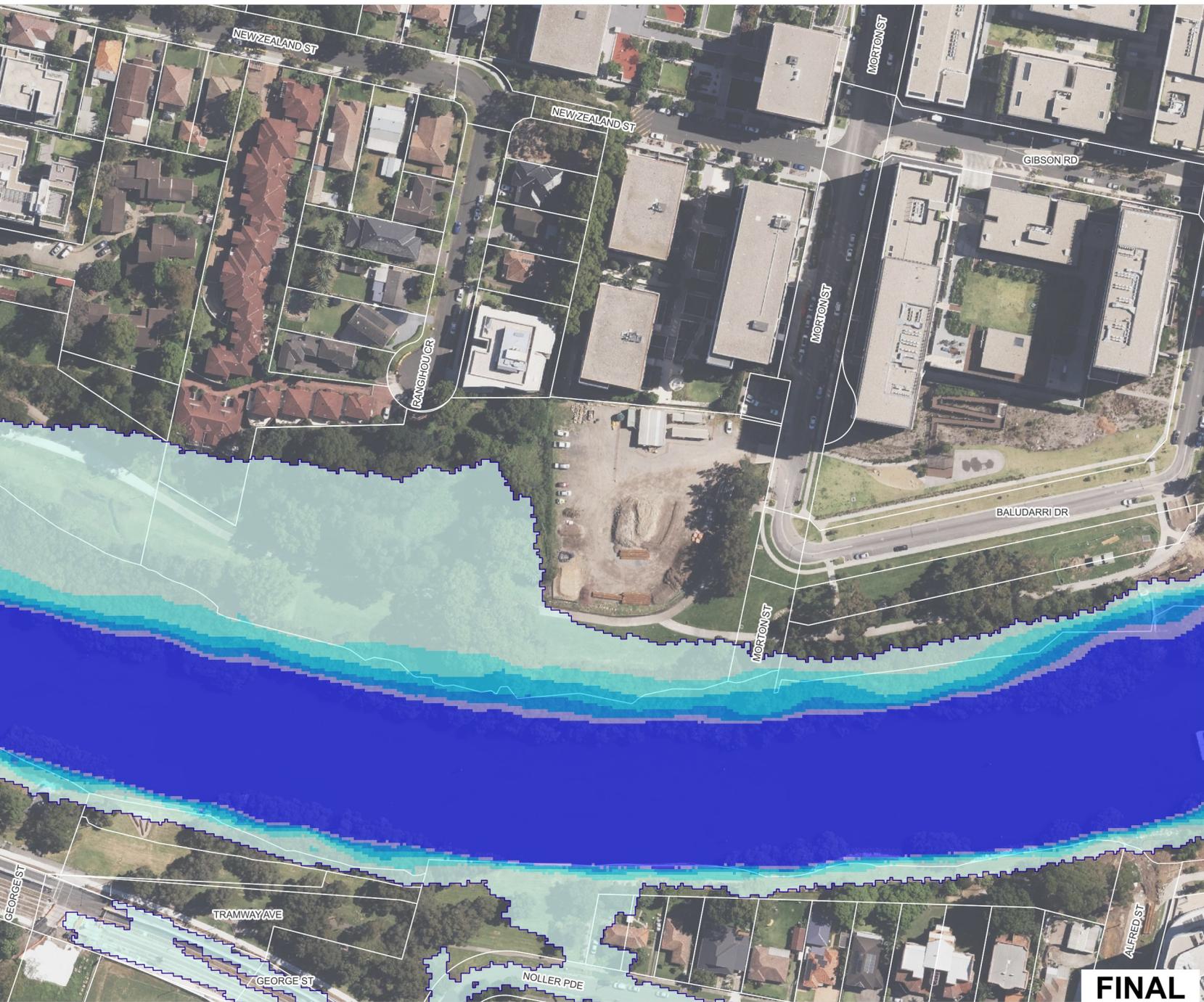


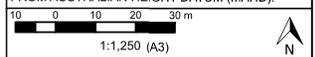
WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY IN INCURRED AS A RESULT OF THE DATA BEING INCOMPLETE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.



LEGEND

	20pc_Existing_Fld_Extent
	20pc_4.5hr_Existing_Fld_DxV_Max
	Band 1
	0.0-0.2
	0.2-0.4
	0.4-0.6
	0.6-0.8
	0.8-1.0
	>1

NOTES:
 1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
 2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

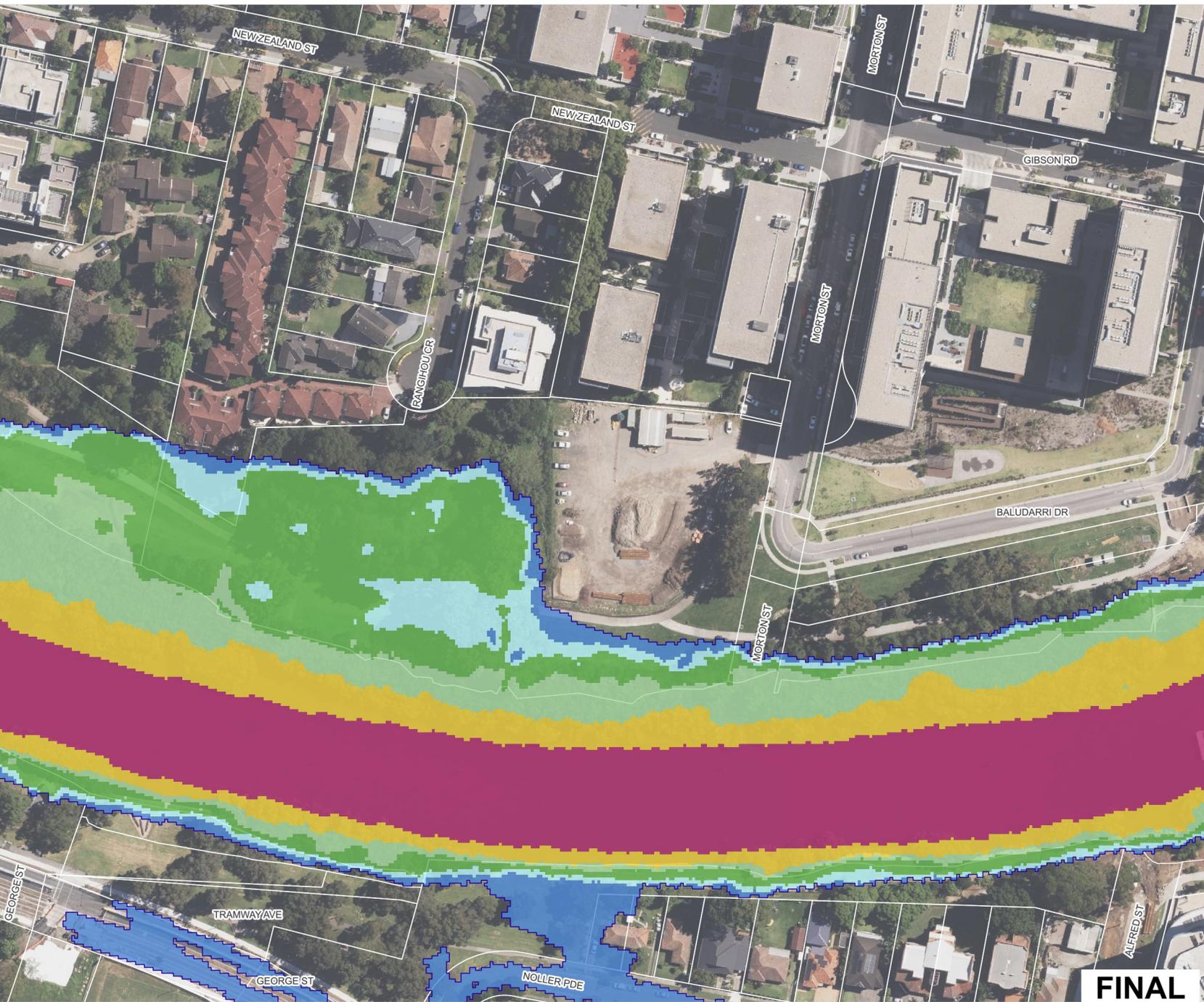
DRAWING TITLE:
 EXISTING SCENARIO
 5YR ARI STORM EVENT
 MAXIMUM FLOOD DEPTH-VELOCITY

FIGURE: A3 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

FINAL

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY IN NEGLIGENCE) FOR ALL EXPENSES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGE) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.

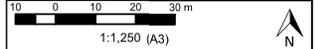


LEGEND

- 20pc_Existing_Fld_Extent
- 20pc_4.5hr_Existing_Max_Fld_Hazard
- Band 1
- H1
- H2
- H3
- H4
- H5
- H6

NOTES:
 1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

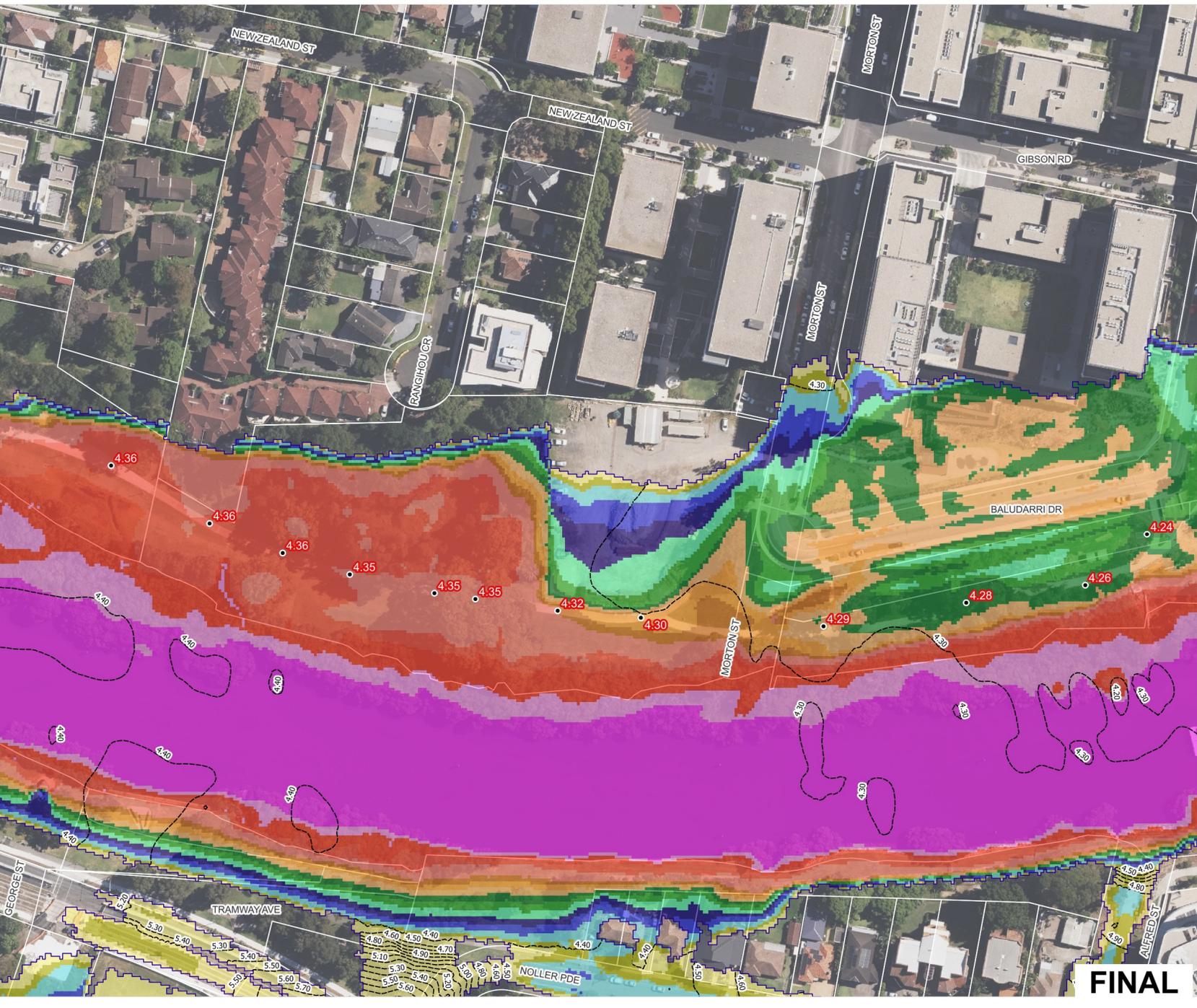
CLIENT:

DRAWING TITLE:
 EXISTING SCENARIO 5YR ARI STORM EVENT MAXIMUM FLOOD HAZARD

FIGURE: A4 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY IN INCURRED AS A RESULT OF CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.



LEGEND

- FFA_1pc_12hr_Max_Fld_Extnt
- FFA_1pc_12hr_Max_Fld_Extnt
- FFA_1pc_12hr_Max_Fld_Extnt

FFA_1pc_12hr_Max_Fld_Depth
Band 1

- <= 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.40
- 1.40 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- > 4.00

NOTES:

- REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
- ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

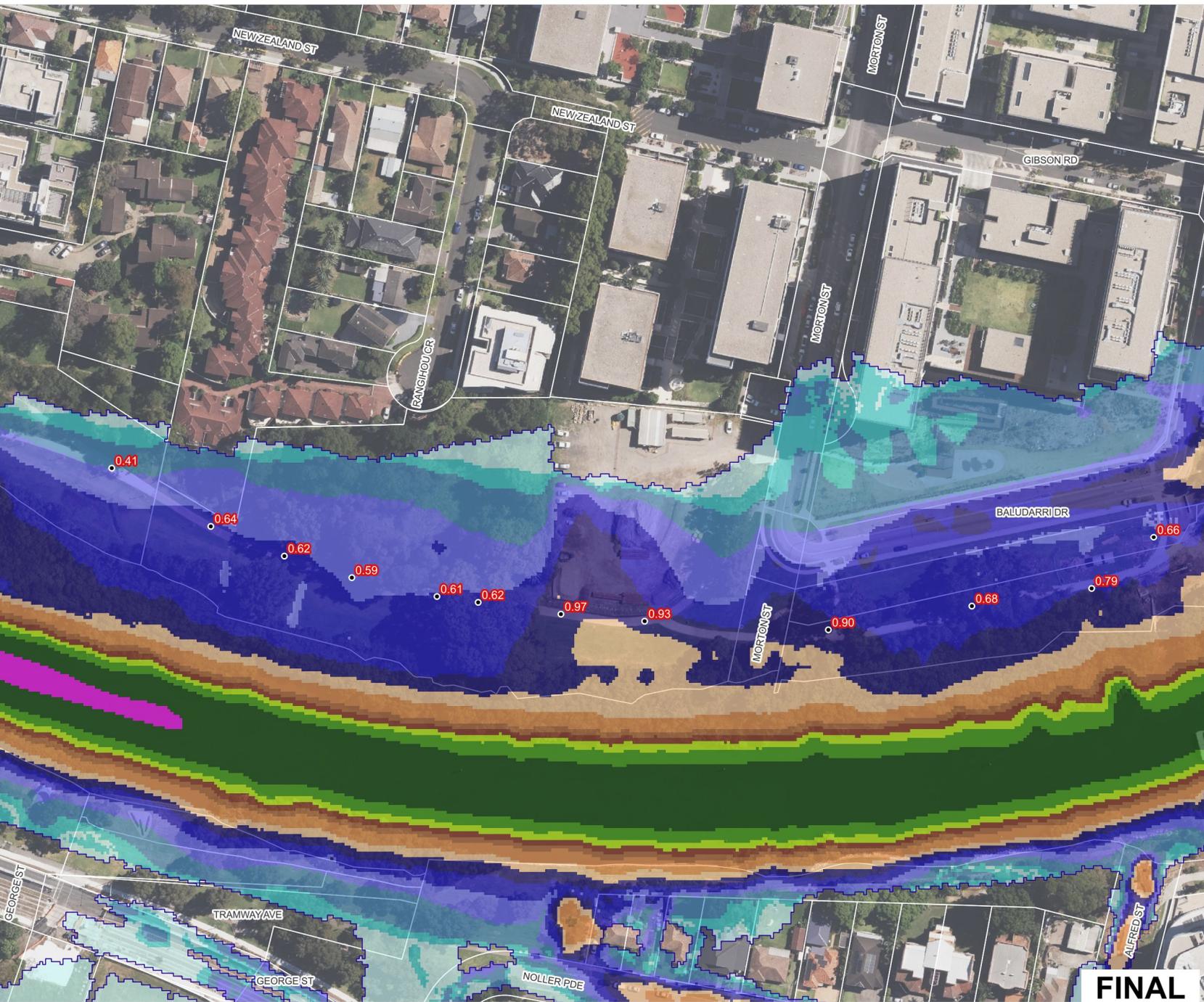
CLIENT:

DRAWING TITLE:
 EXISTING SCENARIO
 FFA_100YR ARI STORM EVENT
 MAXIMUM FLOOD DEPTH

FIGURE: A5 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY FOR ALL EXPENSES, LOSSES, DAMAGES INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.



LEGEND

- FFA_1pc_12hr_Max_Fld_Extent
- FFA_1pc_12hr_Max_Fld_Velocity_Points

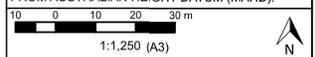
FFA_1pc_12hr_Max_Fld_Velocity

Band 1

- ≤ 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.20
- 2.20 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 5.00
- > 5.00

NOTES:

- REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
- ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

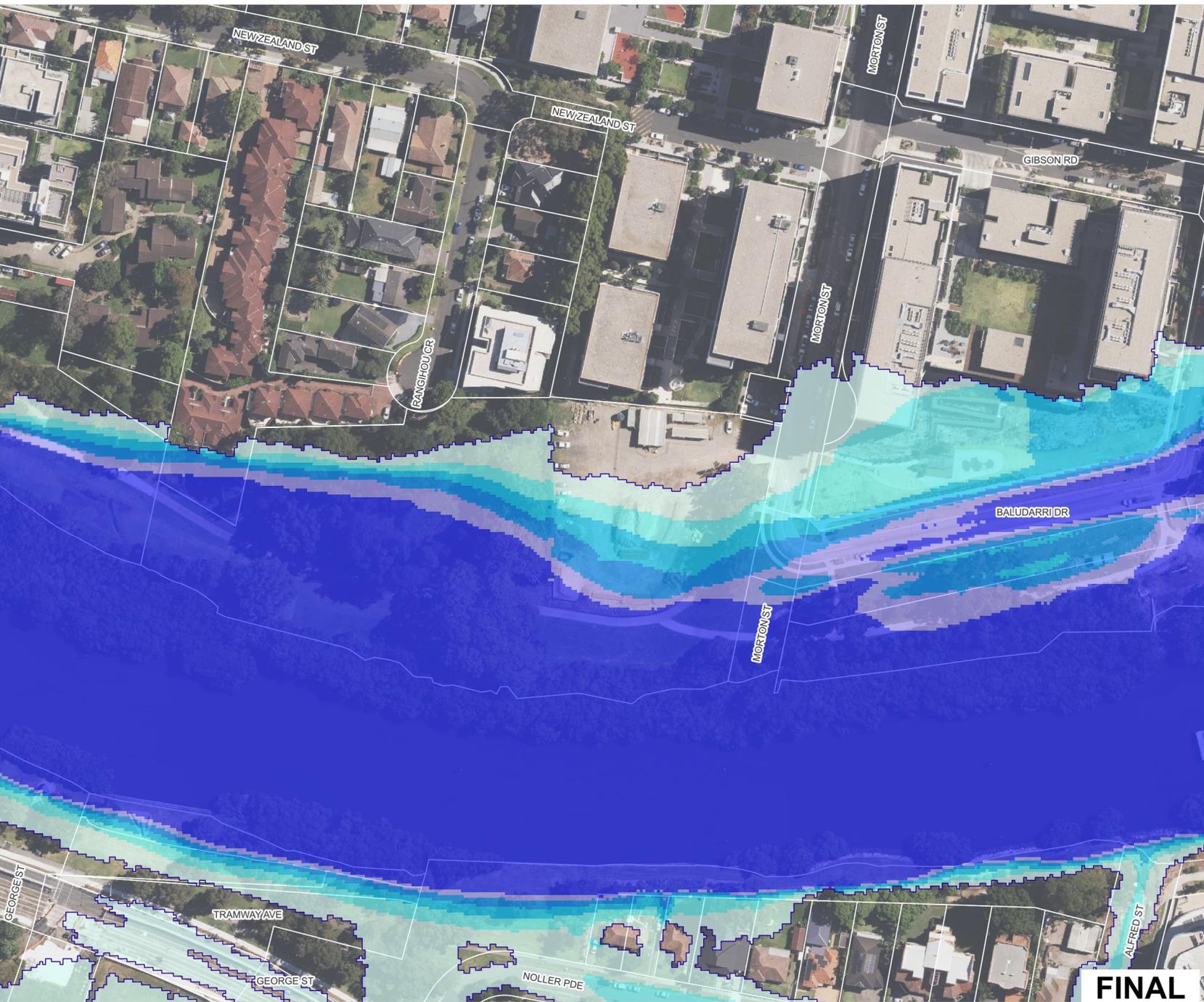
DRAWING TITLE:
EXISTING SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD VELOCITY

FIGURE: **A6** ISSUE: **A**

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

FINAL

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY INCLUDING WITHOUT LIMITATION LIABILITY FOR ALL EXPENSES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.

