WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS

Flood Impact Assessment

24-28 Cairns St, Loganholme

Abdul Ziyath

03 July 2023



Document Status

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1 INTRODUCTION AND BACKGROUND

1.1 Introduction

Water Technology Pty Ltd (WT) have been commissioned by Abdul Ziyath to undertake a Flood Impact Assessment for a proposed development located at 24-28 Cairns Street, Loganholme (The Site). The Site is described as Lot 31 on RP88336 and is 2.7 ha in total area. The Site locality is shown in Figure 1-1 and is located within the Logan City Council (LCC) local government area. The Site is located within the wider Logan River floodplain. There are unnamed tributaries which flow through the site from the southern and western boundaries.

This report documents the flood assessment for local flooding affecting the site. Given the proposed development ensures balanced cut and fill within the site i.e. no loss of floodplain storage, a regional flood impact assessment has not been undertaken.

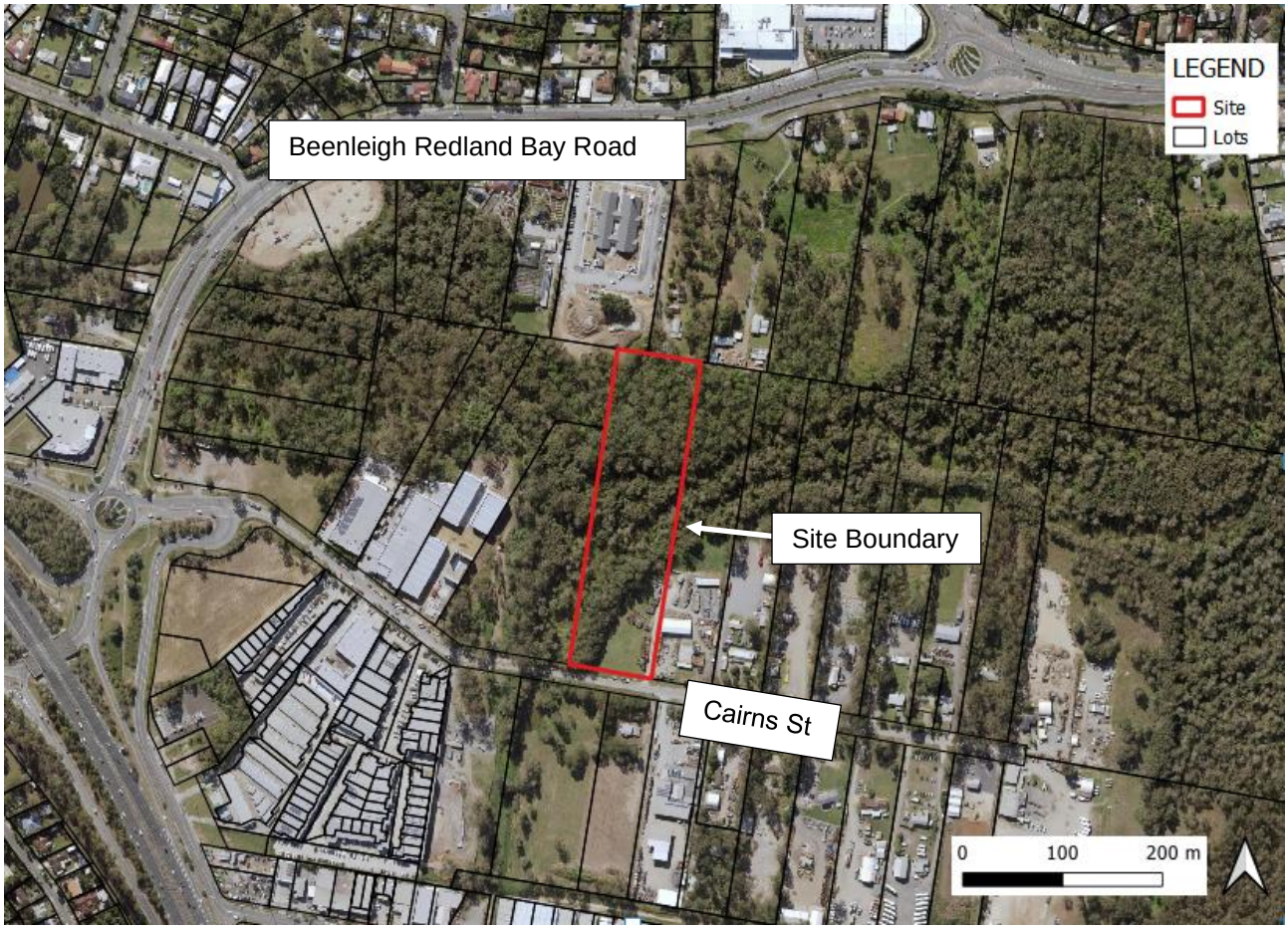


FIGURE 1-1 SITE LOCALITY (IMAGE SOURCE: QUEENSLAND GLOBE

1.2 Background

A prelodgement meeting was held with LCC on 15 March 2022. The meeting minutes indicate the following with respect to flooding:

- The development will be required to be above the defined flood event level, noting that with the entire proposed development area is within the mapped flood hazard area.
- The flood hazard code requires that no loss of floodplain storage be achieved, no increase in peak flow rates downstream, no increase in flood levels external to the site and no increase in duration of inundation external to the site that could cause loss or damage.

Figure 1-2 presents the LCC flood hazard overlay for the Site.

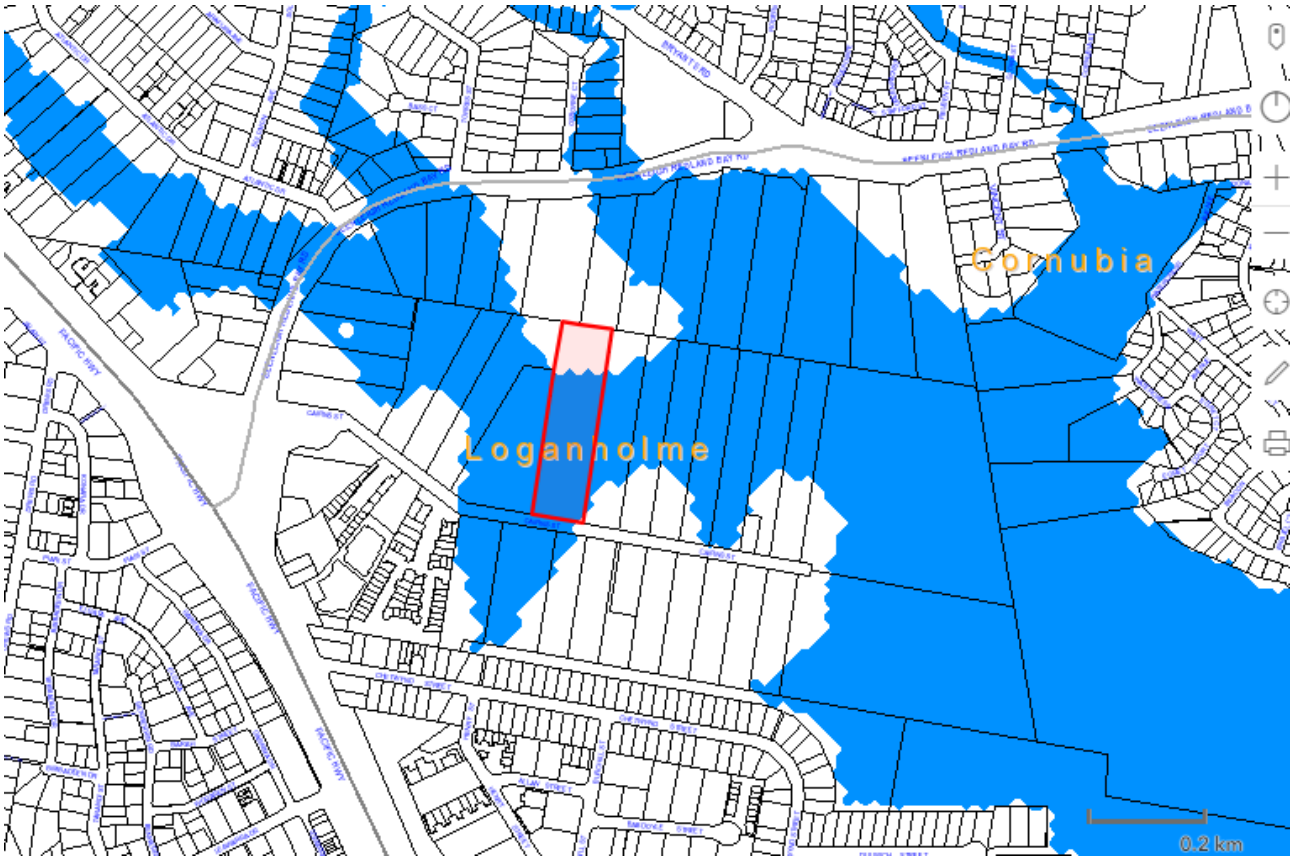


FIGURE 1-2 LCC FLOOD HAZARD OVERLAY

1.3 Proposed Development

The development outcome sought is a material change of use (MCU) for Warehouse. The proposed development consists of the following:

- Works proposed at the site are limited to an existing cleared area in the south-eastern corner of the site.
- The proposed layout includes two large sheds and a vehicle manoeuvring area as illustrated in Figure 1-3.
- The manoeuvring area will be provided on earth fill as illustrated in Figure 1-4, with the sheds constructed on a podium over areas of compensatory cut to achieve no loss in floodplain storage.

