Moore Point Precinct, Liverpool

Flood Impact Assessment

Leamac Property Group & Coronation Property Co. Pty Ltd

January 2024

rp311015-00172rg_crt231218-Moore Point Precinct FIA (Post Gateway)

*The alignment of the northern pedestrian bridge over the Georges River is subject to further discussions with affected landowners.

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Project: **Moore Point Precinct, Liverpool**
Flood Impact Assessment

Rev	Description	Author	Review	Advisian Approval	Date
A	Draft Report for internal review	RG R Golaszewski	CRT	Chris Thomas	25-07-22
B	Final Report for Gateway	RG / CRT R Golaszewski / C Thomas		 Chris Thomas	26-07-22
C	Amended report to address Gateway Determination conditions	RG R Golaszewski	CRT C Thomas	 Chris Thomas	19-01-24

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1 Introduction

Coronation Property and Leamac Property Group, working together as the Moore Point Joint Landowners Group (JLG), have submitted a Planning Proposal for the redevelopment of the Moore Point Precinct at Liverpool. The site is located east of the Liverpool central business district (CBD) on the opposite side of the Georges River and north of Newbridge Road (*refer* **Figure 1.1**). It covers an area of 38 hectares and has until recently been used for a range of industrial land uses.

The site is situated within the Georges River North Precinct of the Liverpool Collaboration Area and is subject to the priorities and actions of the Liverpool Place Strategy (Strategy), which was released by the Greater Sydney Commission (GSC) in December 2018.

The site is located on the Georges River floodplain immediately upstream of Lake Moore. Due to its proximity to the river, there is potential for some areas of the site to be flooded, although history would suggest that this would only occur in rare events.

Flood affectation at the site and across adjoining areas is documented in the *Georges River Flood Study* (the Flood Study) which was published by Liverpool City Council in 2020. The Flood Study is based on the results of flood modelling that was undertaken by BMT Pty Ltd. The modelling confirms that during major floods there is potential for floodwaters to 'spill' from the Georges River and inundate parts of the site.

The Planning Proposal involves cut and fill earthworks across the site including excavation along the eastern foreshore of the Georges River downstream of Liverpool Weir. These works are designed to raise low lying areas of the site to above the flood planning level and thereby meet the requirements of current planning controls. As a result, the works have the potential to cause localised changes to flood characteristics along the section of the Georges River extending from the M5 crossing to Lake Moore.

In recognition of the potential for flood impacts, Advisian was engaged by the JLG to undertake a Flood Impact Assessment (FIA) for the proposed development. A report titled, '*Moore Point Precinct, Liverpool – Flood Impact and Risk Assessment*' (July 2022), was submitted with the Moore Point Planning Proposal (PP-2022-1602) that was lodged with the NSW Department of Planning and Environment (DPE) for Gateway Determination in May 2022.

The Gateway Determination Report was received on 3rd April 2023. Section 5.4.4 of the Gateway Determination Report addresses flooding and includes comments and advice from the DPE's Technical Advisory Group (TAG), the DPE's Flood Planning Advisory Panel, as well as representatives from the Department's planning section. The following sub-sections of Section 5.4.4 relate to flooding:

- Flood hazard and behaviour (Section 5.4.4.1);
- Food evacuation (Section 5.4.4.2);
- Flood risk mitigation measures (Section 5.4.4.3); and,
- Consideration of 9.1 Direction 4.1 Flooding (Section 5.4.4.4).

Additional flood related investigations and analysis have been undertaken since receipt of the Gateway Determination. These additional investigations have been undertaken to address the recommendations and comments outlined in Section 5.4.4 and the recommendations outlined in Section 10 of the Gateway Determination.

The additional work also involved additional flood modelling to assess modifications to the development layout that was previously assessed as part of the 2022 Flood Impact Assessment (FIA) report.

The findings from the additional work are documented in this report which is an updated version of the 2022 FIA Report. It has been prepared in consultation with representatives from the JLG and with other consultants working on the project, most notably the civil designers from Northrop, and serves as the formal response to the recommendations documented in the Gateway Determination.

FIGURE 1.1

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LOCATION OF THE MOORE POINT PRECINCT

2 The Moore Point Precinct

2.1 Description of the Existing Precinct

As shown in **Figure 1.1**, the Moore Point Precinct covers approximately 38ha of land and is located between Newbridge Road to the south, the Georges River to the north and west, and Lake Moore to the east. The Precinct is currently used for industrial purposes with a collection of separate businesses operating on the site.

The topography across the Precinct is shown in **Figure 2.1**. The thematic mapping of land elevation shown in **Figure 2.1** is based on Light Detection and Ranging Survey (LiDAR) that was collected in 2019.

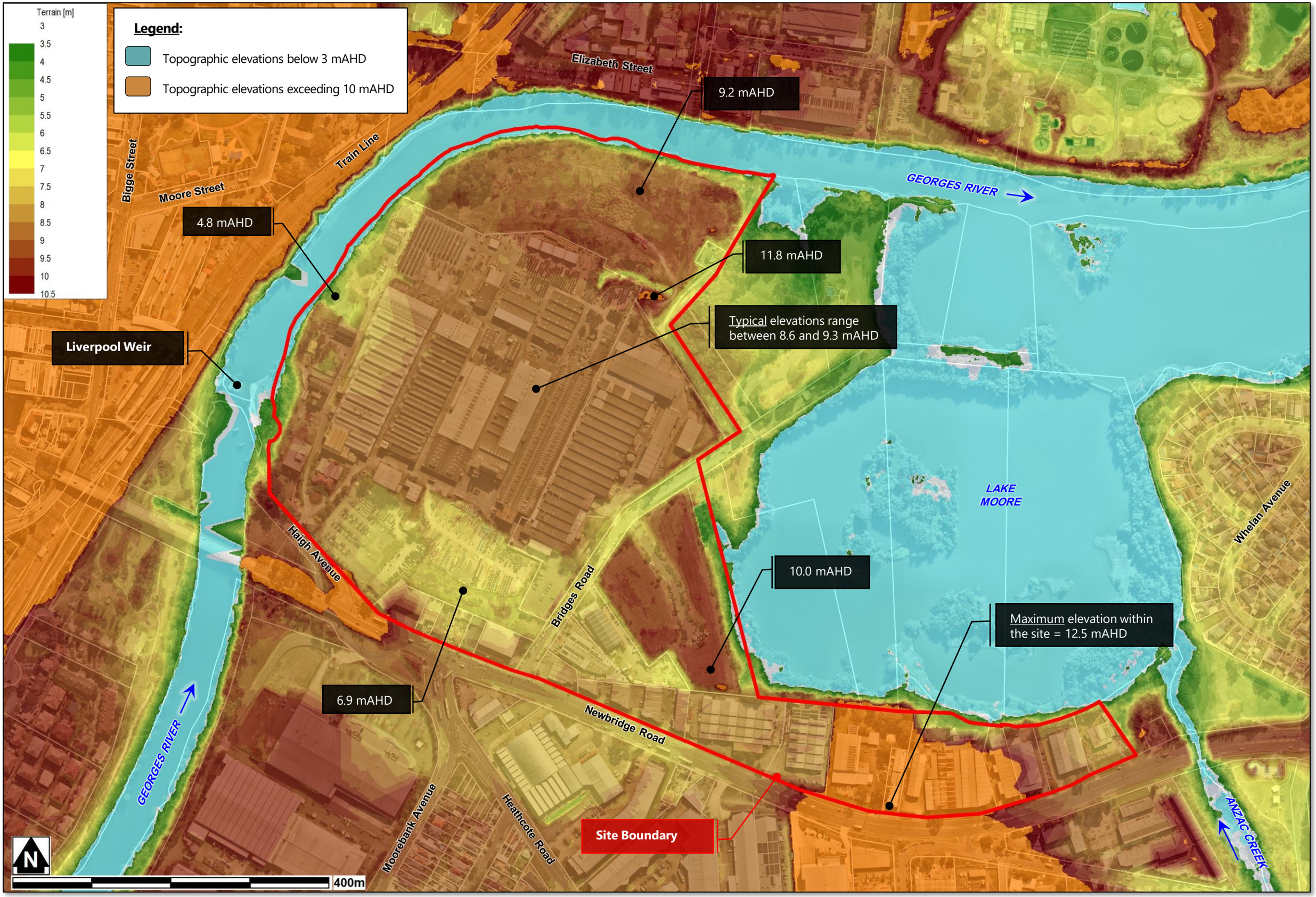
As shown, the site is elevated above the Georges River and Lake Moore with typical elevations across the centre of the site ranging between 8.6 and 9.3 mAHD. A maximum elevation of 12.5 mAHD occurs along the southern boundary of the site adjacent to Newbridge Road. Areas of lower lying land are generally limited to the perimeter of the site along the banks of the Georges River. A depressed section of the site exists between Haigh Avenue and Bridges Road with elevations of 6.9 mAHD and above. These lower elevations extend along Bridges Road through to Lake Moore (*refer* **Figure 2.1**).

The higher terrain that extends through the centre of the site prevents floodwaters from "cutting across" the site and bypassing the meander bend in the Georges River downstream of Liverpool Weir. River levels do not rise to a height sufficient to allow floodwaters to overtop this ridge line until they reach an elevation of 9.4 mAHD at Liverpool Weir (*refer* **Figure 2.1**).

Much of the Precinct is covered by industrial buildings that are aligned north-to-south or orthogonal to the direction that flow would travel through the site if the eastern bank of the Georges River were overtopped. As shown by the examples presented in **Plate 2.1**, these industrial buildings are typically of a solid build capable of blocking or slowing the passage of floodwaters. Much of the remainder of the site is used for the storage of materials which would also serve to impede any flows crossing the site.

Plate 2.1 Examples of Existing Industrial Factories located on the Moore Point Precinct

FIGURE 2.1



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EXISTING TOPOGRAPHY ACROSS AND IN THE VICINITY OF THE MOORE POINT PRECINCT

2.2 Vision for the Proposed Development

The site is situated within the Georges River North Precinct of the Liverpool Collaboration Area. The Collaboration Area is subject to the priorities and actions of the Liverpool Place Strategy (Strategy), which was released by the Greater Sydney Commission (GSC) in December 2018 (*refer* **Plate 2.2**).

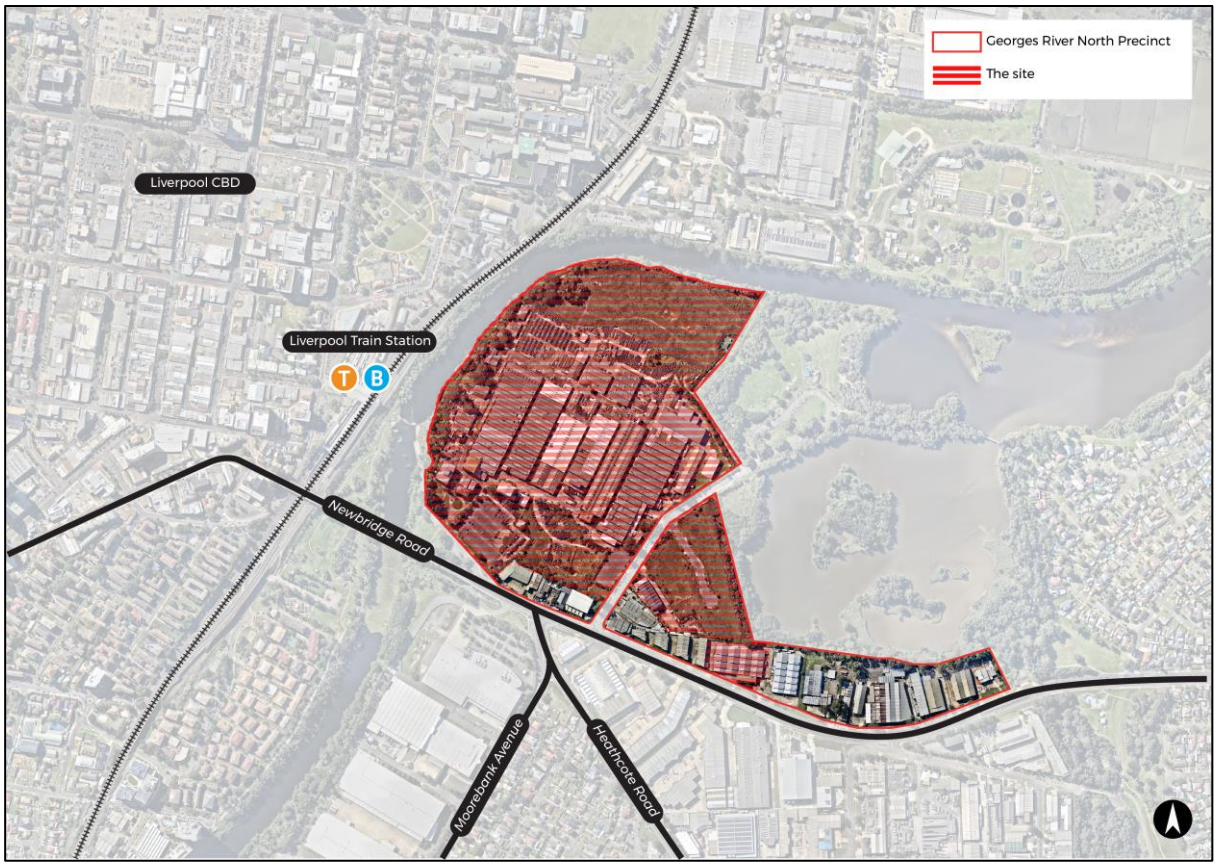

Plate 2.2 Site Aerial showing the extent of the precint (*Source: Nearmap modified by Mecone*)

The Strategy states that by 2036, Liverpool will be a rejuvenated river city, offering diverse and growing residential and employment opportunities. Major health, education and retail precincts, and a mixture of open space and parkland along the Georges River, will create a rich mix of workplaces, public space, shops and entertainment areas (*refer* **Plate 2.3**).

Under the Strategy, the site is identified as 'mixed use', which comprises:

> *'a mixture of commercial, retail, residential and community uses that provide sustainable employment, that is complementary to, and not in competition with, the commercial core'*

The summary from the 2019 Annual Report for the Liverpool Collaboration Area highlighted the key steps that had been commenced and completed to address the imperatives acknowledged in the Strategy. These included:

- engagement with TfNSW to prepare the Liverpool Place-based Integrated Transport Strategy and accelerated investment; and,
- preparation of flood studies and a floodplain risk management plan which was completed by Liverpool City Council.