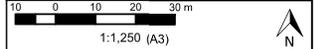


LEGEND

- FFA_1pc_12hr_Max_Fld_Extent
- S1_ParraR_EX040_Existing_FFA_1pc_12
 - Band 1
 - 0.0-0.2
 - 0.2-0.4
 - 0.4-0.6
 - 0.6-0.8
 - 0.8-1.0
 - >1

NOTES:
 1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

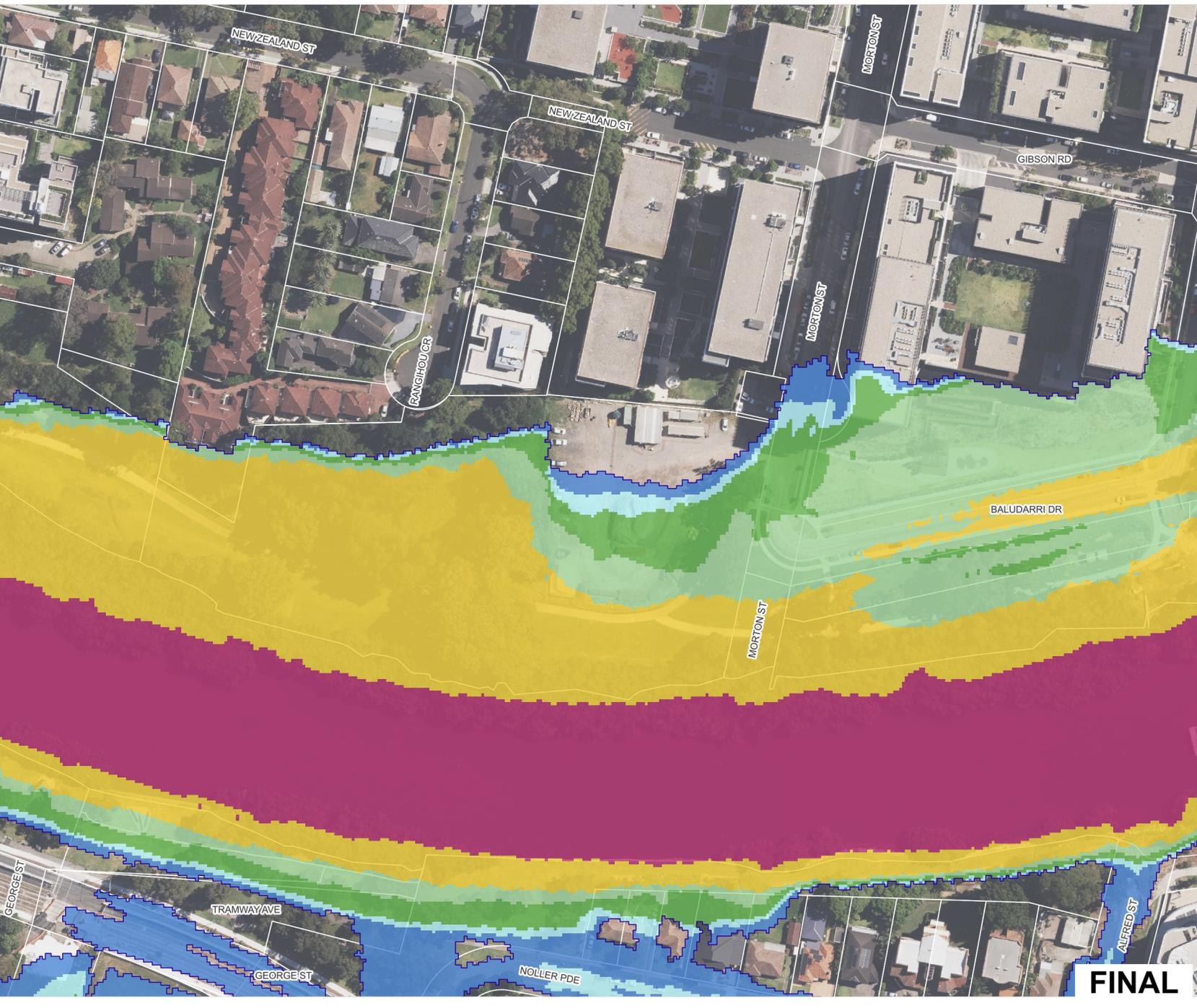
DRAWING TITLE:
 EXISTING SCENARIO
 FFA_100YR ARI STORM EVENT
 MAXIMUM FLOOD DEPTH-VELOCITY

FIGURE: **ISSUE:**
 A7 A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

FINAL

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY FOR ALL EXPENSES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.

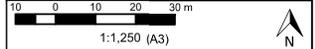


LEGEND

- FFA_1pc_12hr_Max_Fld_Extent
- FFA_1pc_12hr_Max_Fld_Hazard
- Band 1
- H1
- H2
- H3
- H4
- H5
- H6

NOTES:
 1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

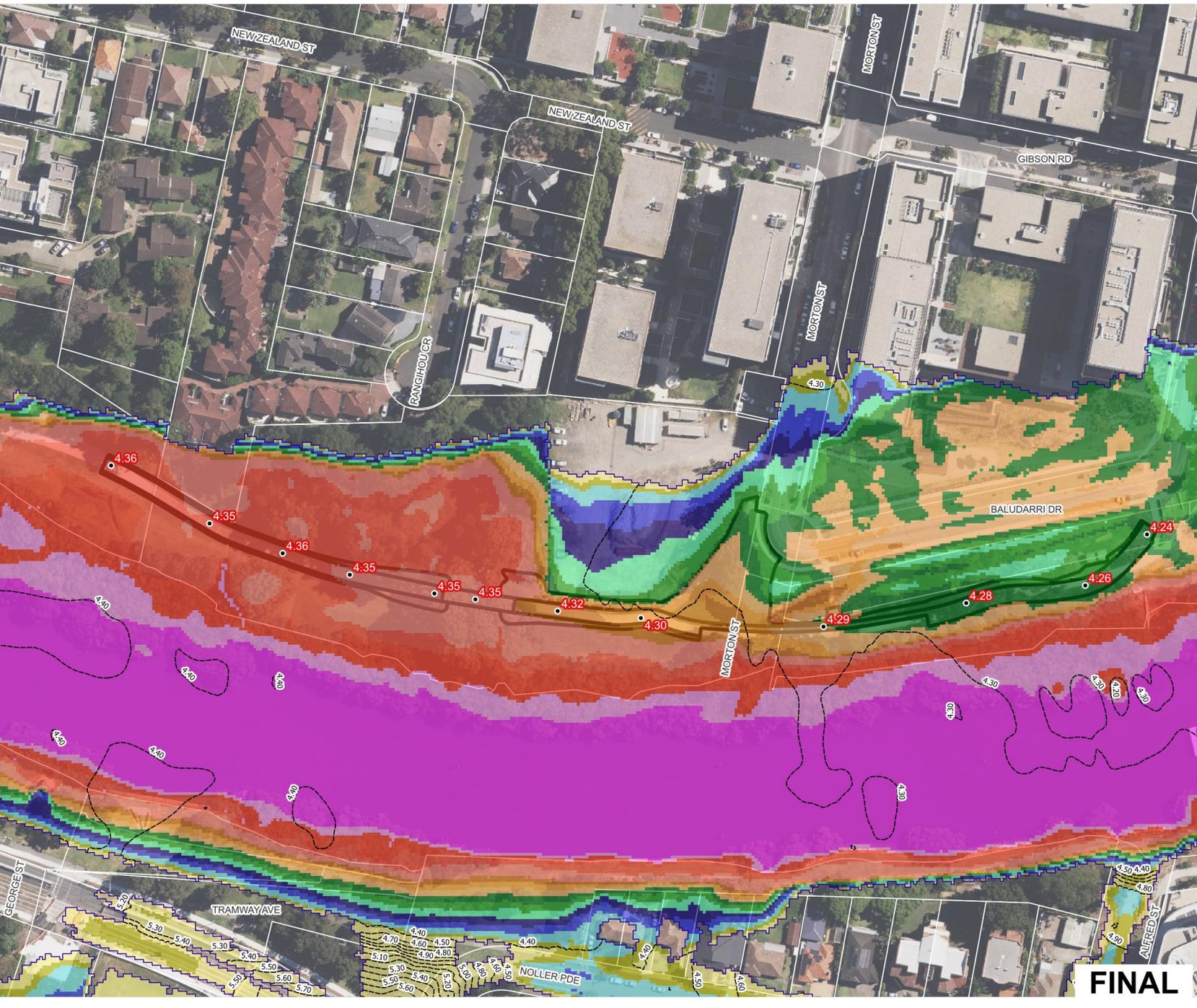
CLIENT:

DRAWING TITLE:
 EXISTING SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD HAZARD

FIGURE: A8 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY INCLUDING WITHOUT LIMITATION LIABILITY IN INCURRED AS A RESULT OF THE DATA BEING INCOMPLETE OR INACCURATE IN ANY WAY AND FOR ANY REASON.



LEGEND

Developed

- FFA_1pc_12hr_Max_Fld_Ext
- FFA_1pc_12hr_Max_Fld_Lvl_Points
- FFA_1pc_12hr_Max_Fld_Lvl_Contour

FFA_1pc_12hr_Max_Fld_Depth

Band 1

- <= 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.40
- 1.40 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- > 4.00

PROJECT FILES

Project Outline

NOTES:

- REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
- ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).

10 0 10 20 30 m

1:1,250 (A3)

N

PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

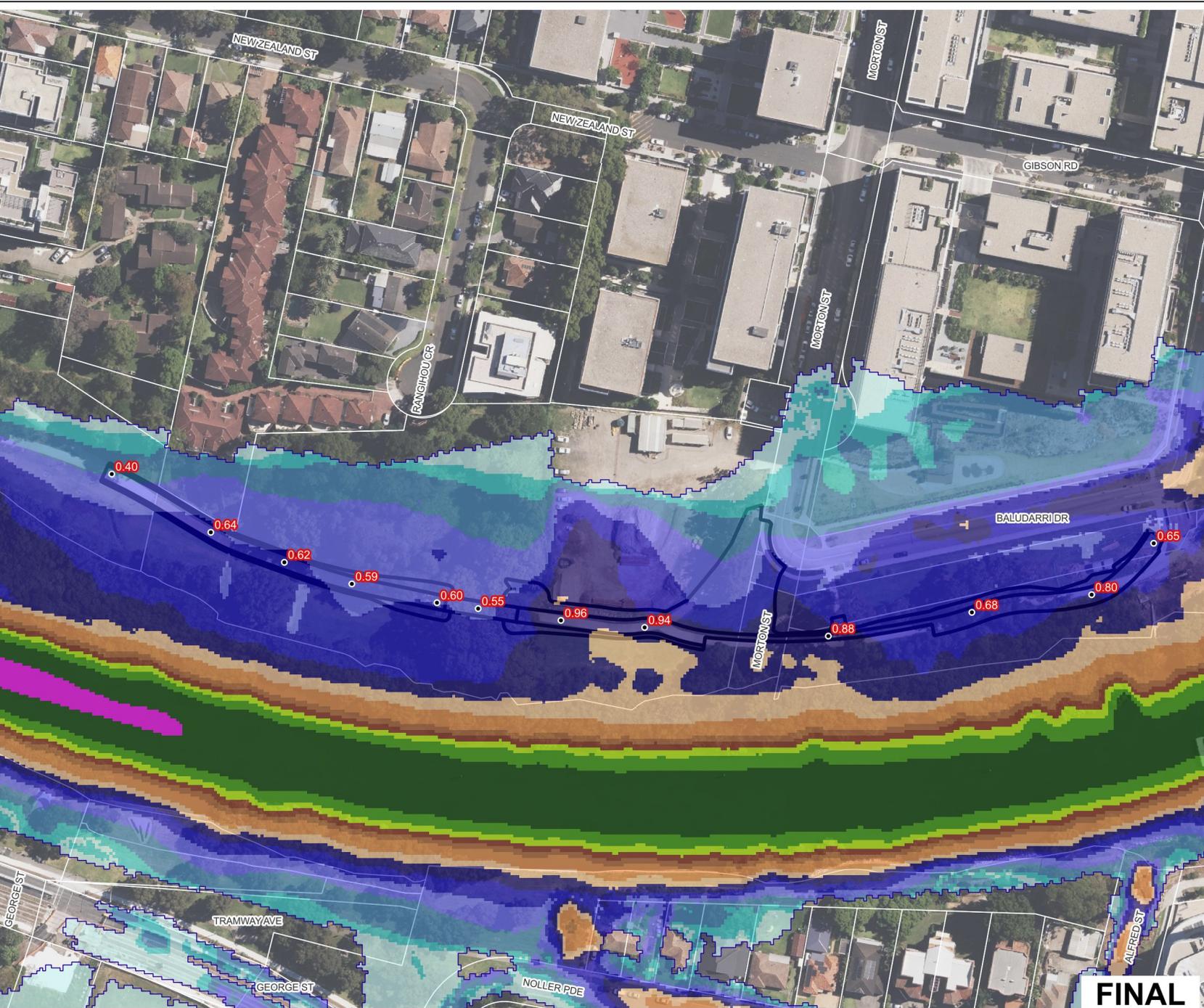
CLIENT:

DRAWING TITLE:
 DEVELOPED SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD DEPTH

FIGURE: A9 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY INCLUDING WITHOUT LIMITATION LIABILITY IN NEGLIGENCE FOR ALL EXPENSES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INACCURATE OR INCOMPLETE IN ANY WAY AND FOR ANY REASON.



LEGEND

Developed

- FFA_1pc_12hr_Max_Fld_Extnt
- FFA_1pc_12hr_Max_Fld_Velocity_Points

FFA_1pc_12hr_Max_Fld_Velocity

Band 1

- <= 0.10
- 0.10 - 0.20
- 0.20 - 0.40
- 0.40 - 0.60
- 0.60 - 0.80
- 0.80 - 1.00
- 1.00 - 1.20
- 1.20 - 1.60
- 1.60 - 1.80
- 1.80 - 2.00
- 2.00 - 2.20
- 2.20 - 2.50
- 2.50 - 3.00
- 3.00 - 3.50
- 3.50 - 4.00
- 4.00 - 5.00
- > 5.00

PROJECT FILES

Project Outline

NOTES:

- REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
- ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).

10 0 10 20 30 m

1:1,250 (A3)

PROJECT:
RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

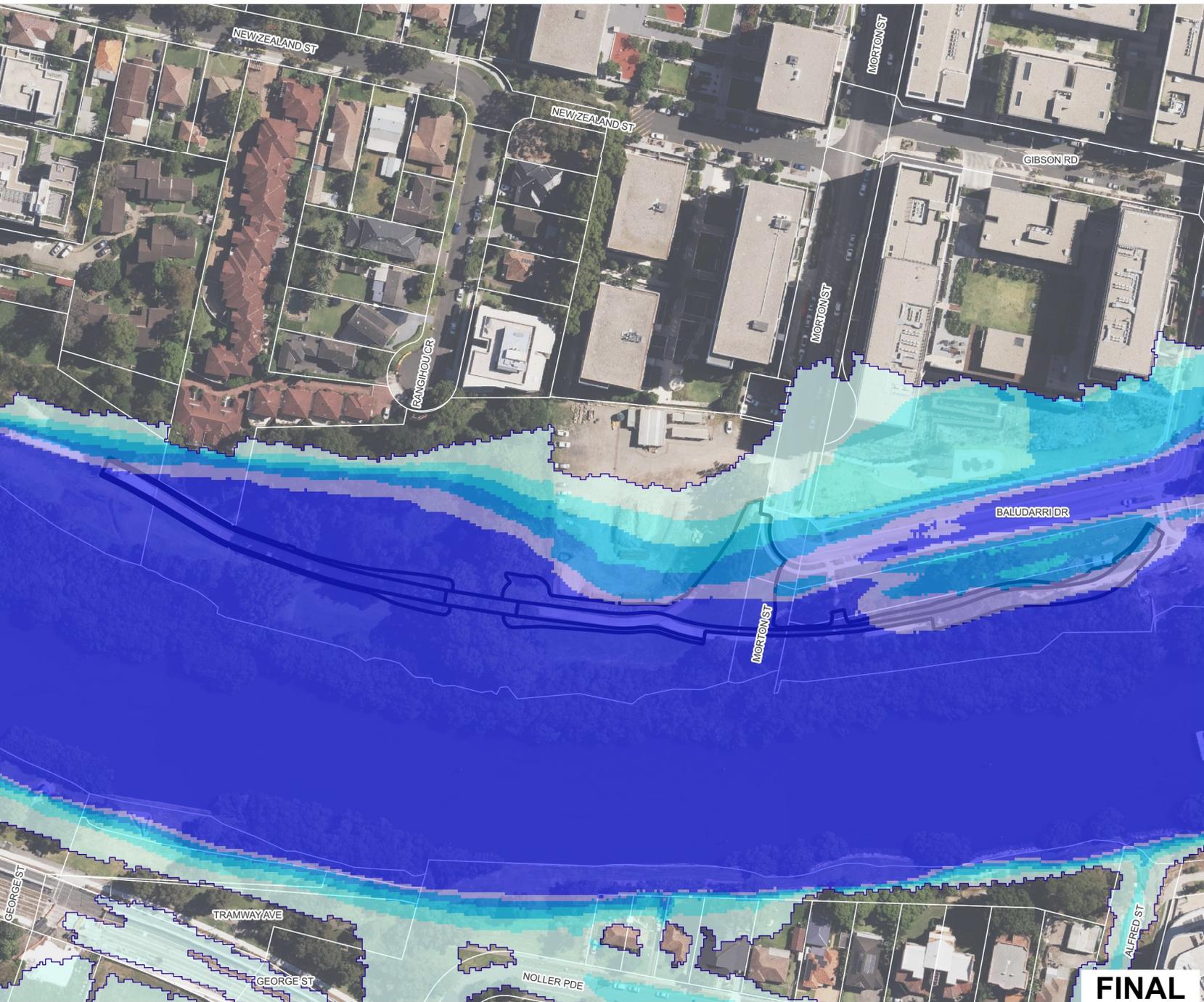
DRAWING TITLE:
DEVELOPED SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD VELOCITY

FIGURE: **A10** ISSUE: **A**

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

FINAL

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY FOR ANY DAMAGES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INCOMPLETE OR INACCURATE IN ANY WAY AND FOR ANY REASON.



LEGEND

Developed

- FFA_1pc_12hr_Max_Fld_Extnt

FFA_1pc_12hr_Max_Fld_DxV

Band 1

- 0.0-0.2
- 0.2-0.4
- 0.4-0.6
- 0.6-0.8
- 0.8-1.0
- >1

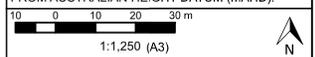
PROJECT FILES

Project Outline

- Project_Outline -- entities

NOTES:

- REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
- ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

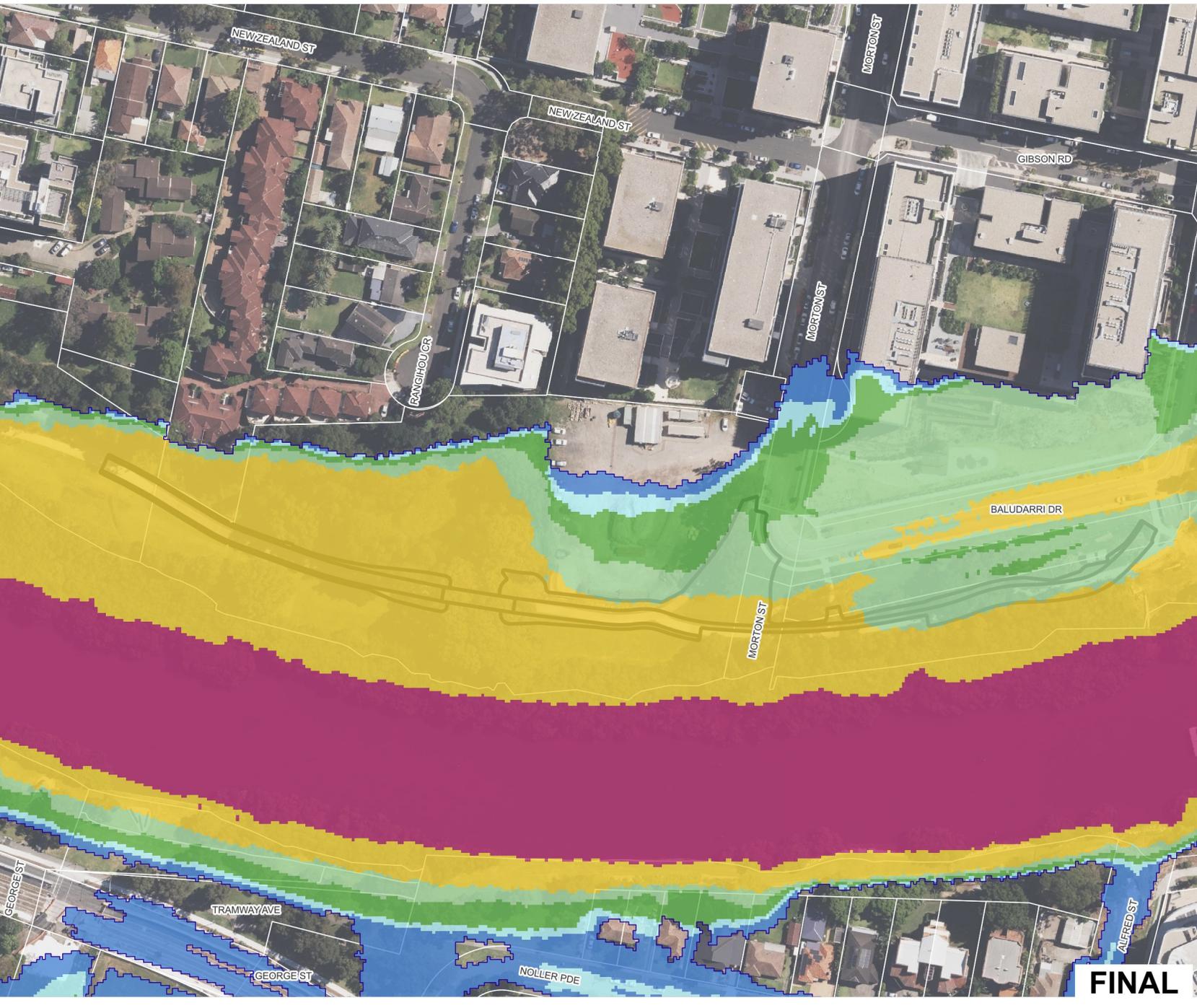
DRAWING TITLE:
 DEVELOPED SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD DEPTH-VELOCITY

FIGURE: A11 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

FINAL

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY INCLUDING WITHOUT LIMITATION LIABILITY IN INCURRED AS A RESULT OF THE DATA BEING INCOMPLETE OR INACCURATE IN ANY WAY AND FOR ANY REASON.