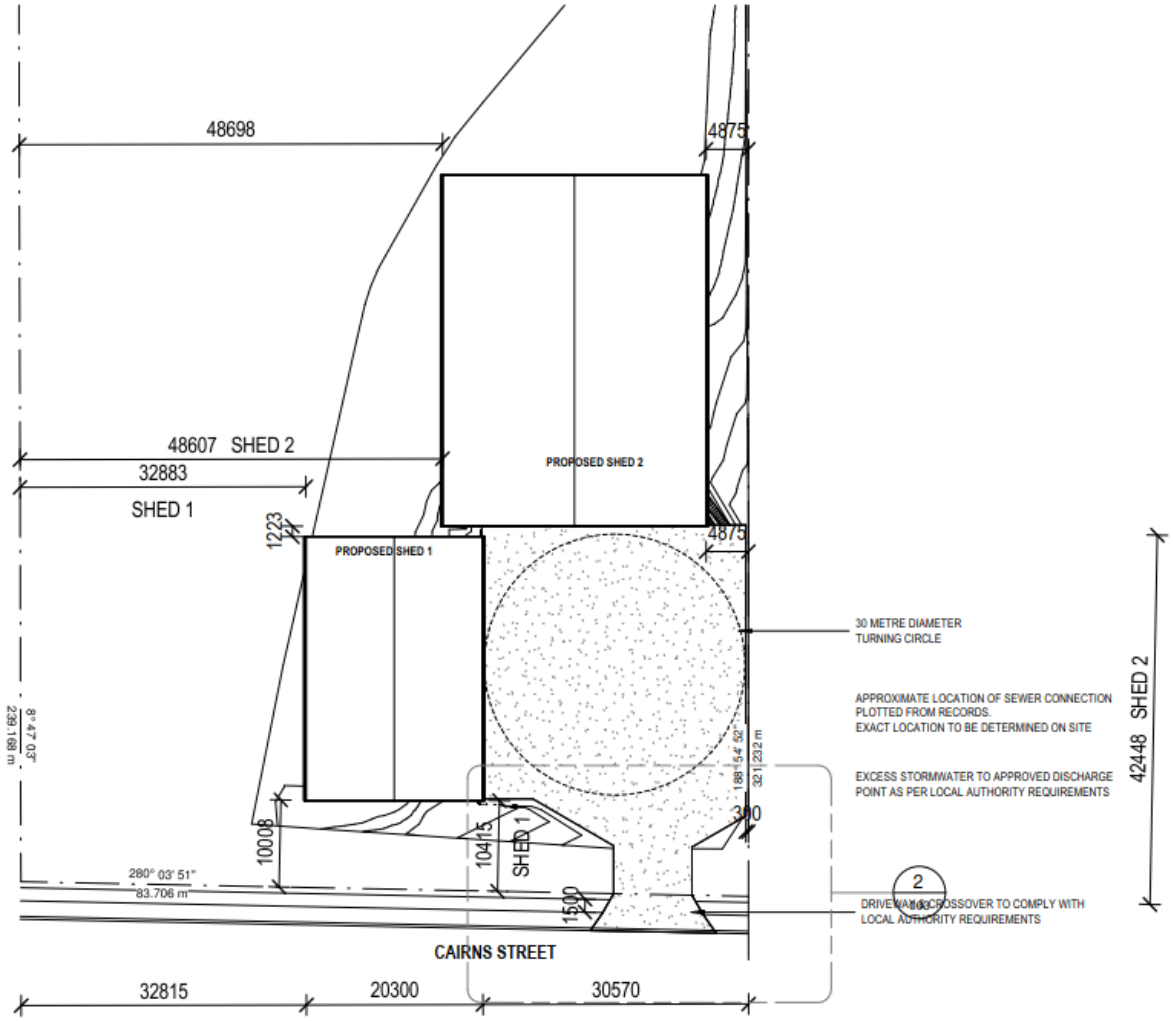


FIGURE 1-3 PROPOSED SITE LAYOUT

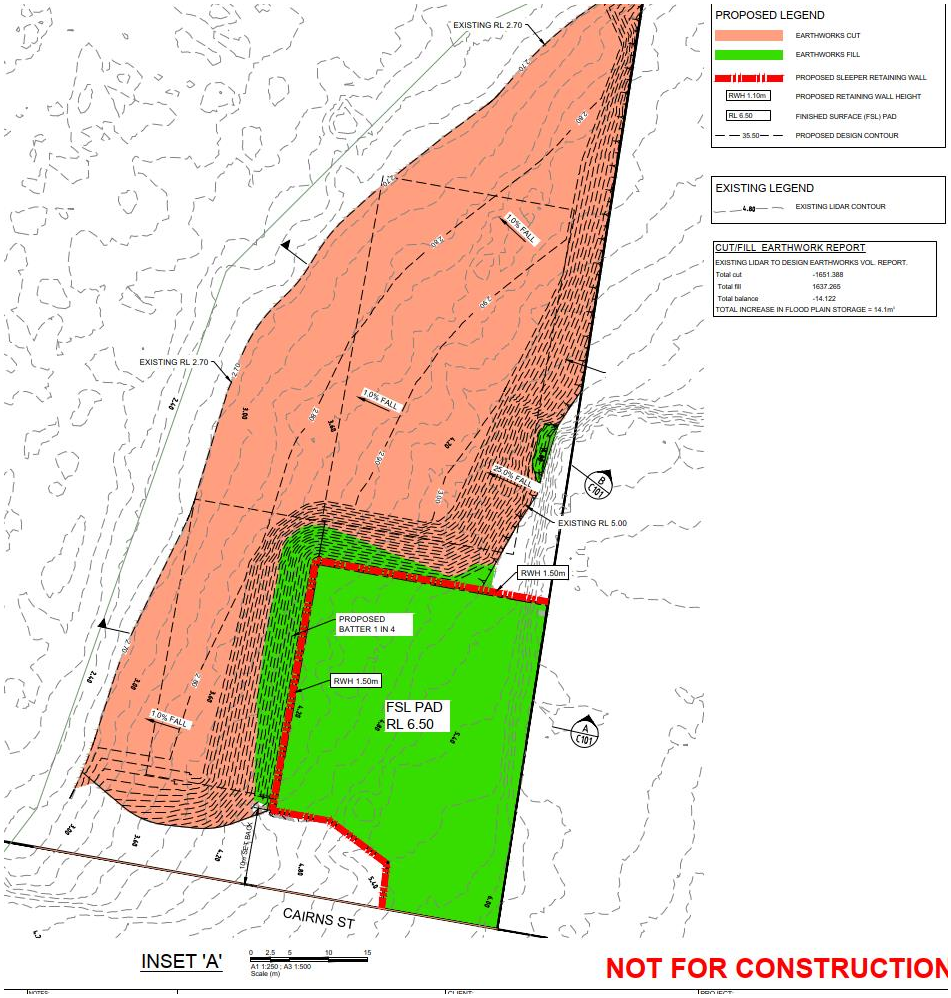


FIGURE 1-4 PROPOSED BULK EARTHWORKS

1.4 Available Data

The following data has been sourced and used to inform the current assessment: -

- Regional flood level data supplied by LCC from the Logan Albert Rivers Flood Study 2021 (Table 1-1;)
- LiDAR and associated contour data captured in 2017 with a 1m data resolution;
- LCC online mapping system;
- Development layout and engineering drawings provided by Hurley Engineering (refer Appendix A);
- Rainfall data from the Bureau of Meteorology (BoM);
- Site photographs captured by Water Technology; and
- Aerial imagery obtained from Google Earth and Queensland Globe.

TABLE 1-1 REGIONAL FLOOD LEVEL DATA FOR 24-28 CAIRNS STREET LOGANHOLME

Design Event	Peak Flood Level
0.5% AEP	6.78m AHD
1% AEP with Climate Change (DFE)	6.74m AHD
2% AEP	6.04m AHD
10% AEP	4.65m AHD

2 SITE CHARACTERISTICS

2.1 Topography and Drainage

Figure 2-1 illustrates the general site topography based on the 2017 LiDAR topographic survey. This data forms the base case of the assessment undertaken, as it most accurately reflects current catchment conditions.

The site is generally low lying with two flow paths traversing the site. The southern flow path drains under Cairns Street through 2 large RCP pipes which were measured on site. Figure 2-2 presents a photograph from the site visit looking at the site from Cairns Street. The low-lying areas of the site are heavily vegetated and were not traversable.

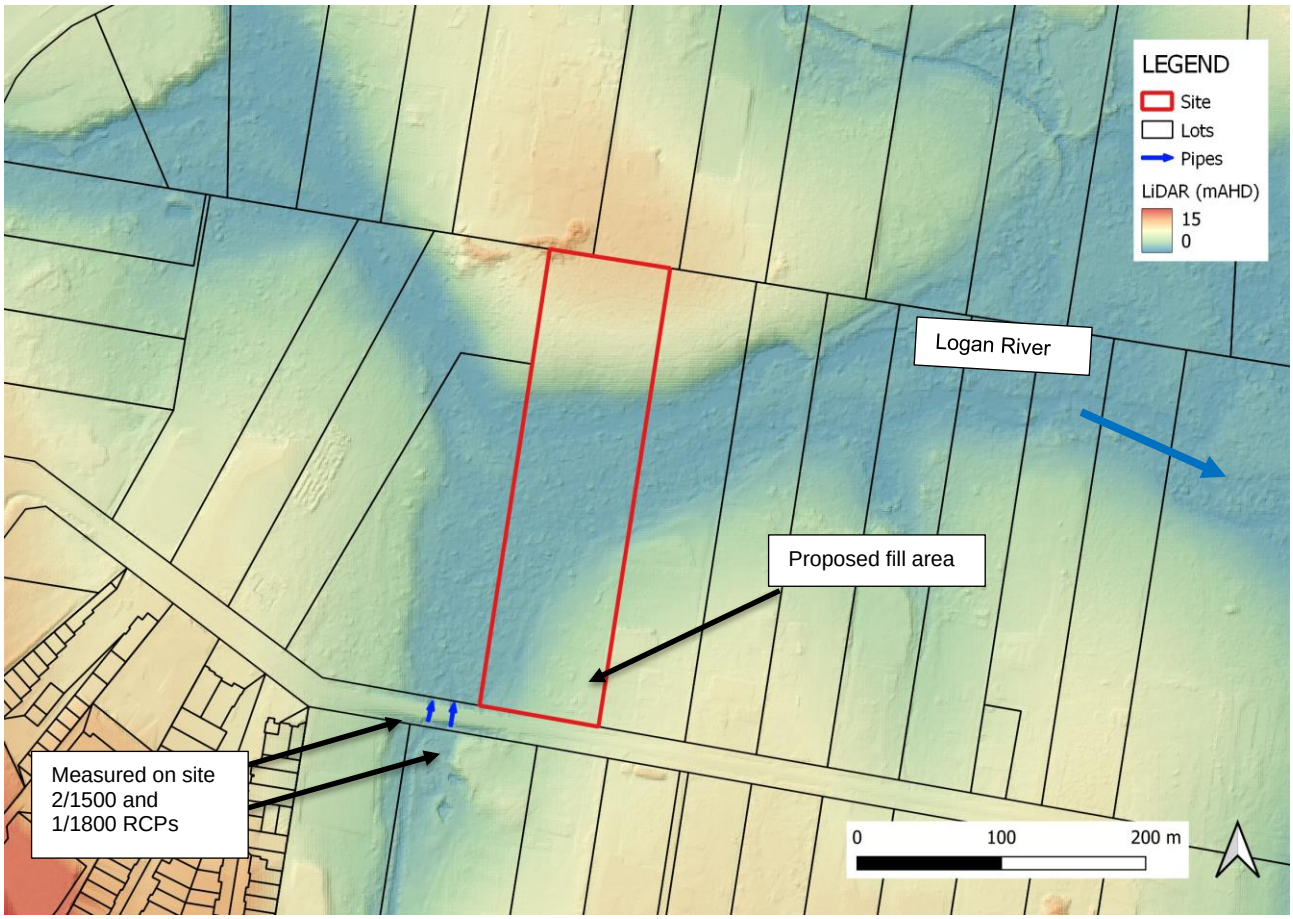


FIGURE 2-1 SITE TOPOGRAPHY AND DRAINAGE



FIGURE 2-2 PHOTOGRAPH FROM SITE VISIT – PERSPECTIVE FROM CAIRNS STREET

3 HYDROLOGIC MODELLING

3.1 Overview

To assess flood characteristics at the site for the local catchment, a hydrologic model has been established using URBS software based on Australian Rainfall and Runoff 2019 Guidelines (ARR 2019). In the absence of stream gauges, the hydrologic models were validated to the Rational Method. The following sections of this report provide further details with respect to the local catchment modelling that has been prepared as part of this site-based study.