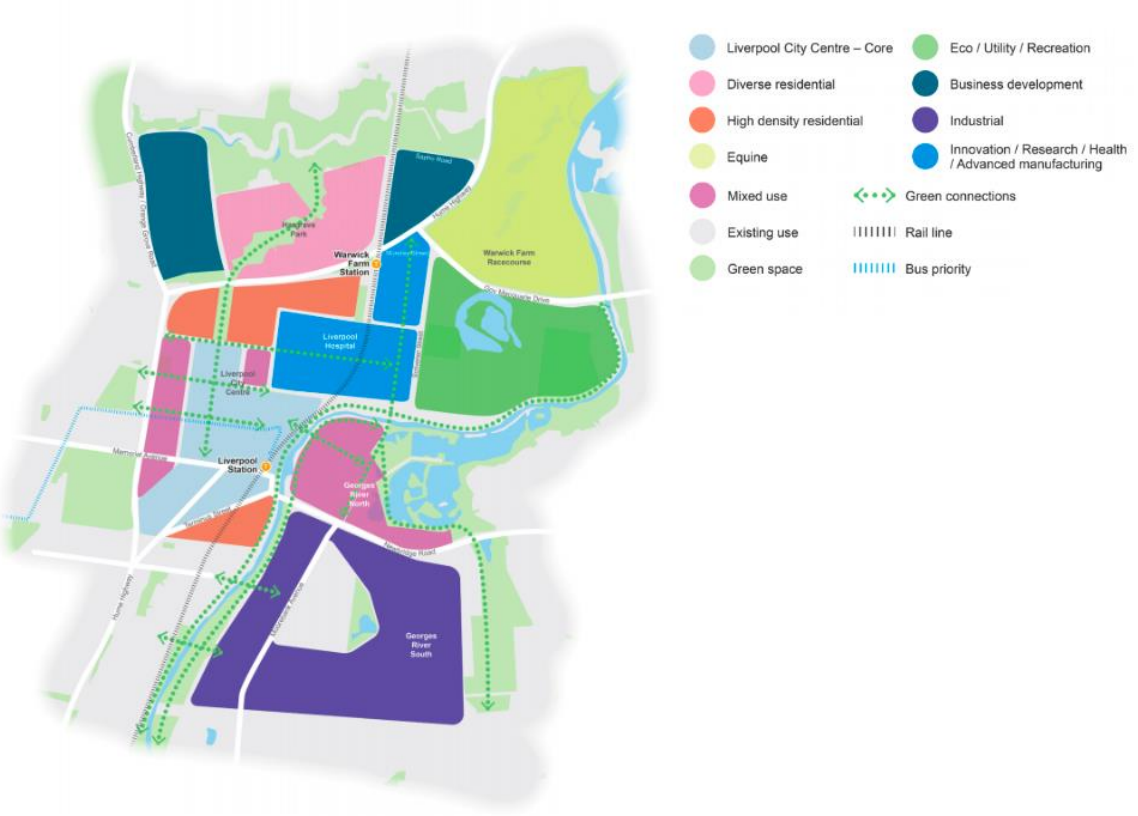

Plate 2.3 Place Strategy for Liverpool
(Source: Liverpool Collaboration Area Place Strategy (2018))

The land uses presented in the Strategy are reinforced in Liverpool City Council's Local Strategic Planning Statement (LSPS) prepared in mid-2019, which identifies the site for investigation as residential/ mixed use to support the CBD and Innovation Precinct in tandem with linking open space and green corridors.

The LSPS provides the following short to medium term action (12-24 months) specific to the Georges River North Precinct:

> *Action 11.2 Amend LEP to rezone Georges River Precinct north of Newbridge Road as a mixed-zone to support the Liverpool CBD and innovation Precinct, with an extensive open space system and cross-river linkages (short term).*

The Planning Proposal involves the creation of a mixed use precinct that will provide new homes, jobs and open space in an area that adjoins the Georges River and which is connected to Liverpool CBD. Key features of the proposal include:

- Adaptive re-use of existing heritage
- Foreshore embellishments and new open spaces
- Educational and cultural facilities
- Connections to Liverpool CBD and Train Station
- Transport, intersection and collector road improvements.

The Planning Proposal aligns with the priorities of the NSW Government and the implementation phase of the Place Strategy by facilitating the transformation of the Collaboration Area with new jobs, infrastructure, green spaces and housing. The Planning Proposal responds to The Pulse of Greater Sydney's performance indicators, which sit under the following key themes.

Infrastructure and Collaboration

The Planning Proposal will facilitate additional jobs, education and housing in close proximity to Liverpool CBD and Train Station. The proposal will support additional medium and long-term housing supply in Liverpool through diverse and new housing products. The proposal supports the continual expansion and growth of Liverpool Innovation precinct and nearby health infrastructure, with potential to provide complementary uses near Liverpool Hospital and educational and cultural facilities on the site.

Productivity

The Planning Proposal supports the growth of the thirty-minute city, ensuring Liverpool emerges as a premier CBD in the Western City. The proposal provides capacity for new transport infrastructure on the site, road and intersection upgrades and locating density near major transport infrastructure (Liverpool Train Station and Badgery's Creek Aerotropolis). The proposal encourages additional business activity and investment in Liverpool by providing new commercial uses that will complement the Liverpool CBD.

Liveability

The Planning Proposal significantly improves upon the existing use of the site by creating walkable places for people to live work and play. This includes foreshore embellishments to the Georges River, improved connections across the Georges River and adaptative re-use of existing heritage items. These measures will contribute to Sydney's Green Grid, improve access to services in Liverpool CBD and establish a community that celebrates identity and place.

Sustainability

The Planning Proposal addresses the urban heat island effect by significantly increasing the quantum of green space on the site for active and passive recreational use. The proposal will provide new parks and green connections to surrounding open spaces including Haigh Park, which will contribute to the urban tree canopy of the area.

3 Assessment of Existing 'Local' Flood Characteristics

The Moore Point Precinct and its surrounds are located on the Georges River floodplain upstream of Lake Moore and Anzac Creek. The site is located downstream of the Newbridge Road bridge crossing and to the east of the Liverpool CBD.

During significant floods there is potential for floodwaters to 'spill' from the Georges River leading to inundation of low-lying areas of the Precinct along the western and northern boundaries. During major events such as a 1% Annual Exceedance Probability (AEP) flood, there is potential for floodwaters to flow through the Precinct towards Lake Moore to the east. When this occurs, floodwaters bypass the river meander that flows around the site to the north.

3.1 Previous Investigations

Flooding of the Georges River has been investigated on a number of occasions. These investigations stemmed from the spate of flooding that occurred in western and south-western Sydney in the mid to late 1980s. The key studies are as follows.

- *'Georges River Flood Study'* (*1991*) prepared by the NSW Public Works Department (PWD)
- '*Georges River Flood Model Study*' (*1999*) prepared by Bewsher Consulting,
- '*Georges River Floodplain Risk Management Study and Plan'* (*2004*) prepared by Bewsher Consulting
- '*Georges River Flood Study*' (*2020*) prepared by BMT.

The 1991 Flood Study used several synthetic hydrologic models to determine flood flows for the Georges River. The computed discharge hydrographs were then input into a physical model to determine predicted flood levels along the river and across the adjoining floodplain. The physical model extended from Liverpool downstream to Picnic Point and could operate under steady-state flood conditions or dynamic conditions. The design flood levels determined from the study were adopted by Council and are still referenced by Council (*BMT, 2020*).

The 1991 Flood Study was used as the foundation for development of a Georges River Floodplain Risk Management Study and Plan. This considered options for reducing flood damages and mitigating the impact of flooding on existing development. It was completed by Bewsher Consulting in 2004.

An updated Flood Study of the Georges River was recently completed by The City of Canterbury Bankstown and Liverpool City Council. The updated '*Georges River Flood Study*' (*January 2020*) was prepared by BMT Australia Pty Ltd (BMT) and involved the development and application of a new two-dimensional flood model to provide both councils with more reliable flood mapping. The study area was limited to the Georges River floodplain from the East Hills Railway Line at Casula to downstream of Alfords Point Road at Lugarno.

BMT developed a two-dimensional TUFLOW HPC hydraulic model of the Georges River that was based on Light Detection and Ranging (*LiDAR*) survey flown in 2013 combined with hydrosurvey of the Georges River that was collected between 1976 and 1997. The TUFLOW model was calibrated and validated to historic flood records available for the 1986, 1988, 2015 and 2016 events.

Inflows for the modelling of design events were based on the XP-RAFTS hydrologic model developed by Bewsher Consulting as part of the 1999 Flood Model Study. The 1999 XP-RAFTS model was based on Intensity Frequency Duration (IFD) data and procedures outlined in *Australian Rainfall and Runoff 1987* (ARR87).

The 2020 Flood Study provides flood mapping and descriptions of the predicted flood behaviour for the 5%, 2% and 1% AEP events, and for an extreme event. The estimated frequency of the extreme event is not specified but is understood to represent the Probable Maximum Flood (PMF). Peak flood levels predicted at Liverpool Weir are listed in **Table 3.1**.

Table 3.1 Adopted Design Flood Levels at Liverpool Weir

Design Event	Predicted Peak Flood Level (*mAHD*)
5% AEP	8.5
2% AEP	9.5
1% AEP	9.6
Extreme Event (Adopted PMF)	12.2

Investigations for the Moore Point Precinct have been ongoing since 2018 when the Joint Landowner Group (JLG) was formed. The investigations have included assessments of the impact of the proposed development of the precinct on flooding along the Georges River. These assessments are documented in the following reports which accompanied the original Planning Proposal that was lodged with the Department of Planning and Environment.

- '*Liverpool Waterfront Water Cycle and Flood Management Strategy*' (*2016*), prepared by J Wyndham Prince
- '*Moore Point Precinct Flood Impact Assessment*' (*2021*), prepared by J Wyndham Prince

The planning proposal was withdrawn and relodged in May 2022 with the following reports.

- '*Moore Point Precinct, Liverpool – Flood Impact and Risk Assessment*' (July 2022) prepared by Advisian
- '*Moore Point Precinct Flood Emergency Response Strategy*' (November 2022), prepared by Advisian

3.2 Modelling Approach

Before investigating the potential impacts associated with the proposed development, it is critical to reliably define flood characteristics (*i.e., peak flood levels and flow velocities*) for existing conditions. Although the TUFLOW model developed for the '*Georges River Flood Study*' (2020) provides a good basis for these investigations, the model was developed with a regional focus with inputs that are now superseded.

Accordingly, the TUFLOW model was truncated and updated to provide a tool more suitable for defining flood characteristics in the vicinity of the Moore Point Precinct. These updates and the resulting outputs for the 5% and 1% AEP events, the 1 in 500 AEP event, and the PMF adopted by Council, are discussed in the following sections.

Outputs are also provided for a 1 in 5,000 AEP event and for a climate change assessment as per the recommendations of the Gateway Determination that was issued in March 2023.

3.2.1 Georges River XP-RAFTS Hydrologic Model

As discussed in **Section 3.1.1**, the hydrology for design events in the '*Georges River Flood Study*' (2020) is based on the XP-RAFTS hydrologic model developed by Bewsher Consulting as part of the '*Georges River Flood Model Study*' (1999).

The 1999 XP-RAFTS model adopted IFD data and procedures based on *Australian Rainfall & Runoff 1987* (ARR87). This is relevant because a new edition of *Australian Rainfall & Runoff* was published in 2019 (ARR 2019) which introduced new procedures and updated IFDs based on an additional 30 years of rainfall data. According to the 2020 Flood Study, application of the 1999 XP-RAFTS model with 1987 IFD data generates 30% higher peak flows for the 1% AEP event than those that would be generated from the updated XP-RAFTS model using 2019 IFD data.

According to the 2020 Flood Study, the 1999 XP-RAFTS model was applied using IFD data from ARR87 to ensure consistency with previous studies and Flood Planning Levels (*FPLs*) that have been adopted by the councils (*BMT 2020*). Therefore, predicted design flood levels based on the flood hydrology documented in the 2020 Flood Study are likely to be conservative estimates.

To ensure consistency with the 2020 Flood Study, the 1999 XP-RAFTS model and the associated inflow hydrographs have been adopted for this study. The adopted peak flows at the site are listed in **Table 3.2** for the 5%, 1% and 1 in 500 AEP events, and the adopted PMF. The shape and duration of the adopted inflow hydrographs is presented in **Plate 3.1**.

Table 3.2 Adopted Peak Flows along the Georges River at the Moore Point Precinct

Design Event	Predicted Peak Flow (m^3/s)
5% AEP	1,368
2% AEP	1,877
1% AEP	2,120
Extreme Event (Adopted PMF)	3,364

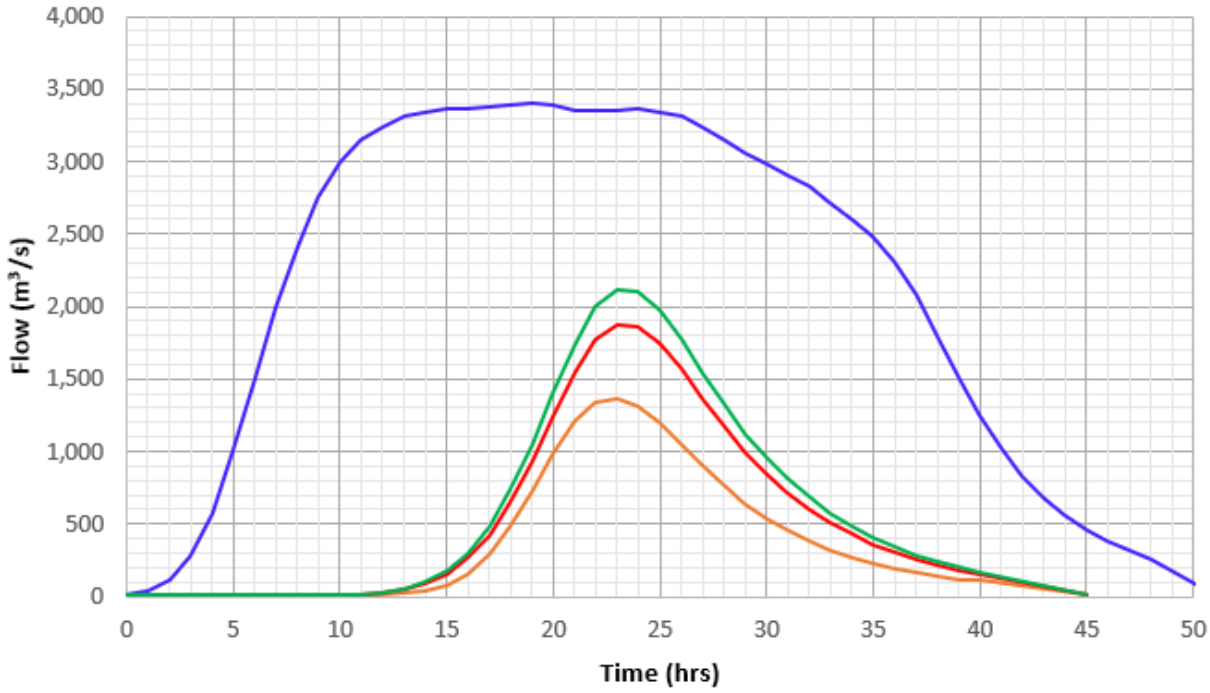

Plate 3.1 Adopted Georges River Inflow Hydrographs as extracted from the 1999 XP-RAFTS Hydrologic Model

3.2.2 Flood Modelling

Georges River Flood Study (2020) TUFLOW Model

The two-dimensional TUFLOW HPC hydraulic model that was developed as part of the '*Georges River Flood Study*' (2020) was adopted as the base for this flood impact assessment. The model was developed to assess flood behaviour and define flood characteristics along the Georges River from the East Hills Railway at Casula to downstream of Alfords Point Road at Lugarno.