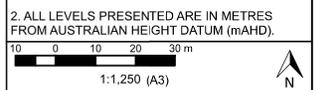
LEGEND

- Developed
- FFA_1pc_12hr_Max_Fld_Extnt
- FFA_1pc_12hr_Max_Fld_Hazard
- Band 1
- H1
 - H2
 - H3
 - H4
 - H5
 - H6

PROJECT FILES

- Project Outline
- Project_Outline -- entities

NOTES:
 1. REFER TO RANGIHOUE RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.
 2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
 RANGIHOUE RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

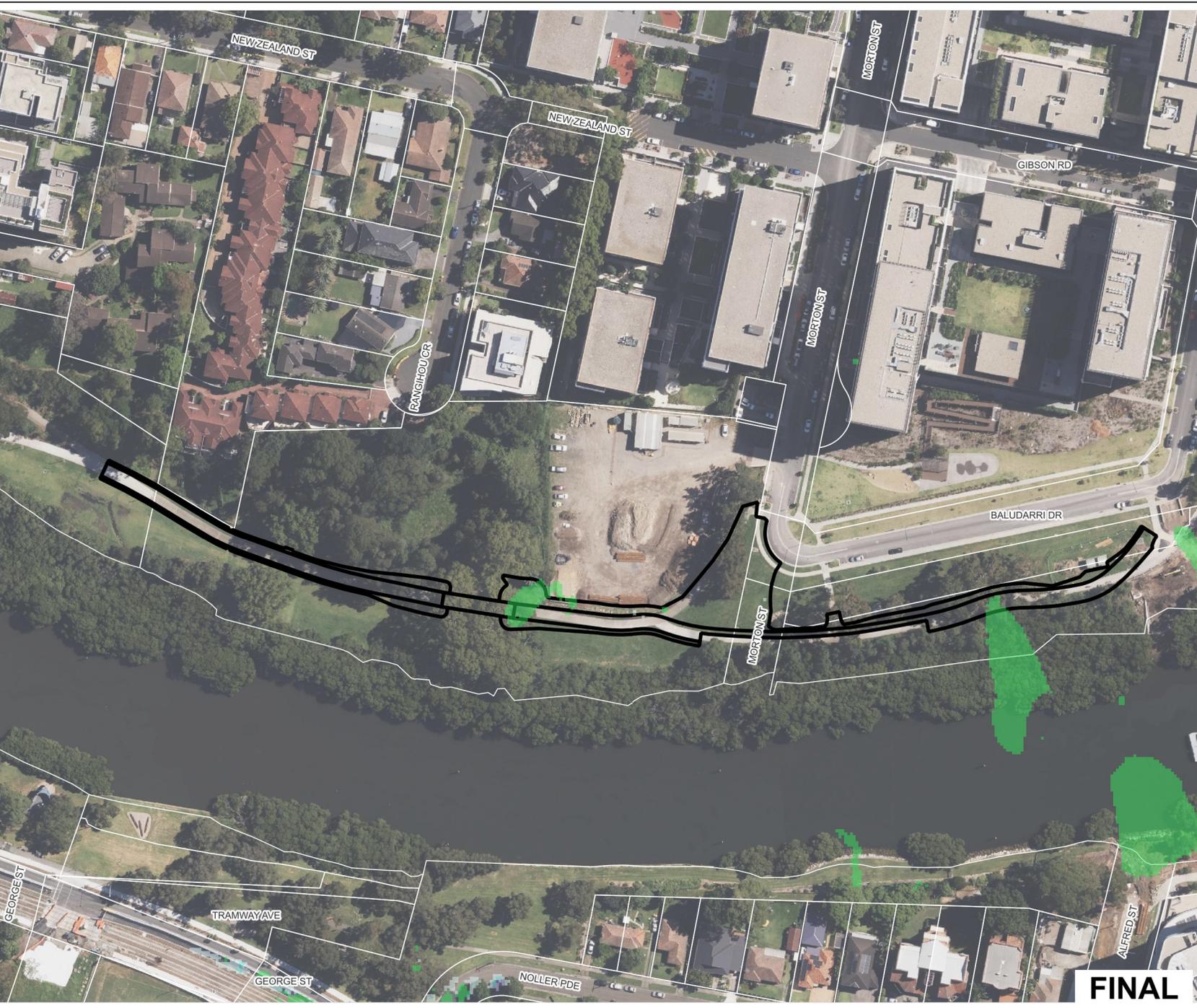
CLIENT:

DRAWING TITLE:
 DEVELOPED SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD HAZARD

FIGURE: A12 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				

WHILE EVERY CARE IS TAKEN TO ENSURE THE ACCURACY OF DATA SOURCED THROUGH THIRD PARTIES, CITY ASSESSORS AND ENVIRONMENT UNIT MAKES NO REPRESENTATIONS OR WARRANTIES ABOUT ITS ACCURACY, RELIABILITY, COMPLETENESS OR SUITABILITY FOR ANY PARTICULAR PURPOSE AND DISCLAIMS ALL LIABILITY (INCLUDING WITHOUT LIMITATION LIABILITY FOR ALL EXPENSES, LOSSES, DAMAGES (INCLUDING INDIRECT OR CONSEQUENTIAL DAMAGES) AND COSTS WHICH MIGHT BE INCURRED AS A RESULT OF THE DATA BEING INCOMPLETE OR INACCURATE IN ANY WAY AND FOR ANY REASON.



LEGEND

- Impact
- 1pc_Impact
- Band 1
- <= -0.01
 - 0.005 - 0.002
 - 0.002 - 0.01
 - 0.01 - 0.015
 - 0.015 - 0.020
 - 0.020 - 0.030
 - 0.030 - 0.040
 - 0.040 - 0.050
 - 0.050 - 0.060
 - 0.060 - 0.080
 - 0.080 - 0.100
 - 0.100 - 0.120
 - 0.120 - 0.140
 - 0.140 - 0.165

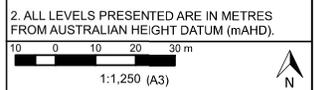
PROJECT FILES

- Project Outline
- Project_Outline — entities

NOTES:

1. REFER TO RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY FLOOD IMPACT ASSESSMENT REPORT BY CITY OF PARRAMATTA COUNCIL.

2. ALL LEVELS PRESENTED ARE IN METRES FROM AUSTRALIAN HEIGHT DATUM (mAHD).



PROJECT:
RANGIHOU RESERVE SHARED PEDESTRIAN AND CYCLIST PATHWAY

CLIENT:

DRAWING TITLE:
DEVELOPED SCENARIO FFA_100YR ARI STORM EVENT MAXIMUM FLOOD IMPACT

FIGURE: A13 **ISSUE:** A

ISS	BY	CHK	DATE	DETAILS
A	DM		29.05.25	FINAL
B				
C				
D				
E				



Contact Us

CITY OF PARRAMATTA COUNCIL

316 Victoria Road, Rydalmere, NSW 2116
PO Box 32, Parramatta, NSW 2124

Report on Detailed Site Investigation

Proposed Pedestrian and Cycleway

Rangihou Reserve, Parramatta NSW

Prepared for City of Parramatta Council

Project 231248.01

16 January 2025

Document History

Details

Project No.	231248.01
Document Title	Report on Detailed Site Investigation
Site Address	Rangihou Reserve, Parramatta NSW
Report Prepared For	City of Parramatta Council
Filename	231248.01.R.002.Rev0

Status and Review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Huy Tran / Michael Le	Paul Gorman	16 January 2025

Distribution of Copies

Status	Issued to
Revision 0	City of Parramatta Council

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

Signature

Date

Author	p.p. 	16 January 2025
Reviewer		16 January 2025

Executive Summary

Douglas Partners Pty Ltd (Douglas) has been engaged by City of Parramatta Council (CoP) to prepare this Detailed Site Investigation (DSI) report on contamination for a proposed pedestrian and cycleway at Rangihou Reserve, Parramatta NSW (the site).

It is understood that the proposed pedestrian and cycleway includes five linked sites spanning from Parramatta to Ermington, however the contamination investigation is only required at three of the sites, as listed in Section 2. Separate DSI reports have been prepared for the Reid Park Valley and Royal Shores sites. A geotechnical investigation was undertaken concurrently by Douglas for the five linked sites, and these have also been reported separately.

In accordance with the project brief, the objective of the DSI is to:

- Inform the design development of the potential works (Civil, Structural and Electrical) as indicated in the draft landscape concept plans; and
- Determine the presence, type and extent of ground contamination (if any) to inform preparation of a Remediation Action Plan (RAP), Work Health and Safety (WHS) contamination site management procedures and to inform costs associated with bulk earthworks including the disposal off site of any contaminated site material during construction works.

The investigation included a desktop review of site history information including soil landscape, geological, topographical, acid sulfate soil (ASS) and hydrogeological published information, review of publicly available government held records including NSW Environment Protection Authority (EPA) contaminated land property records and environmental protection licence databases, completion of a site walkover, collection of soil samples from 12 boreholes (BH101 to BH112), dispatch and analysis of samples for Contaminants of Potential Concern (CoPC) listed in Section 3 to a National Association of Testing Authorities (NATA) accredited laboratory, and preparation of this DSI report with a preliminary waste classification assessment.

The site history information suggests that the site may have been part of agricultural land prior to 1943. The site largely remained undeveloped except for the east portion of the site which was utilised as part of a large commercial / industrial / warehousing development from *circa* 1940s to 1980s. Following demolition of the warehouse in the east portion of the site, the warehouse was replaced with an on-grade carpark, with the remainder of the site remaining as a vacant grassed area until 2005 when a walking track was constructed along the west site alignment. The footpath was extended further east *circa* 2015.

A number of investigations and plans had been prepared by various consultants for various development project at and around the current site, the majority of which identified asbestos in soils as a contamination exposure risk requiring remediation and management. The previous investigations also identified ASS at and around the current site, also to be managed under a management plan.

The concentrations of monocyclic aromatic hydrocarbons (BTEX), polycyclic aromatic hydrocarbons (PAH), phenols, organochlorine pesticides (OCP), organophosphate pesticides (OPP), polychlorinated biphenyls (PCBs) and Total Recoverable Hydrocarbons (TRH) in all samples tested were within the adopted SAC except for benzo(a)pyrene (B(a)P) TEQ in BH102/0.1-0.2 m exceeding the Health Investigation Level (HIL) Site Assessment Criteria (SAC) of 3 mg/kg and B(a)P exceeding the adopted EIL SAC of 0.7 mg. However, the exceedance is not considered to be of concern as the calculated 95% UCL for all fill samples over the site were below the SAC. Furthermore, the B(a)P is below the CRC Care (CRC CARE, 2017) high reliability value of 33 mg/kg.

Bonded and friable asbestos was recorded at three test locations as summarised in Table 5, and a geofabric marker layer associated with management of known asbestos in soils was found at four test locations. Previous investigations by other in part of the site and in surrounding properties have also identified asbestos, and/or the management of asbestos in soil.

Based on the results of the DSI, it is considered that exposure risks associated with identified (and unknown) asbestos in soils at the site can be managed subject to implementation of the following recommendations:

- A RAP is prepared in accordance with NSW EPA (2020) to address:
 - o WHS management protocols during construction works;
 - o Remediation strategy for fill impacted with asbestos;
 - o Protocols for the validation of site remediation;
 - o Protocols for waste classification of any materials requiring off-site disposal, and protocols for material import, including check-sampling, where appropriate;
 - o Other general requirements for RAPs under NSW EPA (2020); and
- Douglas (2025) concludes that Actual Acid Sulfate Soils (AASS) is likely present at the site within the alluvial sediments below the water table in proximity to Parramatta River, at depths ranging from approximately -0.3 m to -0.4 m Australian Height Datum (AHD). As such AASS is expected to be encountered during piling and possibly during bulk excavation works. On this basis, management of Acid Sulfate Soil (ASS) for the proposed development is required through an ASS management plan.

Table of Contents

	Page No
1. Introduction.....	1
2. Proposed development	1
3. Scope of work	2
4. Site information.....	3
5. Environmental setting	4
6. Summary of previous investigations.....	5
6.1 Previous reports	5
7. Site history	6
7.1 Historical aerial photography.....	6
7.2 Public registers and planning records	8
7.3 Council records search	8
7.4 Site history integrity assessment.....	14
7.5 Summary of site history	14
8. Site walkover	14
8.1 Observations	14
9. Preliminary conceptual site model	15
10. Sampling and analysis plan.....	17
10.1 Data quality objectives	17
10.2 Soil sampling and analysis rationale.....	17
10.3 Sample analysis rationale	17
11. Site assessment criteria	18
12. Results	18
12.1 Field work results	18
12.2 Laboratory analytical results.....	19
12.3 Data quality assurance and quality control	19
13. Discussion	19
13.1 Soils.....	19
13.2 Acid sulfate soils.....	21
13.3 Preliminary waste classification	21
14. Revised conceptual site model	23

15.	Conclusions and recommendations	24
16.	References	25
17.	Limitations.....	26

Appendix A: Drawings

Appendix B: About This Report

Appendix C: Site History

C1: Historical Aerial Photography

C2: Council Records Summary

C3: Site Photographs

Appendix D: Data Quality Objectives

Appendix E: Sampling Methodology

Appendix F: Site Assessment Criteria

Appendix G: Borehole Logs

Appendix H: Summary Results Table

Appendix I: Laboratory Reports and Chain of Custody

Appendix J: Data Quality Assurance and Quality Control

Report on Detailed Site Investigation Proposed Pedestrian and Cycleway Rangihou Reserve, Parramatta NSW

1. Introduction

Douglas Partners Pty Ltd (Douglas) has been engaged by City of Parramatta Council (CoP) to prepare this detailed site investigation (DSI) report on contamination for a proposed pedestrian and cycleway at Rangihou Reserve, Parramatta NSW (the site). It is understood that the proposed pedestrian and cycleway includes five linked sites spanning from Parramatta to Ermington, however the contamination investigation is only required at three of the sites, as listed in Section 2. Separate DSI reports have been prepared for the Reid Park Valley and Royal Shores sites. A geotechnical investigation was undertaken concurrently by Douglas for the five linked sites, and these have also been reported separately.

The investigation was undertaken in accordance with Douglas' proposal 231248.00.P.001.Rev0 dated 22 August 2024.

In accordance with the project brief, the objective of the DSI is to:

- Inform the design development of the potential works (Civil, Structural and Electrical) as indicated in the draft landscape concept plans; and
- Determine the presence, type and extent of ground contamination (if any) to inform preparation of a RAP, WHS contamination site management procedures and to inform costs associated with bulk earthworks including the disposal off site of any contaminated site material during construction works.

The project brief limits the investigations to the sampling and testing of soils only.

This report must be read in conjunction with all appendices including the notes provided in Appendix B.

The following key guidelines were consulted in the preparation of this report:

- NEPC *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]* (NEPC, 2013); and
- NSW EPA *Guidelines for Consultants Reporting on Contaminated Land* (NSW EPA, 2020).

2. Proposed development

It is understood that CoP requires environmental investigation and assessment for the following locations:

1. Rangihou Reserve, Parramatta
2. Reid Park Valley, Rydalmere
3. Royal Shores, Ermington

The investigations are being undertaken as part of the Eastern Parramatta River project to support civil, landscaping and structural design of proposed upgrades for each site, broadly including new light poles, new pedestrian and cyclist counters, drainage upgrades, modifications and upgrades to landscaping, upgrading the existing 3 m shared path to a 5 m dedicated cycle way / pedestrian footpath, low height sandstone block retaining walls, new bridge crossings and new raised pedestrian boardwalks. Refer to the Concept Design Drawings (Rev A, dated June 2024) included in Appendix A for further information on each specific site.

This DSI is for the Rangihou Reserve site only.

3. Scope of work

The scope of works comprised:

- A review of development plans, previous reports (if made available) and documentation provided by the client;
- A review of geological, topographic, soil, acid sulfate soil and registered groundwater bores to assess and document the site's environmental setting;
- A review of readily available site history information, comprising:
 - o Historical aerial photographs;
 - o NSW EPA public registers for notices and licences issued under the *Contaminated Land Management Act 1997* (CLM Act) and the *Protection of the Environment Operations Act 1997* (POEO Act);
 - o Council records obtained through an informal Government Information Public Access (GIPA) request;
- Conduct a site walkover to observe signs or indicators of potential contamination;
- Preparation of Field Work Safety and Environment Plan (FWSEP) and Safe Work Method Statements (SWMS);
- Collection of soil samples at regular depth intervals, changes in strata, or upon signs of contamination (e.g. staining, odours) from the 12 boreholes (BH101 to BH112) drilled to varying depths;
- Field testing comprising screening of soil samples using a photo-ionisation detector (PID) to screen for volatile organic compounds (VOC);
- Dispatch of selected soil samples to a NATA accredited laboratory for combination of CoPC as below:
 - o Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
 - o Polycyclic aromatic hydrocarbons (PAHs);
 - o Total recoverable hydrocarbons (TRH);
 - o BTEX;
 - o OCP;
 - o OPP;
 - o PCBs;

- o Asbestos;
- o Toxicity Characteristic Leaching Procedure (TCLP) of PAHs, and metals (if required);
- o Collect and analysis of QA/QC samples including 5% intra-laboratory duplicates, 5% inter-laboratory duplicate, and trip spikes and trip blanks;
- Preparation of this DSI report for the site in accordance with NSW EPA 2020 Guidelines for Consultants Reporting on Contaminated land which includes the results of the desktop investigation, outlines the methods and results of the investigation, test location plan, the borehole logs, results of the laboratory analysis, and responds to the objective of the DSI; and
- A preliminary waste classification assessment is also included as part of this DSI report.

4. Site information

Site address	Rangihou Reserve, Parramatta NSW
Legal description	Rangihou Reserve, Parramatta NSW
Area	Approximately 2,150 m ²
Zoning	Zone RE1 Public recreation
Local Council Area	City of Parramatta Council
Current use	Recreational walkway
Surrounding uses	North – Residential, commercial / industrial East – Recreational walkway South – Parramatta River West – Recreational walkway

The site boundary is shown on Figure 1



Figure 1: Site location

5. Environmental setting

Regional topography	Reference to NSW 10 m Elevation Contours indicates the site is located on the north side of a valley which slopes downwards towards the south to Parramatta River.
Site topography	Reference to NSW 2 m Elevation Contours indicates topography in the area is generally flat and slopes towards Parramatta River. The ground surface of the site is relatively flat at approximately 2 m Australian Height Datum (AHD).
Soil landscape	Reference to Sydney 1:100 000 soil mapping indicates that the site is within Lucas Heights residual soils described as gently undulating crest and ridges on plateau surfaces of the Mittagong formation (alternating bands of shale and fine-grained sandstones). Local relief to 30 m, slopes <10%. Rock outcrop is absent. Extensively or completely cleared, dry sclerophyll low forest and woodland.
Geology	Reference to Sydney 1:100 000 Series Seamless Geology Sheet indicates that the site is underlain by alluvial floodplain deposits which is described as silt, very fine to medium grained lithic to quartz rich sand clay. The site is located adjacent to estuarine channel deposits to the south described as fine – to medium grind lithic-carbonate-quartz sand (marine-deposited), silt, clay, shell, grave and Ashfield Shale to the which is described as black to light grey shale and laminate.
Acid sulfate soils	Reference to published NSW ASS mapping indicates that the site is located in an area with high probability of occurrence at or near

	<p>ground surface from the east to the central portion of the site. The north-west portion of the site is located in an area with high probability of occurrence within 1 m of the ground surface.</p> <p>The Acid Sulfate Soils Map of Parramatta Local Environmental Plan (LEP) 2023 indicates that the site is classified as Class 2 where development consent is required for works below the natural ground surface or works by which the water table is likely to be lowered. The following areas were identified adjacent to the site:</p> <ul style="list-style-type: none"> • Class 1 land to the south whereby consent condition is required for any works; and • Class 5 land to the north where development consent is required for works within 500 metres of adjacent Class 1, 2, 3 or 4 land that is below 5 metres AHD and by which the water table is likely to be lowered below 1 metre AHD on adjacent Class 1, 2, 3 or 4 land. <p>The ASS assessment has been conducted as part of the geotechnical investigation (Douglas, 2025). The assessment results are also summarised in Section 13.2 of this report.</p>
Surface water	<p>Parramatta River is situated adjacent to the site to the south. Rainfall at the site is anticipated to infiltrate into unpaved ground or runoff into the nearby Parramatta River system.</p>
Groundwater	<p>Based on the regional topography and the inferred flow direction of nearby water courses, the anticipated flow direction of groundwater beneath the site is to the south, towards Parramatta River, the likely receiving surface water body for the groundwater flow path. Given the ground surface relative level (RL), it is anticipated that groundwater may be within 2 m from the ground surface at the site.</p> <p>A search of the groundwater bore database maintained by the Department of Primary Industry was undertaken on the 4 December 2024. Review of the records indicates that there is one groundwater well within a 500 m radius of the site is located on the other side of Parramatta River and is considered to be cross gradient.</p>

6. Summary of previous investigations

6.1 Previous reports

The following previous reports were provided by Council and are relevant to the current investigation:

- Coffey, Ground contamination assessment for the Baludarri Wetlands Shared Pathway, Parramatta NSW, dated 16 June 2011, ref GEOTLCOV2425AA-AD (Coffey, 2011); and
- Environmental Investigation Services (EIS), Report to Bonacci Infrastructure on Contamination Site Screening for Proposed Pedestrian & Cyclist Bridge Development at Morton & Alfred Streets, Parramatta, dated 11 May 2017, ref E30306Krpt (EIS, 2017).

Additional reports were obtained from Council through the GIPA search and those are summarised in Section 7.3.

6.1.1 **Coffey (2011) – Ground Contamination Assessment**

A ground contamination assessment was conducted by Coffey to test for contamination for the proposed shared pathway alignment at The Baludarri Wetlands Shared Pathway along Parramatta River between Morton Street and James Ruse Drive, Parramatta. The investigation included drilling six hand augered boreholes. Douglas notes that of the six borehole locations, only one (HA-5) was within the current site in the east portion of the site which was drilled to 0.5 m below ground level (bgl).

All concentrations of CoPC analysed at HA-5 at 0.1 m bgl were below the adopted SAC except for zinc. Total petroleum hydrocarbons were detected at 51 mg/kg, below the adopted SAC. Asbestos fibres were also detected at sample location HA-5. Douglas notes that the laboratory results for the above detections at HA-5 were not included in the report and were only stated in the body of the report.

The report concluded that during construction of the cycleway, the asbestos containing material (ACM) should be removed or managed onsite. Any disturbance of the ACM soil must be carried out under an asbestos removal control plan (ARCP).

6.1.2 **EIS (2017) – Contamination Site Screening**

A contamination site screening report was conducted by EIS to assess soil contamination conditions and assess potential for ASS occurrence at the site for a proposed pedestrian and cyclist bridge. The investigation included drilling six boreholes with a drill rig. Douglas notes that of the six boreholes, only two (BH3 and BH4) are within the current site boundary in the east portion of the site, and these were drilled to depths of 1.4 m and 2.2 m bgl respectively (refer to EIS drawing attached in Appendix A).

All concentrations of CoPC analysed at BH3 and BH4 were below the adopted SAC. Soils analysed for ASS were above the SAC for ASS in both locations.

The report concluded that there were no elevated contaminants above the adopted SAC. One sample had zinc above the adopted ecological SAC but was not considered to pose an unacceptable risk. Given that ASS was detected, the report considered there to be a high potential for ASS/Potential Acid Sulfate Soils (PASS) to be disturbed during the proposed development, therefore an acid sulfate management plan (ASSMP) would be required for the works.