3.2 URBS Model

3.2.1 Subcatchment Breakdown

Subcatchments for the tributary of the Logan River were defined based on LiDAR contours and other available design surfaces. Subcatchment details are summarised in Appendix B and the subcatchment boundaries are illustrated in Figure 3-1.

Hydrology has been developed for a range of design events, including the 1%, 10% and 50% AEPs. Outputs from the URBS model have been included in a detailed TUFLOW model for the catchment as discussed in Section 4.

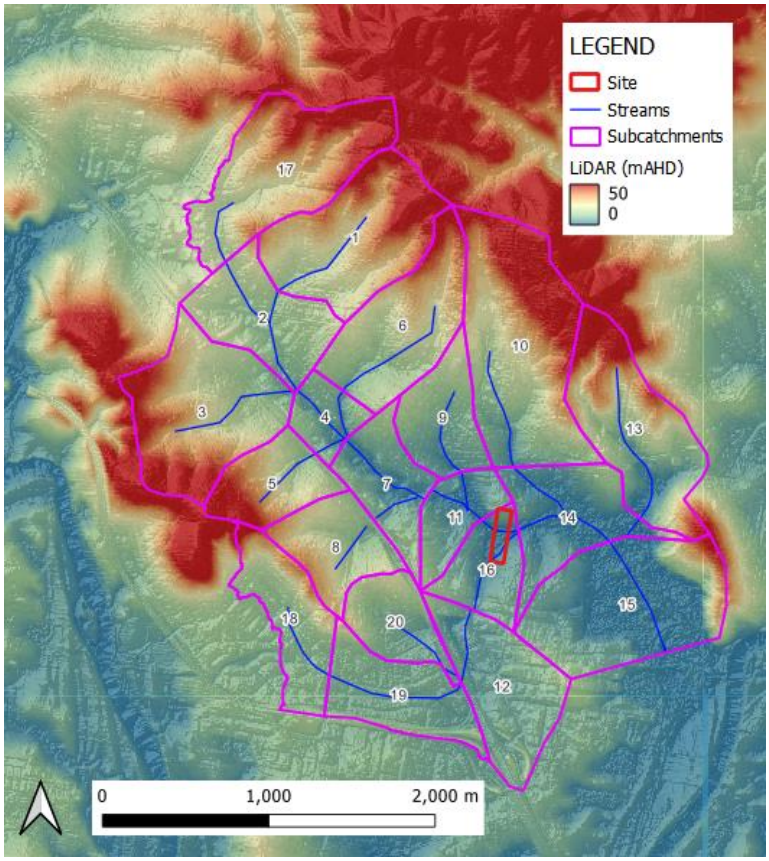


FIGURE 3-1 SUBCATCHMENT DELINEATION – TRIBUTARY

3.2.2 Landuse

Table 3-1 presents the land use zones taken from the Logan Council planning scheme and the associated fraction impervious value adopted for the URBS model subcatchments. Appendix B provides a summary table of the subcatchment attributes.

TABLE 3-1 LANDUSE FRACTION IMPERVOUS

Land Use	Fraction Impervious
Centre	0.9
Community Facilities - School	0.5
Environmental Management and Conservation	0
High Density Residential	0.9
Low Density Residential	0.65
Low Impact Industry	0.9
Medium Density Residential	0.85
Priority Development Area	0.8
Recreation and Open Space	0
Roads	0.9
Rural	0.05
Rural Residential	0.15
Commercial	0.9
Easement	0.15
High Density Residential	0.9
Open space	0
Low-Medium Density Residential	0.75
Special Purpose	0.75
Community Facilities	0.5
Specialised Centre	0.75

3.2.3 Design Rainfall and Losses

The hydrological analysis has utilised the ARR&R (2019) Datahub and BOM 2016 IFD data. All ten (10) temporal patterns for each duration have been simulated in the hydrological model.

The rainfall losses for the design events were based on recommended values from the ARR Datahub. These being 27 mm Initial Loss and 1.6mm/hr Continuing Loss. Preburst have been applied in the design event modelling (50% median values) process through subtraction from the Initial Loss values utilising the URBS ARR19 datahub toolbox.

3.2.4 Model Parameters

Table 3-2 shows the adopted URBS storage routing parameters. These parameters were chosen based on standard routing parameters seen in calibrated southeast Queensland catchments.

TABLE 3-2 ADOPTED URBS PARAMETERS FOR CALIBRATION AND DESIGN EVENT MODELLING

Parameter	Value
Alpha (reach)	0.2
Beta (subcatchment)	3.5
M (routing exponent)	0.8

3.2.5 Validation of the Hydrologic Models

Being a site-specific investigation of an ungauged local catchment, there is no site-based data to calibrate runoff for the site. Accordingly, the existing scenario URBS hydrologic model has been validated using the Rational Method as per guidelines in the Queensland Urban Drainage Manual (QUDM, 2008). The URBS RatARR utility was utilised for the assessment. Validation was performed downstream of the site at the confluence of the two main streams which affect the site.

The Rational Method parameters are summarised below and a comparison of discharges to the hydrologic model presented in Table 3-3.

- Tc of 62 minutes, based on average stream velocity method of 0.9 m/s.
- Total catchment area of 630 ha.

TABLE 3-3 RATIONAL METHOD COMPARISION (LOCATION SUBCATCH #16)

Design Event	Rational Q (m^3/s)	URBS Peak Flow (m^3/s)	Variation (%)
1% AEP	46.7	48.3	+3
10% AEP	88.8	85.8	-3
50% AEP	169.8	143.1	-16

The URBS results are within 20% of the Rational Method results for all the considered events. These flow comparisons are considered acceptable for the purposes of this study and accordingly the URBS model was adopted to inform design inflows to the hydraulic model.

3.2.6 Critical Storm

The critical storm has been extracted from the URBS hydrologic model at the site. Table below summarises the storms selected for hydraulic model simulation. The critical storm was selected as the 6th ranked storm for the critical duration.

TABLE 3-4 CRITICAL DESIGN STORMS AT SITE FOR HYDRAULIC MODELLING

Event	Critical storm
50% AEP	180 min TP05
10% AEP	60 min TP06
1% AEP	90 min TP03

4 HYDRAULIC MODELLING

4.1 Overview

A TUFLOW hydraulic model (build 2020-10-AD) utilising the HPC (Highly Parallelised Computations) solution scheme has been adopted to inform the local flood assessment for the development. TUFLOW is a 1D-2D linked hydraulic model that solves the depth-averaged shallow water equations.

A range of design storms including the 50%, 10% and 1% AEP events were assessed hydraulically in the TUFLOW model to quantify the local flood extent for the proposed development. Two (2) scenarios were assessed hydraulically as part of this study and are summarised as follows:

- Base Case – The study area in its current condition.
- Developed Case – The study area with the site in its ultimate development condition, incorporating the bulk earthworks model for the site.

4.2 Model Details

4.2.1 Base Case Model

Figure 4-1 shows the hydraulic model layout for Base Case. Key features of the hydraulic model include the following: -

- Highly detailed grid resolution of 3m to adequately reflect the topography surrounding the site.
- Model topography is based on LiDAR collected in 2017.
- Inclusion of new hydraulic structures upstream of the site. Sizes were based on site visit estimates.
- A Manning's n of 0.12 was adopted for the dense vegetation across the site. The current grassed area where the fill will be placed was modelled with a Manning's n of 0.035.
- The downstream boundary for the hydraulic model was positioned approximately 600m downstream of the site to ensure boundary conditions did not affect the model results at the site.