The TUFLOW model adopts the following parameters and inputs:

- The model is based on a 10m grid size.
- The topography of the floodplain is based on LiDAR flown in 2013 and which was sampled at 5 metre spacing.
- The bathymetry of the Georges River was embedded within the 2D model domain using hydrosurvey data extracted from the historic MIKE-11 flood model of the Georges River and from survey collected in 1993 by the then NSW Department of Commerce.
- Hydrologic inputs for design event modelling are based on inflow hydrographs extracted from the XP-RAFTS model that was developed for the '*Georges River Flood Study*' (1991) using ARR87 IFD data and procedures.

The TUFLOW model that was developed for the 2020 Flood Study was calibrated and validated to historic flood data collected from the August 1986, April 1988, April 2015 and June 2016 events. This flood data includes historical records of rainfall at a range of locations across the catchment and flows derived from a rating curve for the stream gauge located at the Liverpool Weir.

Truncated Georges River TUFLOW Model

A truncated version of the 2020 Georges River TUFLOW model was created for this study. The truncated model extends from Cambridge Avenue to Governor Macquarie Drive, which is located 2½ kilometres downstream of the Moore Point Precinct. It has a total domain size or area of coverage that is approximately 30% of the domain for the original model that was developed for the 2020 Flood Study.

A schematic of the truncated model is provided as **Figure 3.1**.

In addition to the smaller domain size, the following changes were incorporated into the truncated model.

- Reduced model grid size from 10 metres to 5 metres.
- Review of material roughness types including the variation in roughness adopted across the Moore Point Precinct. A comparison between material types adopted for this study and those used in the TUFLOW model that was developed for the 2020 Flood Study is provided in **Table 3.3**.

  The adopted distribution of roughness types for the truncated model is shown in **Figure 3.2**. The most notable change to roughness is the inclusion of a separate building roughness type for all major structures. This was applied across areas of the Moore Point Precinct where industrial buildings are currently located and for the industrial areas upstream of Newbridge Road. This is considered an improvement as the existing buildings would represent a significant impediment to flow which was under-represented in the 2020 Flood Study model due to its regional scale and focus.
- Updated LiDAR data flown in 2019 sampled at 1 metre spacings. A comparison of terrain data used in the 2020 Flood Study with data used in the 2022 Truncated Model is presented in **Figure 3.3**.
- Resampling of the river bathymetry based on the smaller grid size. This is particularly beneficial along the river edges where the 5 metre grid provides better representation of the channel and embankment.
- Review of the 2d_zshape used to represent the Liverpool Weir.
- Inclusion of works undertaken along the railway embankment located along the western bank of the Georges River downstream of Liverpool Weir.
- Modification of the initial starting water level upstream of Liverpool Weir from 2.91 to 2.81 mAHD.

The boundary conditions for the truncated TUFLOW model are the same as those adopted in the 2020 Flood Study model. In that regard, all inflows applied in the truncated model domain were unchanged for all design events.

A water level time series was adopted at the new downstream boundary from modelling results generated as outputs from the 2020 Flood Study. Different water level time series boundary conditions were extracted for each design event.

FIGURE 3.1

Legend:

- Extent of the 2020 Georges River Flood Study TUFLO Model
- Extent of the Truncated 2022 TUFLOW Model
- 'SA' Catchment Inflow Boundary
- 'QT' Inflow Boundary
- 'HT' Variable Water Level Boundary

Governor Macquarie Drive

Liverpool Weir

CHIPPING NORTON

HORSESHOE POND

LIVERPOOL CBD

LAKE MOORE

MOOREBANK

MILPERRA

GEORGES RIVER

South Western Motorway

ANZAC CREEK

SALT PAN CREEK

Alfreds Point Road

PICNIC POINT

MACQUARIE FIELDS

N

5000m

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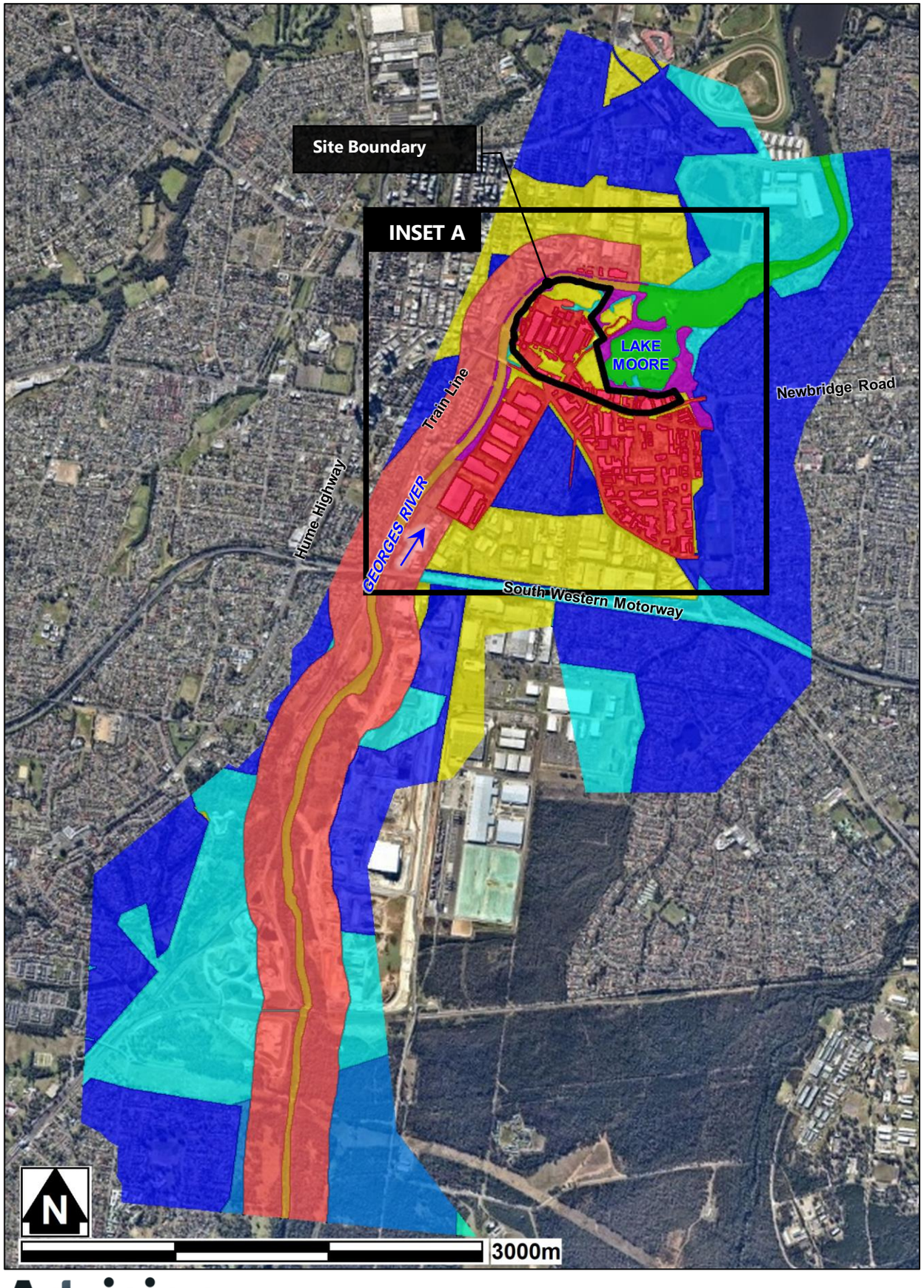
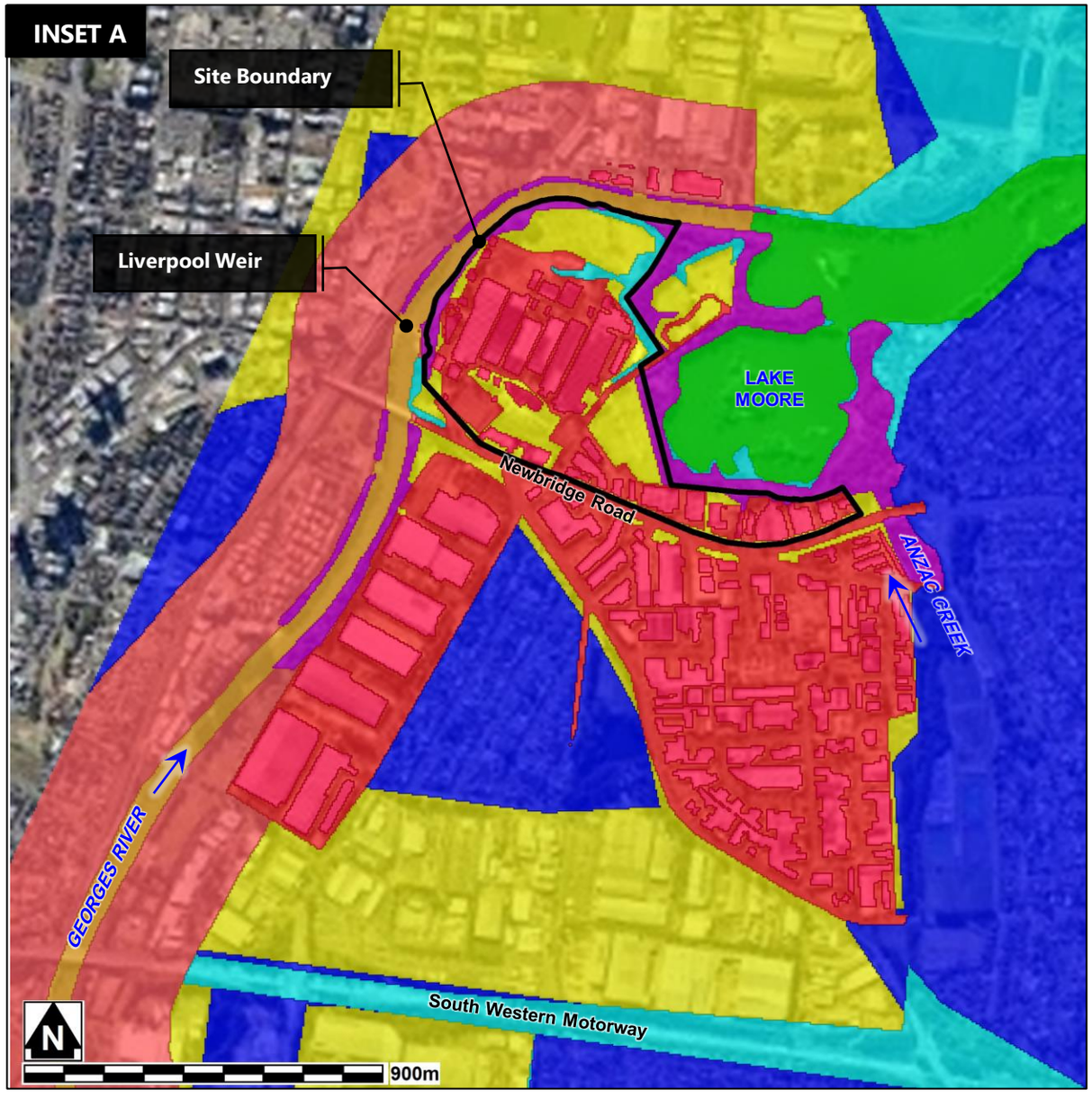
EXTENT AND SCHEMATIC OF THE TRUNCATED TUFLOW MODEL

FIGURE 3.2





Legend:

- Urban (n = 0.100)
- Industrial (n = 0.050)
- Cleared Parklands (n = 0.050)
- Moderate Vegetation (n = 0.070)
- Thick Vegetation (n = 0.080)
- High Density Vegetation (n = 0.150)
- Waterbody Upstream Weir (n = 0.025)
- Waterbody Downstream Weir (n = 0.035)
- Roads and Pavement (n = 0.030)
- Buildings (n = 1.000)

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EXISTING ROUGHNESS TYPES ADOPTED IN THE TRUNCATED TUFLOW MODEL

As shown in **Figure 3.3**, the differences in surface elevations adopted in the original and truncated TUFLOW models are generally within +/- 0.2 metres. This is to be expected as the models are based on different sets of LiDAR data that was gathered 6 years apart; viz., 2013 versus 2019.

Figure 3.3 shows consistent differences in surface elevations exceeding +/- 0.5 metres along river and road embankments. These differences are due to the reduction in grid size adopted for the truncated model which improves the sampling of elevations along steeper areas of the floodplain where significant elevation changes could occur over short distances; i.e., within the 10 metre grid size adopted for the original TUFLOW model.