7. **Site history**

7.1 **Historical aerial photography**

A number of historical aerial photographs were obtained from public databases. Extracts of the aerial photographs are included in Appendix C1. A summary of key features observed for the site and surrounding land is presented in Table 1.

Table 1: Summary of historical aerial photographs

Year	Site	Surrounding land use
1943	The site appears to be located in an open grassed area close to the north foreshore of Parramatta River. The grassed areas may have previously been cultivated for agricultural use.	The surrounding land-use consists of predominantly open grassed areas (potentially previously agricultural) with a cluster of urban residential properties to the north-west.
1955	Significant development occurred in the east portion of the site, comprising a large warehouse extending to the north, with an apparent ramp access to Parramatta River. The remainder of the site was essentially unchanged from the 1943 photograph.	The new warehouse development noted for the site extends further to the north.
1965	No significant changes were apparent when compared to the previous photograph.	New residential structures are apparent north-west of the site. Earthworks was also observed to the north of the site.
1975	No significant changes were apparent when compared to the previous photograph except for some earthworks apparent in the central portion of the site, extending further north.	No significant changes were apparent when compared to the previous photograph except new commercial and residential structures were constructed north of the site.
1986	No significant changes were apparent when compared to the previous photograph, except that the warehouse development in the east appears to no longer be in use, and potentially commencing demolition.	A stockpile of soil was apparent north of the site. Some earthworks was also observed to the east of the site, with the warehouse also potentially under demolition.
1996	No significant changes were apparent when compared to the previous photograph except for the warehouse structure no longer apparent in the east of the site.	A carpark replaced the warehouse structure in the east, with additional significant earthworks apparent further to the north of the carpark.
2005	No significant changes were apparent when compared to the previous photograph except for the new concrete pathway along the western portion of the site.	Some earthwork was apparent north to the site. New structures were constructed such as warehousing to north-east and residential properties to the north-west of the site.
2015	No significant changes were apparent when compared to the previous photograph except for the extension of the walking track to the east.	Some earthwork was apparent north, north-east and east to the site. Earthworks to the east of the site is likely associated with the construction of the Alfred Street bridge to the south of Parramatta River. Additional structures were constructed to the north-east of the site. Geofabric lining is apparent to the north-west of the site which is likely associated with the works summarised in Section 7.3.5.

Year	Site	Surrounding land use
2024	The carpark to the east of the site was replaced with a road and a grassed area. This was likely associated with the remediation works as summarised in Section 7.3.3.	Baludarri Drive was constructed to the north-east of the site. Previous commercial structures north of the site were replaced with new high rise residential development. The pathway alignment to the east was re-adjusted to accommodate for the new Alfred Street bridge pathway.

7.2 Public registers and planning records

EPA Notices available under Section 58 of the Contaminated Land Management Act (CLM Act) Database searched 8 January 2025	There were no records of notices for the site or adjacent sites.
Sites notified to EPA under Section 60 of the CLM Act Database searched 8 January 2025	The site and adjacent sites were not listed as a notified contaminated site.
Licences listed under Section 308 of the Protection of the Environment Operations Act 1997 (POEO Act) Database searched 8 January 2025	It is noted that numerous sites which were issued licenses were identified in the Parramatta central business district (CBD) which are within 500 m of the site. However, given the presence of a hydraulic barrier (Parramatta River) between the site and Parramatta CBD, the potential for the site to be impacted by the properties is low.
PFAS Investigation Sites listed on the EPA website	The site was not listed or adjacent to the site listed under: <ul style="list-style-type: none"> • NSW EPA PFAS Investigation Program; • Defence PFAS Investigation Program; • Defence PFAS Management Program; and • Airservices Australia National PFAS Management Program.

7.3 Council records search

Based on review of council records received on 25 November 2024 as provided in Appendix C2, the council has no record of neighbour complaints, or notices such as clean up or compliance for the site. Council provided several records in relation to the site as follows.

7.3.1 Contamination and Geotechnical Assessment (Martens, 2012)

A contamination and geotechnical assessment was conducted by Martens to comment on site geotechnical and soil contamination status of the property at 1A Morton Street (a former Council depot) to support the proposed sale of the property. The assessment area of the report is located outside of the current site boundary approximately 30 m north of the site.

All soil samples analysed were below the adopted SAC except for lead at 350 mg/kg, TRH (C10-C36) in three locations and asbestos detected in four locations. Furthermore, all samples reported TPH C16-C5 aromatic at concentrations above the adopted SAC. Groundwater samples analysed were below the adopted SAC except for TRH C6-C9, TRH C10-C14, heavy metals such as cadmium, copper, lead and zinc and toluene.

The report concluded that hydrocarbon contamination was evident in site soils and groundwater which was likely attributed to underground fuel tanks, however, due to limited testing, this was unlikely to allow further commenting on the extent of the contamination. The report recommended six underground fuel tanks and associated infrastructure and soil to be removed from the property as well as to further assess the extent of contamination on the property. Additionally, due to the elevated heavy metals and hydrocarbon impacted detected in groundwater, a groundwater monitoring program was recommended to further assess groundwater contamination on the property.

7.3.2 Asbestos Contamination Investigation (EIS, 2014)

An asbestos contamination investigation was conducted by EIS to assess the extent and nature of asbestos contamination at the assessment area and obtain data to develop an asbestos management plan (AMP) for the assessment area for the purpose of restoration works for the Rangihou Reserve. The assessment area was located outside of the current site boundary approximately 10 m north-west of the site.

Of the 12 test pits excavated, eight had identified asbestos. Friable asbestos (FA) was detected in three test pits. An additional nine test pits were excavated to visually assess the extent of asbestos contamination to depths between 0.2 m and 0.4 m bgl. Potential asbestos containing material (PACM) fragments were identified in six of the nine test pits. Four PACM fragments collected from the surface were analysed which contained asbestos. It was further noted that PACM fragments similar to the fragments that were tested were observed sporadically across the surface of the assessment area.

The report recommended the locations within the vicinity of where friable asbestos be isolated with temporary make-safe measures such as covering with plastic and cordoned off with barrier tape. The report considered asbestos exposure to site workers and surrounding occupants to be high during soil disturbance works which could be controlled through the implementation of an AMP.

7.3.3 PRM Asbestos Contamination Investigation Email

An asbestos contamination investigation email dated 27 October 2014 detailed a summary of an investigation whereby 11 test pits and four delineation pits were excavated across an assessment area (PRM, 2014) which is summarised in Section 7.3.4. It is noted that the assessment area of the report is located outside of the current site boundary approximately 40 m west of the site.

The email notes that fragments of ACM were visually identified in the majority of the test pits and in fragments analysed from four test pits. AF were identified in two test pits along the embankment. PRM recommended the contamination to be capped and managed as part of re-sculpting the landform to tie in with the adjoining site and that all works should be completed under controlled conditions by friable licensed contractors.

7.3.4 PRM (2014) Investigation

An asbestos contamination investigation completed by PRM detailed a summary of an investigation whereby 12 test pits and four delineation pits were excavated across an assessment area. The assessment area of the report is located outside of the current site boundary approximately 40 m west of the site. The 16 test pits were excavated to depths between 0.2 m to 0.6 m bgl. Douglas notes that the assessment area for PRM (2014) is located adjacent to the west of the EIS (2014) investigation (refer Section 7.3.2).

Asbestos was identified by laboratory analysis in four test pits, with two test pits identified as containing asbestos fines. PACM was identified in six test pits across the assessment area. The report concluded that the subsurface soils were considered contaminated with friable asbestos. The report recommended that a RAP and / or an AMP be prepared for the site. Should a RAP be prepared, the methodology that would be selected would be to remove all vegetation, remove the retaining wall and footings, re-sculpting of the existing land and placement of a capping layer and re-surfacing of material.

7.3.5 SESL (2015) RAP

A RAP was completed by SESL which covers the areas assessed in the EIS (2014) and PRM (2014) investigations. The RAP considered that on-site management (isolation) was the most appropriate methodology to manage the asbestos contamination.

The preferred remediation strategy involved covering of all contaminated material with a geotextile layer followed by placement of a 200 mm capping layer consisting of crushed sandstone or imported topsoil in proposed turf areas. The RAP indicated that validation of the remedial works would focus on visual inspections of the remediation works as well as validation sampling of imported materials and waste classification of materials to be disposed off-site. An environmental management plan (EMP) was stated to be required to control and manage site activities during site activities.

7.3.6 Prensa (2016a) Acid Sulfate Soil Assessment

An ASS assessment was conducted by Prensa for a portion of the Rangihou Reserve along the Parramatta River foreshore. The assessment was completed as part of the saltmarsh expansion project. Douglas notes that no figures were included in the report, therefore, the assessment area of the report was not identified.

Field screening identified presence of acidic soils between 0.3 m to 1.5 m bgl across the assessment area. Further laboratory analysis indicated results confirmed Actual Acid Sulfate Soils (AASS) and PASS between 0.3 m and 0.5 m bgl. The report concluded that there was potential risk of disturbing ASS during excavation works for the proposed project. Thus, the report recommended the works were to be carried out as per the ASSMP for the project (Prensa, 2016b), as summarised in Section 7.3.7.

7.3.7 Prensia ASSMP (2016b)

An ASSMP was prepared by Prensia for the area in the ASS assessment (2016a). The report outlines management of ASS during the proposed civil works to be undertaken for the project. The report assumed that dark brown clayey silts and dark brown / grey to pale yellow / orange sand soils were ASS unless proven otherwise. The management strategies adopted were onsite treatment prior to disposal and remediation for materials remaining in-situ via application of ag lime into surface layers of soil following excavation to form a crust of neutralised soil to prevent significant acid generation. Douglas notes that no figures were provided for the report, therefore, the assessment area of the report was not identified.

7.3.8 Rangihou Reserve Site Email – EIS (2018)

An email correspondence dated 26 March 2018 detailed a summary of PACM finds for an area that EIS was conducting an investigation on within the Rangihou Reserve. Asbestos was visually identified sporadically on the surface of the assessment area whereby EIS notified CoP. CoP indicated that council was seeking an ACM removal contractor to complete a surface pick. Additionally, test pits that were excavated by EIS had sunken to various depths within the assessment area. Douglas notes that no figures or reports were included in the email.

7.3.9 Rangihou Reserve Initial Soil Results Email – EIS (2018a)

An email from EIS dated 5 April 2018 detailed a summary of soil results for a waste classification completed for the Rangihou Reserve. The email noted 15 samples above the General Solid Waste (GSW) and/or Restricted Solid Waste (RSW) criteria whereby further Toxicity Characteristic Leaching Procedure (TCLP) testing was recommended by EIS if the proposed development includes excavation and disposal of excess soil. Douglas notes that no figures or reports were included in the email.

7.3.10 EIS (2018b)– Contamination Investigation Assessment

A contamination investigation assessment was completed by EIS to assess for the potential for contaminating activities or the presence of contamination within the assessment area for a proposed passive open space development at Rangihou Reserve, Parramatta. Twenty-six locations (two boreholes and 24 test pits) were excavated.

Douglas notes that the assessment area partially includes the central-north portion of the current site. Of the 26 sampling locations, one test pit (TP20) and one borehole which was converted into a monitoring well (BH01/MW01) were within the current site (refer to EIS drawing attached in Appendix A). All concentrations of CoPC analysed in sampling locations relevant to the site for soil were reported below the adopted SAC except for asbestos in TP20 at 1.2-1.8 m bgl (0.2369% w/w) from asbestos sieving. It is noted that total PAH exceeded the adopted SAC in five test pits and asbestos was identified in 22 of the 26 sampling locations across the assessment area from asbestos sieving. Furthermore, PACM fragments were identified sporadically across the ground surface. Groundwater analytical results were below the adopted SAC.

The report concluded that the assessment area posed a risk to current and future site receptors. EIS recommended that the assessment area is cordoned off and an emu pick is conducted over the surface of the assessment area as well as to prepare a RAP and a validation assessment following completion of remediation works. An EMP was also to be prepared to detail ongoing management of contamination remaining on-site.

7.3.11 Request for Crushed Sandstone Email – CoP – 2018

An email dated 18 April 2018 details a request to Westconnex for the availability of 1,330 m³ of crushed sandstone from the Westconnex project to be used for the Ragihou Reserve project. CoP requested for a VENM exemption from the NSW EPA which must be confirmed by CoP.

7.3.1 Cleanaway – Removal of ACM Email – 2018

An email correspondence between CoP and Cleanaway dated 10 April 2018 discusses an asbestos removal and clearance inspection completed by Safework Environments (SWE) on behalf of Cleanaway for CoP. The email included the SWE clearance report (2018) and associated asbestos air monitoring (AAM) report. It is noted that the assessment area partially includes the centre-north portion of the current site.

The SWE report (2018) comprised three visual clearance inspections on the 6 April 2018 following emu picking on approximately 200 m² of surface soils within the assessment area. No visible asbestos residue following removal work remained in or within the vicinity of the assessment area. The AAM report indicated results of <0.01 fibres/ml. A docket from the NSW EPA waste tracking docket and SUEZ Wetherill Park was included which were both dated 6 April 2018.

7.3.2 Prensa (2019) – Environmental Management Plan

An EMP was prepared by Prensa for the assessment area at 2 Morton Street Parramatta. Douglas notes that the assessment area is outside of the current site boundary approximately 10 m north-east of the site. The EMP was prepared for the management of asbestos risks associated with buried ACM within the assessment area. The EMP summarised asbestos issues within the assessment area, outlines the roles and responsibilities for the implementation of the EMP and procedures for ongoing maintenance such as periodic inspections, record keeping and investigation of non-conformances.

7.3.3 Site Audit Statement – Zoic Environmental – 2 Morton Street, Parramatta

Site audit statement (SAS) no. SAS119 dated 21 June 2019 was issued for the assessment area at 2 Morton Street, Parramatta by NSW EPA Auditor Rebeka Hall of Zoic Environmental. Douglas notes that the assessment area is outside of the current site boundary approximately 10 m north-east of the site. The SAS details the requirement for the implementation of an EMP to address residual contamination on the site which required routine inspections and guidance on unexpected finds as a result of asbestos impacted fill. The SAS also included the EMP (Prensa, 2019).

7.3.4 JBS&G (2021a) Acid Sulfate Soil Assessment

An acid sulfate soil assessment was prepared by JBS&G to enable suitable characterisation of PASS in-situ and for stockpiled soils to enable appropriate management, removal and disposal during works for the Baludarri Wetlands project. Douglas notes that part of the east portion of the site is located within the assessment area, but no sampling locations were located within the current site.

Sixteen sampling locations were hand augered across the assessment area and nine stockpile samples were collected. Analytical results indicate that ASS was identified in three sampling locations, but given the inconsistent soil identified during the investigation, JBS&G indicated that ASS/PASS was likely encountered at all sampling locations from surface to 0.3 m bgl. The stockpile samples analysed also indicated that the stockpile contained ASS.

A preliminary waste classification was also conducted whereby lead and B(a)P was detected above the contaminant threshold (CT) 1 threshold at three locations. TCLP was conducted which indicated results below TCLP1 and specific contaminant concentration (SCC) 1 which classified the material as GSW (non-putrescible).

The report concluded that acid sulfate soils were widespread across the site within in-situ and stockpiled materials. The report recommended management by neutralisation with ag lime for all soil that is excavated. Furthermore, an ASSMP should be prepared to manage ASS for the project.

7.3.5 JBS&G – Asbestos and Acid Sulfate Investigation Email – 2021

An email correspondence between CoP and JBS&G dated 17 May 2021 discusses key finds of a contamination assessment, *in-situ* and stockpiled material waste classification and an acid sulfate assessment completed by JBS&G in 2021. The email noted the following key finds for the contamination assessment as follows:

- *The soil contamination concentrations did not present a risk to human or ecological health for recreational / open space land use or for future excavation works;*
- *No asbestos containing material was detected in the stockpile or across the investigation area;*
- *The waste classification is GENERAL SOLID WASTE (non putrescible) – All waste soil disposal to comply with the waste classification; and*
- *An Environmental Management plan shall be developed for the site works including an unexpected finds protocol.*

The acid sulfate soil assessment findings were listed as follows:

- *Potential Acid Sulphate Soil conditions were found at ALL insitu and stockpile sample locations;*
- *Acid sulphate soils were found at 4 locations including two locations in the stockpile;*
- *Acid sulphate treatment is required for all excavated soils across the site; and*
- *An Acid Sulphate Soil Management Plan should be prepared for management of any ASS soils disturbed during the site works including use of lime to neutralise ASS/PASS material.*

A partial image of a figure from the JBS&G report identified several sampling locations, but none of the sampling locations were observed within the current site boundary.

7.4 Site history integrity assessment

The information used to establish the history of the site was sourced from reputable and reliable reference documents, many of which were official records held by Government departments / agencies. The databases maintained by various Government agencies potentially can contain high quality information, but some of these do not contain any data at all.

In particular, aerial photographs can provide high quality information that is generally independent of memory or documentation. They are only available at intervals of several years, so some gaps exist in the information from this source. The observed site features are open to different interpretations and can be affected by the time of day and / or year at which they were taken, as well as specific events, such as flooding. Care has been taken to consider different possible interpretations of aerial photographs and to consider them in conjunction with other lines of evidence.

7.5 Summary of site history

The site history information suggests that the site may have been part of agricultural land prior to 1943. The site largely remained undeveloped except for the east portion of the site which was utilised as part of a large commercial / industrial / warehousing development from *circa* 1940s to 1980s. Following demolition of the warehouse in the east portion of the site, the warehouse was replaced with an on-grade carpark, with the remainder of the site remaining as a vacant grassed area until 2005 when a walking track was constructed along the west site alignment. The footpath was extended further east *circa* 2015.

A number of investigations and plans had been prepared by various consultants for various development project at and around the current site, the majority of which identified asbestos in soils as a contamination exposure risk requiring remediation and management. The previous investigations also identified ASS at and around the current site, also to be managed under a management plan.

8. Site walkover

8.1 Observations

A site walkover was undertaken by an environmental engineer on 21 November 2024. The general site topography was consisted with that described in Section 5.

The following key site features pertinent to the investigation were observed (refer to photographs in Appendix C3):

- Parramatta River was observed to the south of the site and residential apartment blocks were observed to the north of the site (photograph 1);
- The majority of the site comprised open-grassed areas with a concrete footpath observed along the site alignment (photograph 2); and

- Raised grass mounds were apparent in the east (photograph 3) portion of the site, to the north of the bridge, suggesting the potential for filling processes occurring within the general area.

9. Preliminary conceptual site model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or the future i.e. it enables an assessment of the potential source – pathway – receptor linkages (complete pathways).

Based on the site history information reviewed and the site walkover, the following potential sources of contamination and associated CoPC have been identified and summarised in Table 2.

Table 2: Summary of potential sources

Potential sources and associated CoPC
On-site sources
<p>S1: Fill: Associated with levelling, demolition of former buildings on the site: CoPC include metals, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos</p> <p>S2: Former buildings (east portion) CoPC include asbestos, synthetic mineral fibres (SMF), lead (in paint) and PCB</p> <p>S3: General industrial / warehousing use (east portion) CoPC include metals, TRH, BTEX, PAH, PCB, OCP, VOC, phenols and asbestos</p>
Off-site sources
<p>S4: General industrial use (former) to the north and north-east of the site including former Parramatta City Council depot (refer to Section 7.3.1) CoPC include metals, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos</p>

The following potential human and environmental receptors, along with relevant potential pathways, have been identified and summarised in Table 3.

Table 3: Summary of potential receptors and pathways

Potential human receptors
<p>HR1: Current users [public park users]</p> <p>HR2: Construction and maintenance workers</p> <p>HR3: End users [public park users]</p> <p>HR4: Adjacent site users [commercial/industrial properties]</p>

Potential environmental receptors
ER1: Surface water [Parramatta River] ER2: Groundwater ER3: Terrestrial ecosystems
Potential pathways to human receptors
HP1: Ingestion and dermal contact HP2: Inhalation of dust and/or vapours
Potential pathways to environmental receptors
EP1: Surface water run-off EP2: Leaching of contaminants and vertical migration into groundwater EP3: Lateral migration of groundwater providing base flow to water bodies EP4: Inhalation, ingestion and absorption

Summary of potentially complete exposure pathways

A ‘source–pathway–receptor’ approach has been used to assess the potential risks of harm being caused to human or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways (potential complete pathways). As stated in Section 1, the focus and objective of this DSI is the soils within the site, and associated contamination exposure risks. As such, the CSM has been developed to assess only those risks. Potential risks from groundwater, seepage water and /or soil vapour are not addressed as part of the DSI, in accordance with the project brief.

The possible pathways between the above sources (S1 to S4) and receptors, in relation to soil contamination, are provided in below Table 4.

Table 4: Summary of potentially complete exposure pathways

Source and CoPC	Exposure pathway	Receptor	Risk management action
S1: Fill: metals, PFAS, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos S2: Former buildings: asbestos, SMF, lead (in paint) and PCB S3: Former industrial uses: metals, TRH, BTEX, PAH, PCB, OCP, VOC, phenols and asbestos S4: General industrial use (former), north and north-	HP1: Ingestion and dermal contact HP2: Inhalation of dust and/or vapours	HR1: Current users [public park users] HR2: Construction and maintenance workers HR3: End users [public park users]	An intrusive investigation is recommended (and has been undertaken and reported herein) to assess possible contamination in soils at the site.
	HP2: Inhalation of dust and/or vapours	HR4: Adjacent site users [commercial/industrial properties]	
	EP1: Surface water run-off	ER1: Surface water	

Source and CoPC	Exposure pathway	Receptor	Risk management action
east of the site: metals, TRH, BTEX, PAH, PCB, OCP, phenols and asbestos	EP3: Lateral migration of groundwater providing base flow to water bodies		
	EP2: Leaching of contaminants and vertical migration into groundwater	ER2: Groundwater	
	EP4: Inhalation, ingestion and absorption	ER3: Terrestrial ecosystems	

10. Sampling and analysis plan

10.1 Data quality objectives

The DSI was devised with reference to the seven-step data quality objectives (DQO) process which is provided in Appendix B Schedule B2, NEPC (2013). The data quality objective process is outlined in Appendix D.

10.2 Soil sampling and analysis rationale

Based on the CSM and data quality objectives (DQO) the following sampling rationale was adopted.

A systematic sampling strategy based on NSW EPA *Contaminated Sites, Sampling Design Guidelines* (NSW EPA, 2022) to determine borehole locations which was adapted based on areas of access. Borehole locations are shown on Drawing 2, in Appendix B.

NSW EPA (2022) recommends a minimum of 12 sampling points for a site of 0.45 ha for site characterisation. The diameter of the hotspot that can be detected within 95% confidence is approximately 23 m. A total of 12 test locations (BH101 to BH112) were therefore positioned along the site route.