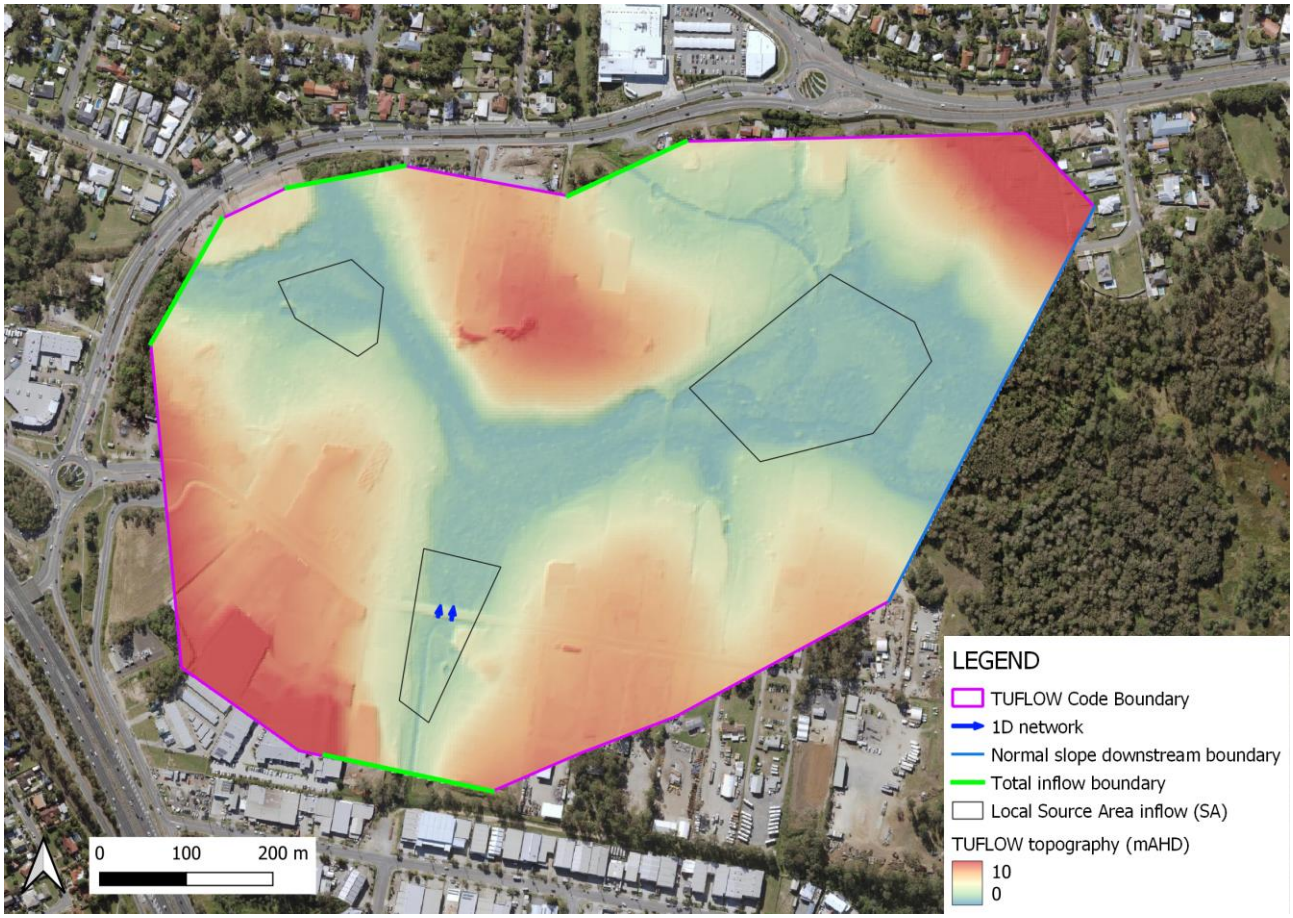


FIGURE 4-1 BASE CASE 1 HYDRAULIC MODEL LAYOUT

4.2.2 Developed Case Model

The developed case hydraulic model was prepared based on the base case model described previously. Figure 4-2 shows the post development case model layout and topography. The following modifications were made to reflect the proposed developed arrangements:

- Introduction of a design surface elevation model provided by Hurley Consulting Engineers. The earthworks model includes the proposed filling in the south-eastern corner and compensatory cut to the west of the filling. The model is representative of the proposed civil works as provided in Appendix A.

This model represents the site in its developed state. No other alterations were made to the model as part of this assessment and the roughness and downstream boundary conditions remained unchanged from the existing case model.

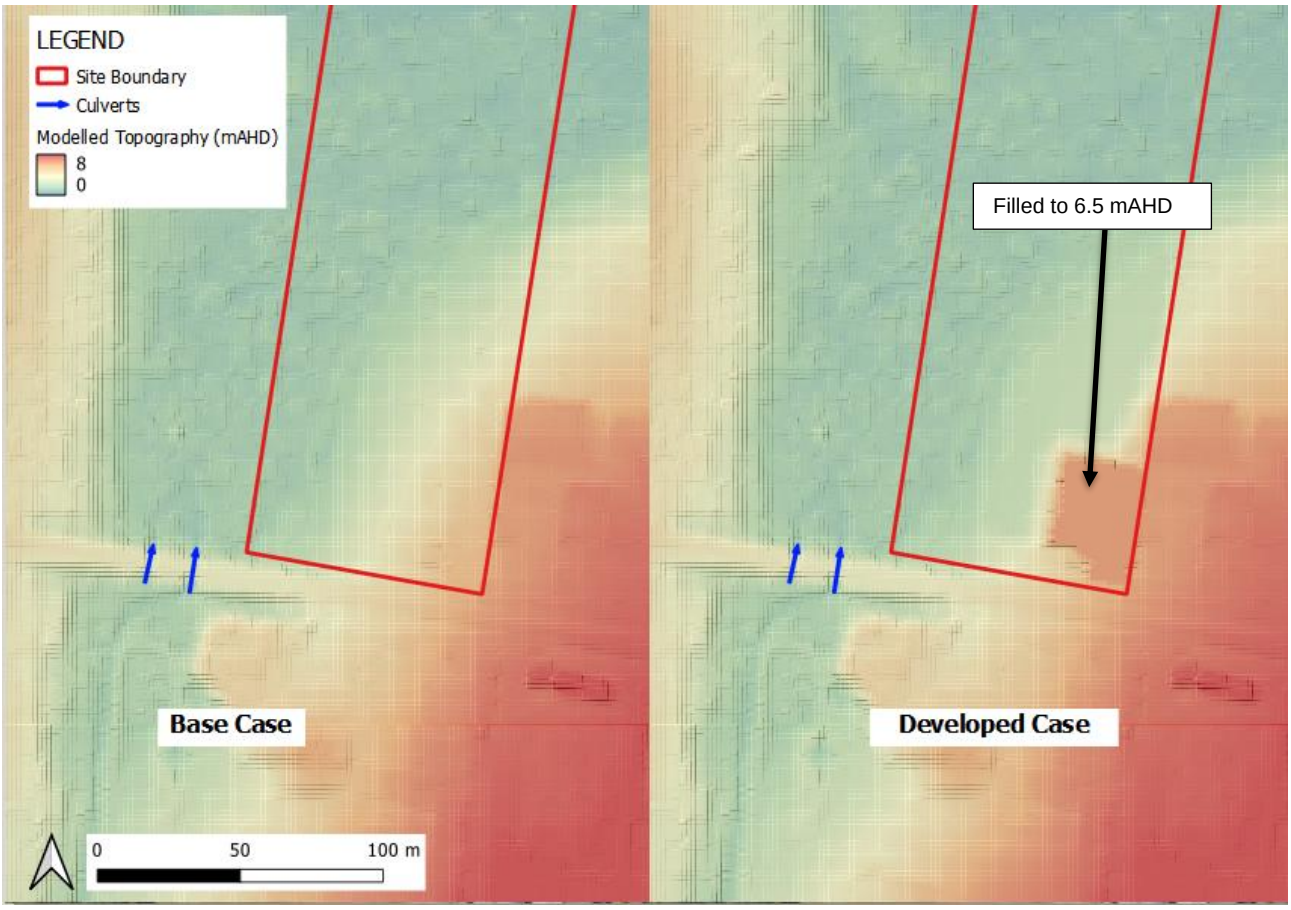


FIGURE 4-2 DEVELOPED CASE HYDRAULIC MODEL LAYOUT

4.3 Hydraulic Model Results

The TUFLOW hydraulic model was simulated for the 50%, 10%, 1% AEP design events to establish baseline scenarios with which to compare flood impacts in the developed case. Flood maps quantifying Base Case local flooding results for the site are attached in Appendix C. Figure 4-3 illustrates the 1% AEP flood depth at the site for base case.

Flood depth maps for the developed case are contained in Appendix D. Flood level impact maps prepared as the difference in water level between the developed case and base case are contained in Appendix E.

The following brief summary is provided in relation to the results of this assessment: -

- The base case flood results show the flood extent only minorly intrudes on the southeastern filled platform in the 1% AEP event. The majority of the local flooding is within the compensatory cut location immediately west of the filled platform.
- The peak 1% AEP local flood level adjacent to the filled platform is estimated to be 3.98 mAHD which is significantly lower than the Logan River DFE level of 6.74 mAHD.
- There is some increase in the extent of inundation in the 1% AEP event although this is contained within the Site boundary.
- There were negligible flood impacts in a local flooding event outside of the lot boundary for the 50%, 10% AEP and 1% AEP events.

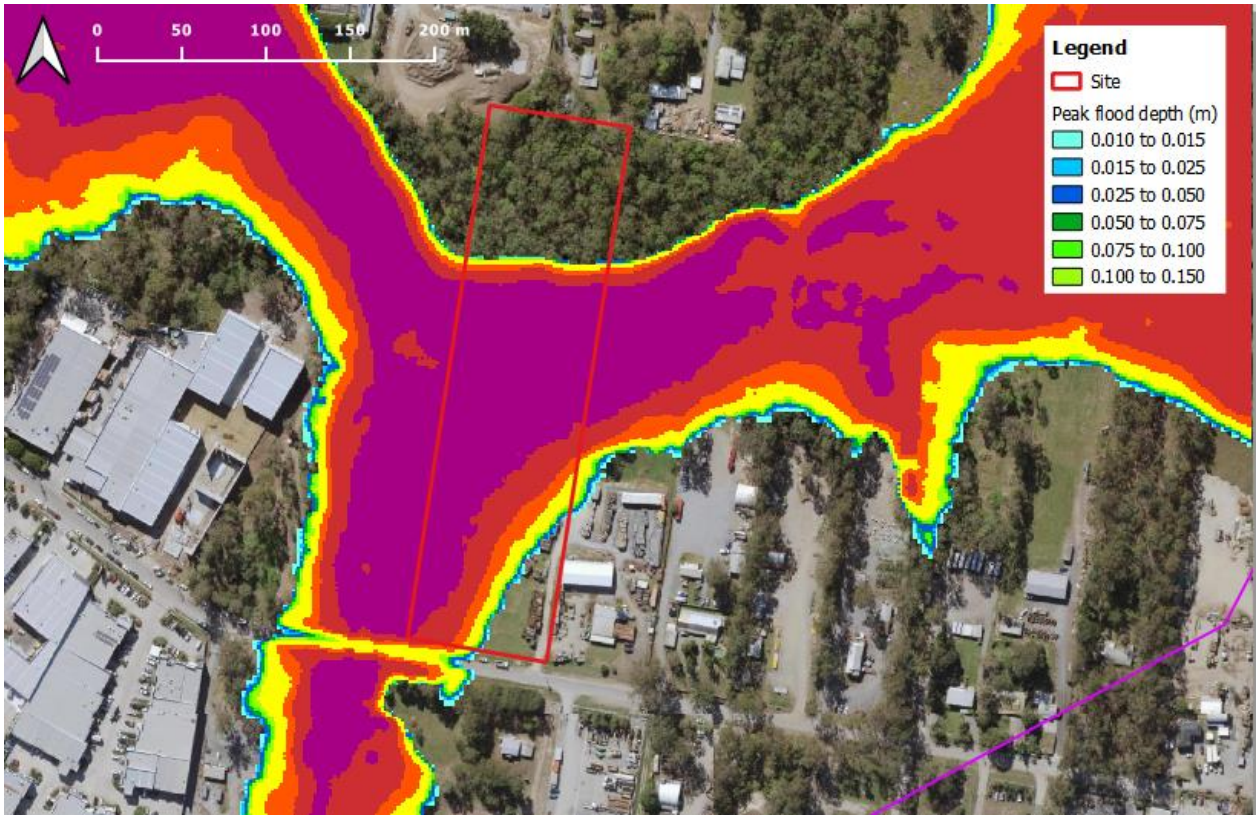


FIGURE 4-3 1% AEP FLOOD DEPTH – BASE CASE



FIGURE 4-4 1% AEP FLOOD LEVEL IMPACT (COMPARED TO BASE CASE)

5 FLOOD OVERLAY CODE REVIEW

A code response to the Flood Overlay Code has been prepared and is included in Appendix F.

