning@cityofparramatta.nsw.gov.au>
Subject: George St Paths - Enquiry

***[EXTERNAL EMAIL] Stop and think before opening attachments, clicking on links or responding. ***

Hello Transport team,

Was looking to check in with a few topics.

1. George St East Bike & Pedestrian paths. Wondering if there is an updated retime for works to be completed?

FYI -
2. 183 Macquarie St Parramatta. This a vacant lot being used as parking. There have been both cars and forklifts using this site.
Being there is no layback the vehicles are using the one on the neighbouring property at 12 Charles st. This has caused major damage to the tiles on the pedestrian foot path and is also a safety issue when walking past.

3. I walk along the light rail route daily in the queens wharf to parramatta square areas. It looks like the concrete surrounds on majority of the stormwater pits along the route are crumbling away. Possibly a sub standard product used.

4. The traffic light outside of the Albion when crossing Harris st to robin thomas reserve does not have any pedestrian audio.

Very best

Mailed submission (cont../)

PLS DO NOT PUBLISH MY PI OR PROVIDE IT TO 3RD PARTIES (CONFIDENTIAL)

① 27/10/23

GEORGE ST EAST REVIEW OF ENVIRONMENTAL FACTORS (REF) FOR GEORGE ST EAST PEDESTRIAN + CYCLIST PATHS

ATTENTION : MR [redacted]K [redacted]N

Firstly, Thank you for allowing us to lodge this submission today, as we do have some concerns about the proposed bike lane which is part of the Queens Wharf Reserve Active Transport Project.

1. Lighting

The addition of lighting the bike paths will over illuminate the area. Darkness is needed for adequate quality sleep; something which will be much less likely given the proposed bike path lighting on top of the recently installed Light Rail lighting. The creation of skyglow (or light pollution) is problematic as it disrupts sleep patterns, which then cause other health issues.

It is essential to ensure that lights comply with Australian Govt National Light Pollution Guidelines + the Adea Criteria. Sadly, most Councils in Australia do not comply with these guidelines, choosing 4,000 CCT LED lighting as it is cheaper. But, even though "high CCT LEDs may not be damaging to road/bike users given a short exposure time, their impacts for wildlife and long term exposure for humans are far more problematic."

2. Trees

It is not yet clear if trees 52 + 53 will survive the proposed paths. Given their heritage and ecological significance, it is suggested that the proposed route be redesigned, to ensure their survival.

3. Traffic + Access Impacts

Since the construction of the Light Rail infrastructure, access to our home has become much more difficult. We live in [redacted]

A) Exiting to Punchase St or George St is constrained by traffic lights which cause queuing as only 2 cars can cross over the green light.

B) Entering Naller Pde from Alfred St is tricky as cars coming from River Road West can't be seen easily due to the curvature of the road. And, many of them do not signal that they are going up Alfred St or

PLS DO NOT PUBLISH MY PI OR PROVIDE IT TO 3RD PARTIES.
(CONFIDENTIAL)

⑨ (cont'd)

GEORGE ST EAST REVIEW OF ENVIRONMENTAL FACTORS

to Naller Pde.
The opening of the Alfred St Bridge will further complicate the situation as the number of people (including cyclists) crossing here will increase dramatically. There are already queques at this intersection at peak times, and it is not uncommon for queques to form in non peak times. This also banks up George St, as cars wait to turn into Alfred St and then into Naller Pde on River Rd West.
Note: 1) This (A & B above) is all before the Light Rail actually commences operation.
2) The Light Rail Tramway St Stop is very near this intersection as well.

This complicated traffic situation will be further exacerbated by the proposed bike lane in Naller Pde, as it will remove one lane of vehicular traffic in a very narrow, one way street.
Entering and exiting our own driveway will be more difficult as we will be hemmed in. Once cars are parked on the eastern side of our driveway, we will not have vision of the road into which we are exiting, until we are almost upon it.

We don't believe that will be no cumulative impacts, as we are already experiencing them from the infrastructure changes to date.
We believe that safety will be compromised and congestion will be considerably increased if significant changes are not made to the proposal.

If the bikeway is to be constructed (and it appears so, given the number of draft reports exhibited) it needs to take into account the amenity, welfare and safety of residents, as well as visitors, pedestrians, car users and cyclists. If practical solutions are not implemented then foreseeable problems will be accidents waiting to happen.

[redacted]

We have nothing to declare.

Pg 2 of 2