Soil samples were collected from each borehole at depths of approximately the surface and then every 0.5 m thereafter, and changes in lithology or signs of contamination.

The general sampling methods are described in the field work methodology in Appendix E.

10.3 Sample analysis rationale

Samples were selected for analysis based upon field observations and PID screening results, and to provide lateral and vertical coverage of the site. The selected samples were analysed for the CoPC in the CSM and for physical parameters, cation exchange capacity (CEC) and pH.

At least one fill sample from each borehole was analysed for the CoPC associated with imported fill, former buildings and general industrial use, with more samples analysed from boreholes where deeper fill was encountered, or where signs of contamination were observed (such as staining, odours and PACM).

Although a detailed asbestos assessment was not carried out, at least one soil sample from each borehole was collected for the analysis of AF/FA and / asbestos identification (AS4964) to provide an indication of whether asbestos was present in the soil.

The potential for VOC in soil samples was assessed through field screening with the PID.

11. Site assessment criteria

The SAC applied in the current investigation are informed by the CSM (Section 9) which identified human and environmental receptors to potential contamination on the site. Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising primarily the investigation and screening levels of Schedule B1 of NEPC (2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic recreational land use scenario. The derivation of the SAC is in Appendix F, and the adopted SAC are listed on the summary analytical results tables in Appendix H.

12. Results

12.1 Field work results

The boreholes were augered to depths of between 0 m and 2.0 m bgl, with a number of boreholes meeting auger refusal in fill or terminated at the request of the client.

The borehole logs for this assessment are provided in Appendix G. The logs recorded the following general sub-surface profile:

Fill / Top Soil / Silty Clay:	Dark brown topsoil with rootlets to depths of 0.05 m bgl;
Fill / Gravelly Sand with silt	Dark brown, fine to coarse gravels with silt in BH107 and BH109 to depths of between 0.3 m to 1.0 m bgl;
Fill / Silty Clay with sand	Dark brown low to medium plasticity clay, with fine sand in all boreholes to depths of between 1.0 m and 1.5 m bgl;
Sand:	Fine grained, dark grey alluvial sand, with silt in BH101, 103, 104, 105 and 106 to depths of between 1.5 m and 2.0 m bgl; and
Silty Sand:	Fine grained sand trace ironstone gravels in BH102 and BH107 to depths of 2.0 m bgl.

Anthropogenic material (building rubble, bricks, tiles, concrete, pavers fragments) was observed in BH107 and BH109. No other visual or olfactory evidence (e.g. staining, odours, free phase product) was observed during the investigation to suggest the presence of contamination within the soils at the site.

A geofabric marker layer was found at BH109 at 1.0 m bgl, below the gravelly sand fill. The client confirmed that the marker layer was associated with management of deeper asbestos contaminated fill. A similar marker layer was encountered in BH110, BH111 and BH112 at depths of 0.5 m, 0.2 m and 0.5 m bgl respectively, at which depth the borehole was terminated at the request of the client as the client had confirmed that the marker layer was indicative of asbestos contamination soil. BH108 was also terminated at 0.2 m bgl due to observations of PACM at depth.

The PID screening recorded that the sub-surface conditions were generally absent of VOC with all recorded values of less than 4 ppm, except for a BH103 / 0.4-0.5 m that recorded a value of 17.1 ppm. This was at the same depth of a reported decomposing organic odour. It is noted that no PID readings were undertaken for BH108, BH110, BH111 and BH112.

No free groundwater was observed during drilling of boreholes except for BH101, BH102, BH103, BH104 and BH105 at 1.4 m, 1.6 m, 1.0 m, 1.6 m and 1.8 m bgl respectively.

12.2 Laboratory analytical results

The results of laboratory analysis are summarised in the following tables in Appendix H:

- Table A1: Summary of results of soil analysis;
- Table A2: Summary of results of preliminary waste classification; and
- Table A3: Summary of UCL Statistics.

The laboratory certificates of analysis together with the chain of custody and sample receipt information are provided in Appendix I.

12.3 Data quality assurance and quality control

The data quality assurance and quality control (QA / QC) results are provided in Appendix J. Based on the results of the field QA and field and laboratory QC, and evaluation against the data quality indicators (DQI) it is concluded that the field and laboratory test data obtained are reliable and useable for this assessment.

13. Discussion

13.1 Soils

As shown in Table A1, the concentrations of BTEX, phenols, OCP, OPP, and PCB in all samples tested were below the practical quantitation limit (PQL). Concentration of metals, PAH, and TRH were reported above the PQL but within the adopted SAC (NEPM (2013), corresponding to land use category 'C', public open space such as parks, playgrounds, playing fields, secondary schools; and footpaths) with the exception of those listed below.

The 95% upper confidence limit (UCL) of the arithmetic mean (95% UCL) has been calculated for contaminants of potential concern as discussed below. All statistical analysis was undertaken on fill samples only by using USEPA ProUCL program, with inputs and outputs provided in Table A3. Wherever the concentration of the triplicate sample is greater than the primary sample, the higher concentration is selected for the 95% UCL calculation.

HIL exceedances comprised:

- The concentration of B(a)P TEQ in BH102/0.1-0.2 m at 6.9 mg/kg exceeding the SAC of 3 mg/kg. This exceedance is not considered to be of concern as the calculated 95% UCL for all fill samples over the site at 1.42 mg/kg was below the SAC.

Ecological screening level (ESL) exceedances comprised:

- The concentration of B(a)P in BH102/0.1-0.2 m at 4.9 mg/kg, and BH107/1.4-1.5 m at 0.73 mg/kg exceeded the SAC of 0.7 mg. The exceedances are not considered to be of concern as the calculated 95% UCL for all fill samples over the site at 0.221 mg/kg was below the SAC:
 - o Furthermore, it is noted that the B(a)P ESL is a low reliability value. Higher reliability screening levels have been published in CRC CARE *Risk-based Management and Remediation Guidance for Benzo(a)pyrene* (CRC CARE, 2017). The high reliability value of 33 mg/kg (or ranging from 21 mg/kg to 135 mg/kg) for fresh B(a)P suggests that the concentrations of B(a)P detected at the site are unlikely to pose an unacceptable risk to terrestrial ecosystems and therefore the exceedance(s) are not considered to be of concern.

Bonded asbestos and / or Asbestos fines / Fibrous Asbestos (AF/FA) was recorded in fill at test locations BH107 and BH108, as well as TP20 from EIS (2018). A summary of those finds is shown in Table 8 below.

Table 5: Summary of asbestos in soil results that exceeded the site assessment criteria

Analyte (SAC)	Location	Depth (m)	Result	Exceeded AF/FA SAC Yes/No
Current Investigation				
Asbestos (0.001% w/w [AF/FA])	BH107	0.4-0.5	AF / FA detected at concentration of less than 0.001% w/w Bonded asbestos was also identified	No
	BH108	0.1-0.2	No AF / FA detected at concentration of less than 0.001% w/w Bonded asbestos was also identified	No
EIS (2018) Investigation				
	TP20	0-0.1	Bonded asbestos was also identified on surface	No

Analyte (SAC)	Location	Depth (m)	Result	Exceeded AF/FA SAC Yes/No
Asbestos (0.001% w/w [AF/FA])	TP20	1.2-1.8	Bonded asbestos detected at a concentration of 0.2369% w/w during asbestos sieving	Yes

Note: N/A – The concentration of the bonded asbestos cannot be calculated as 10 L bulk samples were not part of the scope.

13.2 Acid sulfate soils

The geotechnical investigation (Douglas, 2025) concludes that AASS is likely present at the site within the alluvial sand below the water table in proximity to Parramatta River at depths ranging from approximately -0.3 m to -0.4 m AHD. As such AASS is expected to be encountered possibly during piling and possibly during bulk excavation.

On this basis, management of ASS for the proposed development is required.

13.3 Preliminary waste classification

13.3.1 Fill

NSW EPA (2014) contains a six-step procedure for determining the type of waste and the waste classification. Part of the procedure, for materials not classified as special waste or pre-classified waste, is a comparison of analytical data initially against CT values specific to a waste category. Alternatively, the data can be assessed against SCC thresholds when used in conjunction with TCLP thresholds.

The CT, SCC, and TCLP values relevant to this preliminary waste classification are shown in attached Table A2.

The following Table 6 presents the results of the six-step procedure outlined in EPA (2014) for determining the type of waste and the waste classification. This process applies to the fill at the site.

Table 6: Six step classification

Step	Comments	Rationale
1. Is it special waste?	Yes (At test locations BH107 and BH108 in the current investigation and TP20 from EIS (2018))	Bonded asbestos was detected in the test locations listed. Refer Table A2. Anthropogenic material (an indicator of potential ACM) was also reported in BH109, and a geofabric marker layer indicating asbestos contaminated soils was found at BH109, BH110, BH111 and BH112
2. Is it liquid waste?	No	Materials composed of a soil matrix.
3. Is the waste “pre-classified”?	No	Filling and natural material did not fall into one of the pre-classified categories

Step	Comments	Rationale
4. Does the Waste have hazardous waste characteristics	No	Waste not observed to / or considered at risk to contain explosives, gases, flammable solids, oxidising agents, organic peroxides, toxic substances or corrosive substances, substances liable to spontaneous combustion.
5. Chemical Assessment	Conducted	Refer to attached Table A2
6. Is the Waste Putrescible?	No	All observed components of filling composed of materials pre-classified as non-putrescible (i.e. soil).

As shown in attached Table A2 all contaminant concentrations for the analysed fill samples were within CTI for GSW except for the following:

- Sample BH102/0.1-0.2 m for lead at 110 mg/kg and B(a)P at 4.9 mg/kg which exceed the CTI criteria of 100 mg/kg and 0.8 mg/kg respectively. TCLP analysis was conducted on this exceedance sample and results were within the TCLP1 and SCC1 criteria for general solid waste; and
- Sample BH107 /0.1-0.2 m for lead at 55 mg/kg which exceeded the CTI criteria of 40 mg/kg. TCLP analysis was conducted on this exceedance sample and results were within the TCLP1 and SCC1 criteria for general solid waste.

Analytical results indicate that bonded asbestos and / or AF / FA were detected in test locations BH107 and BH108. Therefore, asbestos is considered highly probably that asbestos is present in fill throughout the site.

Based on the field observations, investigations completed for areas adjacent to the site (as summarised in Section 7.3) and the above analytical results, the fill at the site is assigned a preliminary waste classification of Special Waste Asbestos (friable) – General Solid Waste in accordance with NSW EPA (2014).

It is possible that some of the fill between BH101 and BH106 could be re-classified as General Solid Waste (non-putrescible) subject to further visual and analytical assessment for asbestos. Sampling from small diameter boreholes is not ideal for the assessment of asbestos in soils. As such, if there is an appetite to review the waste classification between the reported asbestos finds, a more detailed assessment of asbestos risk is recommended.

13.3.2 Natural soils

The following Table 7 presents the results of the assessment of natural soils at the site with reference to the VENM definition in the POEO Act and the EPA¹ website.

¹ <https://www.epa.nsw.gov.au/your-environment/waste/classifying-waste/virgin-excavated-natural-material>

Table 7: VENM classification procedure

Step	Comments	Rationale
1. Is the material natural?	Yes	Natural soil logged in the boreholes as sand. These materials underlie the fill at the site. Refer attached Table A2.
2. Are manufactured chemicals or process residues present?	No	There were no visual or olfactory indicators of chemical contamination of the materials in the boreholes. Concentrations of contaminants were considered to be typical of background concentrations (Table A2).
3. Are sulfidic ores or soils present?	Yes	AASS at one test location. Refer to the Douglas (2025) geotechnical report.
4. Are there current or previous land uses that have (or may have) contaminated the materials?	Yes Imported fill	Imported fill on site may have impacted natural materials; however, soil analytical results indicate that this is unlikely.
	No – remaining natural soils	Analytical results suggest that current and previous land uses are unlikely to have impacted remaining natural soils.

Based on the outcome presented in Table A2, it is likely that the natural soils within the site within the depth of investigation, is subject to confirmation or otherwise of ASS conditions.

14. Revised conceptual site model

The data collected for this DSI has generally confirmed that certain potential contaminant sources outlined in the CSM outlined in Section 9 pose a potentially complete pathway to the identified receptor(s) whilst others do not, in relation to soils. This is summarised in Table 8.

Table 8: Updated summary of potentially complete exposure pathways (proposed land use)

Source and CoPC	Exposure pathway	Receptor	Risk management action
S1: Fill: Asbestos (bonded and/or friable) in fill at test locations BH107 and BH108 in the current	HP2: Inhalation of dust and/or vapours	HR1: Current users [public park users] HR2: Construction and	Controls should be in place in the event that fill within the site is disturbed during construction. Options for the management of ACM impacted fill which exceed the relevant land use criteria include cap

Source and CoPC	Exposure pathway	Receptor	Risk management action
investigation and TP20 from EIS (2018)		maintenance workers HR3: End users [public park users] HR4: Adjacent site users [commercial/industrial properties]	and contain, remediation of impacted soil and off-site disposal. A RAP is recommended to outline the preferred approach.

15. Conclusions and recommendations

The DSI comprised a site walkover, a desktop study, and intrusive soil investigation to address the investigation objectives outlined in Section 1.

The concentrations of BTEX, PAH, phenols, OCP, OPP, TRH and PCB in all samples tested were within the adopted SAC except for B(a)P TEQ in BH102/0.1-0.2 m exceeding the HIL SAC of 3 mg/kg and B(a)P exceeding the adopted EIL SAC of 0.7 mg. However, the exceedance is not considered to be of concern as the calculated 95% UCL for all fill samples over the site were below the SAC. Furthermore, the B(a)P is below the CRC Care (CRC CARE, 2017) high reliability value of 33 mg/kg.

Bonded and friable asbestos was recorded at three test locations as summarised in Table 5, and a geofabric marker layer associated with management of known asbestos in soils was found at four test locations. Previous investigations by other in part of the site and in surrounding properties have also identified asbestos, and / or the management of asbestos in soil.

Preliminary *in situ* waste classification has been provided in Section 13.3.

Based on the results of the DSI, it is considered that exposure risks associated with identified (and unknown) asbestos in soils at the site can be managed subject to implementation of the following recommendations:

- A RAP is prepared in accordance with NSW EPA (2020) to address:
 - o WHS management protocols during construction works;
 - o Remediation strategy for fill impacted with asbestos;
 - o Protocols for the validation of site remediation;
 - o Protocols for waste classification of any materials requiring off-site disposal, and protocols for material import, including check-sampling, where appropriate;
 - o Other general requirements for RAPs under NSW EPA (2020); and

- Douglas (2025) concludes that AASS is likely present at the site within the alluvial sediments below the water table in proximity to Parramatta River, at depths ranging from approximately 0.3 m. As such AASS is expected to be encountered during piling and possibly during bulk excavation works. On this basis, management of ASS for the proposed development is required through an ASS management plan.

16. References

Coffey. (2011). *Ground contamination assessment for the Baludarri Wetlands Shared Pathway, Parramatta NSW*. ref GEOTLCOV2425AA-AD: Coffey.

CRC CARE. (2017). *Risk-based Management and Remediation Guidance for Benzo(a)pyrene*. Technical Report no. 39: Cooperative Research Centre for Contamination Assessment and Remediation of the Environment.

Douglas. (2025). *Report on Geotechnical Investigation, Proposed Pedestrian Cycleway Upgrades, Rangihou Reserve, Parramatta NSW*. Ref 231248.00.R.001.Rev0: Douglas Partners Pty Ltd.

EIS. (2014). *Asbestos Contamination Investigation for proposed environmental restoration at Rangihou Reserve, Macarthur Street, Parramatta NSW*. Ref E27289Krpt: Environmental Investigation Services.

EIS. (2017). *Report to Bonacci Infrastructure on Contamination Site Screening for Proposed Pedestrian & Cyclist Bridge Development at Morton & Alfred Streets, Parramatta*. Ref E30306Krpt: Environmental Investigation Services.

EIS. (2018). *Contamination Investigation Assessment for Proposed Passive Open Space Development at Rangihou Reserve, Part of 1C and 1D Morton Street, Parramatta NSW*. Ref E31269Krpt: EIS.

JBS&G. (2021a). *Acid Sulfate Soil Assessment - Baludarri Wetland, 10 Pemberton Street, Parramatta NSW*. Ref 60377-137612: JBS&G.

Martens. (2012). *Contamination and Geotechnical Assessment, Parramatta City Council Depot, 1A Morton Street, Parramatta*. Ref P1203374JR02V01: Martens.

NEPC. (2013). *National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) [NEPM]*. Australian Government Publishing Services Canberra: National Environment Protection Council.

NSW EPA. (2020). *Guidelines for Consultants Reporting on Contaminated Land*. Contaminated Land Guidelines: NSW Environment Protection Authority.

NSW EPA. (2022). *Contaminated Sites, Sampling Design Guidelines*. NSW Environment Protection Authority.

Prensa. (2016a). *Acid Sulfate Soil Assessment, Proposed Saltmarsh Expansion Project, Rangihou Reserve, Parramatta NSW*. Ref 54322: Prensa.

Prensa. (2016b). *Acid Sulfate Soil Management Plan, Proposed Saltmarsh Expansion Project, Rangihou Reserve, Parramatta NSW*. Ref 54322: Prensa.

Prensa. (2019). *Environmental Management Plan, Lot 301, Morton St, Parramatta NSW*. Ref 58165: Prensa.

PRM. (2014). *Asbestos Contamination Investigation, Rangihou Reserve, Parramatta NSW*. Ref P067: PRM.

SESL. (2015). *Asbestos Remedial Action Plan – Landscape Improvement Works, Rangihou Reserve, Parramatta NSW 2150 (Lot 1 DP587055 – Lot 22 DP876418)*. Ref C2953.Q4906.B36645FA RAP: SESL.

SWE. (2018). *Clearance Certificate for Asbestos Removal Work*. Ref S107284-CC-Cleanaway-RangihouReserve,RangihouCresParramatta-060418 : SWE.

17. Limitations

Douglas Partners Pty Ltd (Douglas) has prepared this report (or services) for this project at Rangihou Reserve, Parramatta NSW in line with Douglas' proposal dated 22 August 2024 and acceptance received from Shane Lauger of City of Parramatta Council. The work was carried out under the Contract of Services (non-construction) dated November 2024). This report is provided for the exclusive use of City of Parramatta Council for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of Douglas, does so entirely at its own risk and without recourse to Douglas for any loss or damage. In preparing this report Douglas has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and / or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after Douglas' field testing has been completed.

Douglas' advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by Douglas in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and / or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the environmental components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

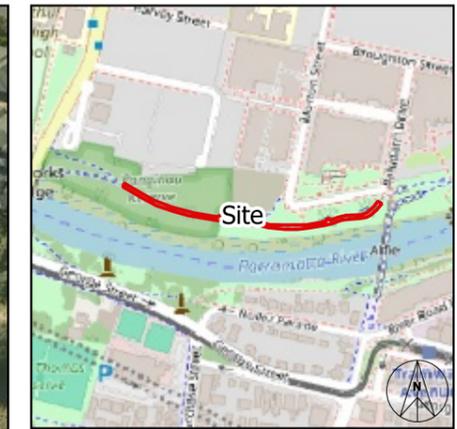
Asbestos has been detected by laboratory analysis, in filling materials at the selected test locations sampled and analysed. Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to parts of the site being inaccessible and not available for inspection/sampling and reasonable access. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. Douglas cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by Douglas. This is because this report has been written as advice and opinion rather than instructions for construction.