6 CONCLUSION

Water Technology Pty Ltd (WT) have been commissioned by Abdul Ziyath to undertake a Flood Impact Assessment for a proposed development located at 24-28 Cairns Street, Loganholme (The Site). This report documents the detailed local flooding assessment undertaken in respect to the proposed development.

We consider that the proposed development adequately demonstrates that an appropriate outcome can be achieved in respect to the provisions of the 2015 Logan Planning Scheme. The outcomes of the assessments undertaken are summarised as follows: -

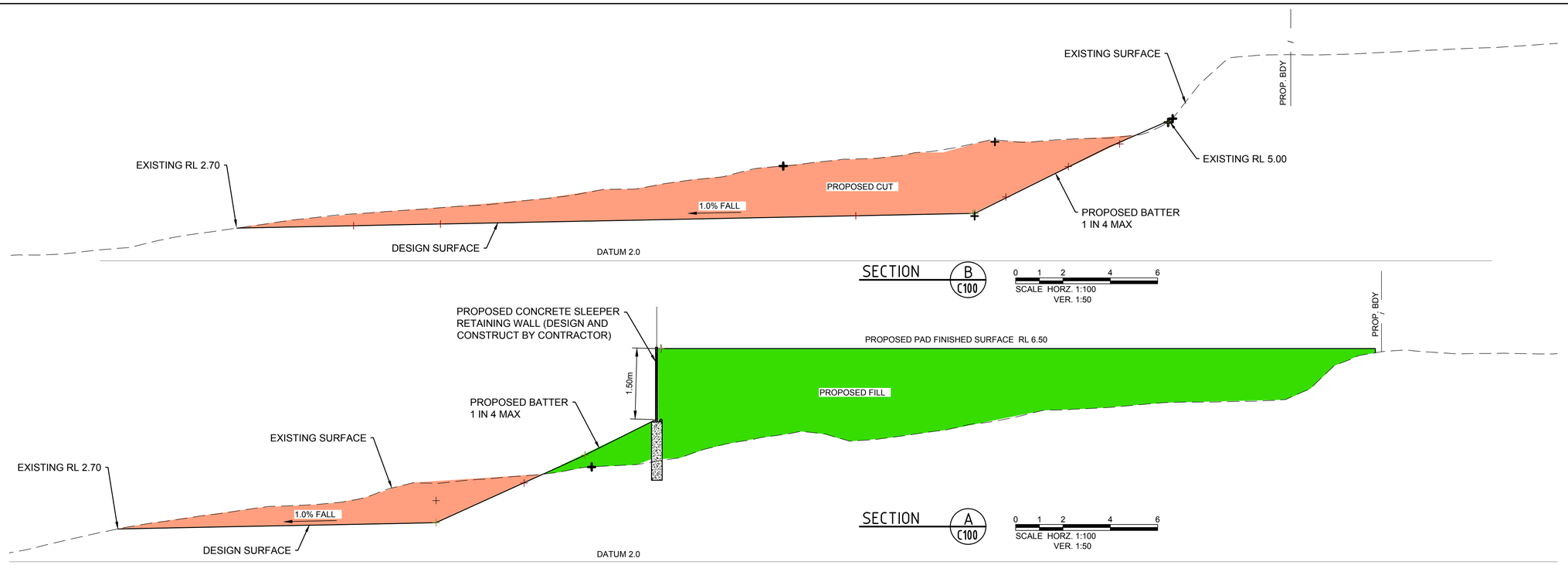
- Detailed modelling has demonstrated that the proposed development can be fundamentally supported.
- The development and associated earthworks do not result in adverse offsite impacts in respect to local flooding.
- The bulk earthworks design has ensured balanced earthworks up to the defined flood event level (based on regional Logan River flooding) in the south-eastern corner of the site and therefore are unlikely to result in adverse offsite flood impacts in a regional flood event.

On this basis, we believe that the development can be readily supported by LCC subject to reasonable and relevant conditions.

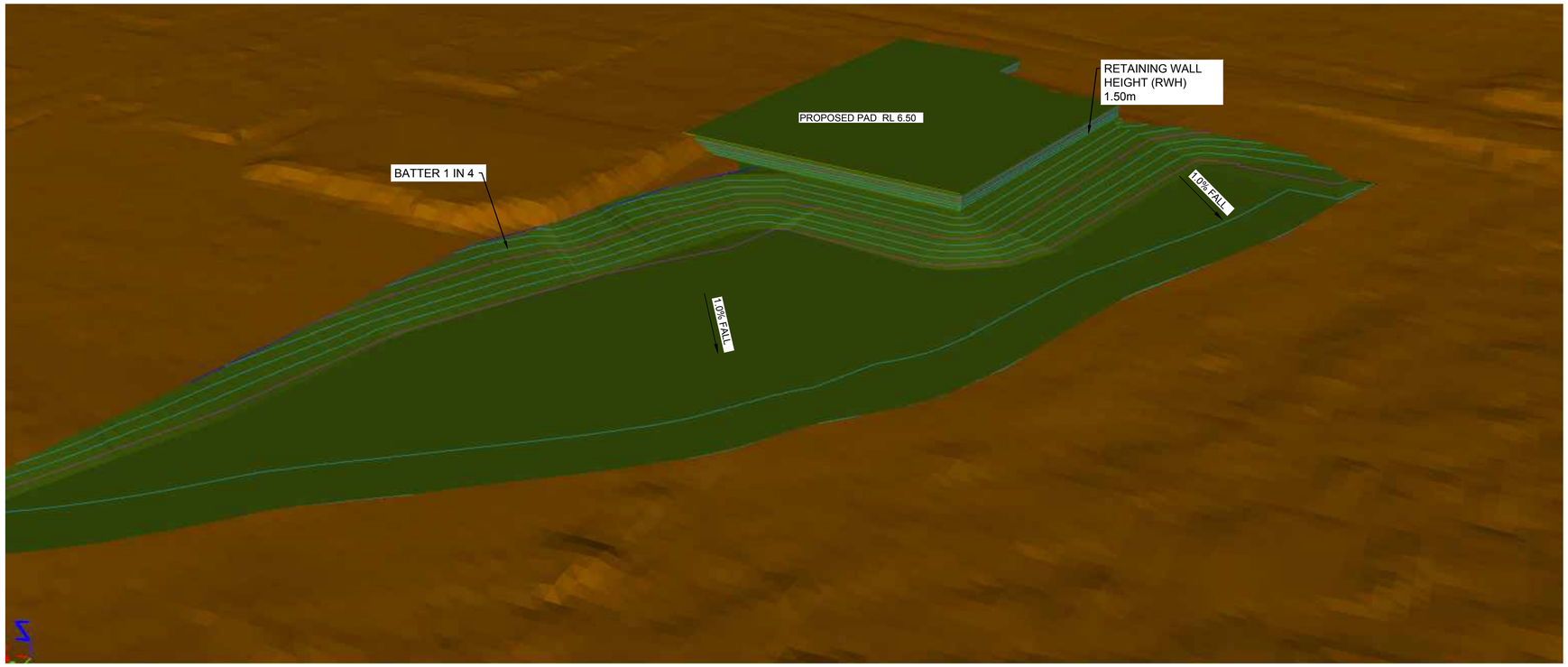
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APPENDIX A
DEVELOPMENT LAYOUT AND ENGINEERING DRAWINGS





BULK EARTHWORKS SECTIONS (TYP.)



BULK EARTHWORKS - 3D MODEL

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK
A	FOR APPROVAL	15/05/23	HW	HW	CH

LOT DESCRIPTION:
Lot 11 on RP90981
LEVEL DATUM:
OPM 162002 RL 31.644m AHD

APPROVED FOR AND ON BEHALF OF
HURLEY CONSULTING ENGINEERS PTY LTD:

NAME: CRAIG HURLEY
RPEQ NO: 15957

ORIENTATION & SCALES:

0 10 20 40 60
A1 1:1000 ; A3 1:2000
Scale (m)
DO NOT SCALE FROM DRAWING

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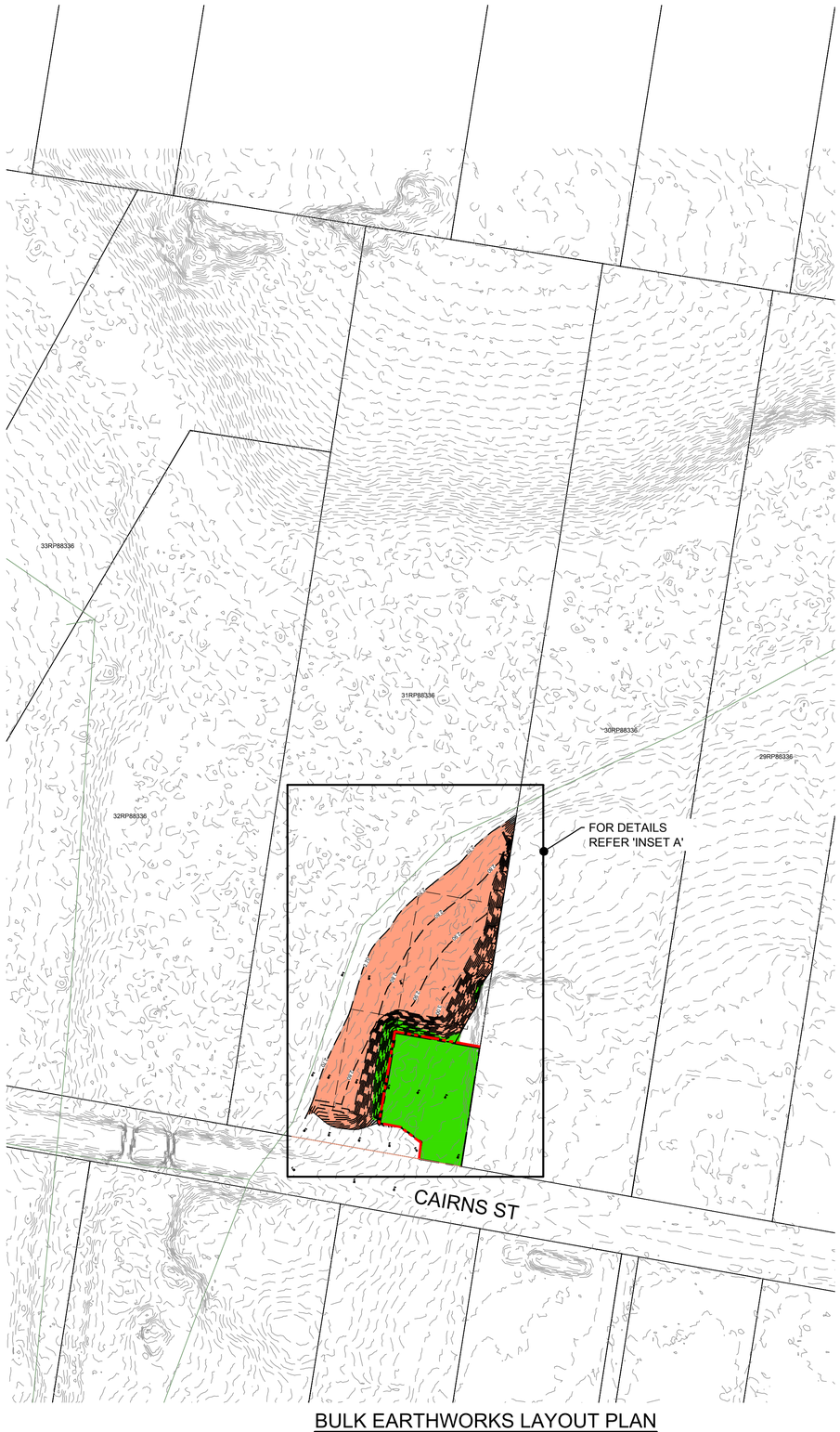
DEVELOPMENT APPLICATION NO:

LOCAL GOVERNMENT AUTHORITY:
LOGAN CITY COUNCIL

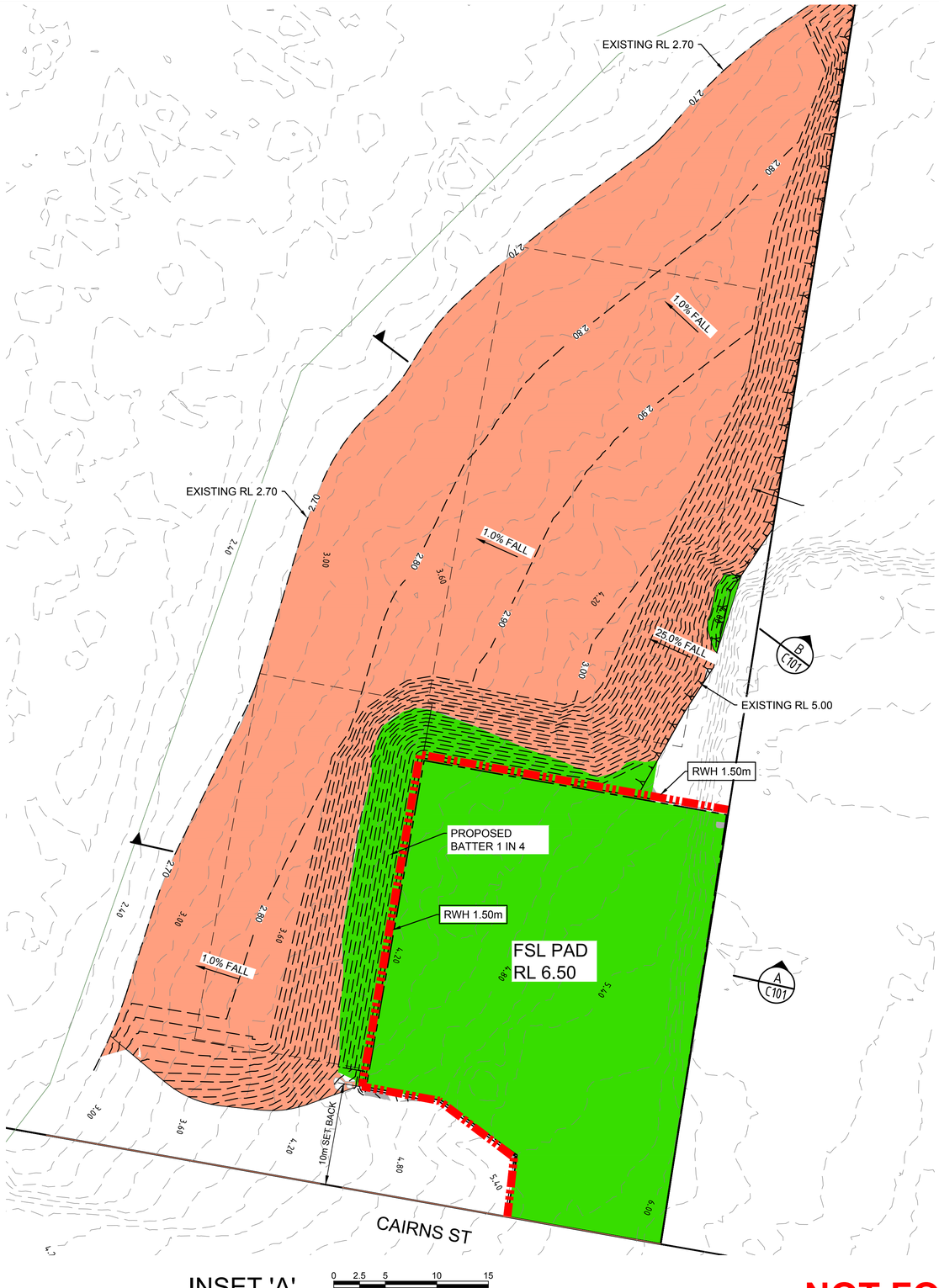
PROJECT:
PROPOSED COMMERCIAL DEVELOPMENT
24-28 CAIRNS ST, LOGANHOLME

DRAWING TITLE:
EARTHWORKS CROSS SECTIONS (TYP.) & 3D MODELS PLAN

ORIGINAL SIZE:	DRAWING No.:	REV:
A1	C23032-SK-C101	A



BULK EARTHWORKS LAYOUT PLAN



INSET 'A'

0 2.5 5 10 15
A1 1:250 ; A3 1:500
Scale (m)

PROPOSED LEGEND

- EARTHWORKS CUT
- EARTHWORKS FILL
- PROPOSED SLEEPER RETAINING WALL
- RWH 1.10m — PROPOSED RETAINING WALL HEIGHT
- RL 6.50 — FINISHED SURFACE (FSL) PAD
- 35.50 — PROPOSED DESIGN CONTOUR

EXISTING LEGEND

- 4.80 — EXISTING LIDAR CONTOUR

CUT/FILL EARTHWORK REPORT

EXISTING LIDAR TO DESIGN EARTHWORKS VOL. REPORT.

Total cut	-1651.388
Total fill	1637.265
Total balance	-14.122

TOTAL INCREASE IN FLOOD PLAIN STORAGE = 14.1m³

NOT FOR CONSTRUCTION

REV	DESCRIPTION	DATE	DRAWN	DESIGN	CHECK
A	FOR APPROVAL	15/05/23	HW	HW	CH

LOT DESCRIPTION:
Lot 11 on RP90981
LEVEL DATUM:
OPM 162002 RL 31.644m AHD

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LOCAL GOVERNMENT AUTHORITY:
LOGAN CITY COUNCIL

PROJECT:
PROPOSED COMMERCIAL DEVELOPMENT
24-28 CAIRNS ST, LOGANHOLME

DRAWING TITLE:
BULK EARTHWORKS LAYOUT PLAN

ORIGINAL SIZE:	DRAWING No.:	REV:
A1	C23032-SK-C100	A

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APPENDIX B
URBS CATCHMENT PARAMETERS

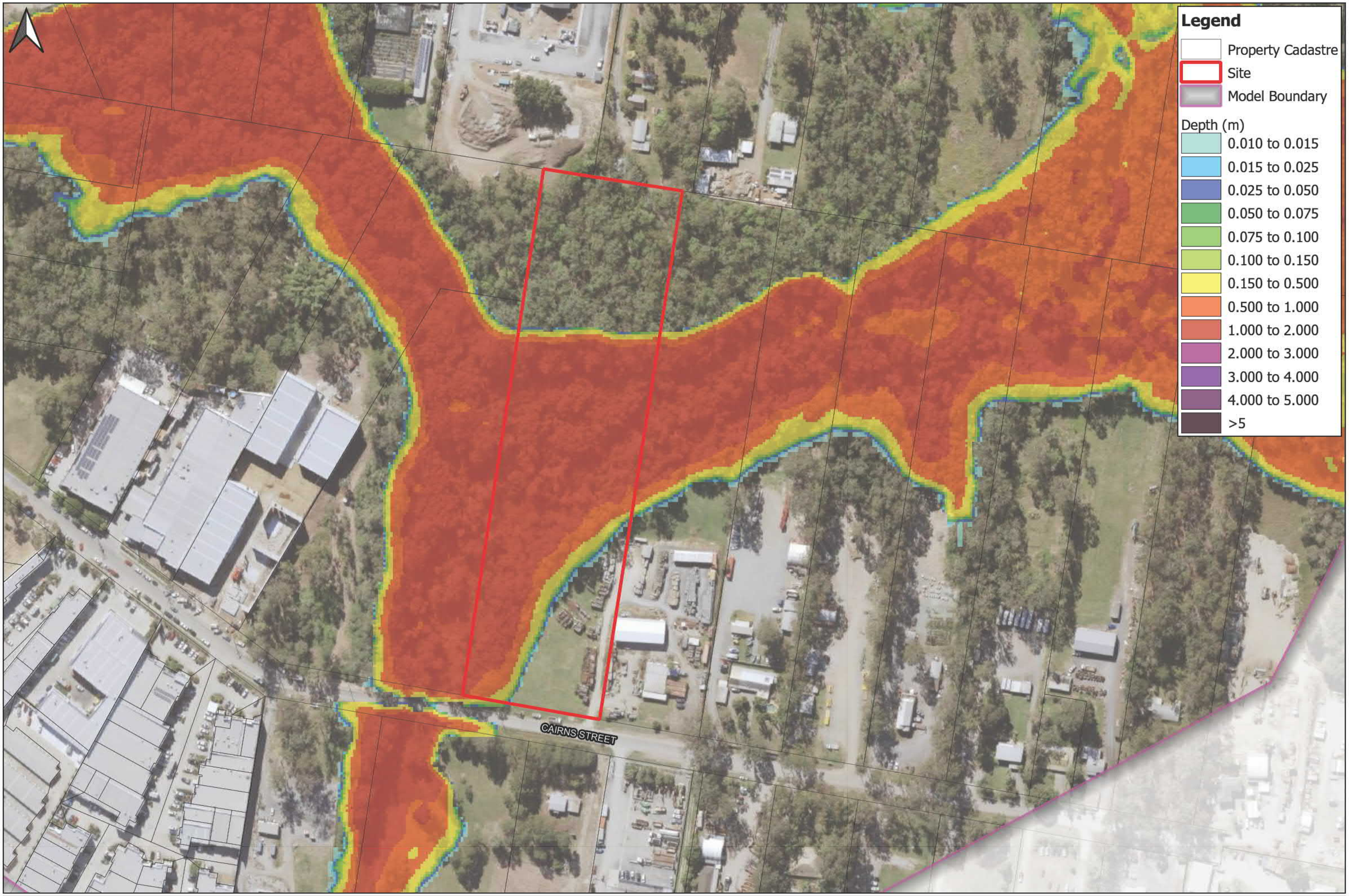


URBS ID	Area (km2)	Fraction Impervious
1	0.66	0.65
2	0.42	0.84
3	0.70	0.68
4	0.16	0.72
5	0.30	0.66
6	0.54	0.66
7	0.31	0.70
8	0.32	0.67
9	0.30	0.74
10	0.90	0.65
11	0.21	0.74
12	0.49	0.78
13	0.62	0.65
14	0.43	0.72
15	0.78	0.74
16	0.25	0.80
17	0.69	0.71
18	0.36	0.65
19	0.39	0.62
20	0.26	0.68