Table 3.3 Adopted Mannings 'n' Roughness Types and Values

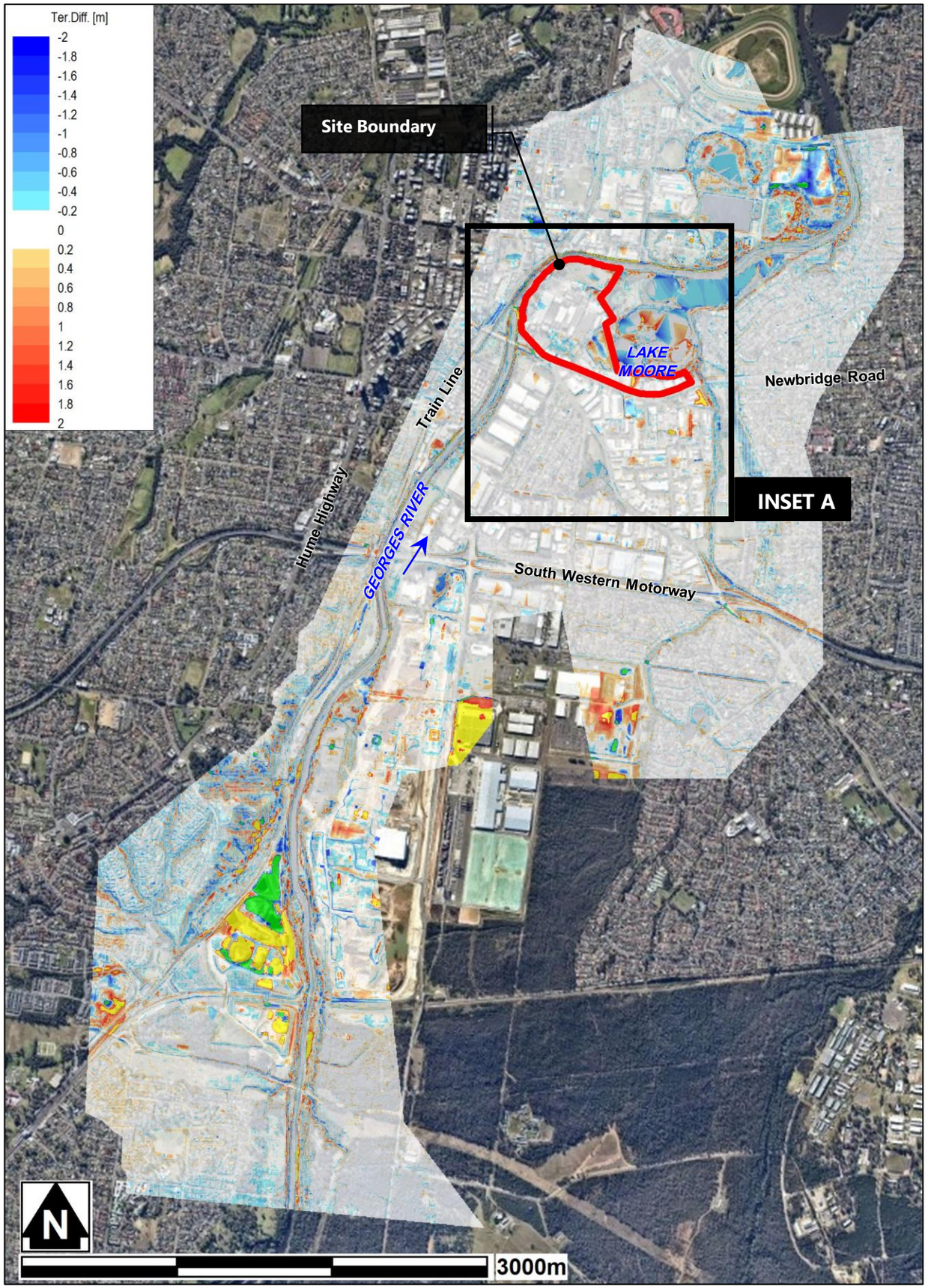
Land use	Mannings 'n' Roughness Value	
	Base 2020 TUFLOW Model	Truncated TUFLOW Model
Urban	0.100	0.100
Industrial	0.050	0.050
Cleared Parklands	0.050	0.050
Moderate Vegetation	Not Included	0.070
Thick Vegetation	0.080	0.080
High Density Vegetation	0.150	0.150
Waterbody	0.030	0.020
Waterbody D/S Liverpool Weir	0.035	0.035
Roads and Paved Areas	Not Included	0.030
Buildings	Not Included	1.000

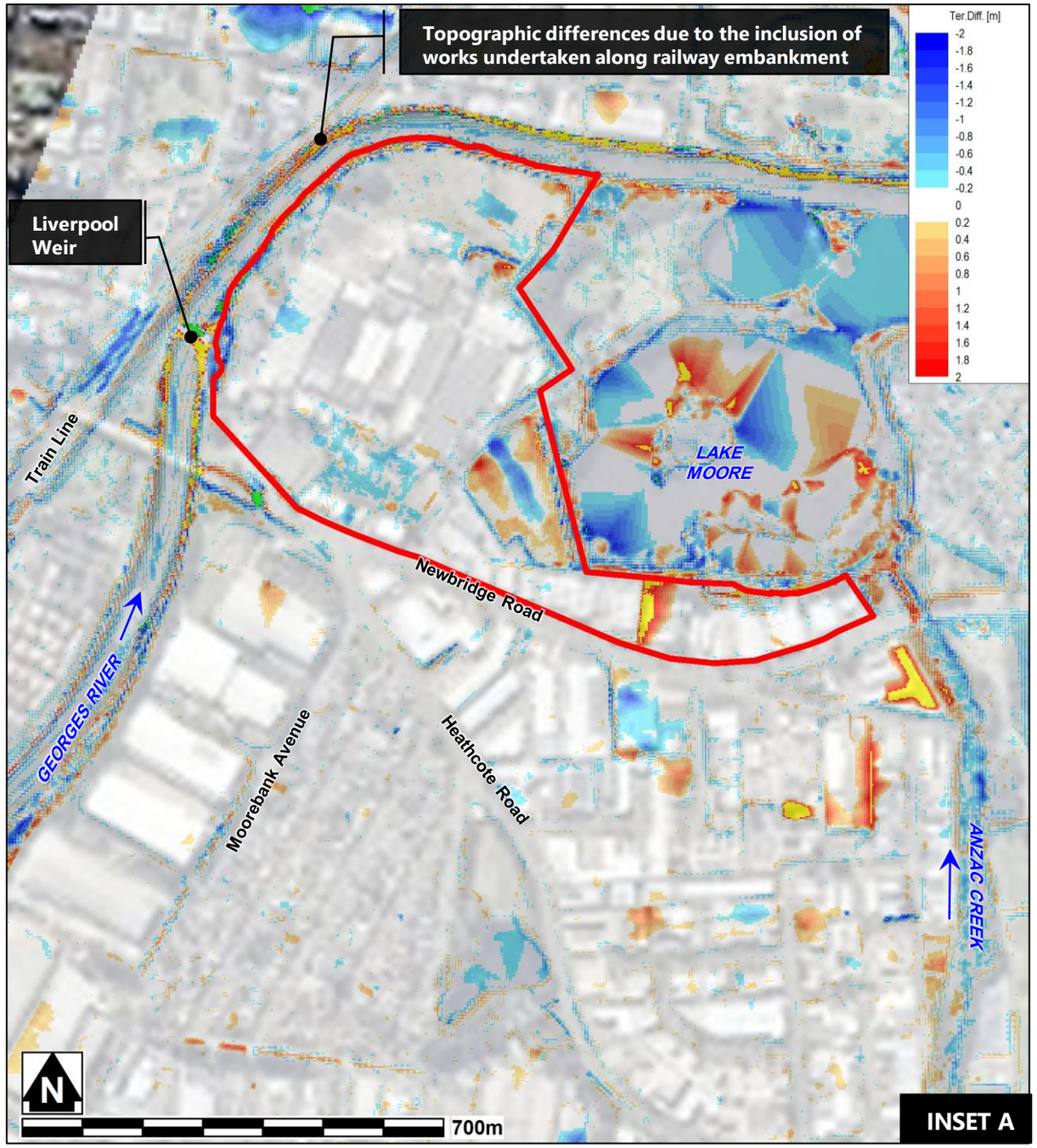
Truncated Model Validation

The 1% AEP design event was re-simulated using the truncated TUFLOW model and the results compared against those documented in the 2020 Flood Study. Flood level difference mapping was prepared from the modelling results to quantify any changes to peak flood levels predicted by the truncated model. This effectively creates a contour map of predicted changes in peak flood levels (*i.e., increases and decreases*) and allows visual assessment of the difference in results generated by the two models.

The flood level difference mapping for the 1% AEP event is presented in **Figure 3.4**. The difference mapping is based on the subtraction of flood levels predicted using the original TUFLOW model from those predicted using the truncated model. In that regard, reductions in flood levels indicate locations where the original TUFLOW model predicted flood levels that are higher than those predicted using the truncated model. Accordinlgy, increases indicate locations where the original TUFLOW model predicted lower flood levels.

FIGURE 3.3





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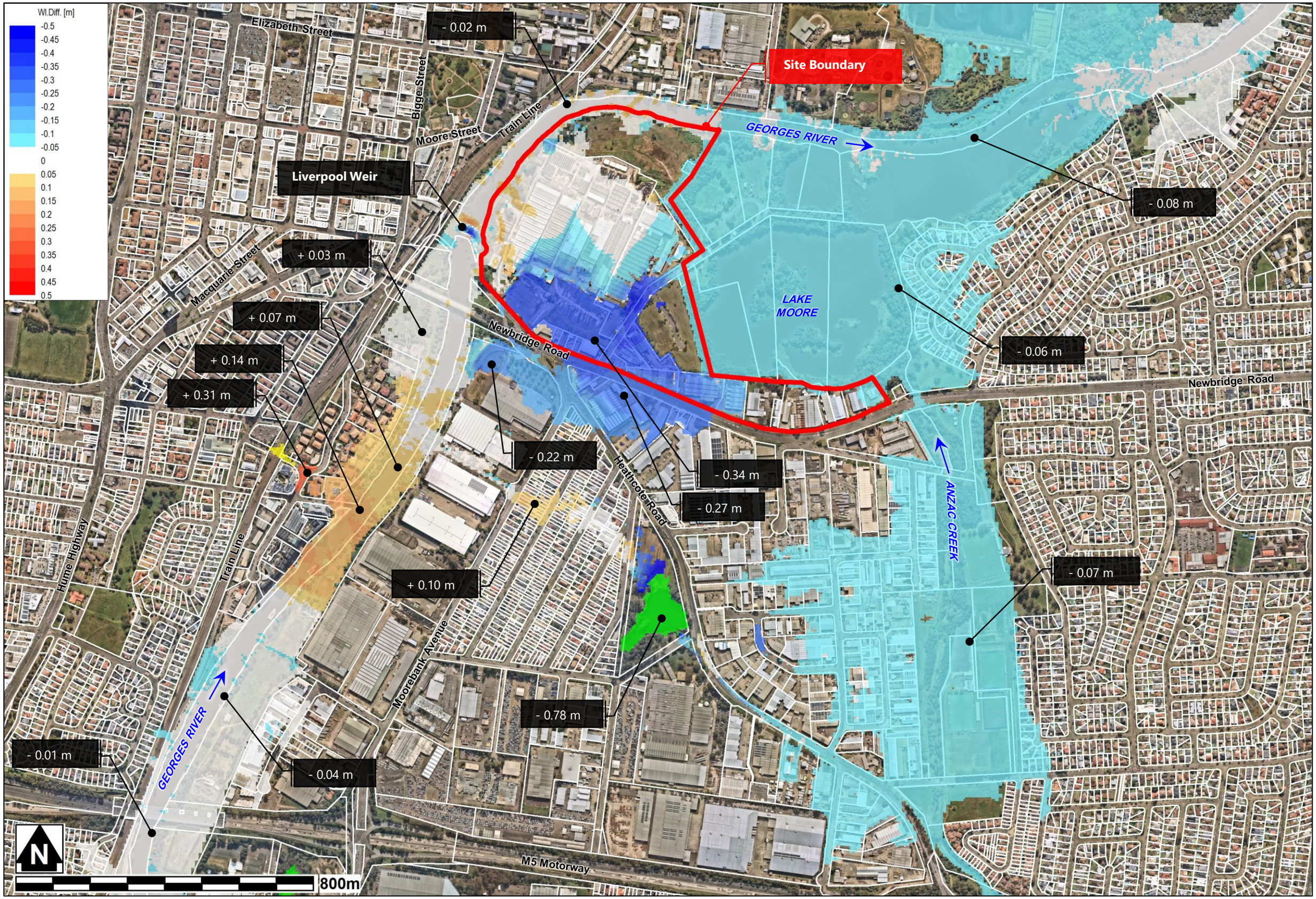
COMPARISON OF TUFLOW SURFACE ELEVATIONS ADOPTED WITHIN THE 2020 TUFLOW MODEL AND TRUNCATED MODEL

FIGURE 3.4



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COMPARISON BETWEEN PEAK 1% AEP FLOOD LEVELS PREDICTED USING THE 2020 TUFLOW MODEL AND TRUNCATED MODEL

As shown in **Figure 3.4**, the truncated TUFLOW model predicts peak 1% AEP flood levels that are generally within +/- 0.10 metres of those predicted using the 2020 TUFLOW model. Further comments on the outcomes of the validation are provided in the following bullet points.

- Peak 1% AEP flood levels downstream of the site and across Lake Moore are predicted to be between 0.06 and 0.08 metres lower using the truncated TUFLOW model. This reduction is attributed to the following changes.
  - Updated material roughness across the Moore Point Precinct that better represents the blockages caused by the buildings that would slow the passage of floodwaters through the site and to Lake Moore.
  - Updated topographic elevations for the Moore Point Precinct and in particular along the eastern site boundary. This ensures that the higher elevations along the south-to-north aligned ridge that exists in this area are correctly represented in the model. This ridge of higher ground acts to prevent the passage of floodwaters through the site to Lake Moore except in very large floods.
  - Improved definition of the Georges River embankment and inclusion of the embankment works recently completed by Transport for NSW (TfNSW) along the railway embankment downstream of Liverpool Weir (*refer* **Figure 3.3**).
- A maximum increase in peak 1% AEP flood levels is predicted upstream of Newbridge Road at the intersection of Riverbank Drive and Shepherd Street. This difference of up to 0.31 metres occurs as a direct result of the increased flood levels predicted to the east along the Georges River which cause additional flows to spill into a localised depression. Note that this increase **is not** a consequence of the proposed redevelopment of the Moore Point Precinct. It is a consequence of the coarseness of the 2020 TUFLOW model in this area and means that existing condition 1% AEP flood levels are under-estimated at this location in the 2020 Flood Study.
- A maximum increase in peak 1% AEP flood levels of up to 0.14 metres is predicted along the Georges River.

The reduction in flood levels across the Moore Point Precinct is attributed to the refinement of roughness types for the site, and in particular, across building footprints. In that regard, the 2020 TUFLOW model adopted a roughness value of 0.05 across the Moore Point Precinct with no variation to account for buildings. This led to floodwaters discharging through the Precinct more freely leading to a higher volume and peak magnitude of flows entering the site.

The location of the primary path of floodwaters that would enter the Precinct as determined from modelling completed for the 2020 Flood Study is shown in **Plate 3.2**. As shown, floodwaters entering the Precinct at this location would be totally obstructed by the existing buildings which are of solid construction and aligned orthogonal to the direction of flow predicted by the 2020 TUFLOW model. A roughness value of 0.05 is considered to significantly under-represent the impediment that would be caused by these buildings.

For this reason, roughness values adopted in the truncated TUFLOW model were changed to a value of 1.0 across all building footprints (*refer* **Figure 3.2**). This change is considered to allow the flood model to more reliably represent the impediment that these buildings would present to floodwaters entering the Precinct leading to a reduction in peak flows and the volume of overland flow that would enter the site (*refer* **Figure 3.4**).