Appendix A

Drawings



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

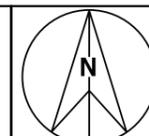


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

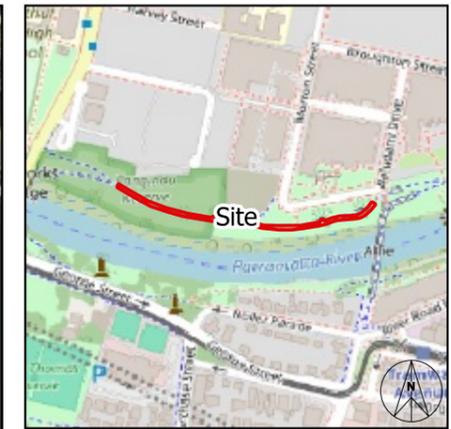
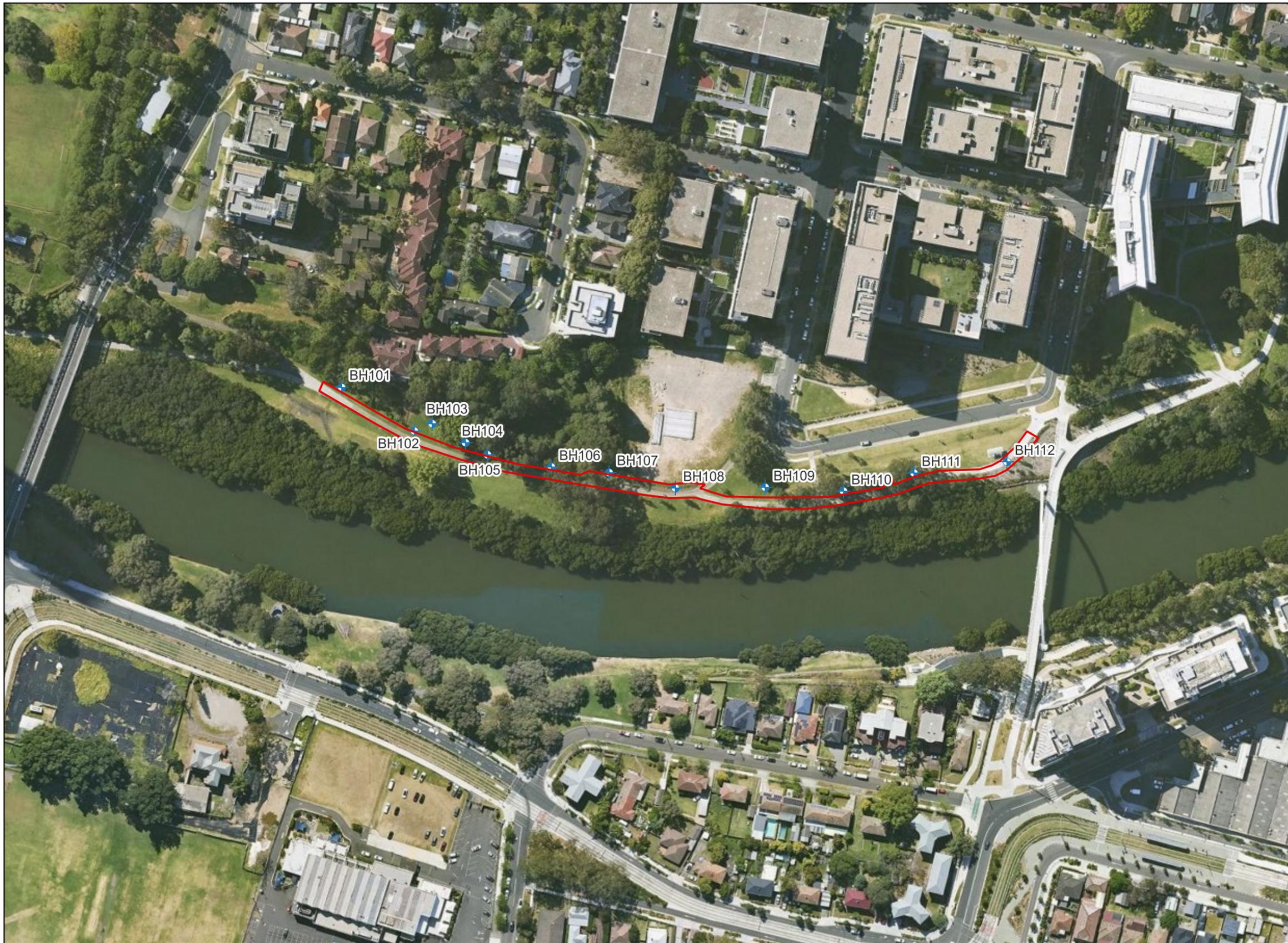


CLIENT: City of Parramatta Council	DRAWN BY: ML
OFFICE: Sydney	DATE: 13.January.2025
SCALE: 1:2500 @A3	

TITLE: **Site location**
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW



PROJECT: 231248.01
DRAWING No: 1
REVISION: 0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

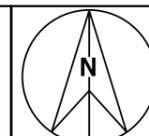


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

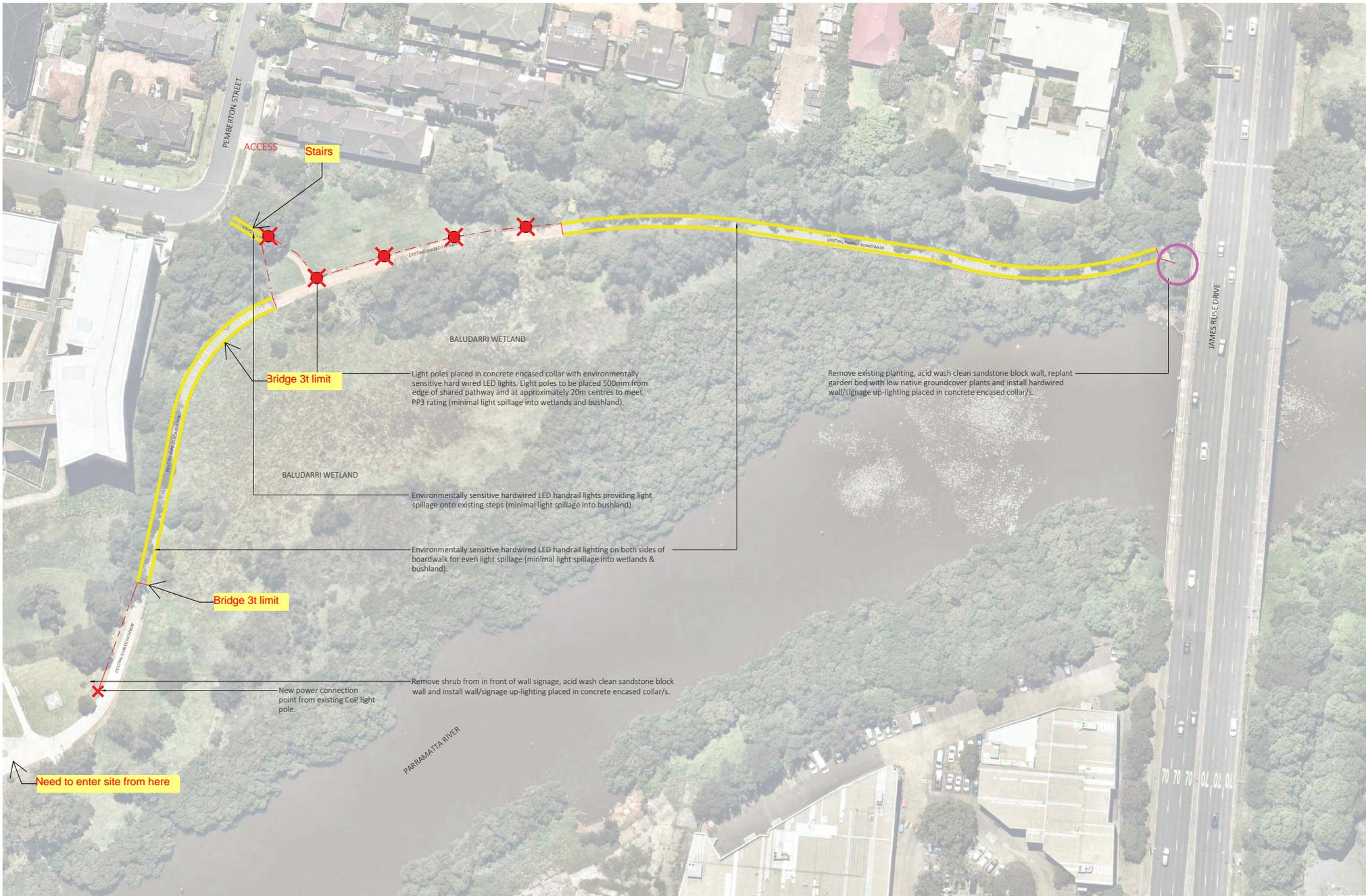


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2000 @A3	DATE: 13.January.2025

TITLE: **Test location plan**
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW



PROJECT:	231248.01
DRAWING No:	2
REVISION:	0



BOREHOLE LOCATIONS

Date:

June 2024

Drawing Status:

REVISION A - CONCEPT

* Subject to consultation & further investigative works

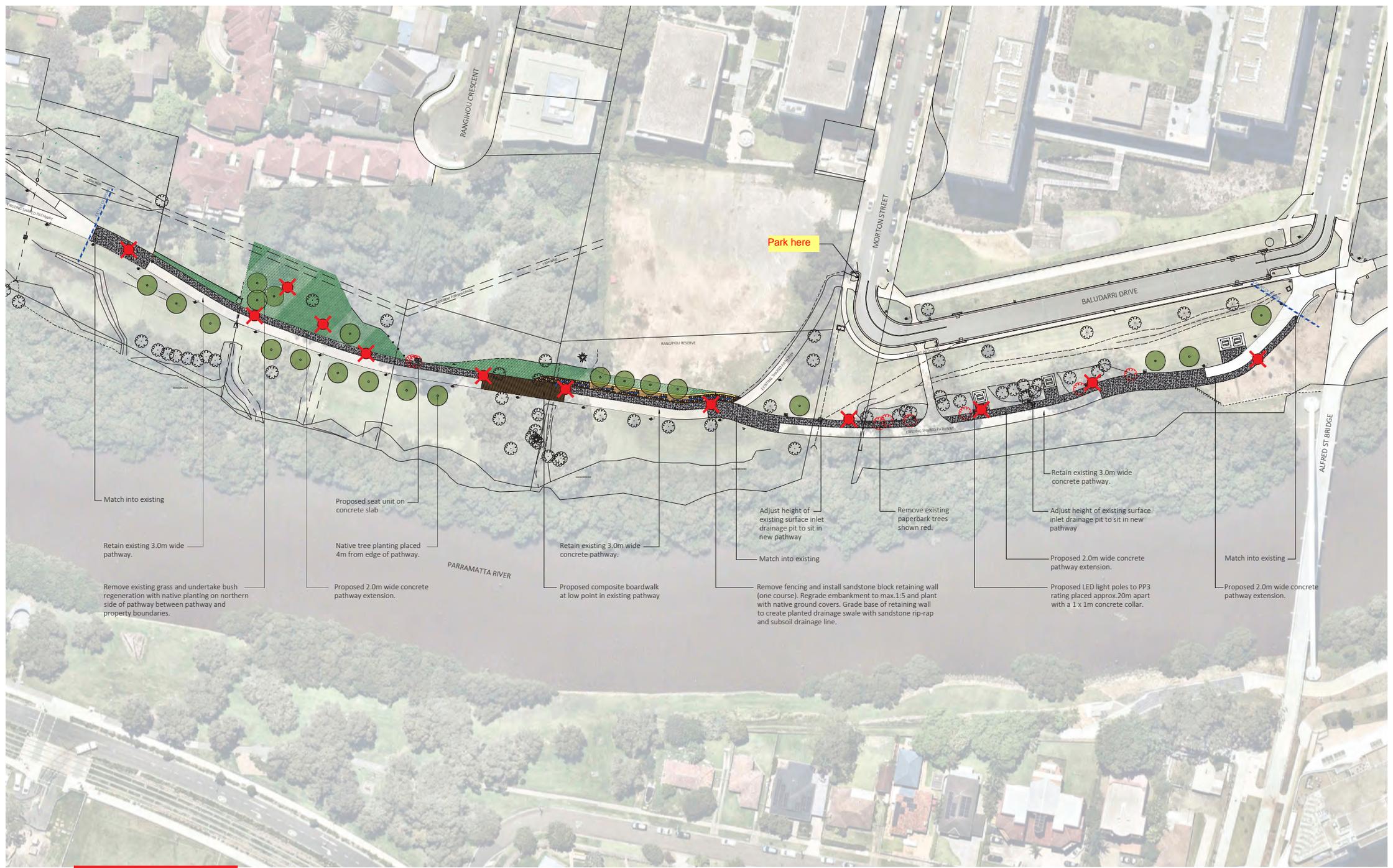


BALUDARRI WETLAND PARRAMATTA

SHARED PATHWAY ENVIRONMENTALLY SENSITIVE LIGHTING



**CITY OF
PARRAMATTA**



BOREHOLE LOCATIONS

Date: June 2024

Drawing Status:
REVISION B - CONCEPT
** Subject to consultation & further investigative works*



RANGIHOU RESERVE PARRAMATTA

PEDESTRIAN AND CYCLIST PATHWAYS



CITY OF PARRAMATTA



BOREHOLE LOCATIONS

Date: June 2024

Drawing Status: REVISION B - CONCEPT

* Subject to consultation & further investigative works



REID PARK RYDALMERE PEDESTRIAN AND CYCLIST PATHWAYS



**CITY OF
PARRAMATTA**



SHEET JOIN

BOREHOLE LOCATIONS

Date: June 2024

Drawing Status: REVISION B - CONCEPT

** Subject to consultation & further investigative works*



ROYAL SHORES ERIMINGTON - SHEET 1

PEDESTRIAN AND CYCLIST PATHWAYS



CITY OF PARRAMATTA



SHEET JOIN

SHEET JOIN

BOREHOLE LOCATIONS

Date: June 2024
 Drawing Status: REVISION B - CONCEPT
 * Subject to consultation & further investigative works



ROYAL SHORES ERIMINGTON - SHEET 2

SEPARATED CYCLEWAY & PEDESTRIAN PATHWAY / SHARED PATHWAY



CITY OF PARRAMATTA



Proposed native garden bed to replace existing pathway and reduce small turf mowing areas.

Select removal of existing trees and construction of new 5m wide grated boardwalk over structural root zone to improve user sight lines and grades for pathway users

Proposed 2.5m wide concrete cyclist pathway with adjusted levels to improve grades

Match into existing

Proposed 2.5m wide concrete pedestrian pathway with coloured surface treatment and sandstone retaining wall.

SHEET JOIN

 BOREHOLE LOCATIONS

Date: June 2024
 Drawing Status: REVISION B - CONCEPT
 * Subject to consultation & further investigative works



ROYAL SHORES ERIMINGTON - SHEET 3

SEPARATED CYCLEWAY & PEDESTRIAN PATHWAY / SHARED PATHWAY



CITY OF PARRAMATTA

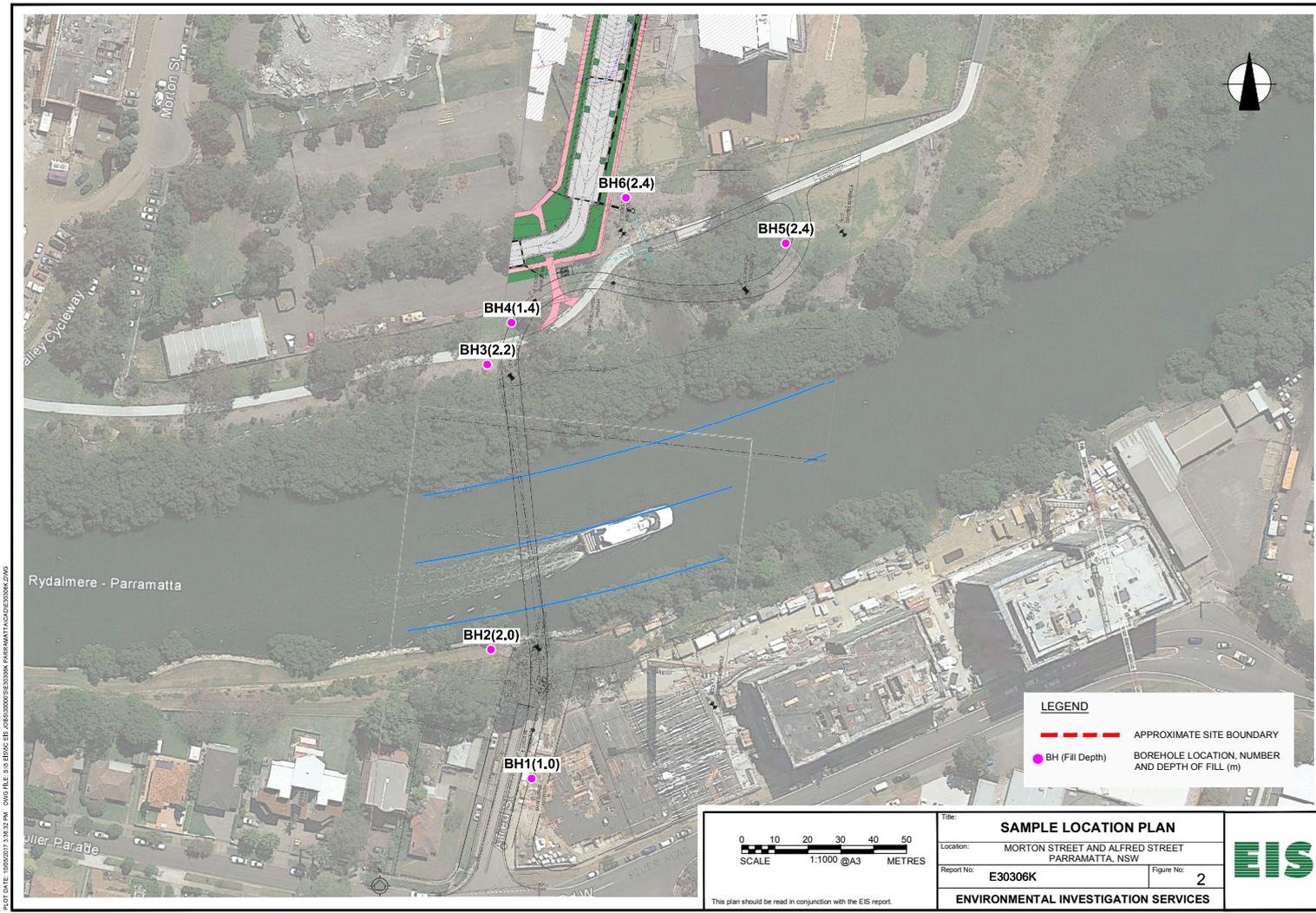


AERIAL IMAGE SOURCE: GOOGLE EARTH PRO 7.1.5.1557
 AERIAL IMAGE © 2015 GOOGLE INC.

Title: SITE LOCATION PLAN	
Location: MORTON STREET AND ALFRED STREET PARRAMATTA, NSW	
Report No: E30306K	Figure No: 1
ENVIRONMENTAL INVESTIGATION SERVICES	



This plan should be read in conjunction with the EIS report.



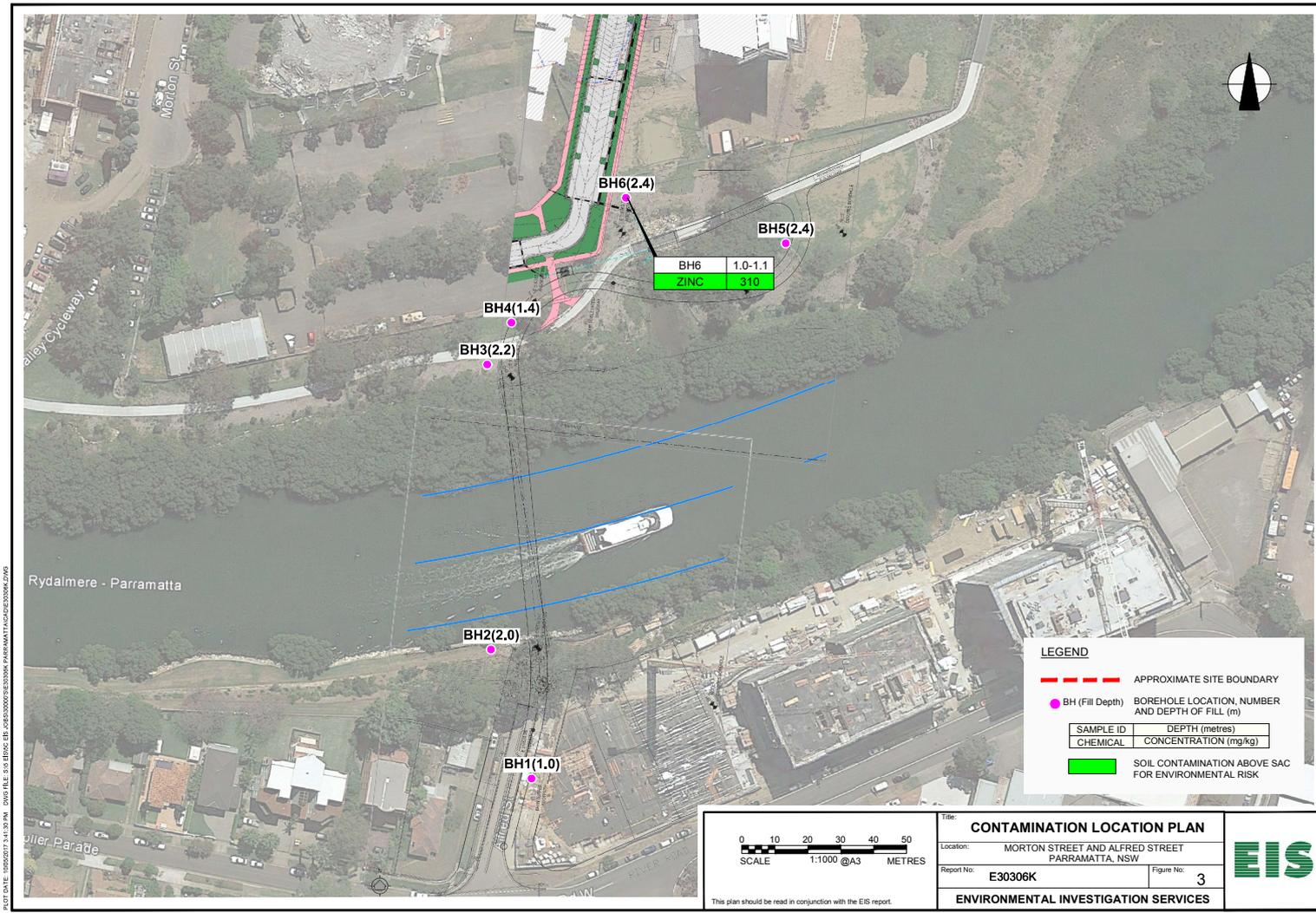
PLOT DATE: 10/06/2017 3:30:22 PM FILE: S:\BBOX\B1\JOB\30306\30306K_PARRAMATTA\GIS\30306K_2.DWG
 © EIS

LEGEND

- - - APPROXIMATE SITE BOUNDARY
- BOREHOLE LOCATION, NUMBER AND DEPTH OF FILL (m)

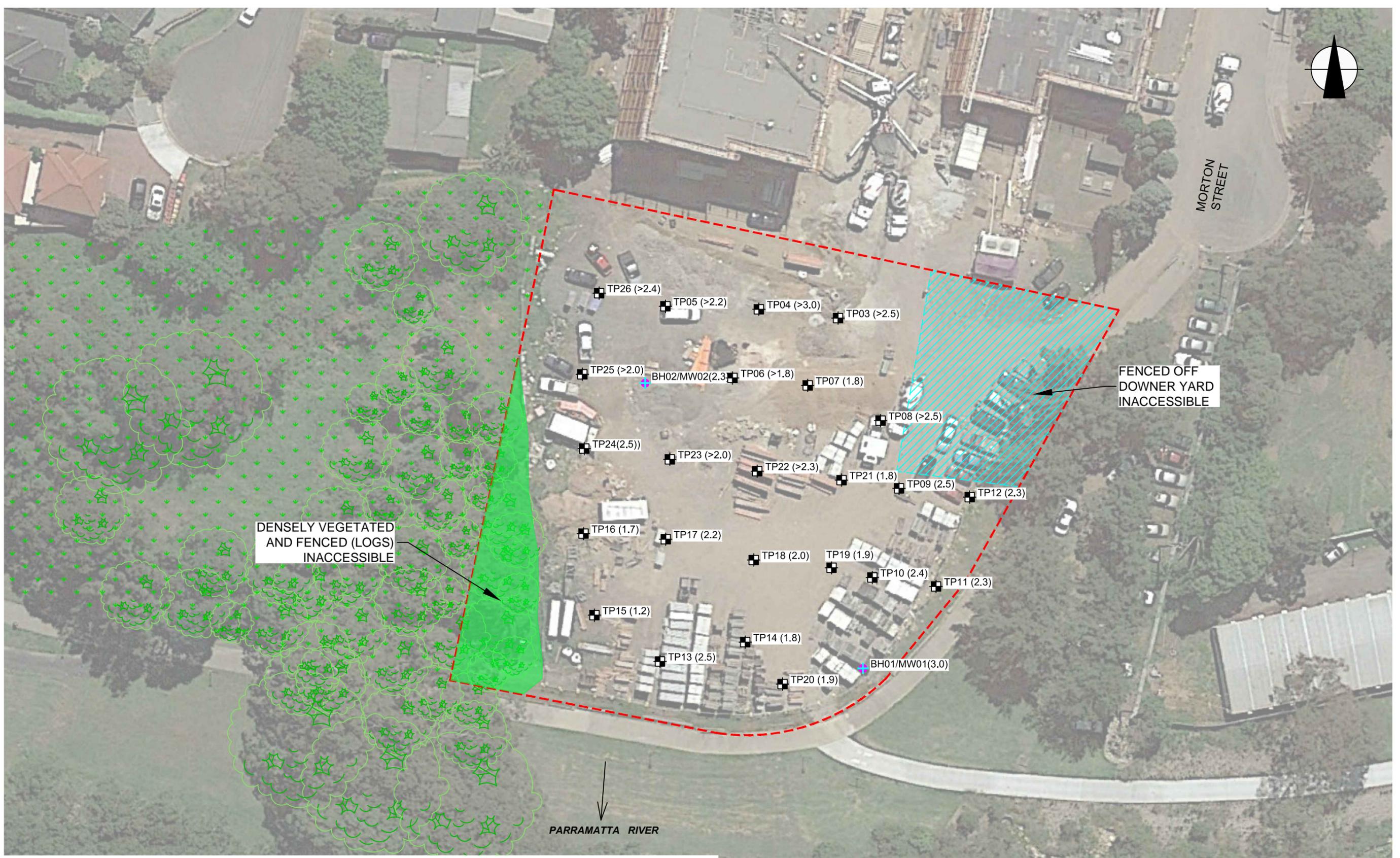
<p>0 10 20 30 40 50 SCALE 1:1000 @A3 METRES</p>	<p>Title: SAMPLE LOCATION PLAN Location: MORTON STREET AND ALFRED STREET PARRAMATTA, NSW</p>	
<p>Report No: E30306K Figure No: 2</p>		
<p>ENVIRONMENTAL INVESTIGATION SERVICES</p>		

This plan should be read in conjunction with the EIS report.