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APPENDIX C
BASE CASE FLOOD MAPS





Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

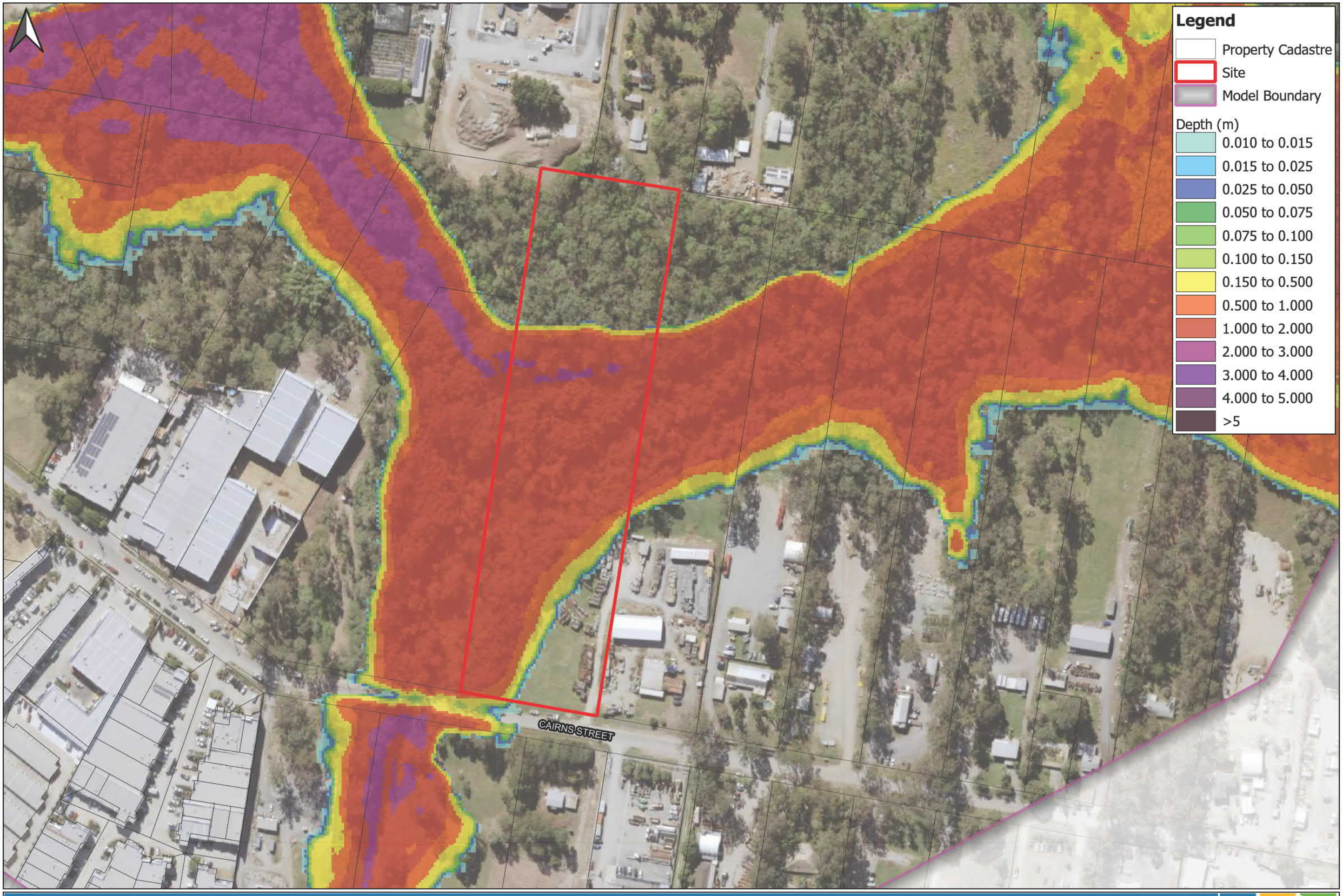
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0 50 100 150 200 m

24-28 Cairns Street Loganholme

Base Case - 50% AEP Peak Water Depth

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

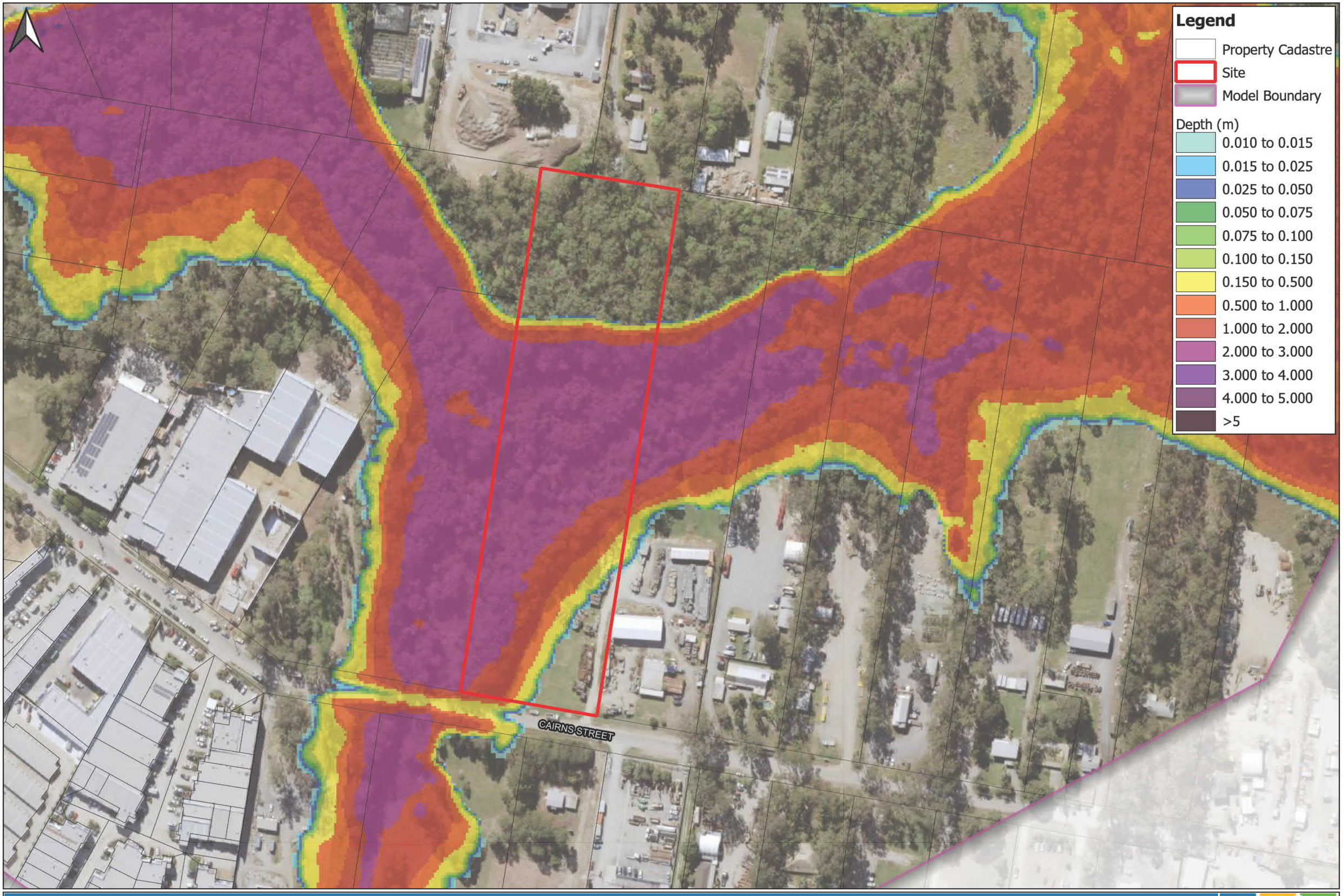
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0 50 100 150 200 m

24-28 Cairns Street Loganholme

Base Case - 10% AEP Peak Water Depth

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

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0 50 100 150 200 m

24-28 Cairns Street Loganholme

Base Case - 1% AEP Peak Water Depth

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Base Case - 50% AEP Peak Water Velocity

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Base Case - 10% AEP Peak Water Velocity