Plate 3.2 Primary Flow Path into the Moore Point Precinct During a 1% AEP Design Event

3.3 Flood Modelling Results – Existing Conditions

The truncated TUFLOW model was adopted to simulate existing conditions for the 5%, 1% and 1 in 500 AEP design events and the adopted PMF.

The results of the modelling are discussed in the following sections in terms of the predicted flow distributions, peak flood levels and extents, depths and flow velocities, flood hazards, hydraulic categories and flood risk precincts.

An assessment of the potential impact of climate change and the results from simulation of a 1 in 5000 AEP flood are also included in the following sections. These additional simulations and associated assessment were undertaken as a response to a requirement of the Gateway Determination issued for the Planning Proposal (PP-2022-1602) in March 2023.

3.3.1 Flow Distribution for Existing Conditions

Flood behaviour adjacent to and across the Moore Point Precinct and the nearby floodplain lands between the South West Motorway crossing of the Georges River and Lake Moore, is predicted to vary substantially as the severity of flooding increases. As shown in **Figure 3.5**, flooding during a 5% AEP event is almost entirely contained within the banks of the Georges River and Lake Moore, with only minor breakouts onto low lying areas along the edges of the Precinct.

During a 1% AEP event, additional flow breakouts are predicted with floodwaters escaping the confines of the Georges River and inundating most of the site, albeit to relatively shallow depths. Flow breakouts also occur upstream of the site and would inundate existing residential and industrial/commercial properties located along the western bank of river upstream of the Newbridge Road crossing. As shown in **Figure 3.5**, breakouts across the eastern bank of the river would create a flow connection between the river and Anzac Creek and between the river and Lake Moore.

The significance of these flow break-outs increases with the severity of the flood. In the PMF, floodwaters will freely spread overland to Anzac Creek and Lake Moore. During the PMF, floodwaters are also predicted to break the banks of the Georges River immediately north of the Precinct leading to widespread inundation of the Liverpool CBD (*refer* **Figure 3.5**).

Due to the activation of new flow breakouts between the South West Motorway and Newbridge Road, the magnitude of flows escaping the Georges River upstream of the Moore Point Precinct is greater than predicted by the 2020 TUFLOW model. As a result, the percentage increase in flows passing through Newbridge Road is reduced.

3.3.2 Peak Flood Levels for Existing Conditions

Peak flood levels for the adopted design events have been extracted from the flood modelling results and are shown on **Figures 3.6** to **3.9**. The variation in flood levels and extents across the Moore Point Precinct are discussed in the following for each design event.

5% AEP Event

The mapping indicates that inundation of the Precinct will be minimal during a 5% AEP event with floodwaters typically encroaching into the site by less than 20 metres (*refer* **Figure 3.6**). The largest encroachment is predicted to occur to the east of the Liverpool Weir where floodwaters extend into the site by up to 100 metres. The peak flood level at this location during the 5% AEP event is predicted to be 7.85 mAHD.

Floodwaters are also predicted to "back-up" into the Precinct along Bridges Road. As shown in **Figure 3.6**, a peak 5% AEP flood level of 7.27 mAHD is predicted along Bridges Road and across Lake Moore.

1% AEP Event

Inundation across the Moore Point Precinct is predicted to become more widespread during a 1% AEP event with floodwaters entering the Precinct from upstream of Newbridge Road and near Liverpool Weir. As shown in **Figure 3.7**, floodwaters are predicted to break the banks of the Georges River upstream of Newbridge Road before flowing east and over Moorebank Avenue and Heathcote Road. Once east of Heathcote Road, floodwaters build-up upstream of Newbridge Road before overtopping it and entering the Precinct.

The majority of inundation across the Precinct is caused by floodwaters overtopping the riverbanks downstream of Newbridge Road and near Liverpool Weir. As shown in **Figure 3.7**, floodwaters enter the Precinct over a length of approximately 400 metres extending from Haigh Avenue to near the bend in the river downstream of the weir.

Peak 1% AEP flood levels across the Precinct are predicted to vary between 9.37 and 8.38 mAHD.

FIGURE 3.5

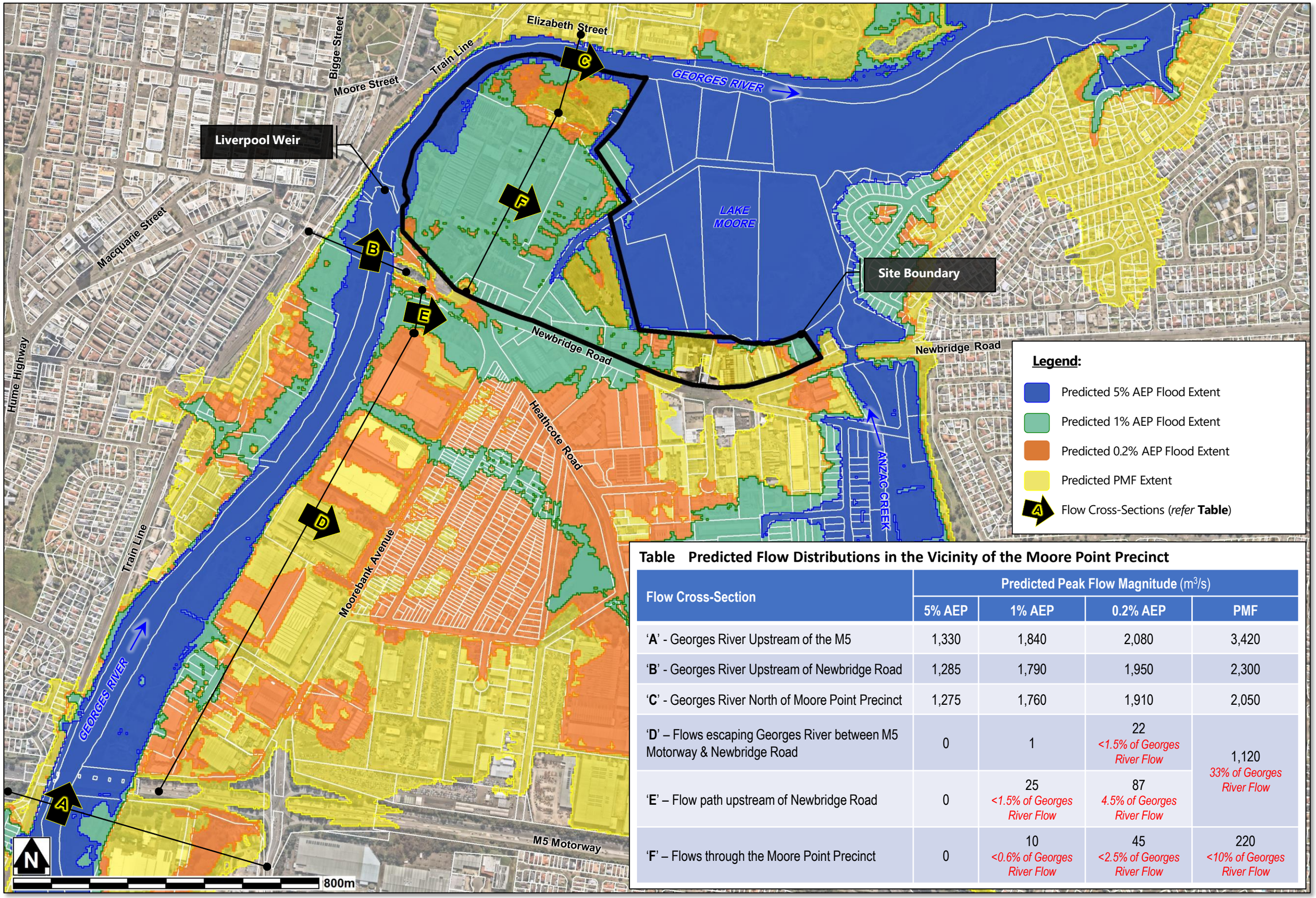

Table Predicted Flow Distributions in the Vicinity of the Moore Point Precinct

Flow Cross-Section	Predicted Peak Flow Magnitude (m^3/s)			
	5% AEP	1% AEP	0.2% AEP	PMF
'**A**' - Georges River Upstream of the M5	1,330	1,840	2,080	3,420
'**B**' - Georges River Upstream of Newbridge Road	1,285	1,790	1,950	2,300
'**C**' - Georges River North of Moore Point Precinct	1,275	1,760	1,910	2,050
'**D**' – Flows escaping Georges River between M5 Motorway & Newbridge Road	0	1	22 *<1.5% of Georges River Flow*	1,120 *33% of Georges River Flow*
'**E**' – Flow path upstream of Newbridge Road	0	25 *<1.5% of Georges River Flow*	87 *4.5% of Georges River Flow*	
'**F**' – Flows through the Moore Point Precinct	0	10 *<0.6% of Georges River Flow*	45 *<2.5% of Georges River Flow*	220 *<10% of Georges River Flow*

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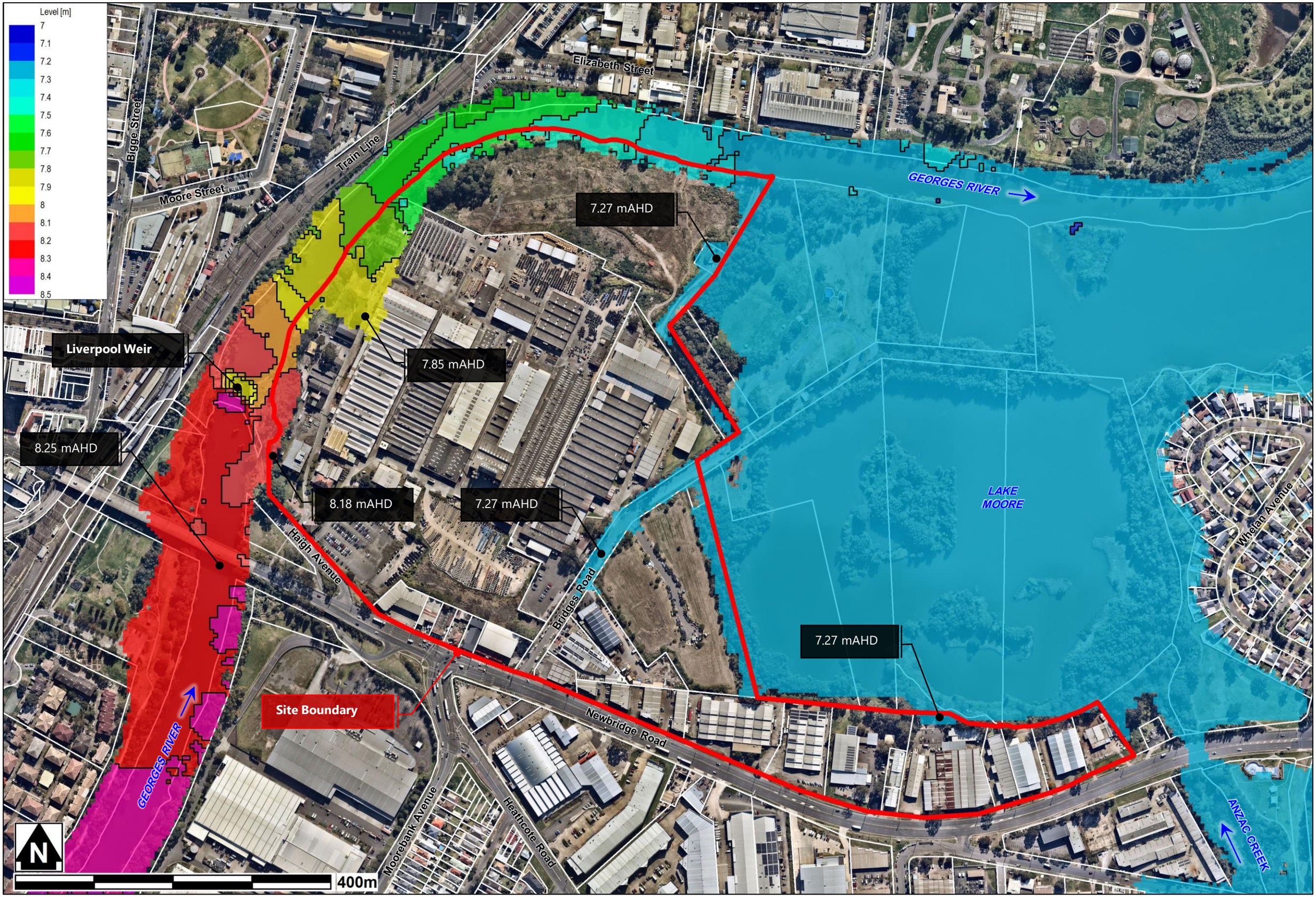
PREDICTED FLOW DISTRIBUTIONS IN THE VICINITY OF THE MOORE POINT PRECINCT

FIGURE 3.6



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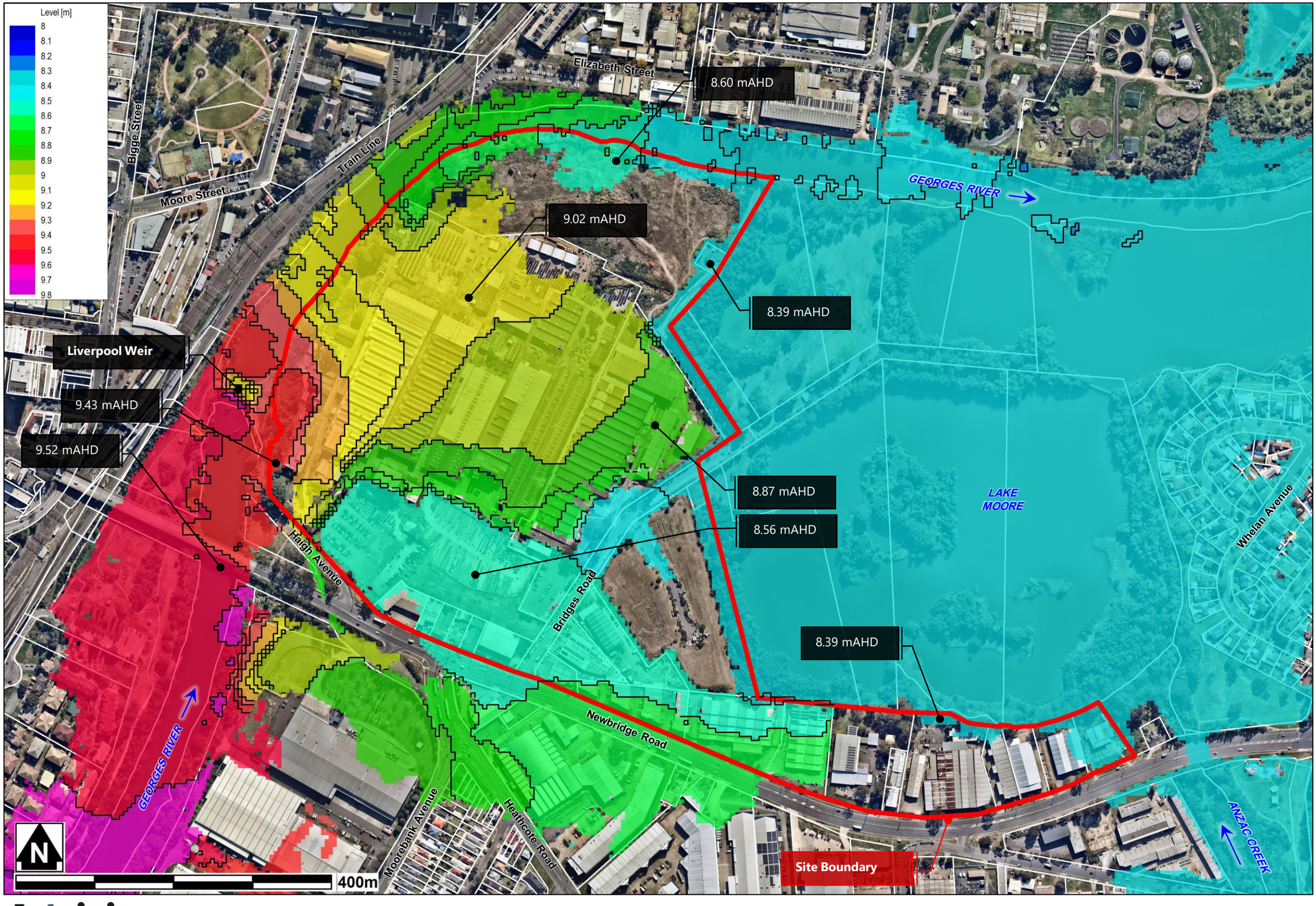
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 5% AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.7