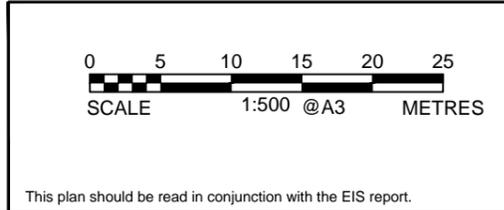
PLOT DATE: 10/06/2017 3:41:30 PM DWG FILE: E:\030306K\030306K_PARRAMATTA\030306K.DWG © EIS

PLOT DATE: 9/04/2018 11:56:34 AM DWG FILE: S:\6 EIS\50 EIS JOBS\31269K PARRAMATTA RANGIHOU RESERVE\CAD\E31269K.DWG



LEGEND

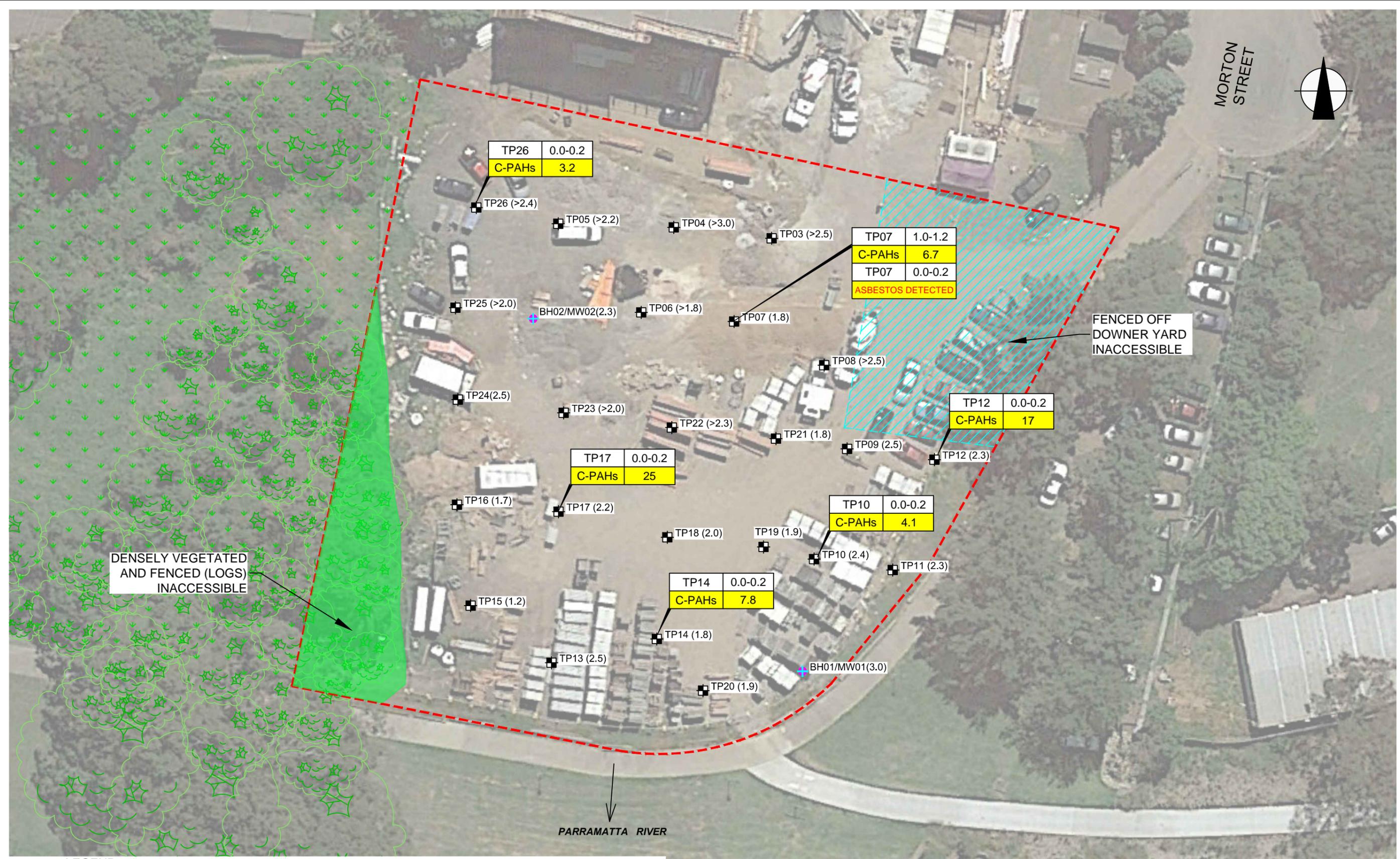
- - - - - APPROXIMATE SITE BOUNDARY
- ◆ BH/MW(Fill Depth) BOREHOLE AND GROUND WATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- ⊕ TP(Fill Depth) TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)



Title: SAMPLE LOCATION PLAN	
Location: RANGIHOU RESERVE, PART OF 1C & 1D MORTON STREET, PARRAMATTA, NSW	
Report No: E31269K	Figure No: 2
ENVIRONMENTAL INVESTIGATION SERVICES	



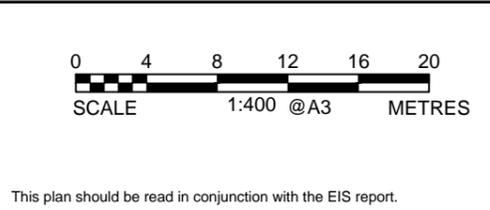
PLOT DATE: 9/04/2018 11:56:54 AM DWG FILE: S:\6 EIS\50 EIS JOBS\531000\SE31269K PARRAMATTA RANGIHOU RESERVE\ICAD\E31269K.DWG



LEGEND

- - - APPROXIMATE SITE BOUNDARY
- + BH/MW(Fill Depth) BOREHOLE AND GROUND WATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- + TP(Fill Depth) TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)

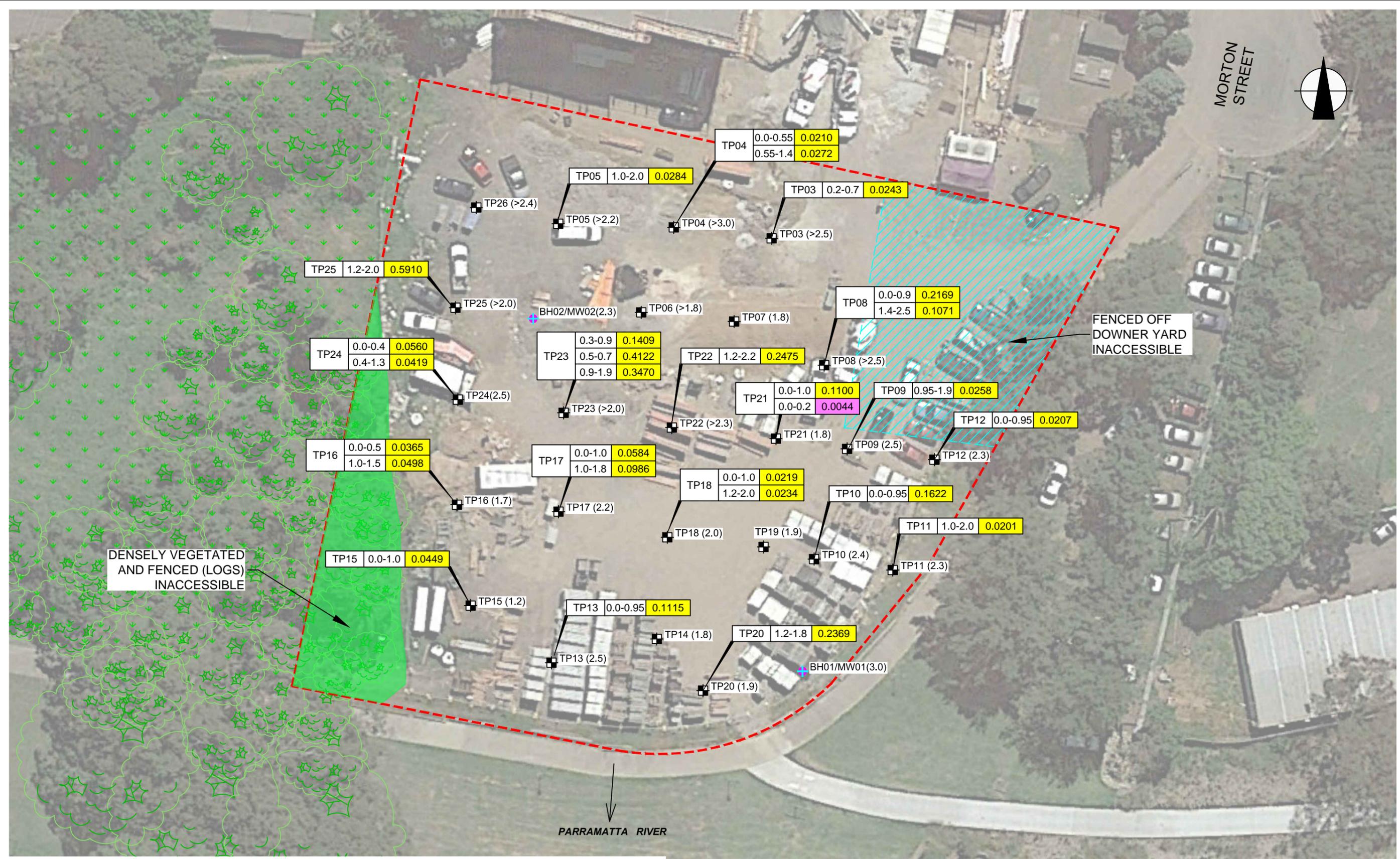
SAMPLE ID	DEPTH (metres)
CHEMICAL	CONCENTRATION
CARCINOGENIC PAHs	SOIL CONTAMINATION ABOVE SAC FOR HUMAN HEALTH RISK (mg/kg)



CONTAMINATION LOCATION PLAN	
Location: RANGIHOU RESERVE, PART OF 1C & 1D MORTON STREET, PARRAMATTA, NSW	
Report No: E31269K	Figure No: 3
ENVIRONMENTAL INVESTIGATION SERVICES	



PLOT DATE: 9/04/2018 11:56:46 AM DWG FILE: S:\6 EIS\50 EIS JOB\503\1000\SE31269K PARRAMATTA RANGIHOU RESERVE\CAD\E31269K.DWG



LEGEND

- - - - APPROXIMATE SITE BOUNDARY
- + BH/MW(Fill Depth) BOREHOLE AND GROUND WATER MONITORING WELL LOCATION, NUMBER AND DEPTH OF FILL (m)
- + TP(Fill Depth) TEST PIT LOCATION, NUMBER AND DEPTH OF FILL (m)

SAMPLE ID	DEPTH (metres)	CONCENTRATION
		ABOVE ASBESTOS CONTAMINATION IN SOIL FOR HSL-C (RECREATIONAL) (%w/w)
		ABOVE ASBESTOS CONTAMINATION IN SOIL AF/FA (%w/w)

0 4 8 12 16 20

SCALE 1:400 @A3 METRES

This plan should be read in conjunction with the EIS report.

Title: ASBESTOS QUANTIFICATION	
Location: RANGIHOU RESERVE, PART OF 1C & 1D MORTON STREET, PARRAMATTA, NSW	
Report No: E31269K	Figure No: 4
ENVIRONMENTAL INVESTIGATION SERVICES	



Appendix B

About This Report

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at

the time of construction as are indicated in the report; and

- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

continued next page

About this Report

Site Anomalies

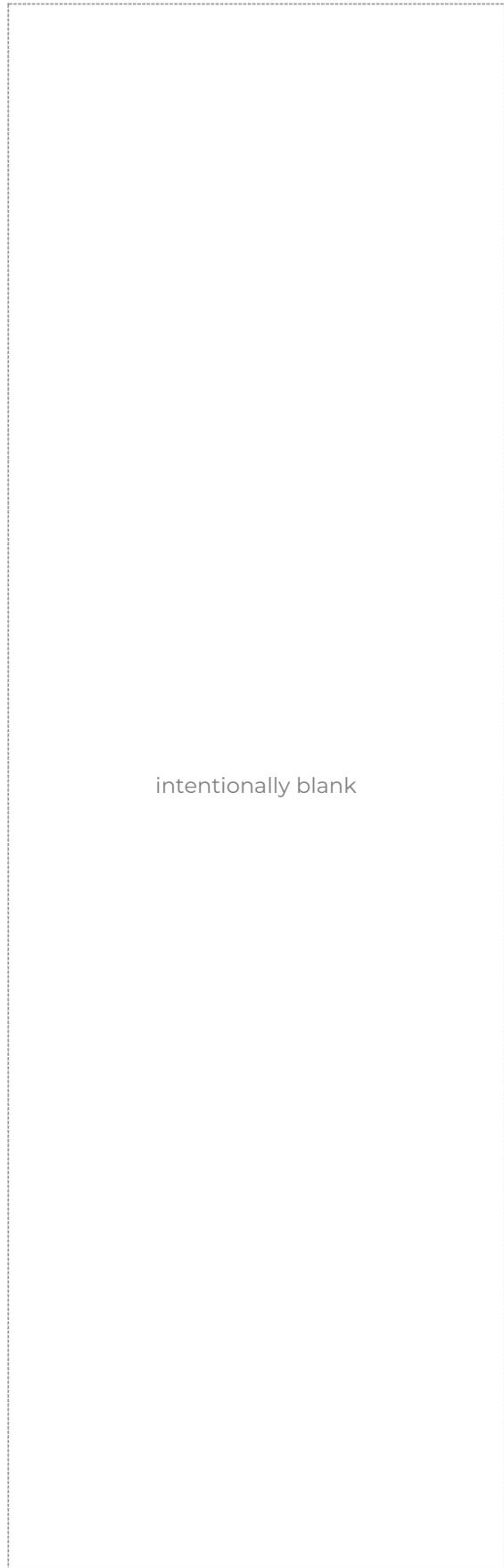
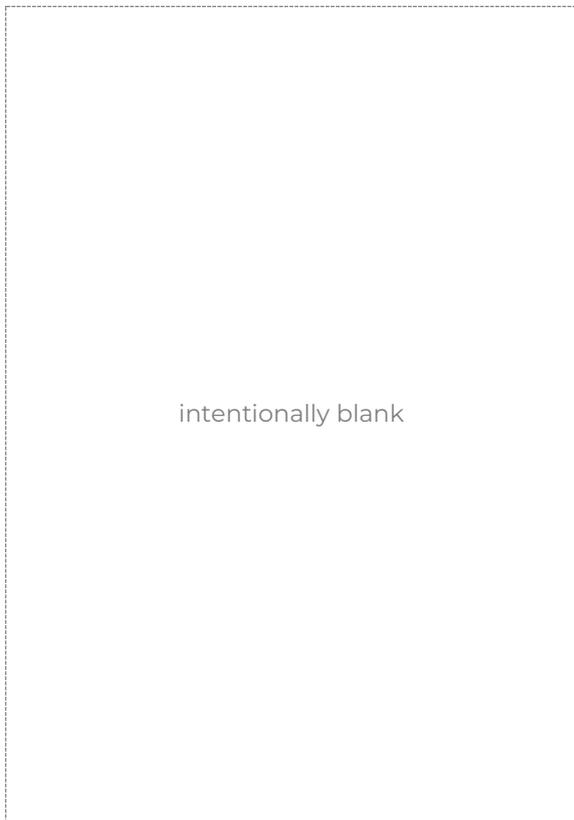
In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

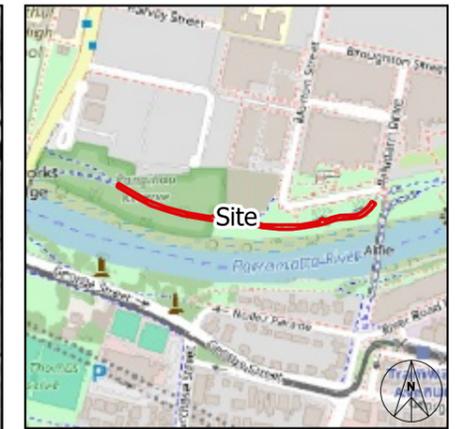
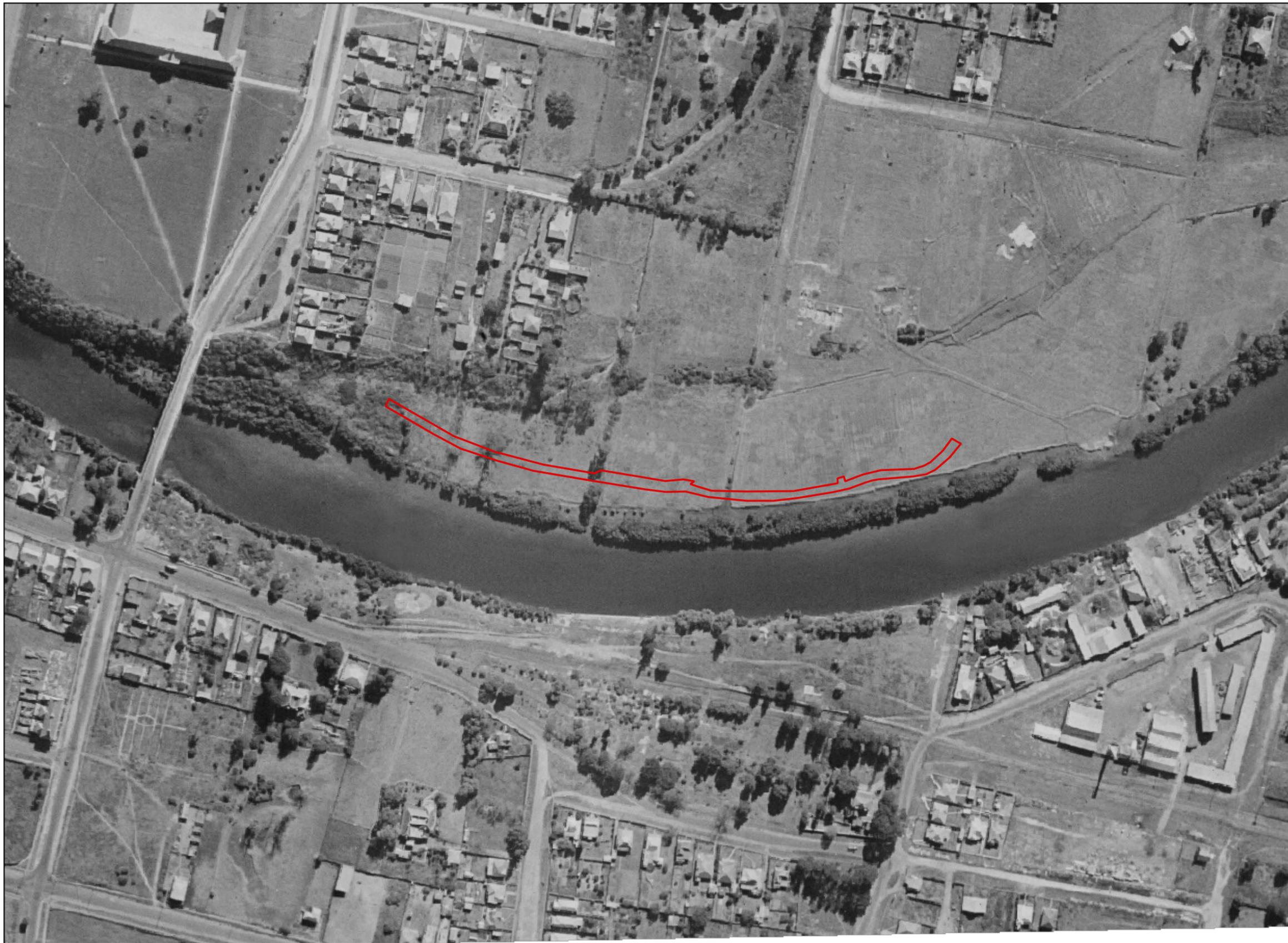