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

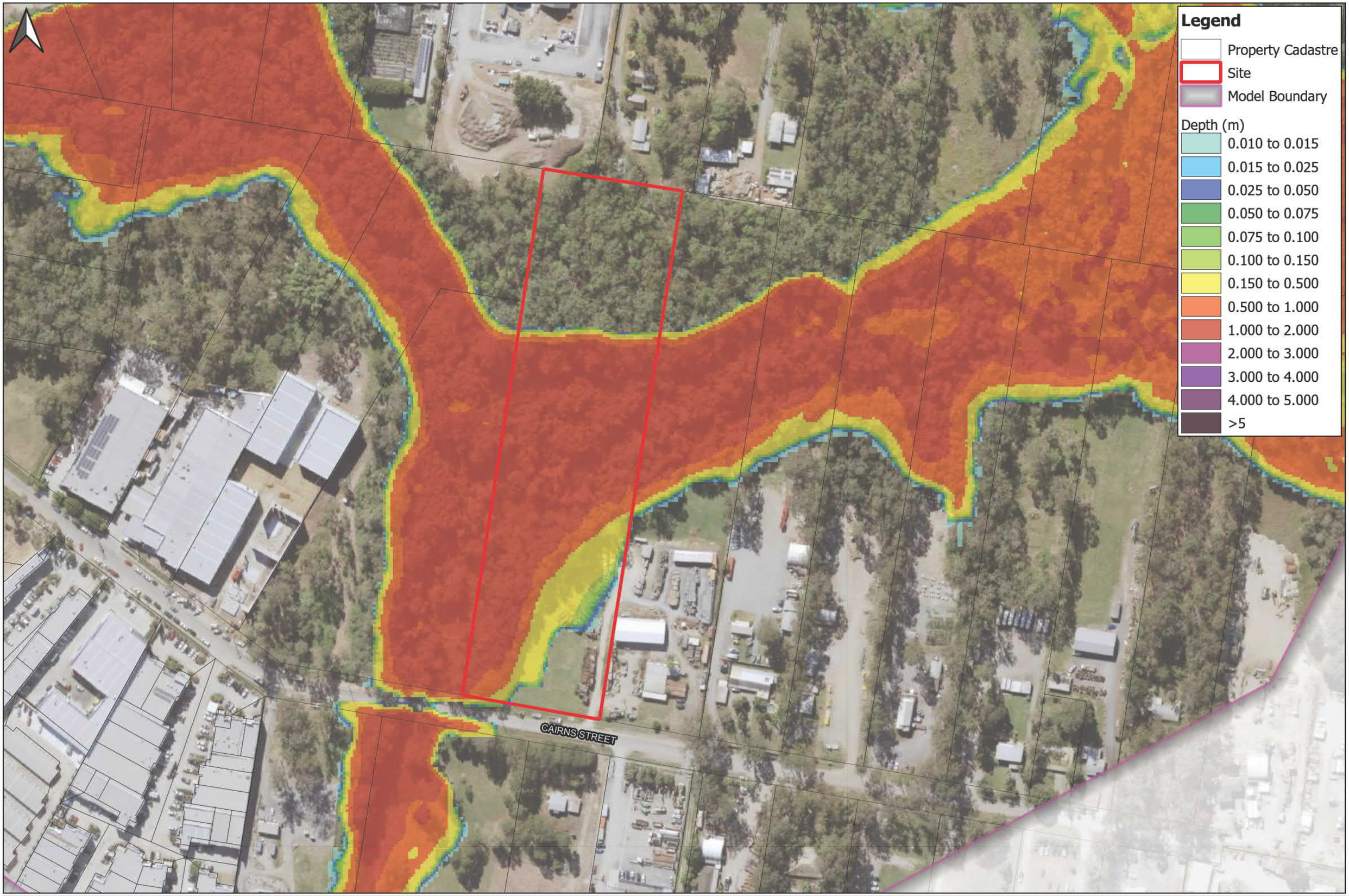
Base Case - 1% AEP Peak Water Velocity

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WATER TECHNOLOGY
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APPENDIX D
POST DEVELOPMENT CASE FLOOD MAPS





Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

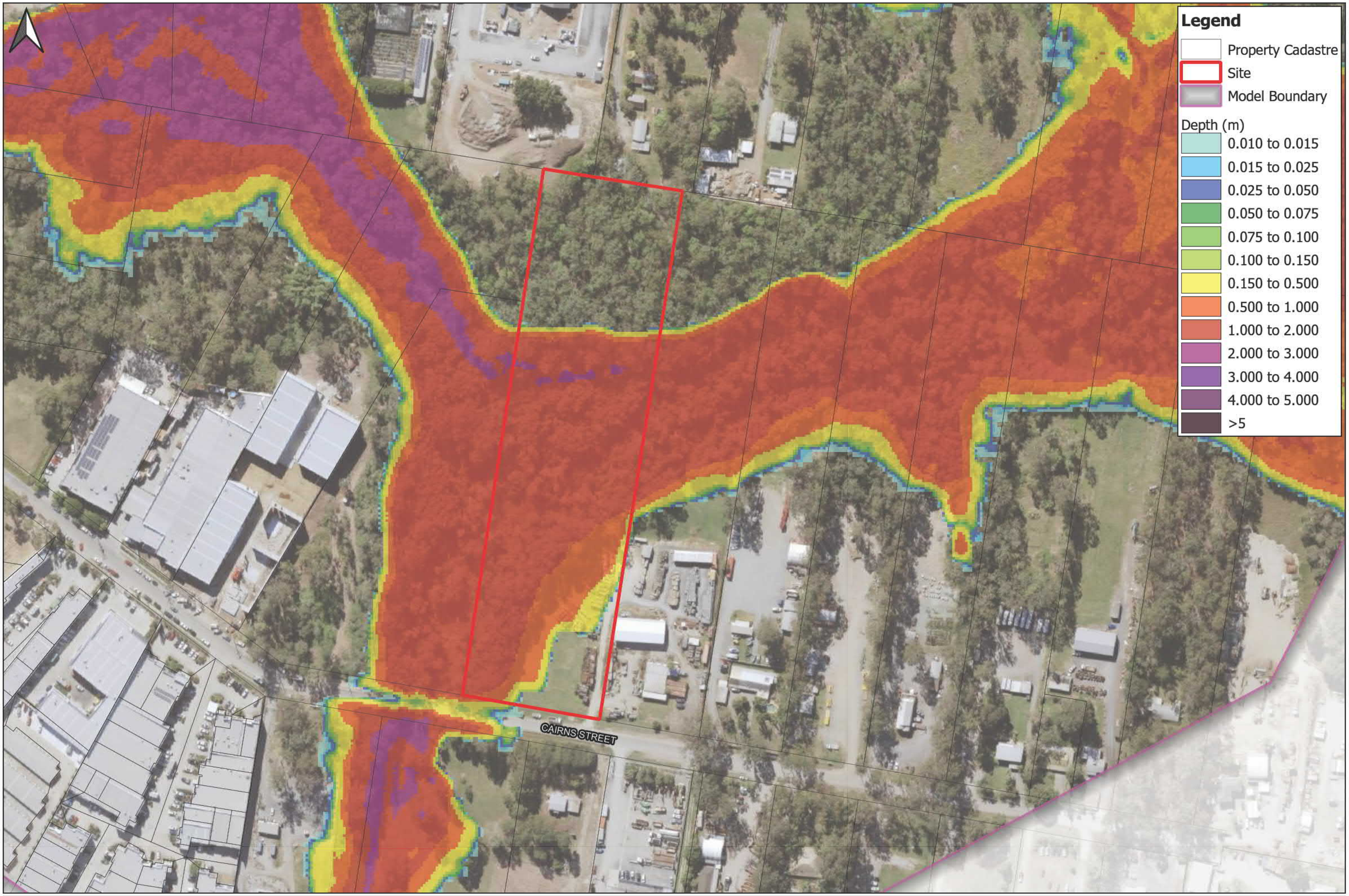
1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 50% AEP Peak Water Depth

WATER TECHNOLOGY
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Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

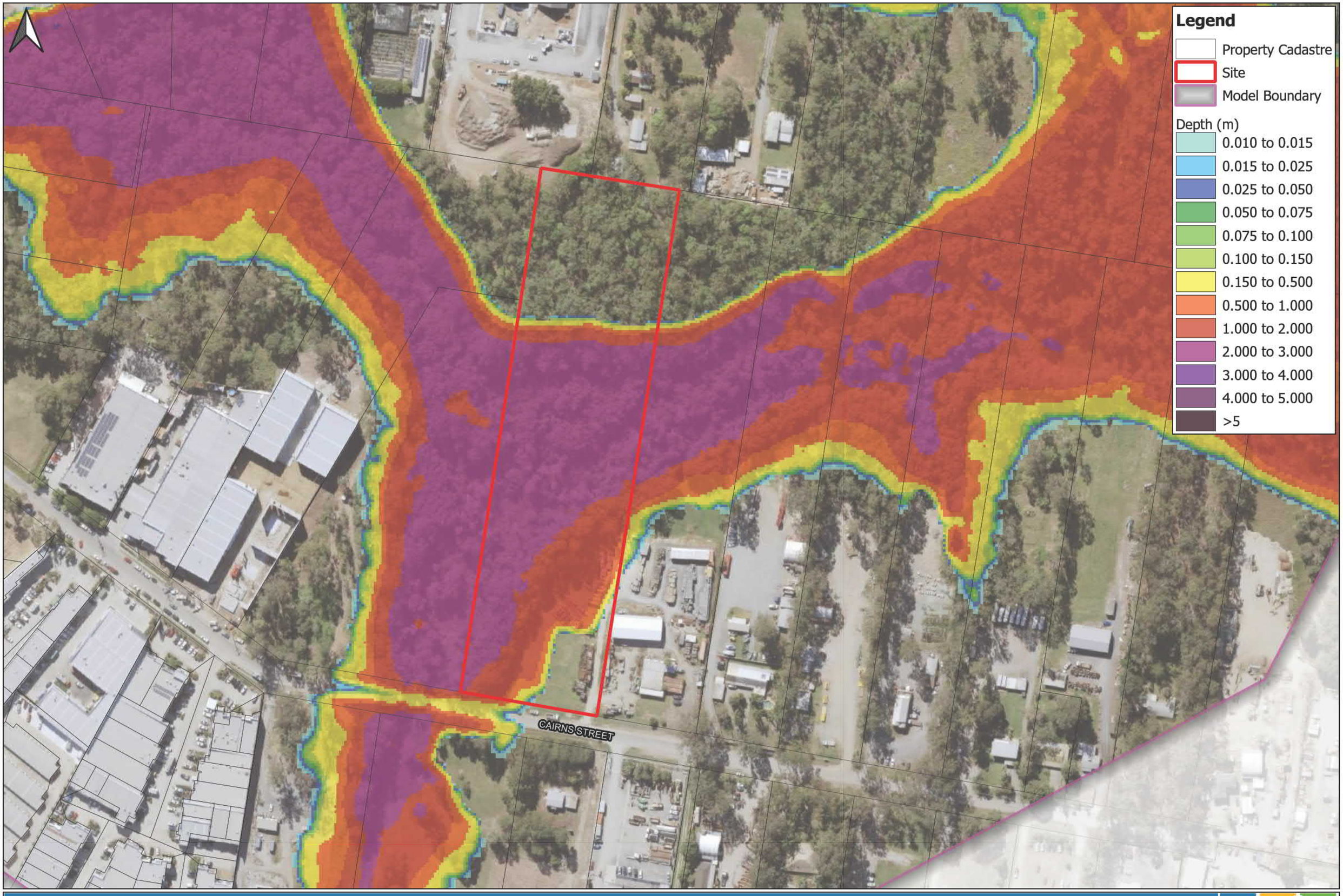
1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 10% AEP Peak Water Depth

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 1% AEP Peak Water Depth

WATER TECHNOLOGY
WATER, COASTAL & ENVIRONMENTAL CONSULTANTS



Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 50% AEP Peak Water Velocity

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Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 10% AEP Peak Water Velocity

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Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 1% AEP Peak Water Velocity

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APPENDIX E
FLOOD IMPACT MAPS





Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 50% AEP Flood Level Impacts

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Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 10% AEP Flood Level Impacts

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Water Technology Pty Ltd
Projection: GDA94 MGA56
Imagery: QLD Globe

1:2,000

0 50 100 150 200 m

24-28 Cairns Street Loganholme

Design Case - 1% AEP Flood Level Impacts

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