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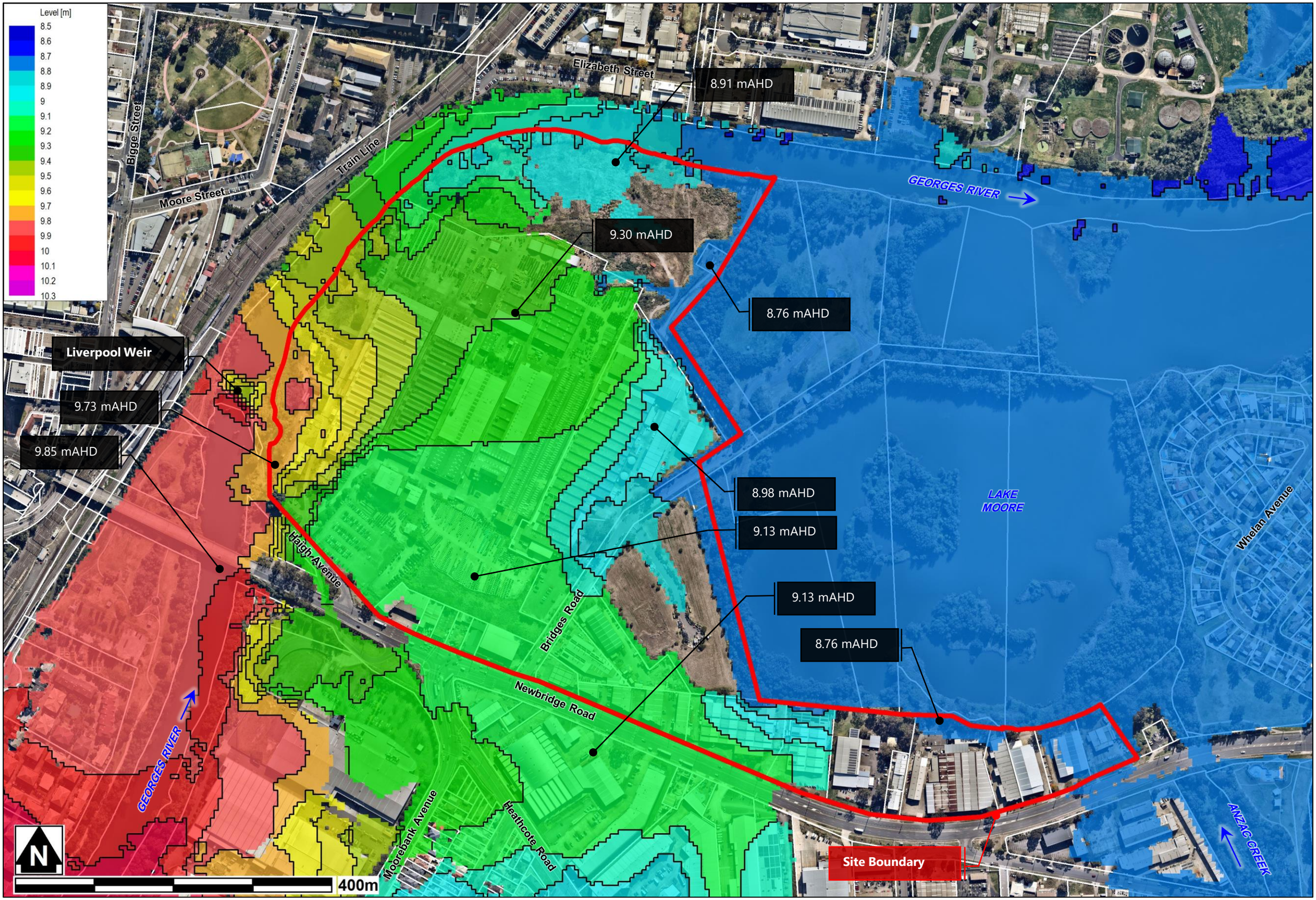
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 1% AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.8



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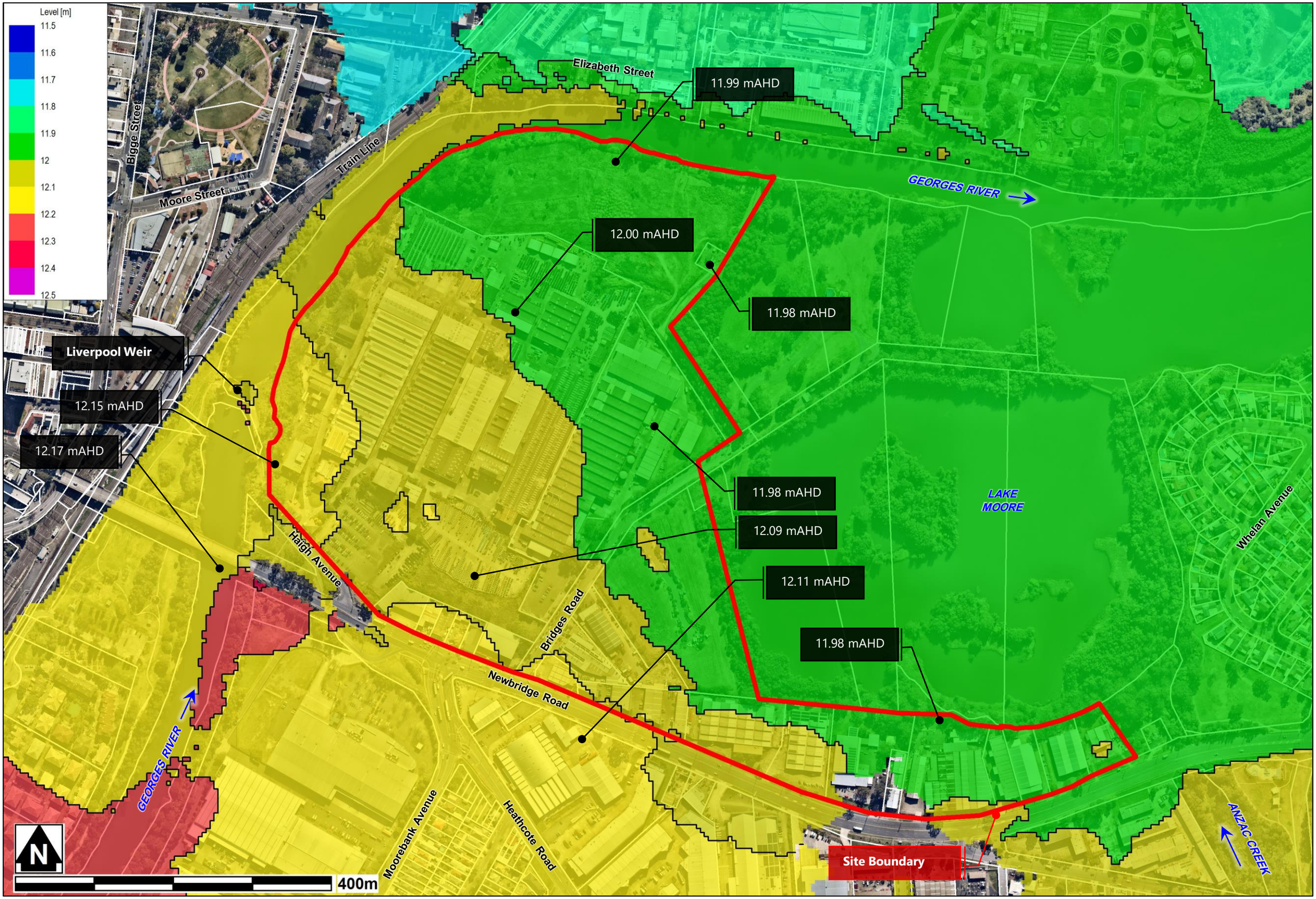
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 1 IN 500 AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.9



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PREDICTED FLOOD LEVELS AT THE PEAK OF THE PMF DESIGN EVENT FOR EXISTING CONDITIONS

1 in 500 AEP Event

As shown in **Figure 3.8**, approximately 80% of the Moore Point Precinct is predicted to be inundated at the peak of the 1 in 500 AEP flood. Floodwaters are predicted to enter the Precinct via the same flow paths as outlined above for the 1% AEP event; that is, both upstream and downstream of the Newbridge Road bridge crossing.

Peak flood levels within the Precinct for the 1 in 500 AEP event are typically between 0.3 to 0.4 metres higher than those predicted for the 1% AEP event. Peak flood levels within Lake Moore also vary by a similar magnitude with a maximum difference of 0.37 metres; i.e., 8.39 mAHD compared to 8.76 mAHD for the 1% and 1 in 500 AEP events, respectively.

The modelling predicts a change to flow patterns through the site for the 1 in 500 AEP event with floodwaters escaping to Lake Moore and towards the south over Newbridge Road. As show in **Figure 3.8**, flows from the site combine at Newbridge Road with those arriving from the west and upstream of the Newbridge Road bridge crossing. From there, floodwaters reach a flood level that is sufficient for flow to travel to the south-east.

Further information on the variation in flow distributions between design events is provided in **Section 3.3.1**.

Extreme Event (Adopted PMF)

Floodwaters are predicted to inundate the entire Precinct during the adopted PMF with peak flood levels varying between 12.15 mAHD and 11.98 mAHD (*refer* **Figure 3.9**).

3.3.3 Flood Depths and Flow Velocities

Flood depth mapping for the 5%, 1% and 1 in 500 AEP floods and the PMF is presented in **Figures 3.10** to **3.13**, respectively.

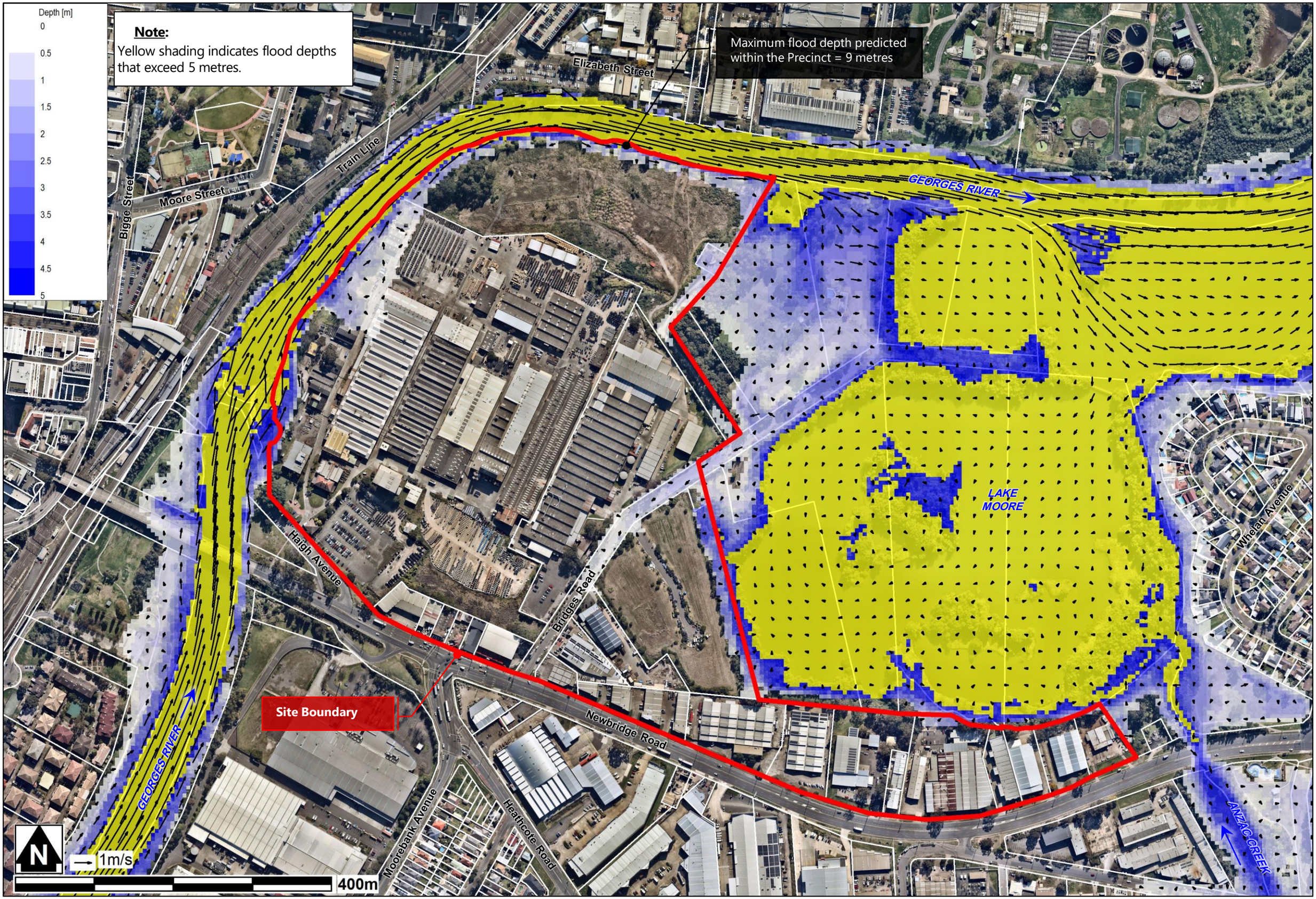
Mapping of peak flow velocities is presented in **Figure 3.14** to **3.17**.