Appendix C

Site History

Appendix C1

Historical Aerial Photography



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

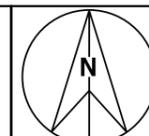


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

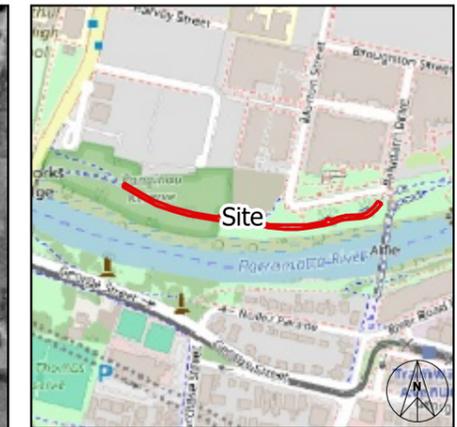
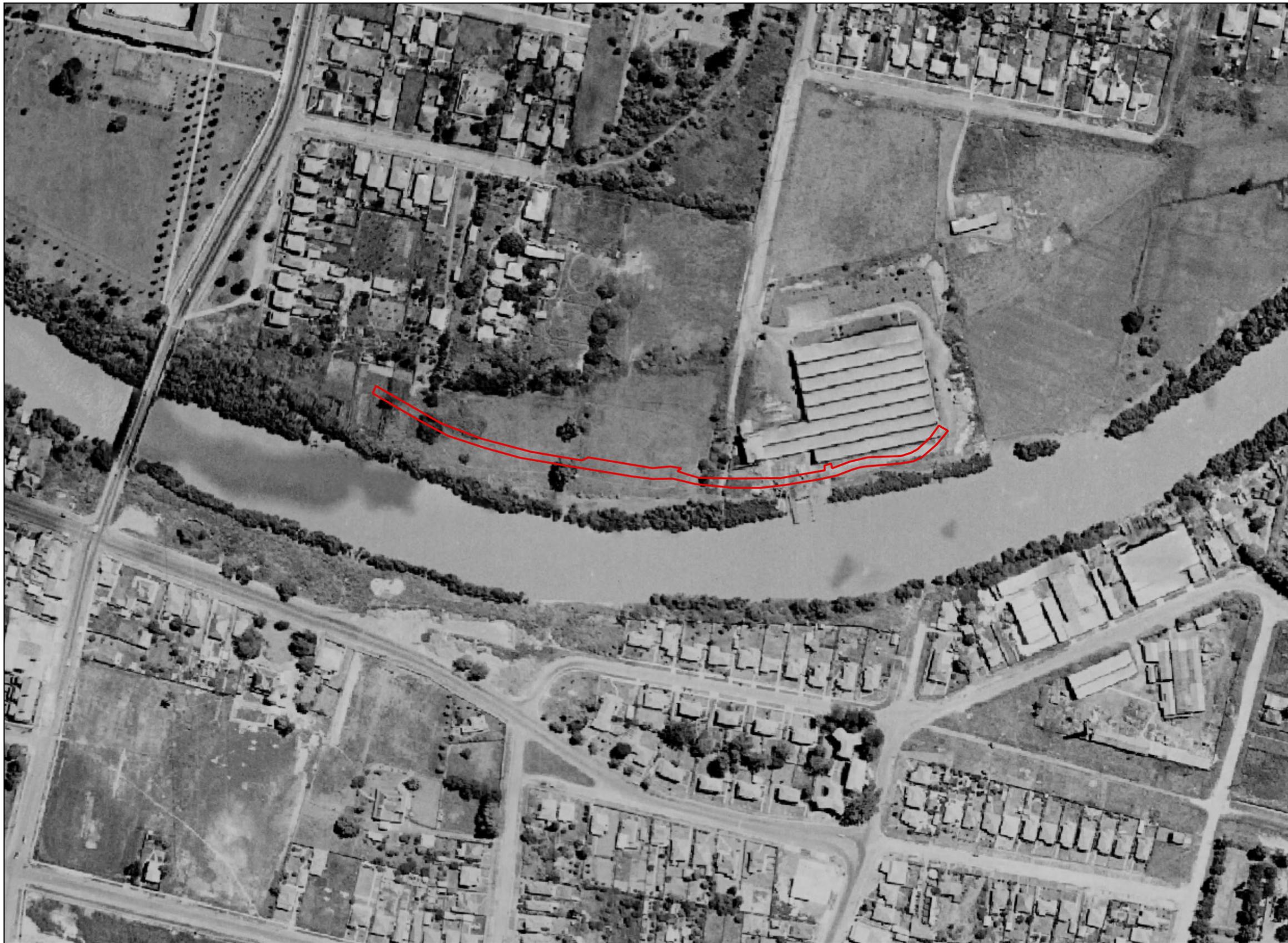


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1943 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	A
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

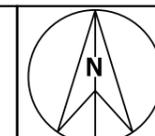


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

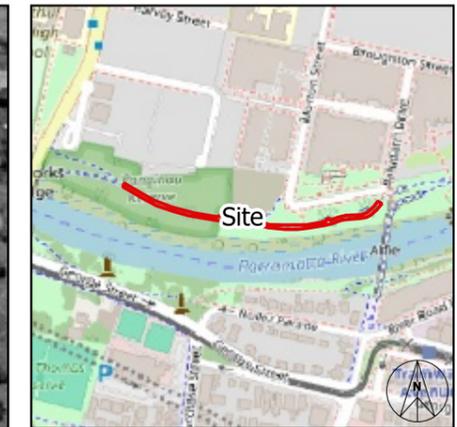


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1955 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	B
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

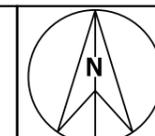


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

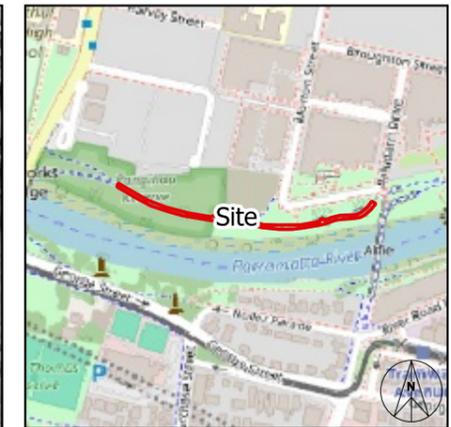


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1965 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	C
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

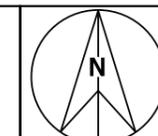


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

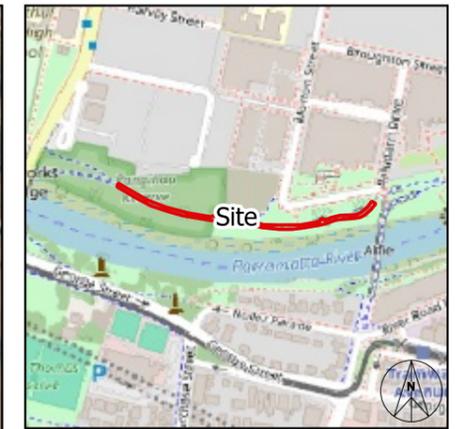


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1975 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	D
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

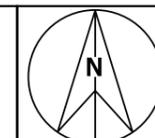


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

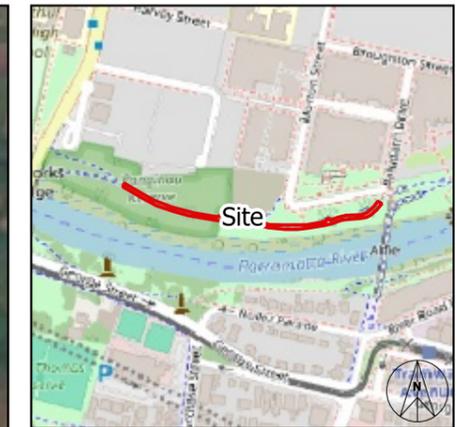


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1986 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	E
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

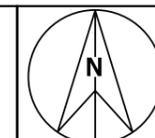


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery

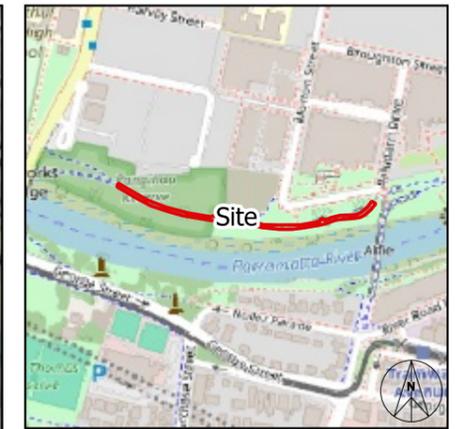


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **1996 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	F
REVISION:	0

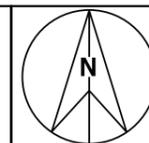


SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m



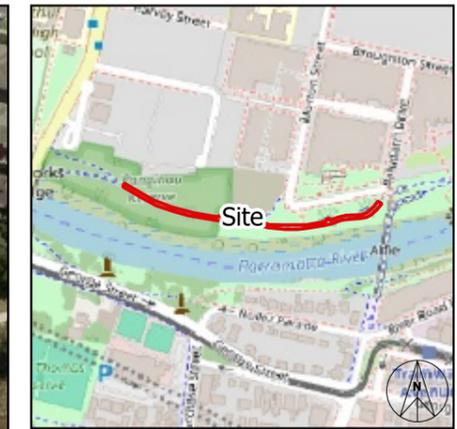
PROJECT:	231248.01
DRAWING No:	G
REVISION:	0

NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery



CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **2005 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

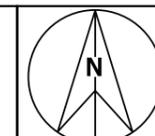


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publicly available aerial imagery

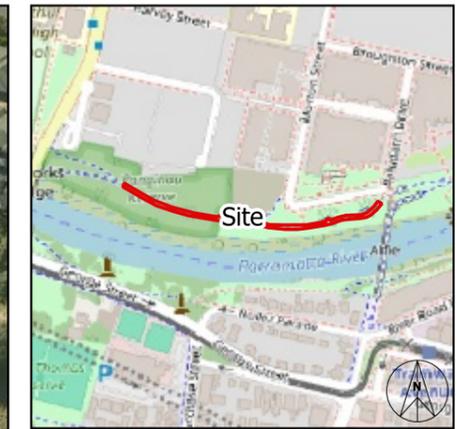


CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **2015 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	H
REVISION:	0



SITE LOCATION

LEGEND

 Site Boundary

0 20 40 60 80 100 m

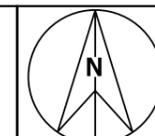


NOTE:
1. Drawing projection in GDA2020 / MGA zone 56, adapted from publically available aerial imagery



CLIENT: City of Parramatta Council	
OFFICE: Sydney	DRAWN BY: ML
SCALE: 1:2500 @A3	DATE: 13.January.2025

TITLE: **2024 Historical Aerial Imagery
Detailed Site (Contamination) Investigation
Rangihou Reserve, Rydalmere NSW**



PROJECT:	231248.01
DRAWING No:	I
REVISION:	0

Appendix C2

Council Records Summary

martens

consulting engineers since 1989

F2008/02904

RECEIVED IN RECORDS
17 OCT 2012
Initials

To: Graeme Bleus

Regards Ben McGriffin

SCANNED
17 OCT 2012
PCC

RECEIVED IN RECORDS
1130am
26 FEB 2013
Initials
MT

Head Office
Unit 6 / 37 Leighton Place
Hornsby NSW 2077, Australia
Ph 02 9476 9999 Fax 02 9476 8767

> mail@martens.com.au
www.martens.com.au
MARTENS & ASSOCIATES P/L
ABN 85 070 240 890 ACN 070 240 890

With Compliments

ENVIRONMENT



WATER



WASTE



GEOTECHNICS



CIVIL



STRUCTURAL



Parramatta City Council

Contamination and Geotechnical
Assessment
Parramatta City Council Depot
1A Morton St, Parramatta



ENVIRONMENTAL



WATER



WASTEWATER



GEOTECHNICAL



CIVIL



PROJECT
MANAGEMENT



P1203374JR02V01
September 2012

Copyright Statement

Martens & Associates Pty Ltd (Publisher) is the owner of the copyright subsisting in this publication. Other than as permitted by the Copyright Act and as outlined in the Terms of Engagement, no part of this report may be reprinted or reproduced or used in any form, copied or transmitted, by any electronic, mechanical, or by other means, now known or hereafter invented (including microcopying, photocopying, recording, recording tape or through electronic information storage and retrieval systems or otherwise), without the prior written permission of Martens & Associates Pty Ltd. Legal action will be taken against any breach of its copyright. This report is available only as book form unless specifically distributed by Martens & Associates in electronic form. No part of it is authorised to be copied, sold, distributed or offered in any other form.

The document may only be used for the purposes for which it was commissioned. Unauthorised use of this document in any form whatsoever is prohibited. Martens & Associates Pty Ltd assumes no responsibility where the document is used for purposes other than those for which it was commissioned.

Limitations Statement

The sole purpose of this report and the associated services performed by Martens & Associates Pty Ltd is to provide a geotechnical and contamination assessment in accordance with the scope of services set out in the contract / quotation between Martens & Associates Pty Ltd and Parramatta City Council (hereafter known as the Client). That scope of works and services were defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

Martens & Associates Pty Ltd derived the data in this report primarily from a number of sources which may include for example site inspections, correspondence regarding the proposal, examination of records in the public domain, interviews with individuals with information about the site or the project, and field explorations conducted on the dates indicated. The passage of time, manifestation of latent conditions or impacts of future events may require further examination / exploration of the site and subsequent data analyses, together with a re-evaluation of the findings, observations and conclusions expressed in this report.

In preparing this report, Martens & Associates Pty Ltd may have relied upon and presumed accurate certain information (or absence thereof) relative to the site. Except as otherwise stated in the report, Martens & Associates Pty Ltd has not attempted to verify the accuracy of completeness of any such information (including for example survey data supplied by others).

The findings, observations and conclusions expressed by Martens & Associates Pty Ltd in this report are not, and should not be considered an opinion concerning the completeness and accuracy of information supplied by others. No warranty or guarantee, whether express or implied, is made with respect to the data reported or to the findings, observations and conclusions expressed in this report. Further, such data, findings and conclusions are based solely upon site conditions, information and drawings supplied by the Client etc. in existence at the time of the investigation.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between Martens & Associates Pty Ltd and the Client. Martens & Associates Pty Ltd accepts no liability or responsibility whatsoever for or in respect of any use of or reliance upon this report by any third party.

© September 2012
 Copyright Martens & Associates Pty Ltd
 All Rights Reserved

Head Office
 6/37 Leighton Place
 Hornsby, NSW 2077, Australia
 ACN 070 240 890 ABN 85 070 240 890
Phone: +61-2-9476-9999
 Fax: +61-2-9476-8767
 Email: mail@martens.com.au
 Web: www.martens.com.au

Document and Distribution Status								
Author(s)			Reviewer(s)		Project Manager		Signature	
Ben McGiffin			Jeff Fulton Andrew Norris		Jeff Fulton			
Revision No.	Status	Release Date	Document Location					
			File Copy	MA Library	Parramatta City Council			
1	Draft	16.05.2012	1E	1H	1E			
1	Final	11.07.2012	1E	1H	1E			
1	Final	06.09.2012	1E	1H	1P			

Distribution Types: F = Fax, H = hard copy, P = PDF document, E = Other electronic format. Digits indicate number of document copies.



Executive Summary

Overview

The purpose of this report is to provide comment on site geotechnical conditions and site soil contamination status. This report has been commissioned by Parramatta City Council (PCC) as part of a due diligence process to support the sale of the site for proposed future residential use.

Site Description

The site is located at 1A Morton Street, Parramatta and consists of Lot 8, DP1097934 having an area of approximately 2.25ha. Surrounding land use is mixed residential and business. The nearest sensitive environmental receptor to the site is the Parramatta River which is located approximately 50 meters from the site's southern boundary.

Methods

Site investigations for geotechnical and contamination purposes were undertaken and included the following:

- A general walkover inspection of the site to assess existing site conditions, presence of geotechnical hazards, potential contaminating land uses and document site geomorphology;
- Underground services locating and ground penetrating radar (GPR) to locate existing underground storage tanks (UST);
- Excavation of 15 test locations using a truck-mounted hydraulic drill rig;
- Dynamic Cone Penetrometer (DCP) testing at 7 locations to determine preliminary soil strength properties, and compliment borehole log data;
- Soil samples collected at each testing location for the purposes of geotechnical and contamination assessment; and
- Installation of 2 temporary groundwater monitoring wells

Geotechnical Assessment

Site subsurface material consists of variable fill (granular and clay fill) overlying residual clays (firm to stiff, plastic) and weathered shale.

Ground water was intercepted during subsurface investigation and two groundwater monitoring wells were installed as part of the assessment. Groundwater inflow observed during subsurface investigation were at a depth range of 3.5-6.0 m below grad. Ground water measured one week after installation of wells was at a depth range of 0.3 – 1.2 m below grade. A more accurate understanding of

groundwater conditions and behaviour at the site would require the installation of additional monitoring wells and long-term monitoring

Contamination Assessment

Overview

The previous Stage 1 Environmental Assessment completed by Martens and Associates (ref: P1203374JR01V01 2012) revealed nine (9) areas of environmental concern (AEC) and associated chemicals of concern (COC). Of note was the discovery of potential asbestos containing material found at two locations on the site and six (6) underground petrol storage tanks which have been decommissioned. A sampling regime consisting of soil, water and material samples was undertaken based on the identified AECs.

Contamination Testing Results Summary

Material Contamination

Four fibrous material samples collected from the surface were analysed for asbestos with all four samples returning a positive identification of asbestos.

Soil Contamination

- Surface soil samples were analysed for asbestos in soil and a positive identification of asbestos in soil was confirmed at a single location.
- Heavy metals concentrations in most samples across the site are at levels below adopted HILs and consisting with natural background levels. Lead was identified to be in exceedance of adopted investigation levels in one sample.
- TRH C₁₀-C₃₆ was detected in samples at a level above the adopted investigation level.
- TRH speciation reported concentration of TPH C₁₆-C₃₅ aromatic at concentrations above adopted HIL in all samples.

Ground water contamination

- TRH C₆-C₉ was detected at levels above the adopted groundwater investigation levels (GIL).
- TRH C₁₀-C₁₄ was detected at levels above the adopted GIL
- Heavy metals were detected at levels above the adopted GIL

Contamination Conclusion

Based on the location of the contaminated samples and site historical use, the likely source of hydrocarbon contamination is the underground fuel tanks. To allow for future residential site use, the six underground fuel tanks need to be removed from the site with additional testing and remediation of the contaminated soil conducted under the guidance of a remediation action plan (RAP).

The material samples of asbestos were bonded asbestos which can be remediated under the guidance of a RAP. The positive identification of asbestos fibres in soils was an isolated incident and will require localised remediation under a RAP.

Groundwater analysis indicated minor hydrocarbon impact and elevated heavy metal levels. With only two monitoring wells and no long term data, it is difficult to attribute this contamination to any one particular source or outline contamination distribution and trends. Future analysis of site groundwater can be assessed through a ground water monitoring program.

The contamination assessment conducted should be viewed as preliminary in nature. A more thorough assessment of site contamination will be required to outline the extent and degree of contamination. Following this, remediation and validation plans for the site can be drafted.

Contents

1 INTRODUCTION	9
1.1 Overview	9
1.2 Field Investigations	9
1.3 Relevant Guidelines/Standards	10
2 SITE DESCRIPTION	11
2.1 Site Location and Description	11
2.2 Topography and Drainage	12
2.3 Lithology and Soil Landscapes	12
3 GEOTECHNICAL ASSESSMENT	13
3.1 Sub-surface Materials	13
3.2 Engineering Properties	14
3.3 Groundwater	14
3.4 Design Advice	15
3.5 Atterberg Limits and Linear Shrinkage Testing	16
3.6 Salinity and Acid Sulfate Soils	16
3.7 General Recommendations	16
3.7.1 Excavations	16
3.7.2 Batters	17
3.7.3 Footing and Foundations	17
4 ENVIRONMENTAL SITE ASSESSMENT AND PRELIMINARY SOIL SAMPLING	18
4.1 Review of PESA	18
4.2 Preliminary Soil and Groundwater Sampling	21
4.2.1 Field Investigation	21
4.2.2 Quality Assurance/ Quality Control	21
4.2.3 Laboratory Analysis	21
4.3 Chemical Assessment of Soils	22
4.3.1 Soil Investigation Criteria	22
4.3.2 Assessing Petroleum Hydrocarbon Investigation Criteria	23
4.3.3 Ground water Investigation Criteria	23
4.3.4 Assessing Asbestos Investigation Criteria	24
4.4 Soil Results	24
4.4.1 Comparison of Soil Analytical Results with Soil Investigation Criteria	24
4.4.2 Additional Soil Analysis	25
4.5 Ground Water Results	26
4.6 Discussion	26
5 LIMITATIONS	28
6 REFERENCES	29
7 ATTACHMENT A – SITE PLANS AND FIGURES	30
8 ATTACHMENT B – BOREHOLE LOGS	32
9 ATTACHMENT C –DCP SHEET	33
10 ATTACHMENT D –LABORATORY ANALYTICAL CERTIFICATES	34

11 ATTACHMENT E- ATTERBERG LIMITS AND LINEAR SHRINKAGE35
12 ATTACHMENT F – TABULATED LABORATORY RESULTS.....37
13 ATTACHMENT G- DATA VALIDATION REPORT38

1 Introduction

1.1 Overview

A geotechnical and preliminary contamination assessment was undertaken by Martens & Associates Pty Ltd for Parramatta City Council (PCC) at the council owned depot located at 1A Morton Street, Parramatta (the site). The assessment discusses site geotechnical conditions and provides comment (where possible) on site contamination status based on preliminary soil sampling. It is understood the report has been commissioned by PCC to support the proposed sale of the property.

We note that a Stage 1 Preliminary Environmental Site Assessment (PESA) has been completed for the site with findings presented in Martens and Associates report P11203374JR01V01 (April, 2012).

1.2 Field Investigations

Site investigations were undertaken on March 28 & 29, 2012, with additional works conducted on April 4, 2012. Works included the following:

- A general walkover inspection of the site to assess existing site conditions, presence of geotechnical hazards, potential contaminating land uses and document site geomorphology;
- Underground services locating and ground penetrating radar (GPR) to locate existing underground storage tanks (UST);
- Excavation of 15 test locations using a truck-mounted hydraulic drill rig;
- Dynamic Cone Penetrometer (DCP) testing at 7 locations to determine preliminary soil strength properties, and compliment borehole log data;
- Soil samples collected at each testing location for the purposes of geotechnical and contamination assessment; and
- Installation of 2 temporary groundwater monitoring wells.

Testing and sampling locations are presented in Attachment A.

1.3 Relevant Guidelines/Standards

This report has been prepared in general accordance with the following guidelines/standards:

- Australian Standard 1289 6.3.2 (1997) Methods of testing soils for engineering purposes - Soil strength and consolidation tests DCP;
- Australian Standard 1726 (1993) Geotechnical Site Investigations;
- Australian Standard 2870 (1996) Residential Slabs and Footings
- NSW EPA (1995) Contaminated Sites: Sampling Design Guidelines.
- NSW DEC (2006) Guidelines for the NSW Auditor Scheme (Second Edition);
- NSW EPA (1994) Guidelines for Assessing Service Station Sites; and
- NEPC (1999) National Environmental Protection (Assessment of Site Contamination) Measure (NEPM).