As shown in **Figure 3.10**, only the low-lying areas around the edges of the precinct are predicted to be inundated in the 5% AEP event. Although inundation is predicted across the existing site in the 1% AEP event (refer **Figure 3.11**), the depth of inundation is typically less than 0.5 metres.

As shown in **Figures 3.14** to **3.17**, peak flow velocities across the Precinct are predicted to be low and to typically be less than 0.1 m/s. This low flow velocity reflects the significant impediment to floodwaters that the existing buildings would cause.

Although flow velocities across the Precinct are low across building footprints, localised velocities of up to 0.95, 1.8 and 2.3 m/s are predicted along internal roads for the 1% and 1 in 500 AEP events and the PMF, respectively. Maximum flow velocities are predicted to occur along Bridges Road as floodwaters flow through the Precinct to Lake Moore (*refer* **Figures 3.15** *to* **3.17**).

FIGURE 3.10



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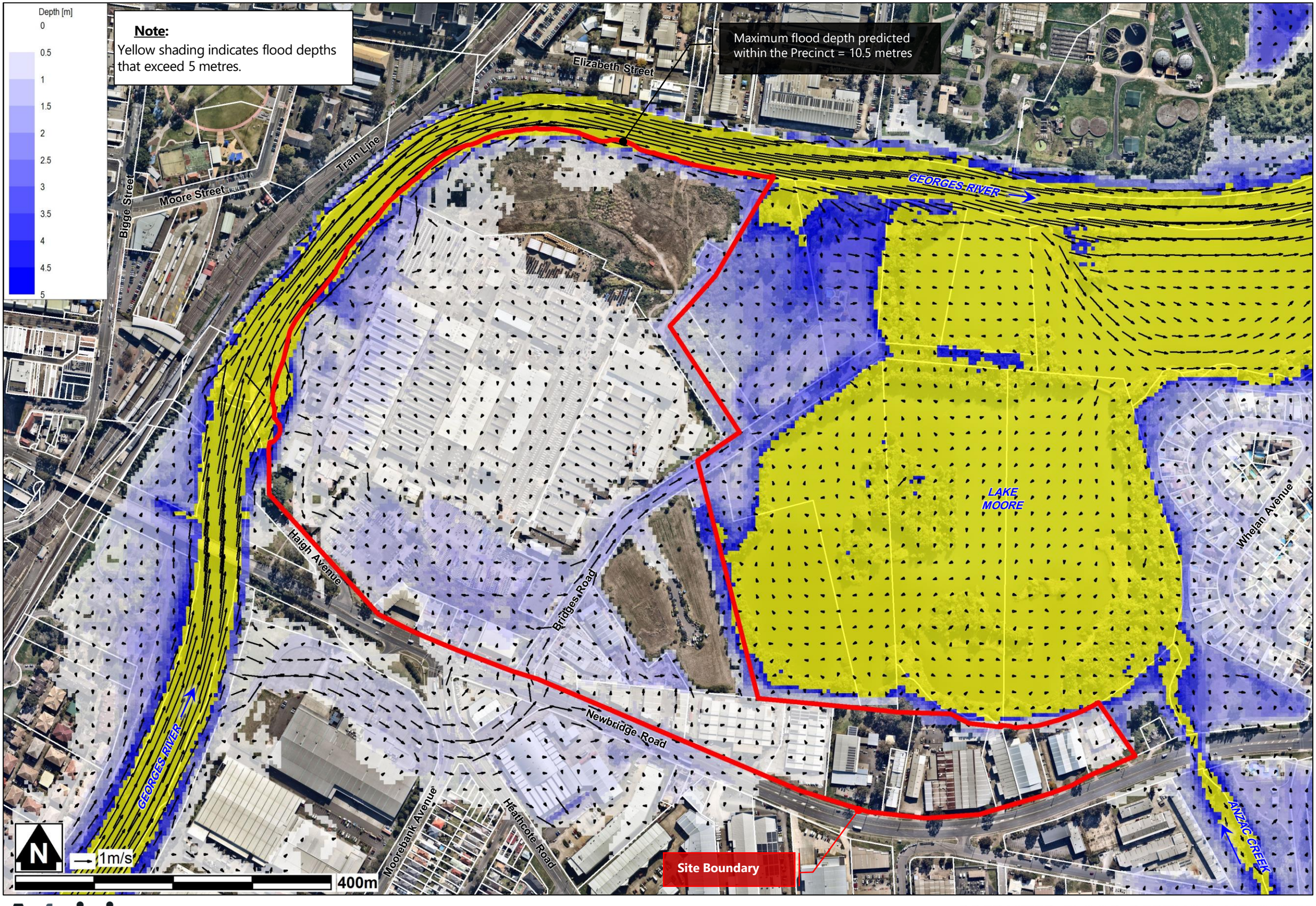
PREDICTED FLOOD DEPTHS & VELOCITY VECTORS AT THE PEAK OF THE 5% AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.11



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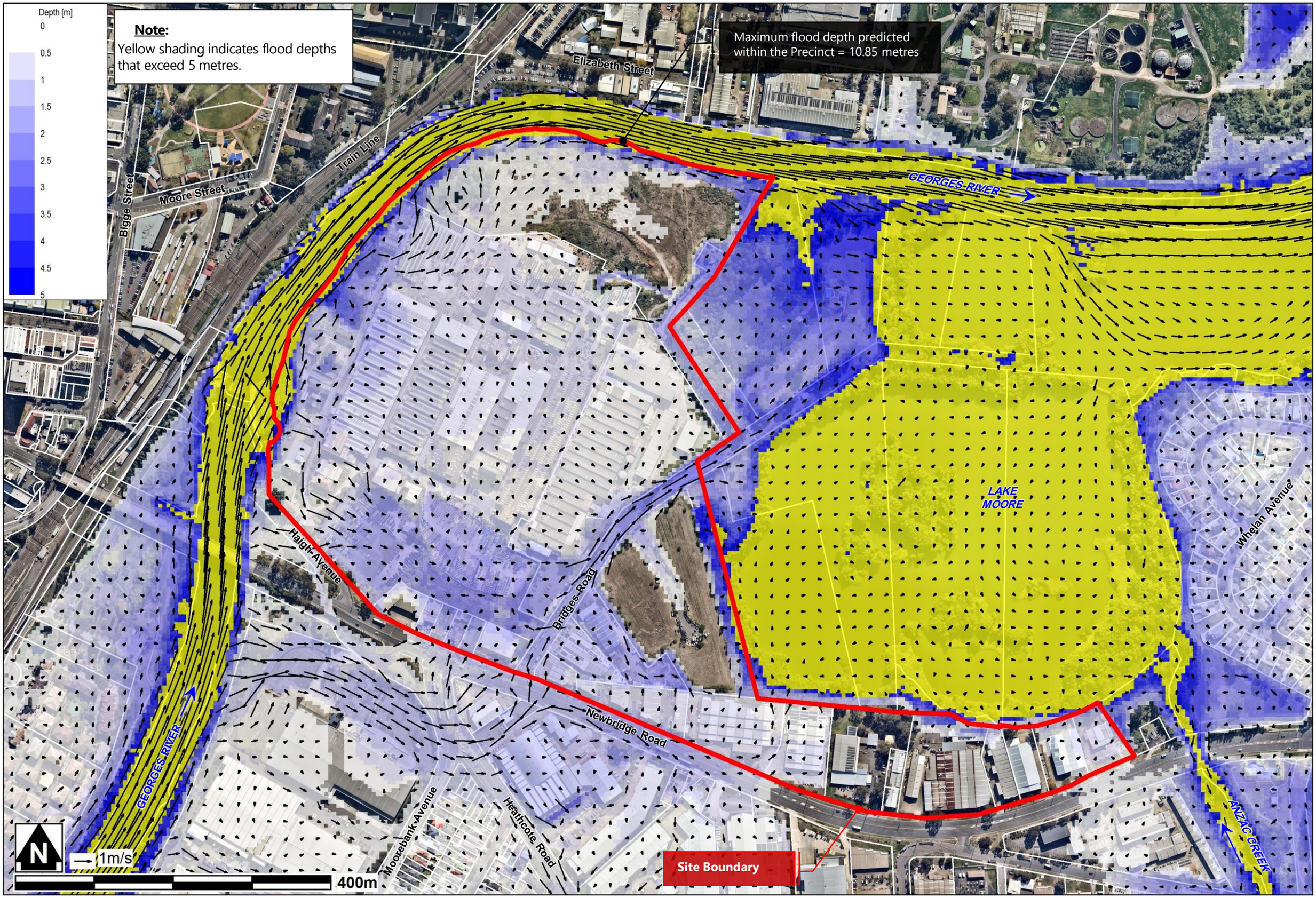
PREDICTED FLOOD DEPTHS & VELOCITY VECTORS AT THE PEAK OF THE 1% AEP DESIGN EVENT FOR EXISTING CONDITIONS



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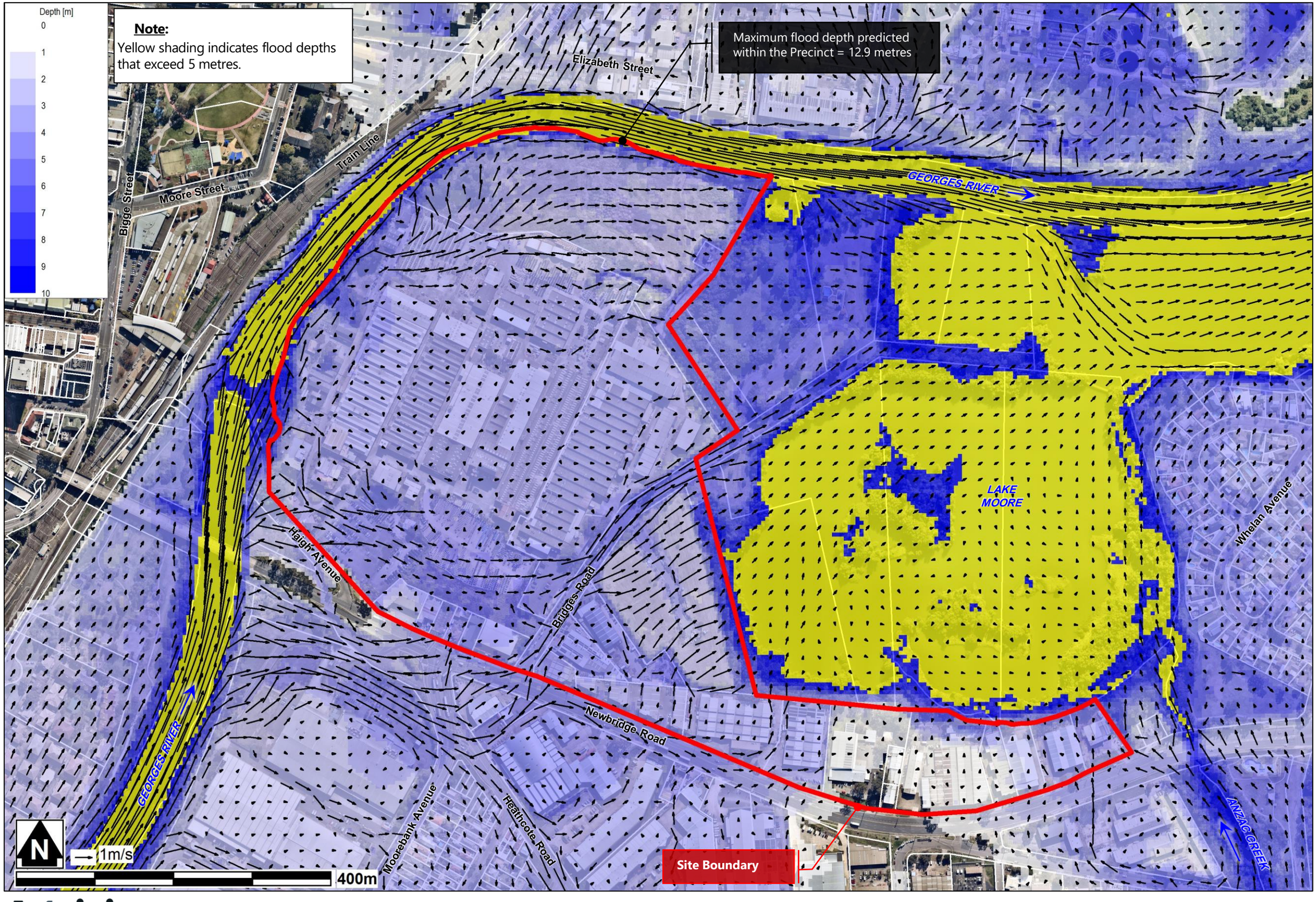
PREDICTED FLOOD DEPTHS & VELOCITY VECTORS AT THE PEAK OF THE 1 in 500 AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.13



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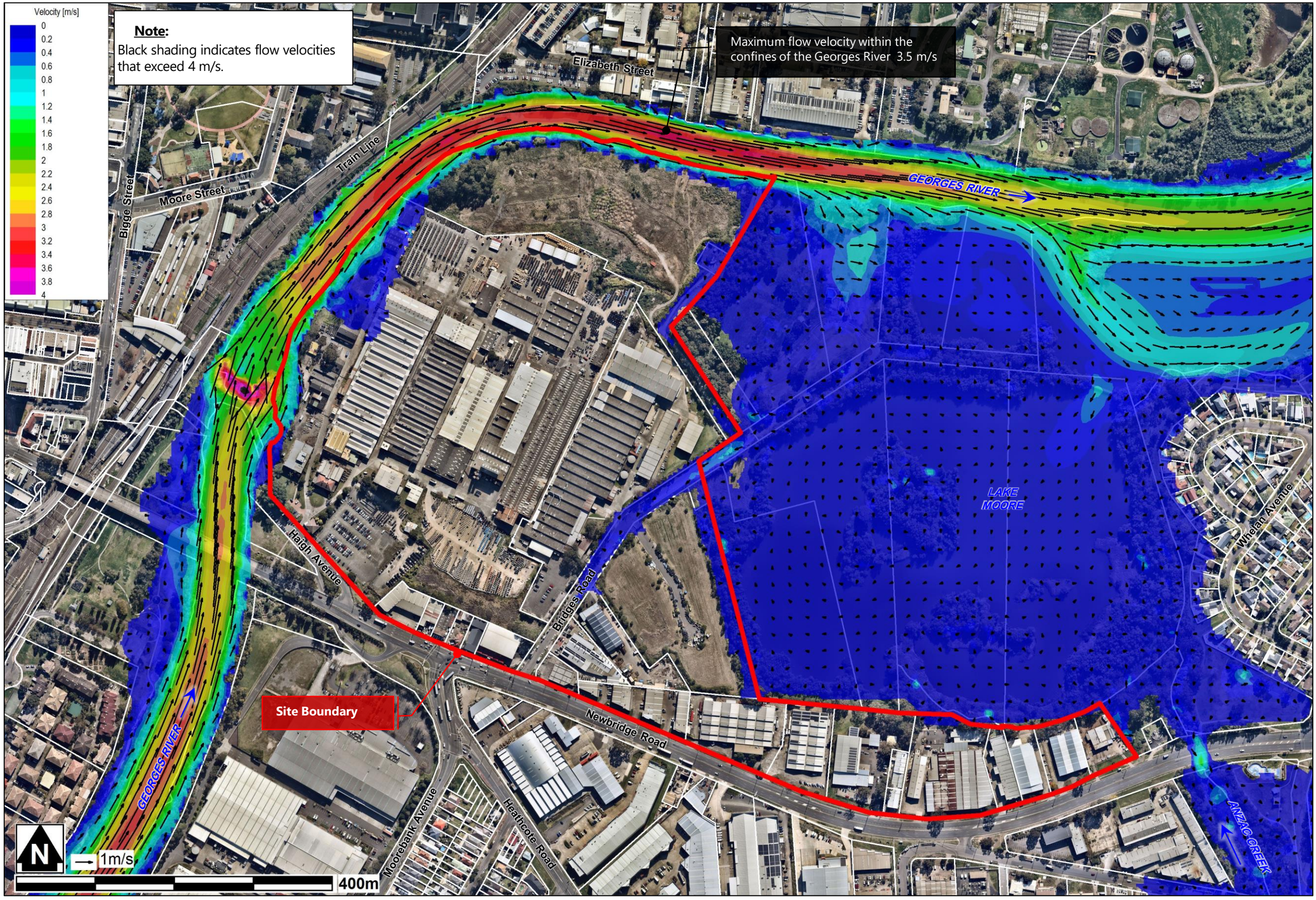
PREDICTED FLOOD DEPTHS & VELOCITY VECTORS AT THE PEAK OF THE PROBABLE MAXIMUM FLOOD FOR EXISTING CONDITIONS

FIGURE 3.14



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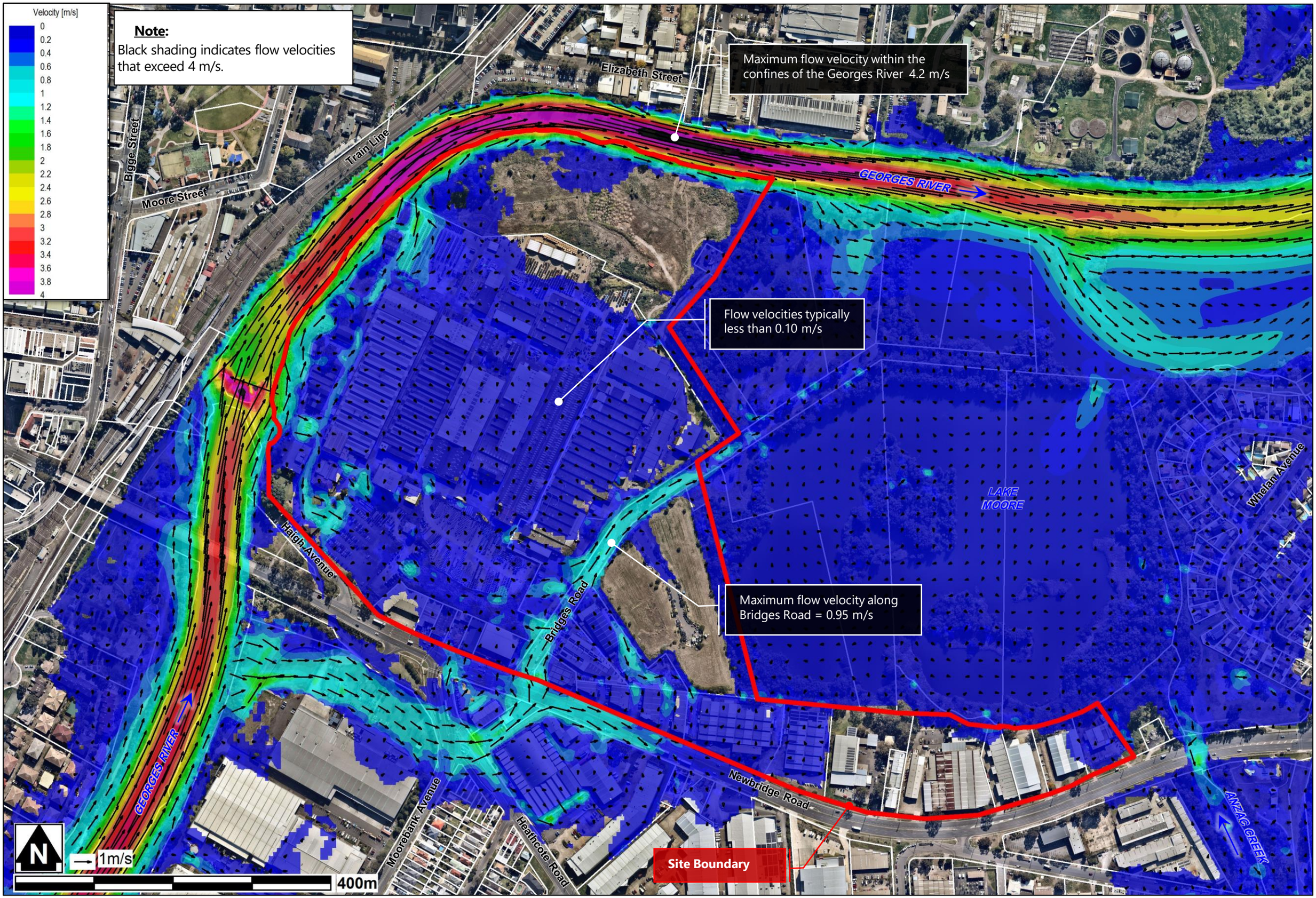
PREDICTED FLOW VELOCITIES AT THE PEAK OF THE 5% AEP DESIGN DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.15



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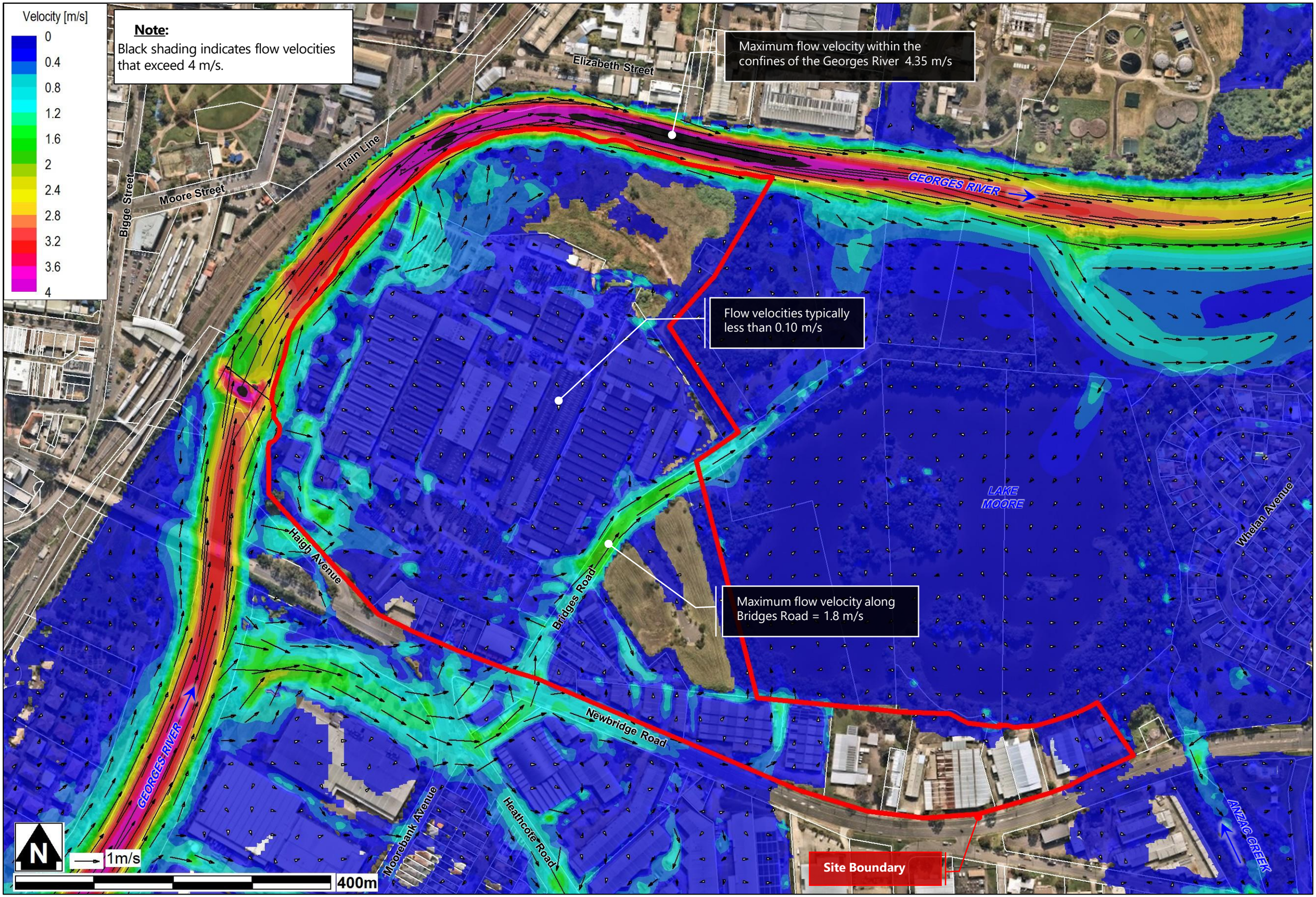
PREDICTED FLOW VELOCITIES AT THE PEAK OF THE 1% AEP DESIGN DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.16



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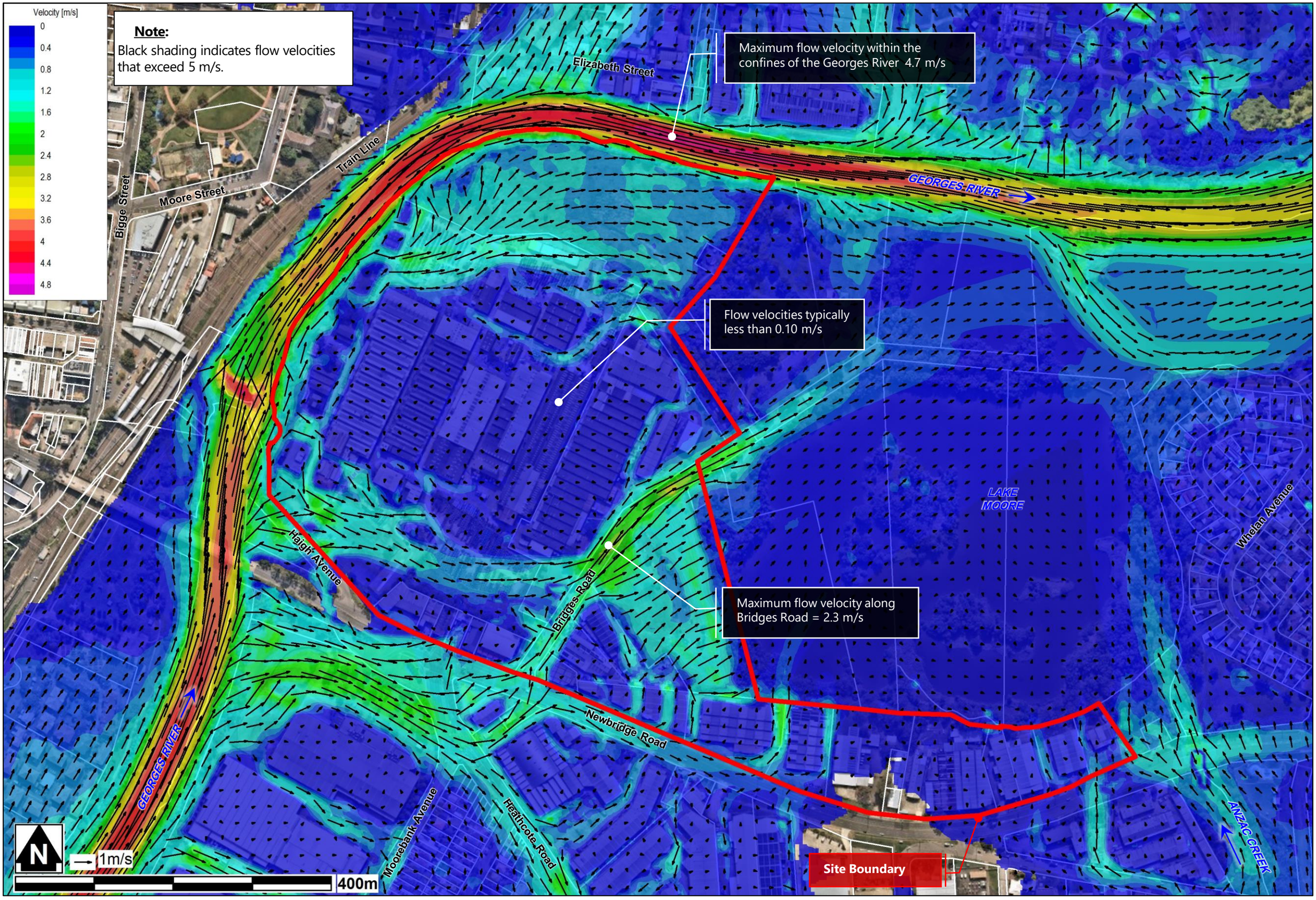
PREDICTED FLOW VELOCITIES AT THE PEAK OF THE 1 IN 500 AEP DESIGN DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.17



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PREDICTED FLOW VELOCITIES AT THE PEAK OF THE PROBABLE MAXIMUM FLOOD FOR EXISTING CONDITIONS

3.3.4 Flood Hazard

The flood hazard describes the potential impact that flooding would have on development and people in a particular area and reflects the risks to which people in that area could be exposed. The hazard category relevant to a particular location within the floodplain is determined based on the predicted magnitude of flood depths and flow velocities and a combination of both, referred to as the velocity-depth product.

A description of the hydraulic criteria for each hazard classification according to *Australian Rainfall & Runoff 2019* is provided in **Plate 3.1**.

Mapping of the flood hazard in the vicinity of the Moore Point Precinct at the peak of the 1% AEP flood is presented in **Figure 3.18**.

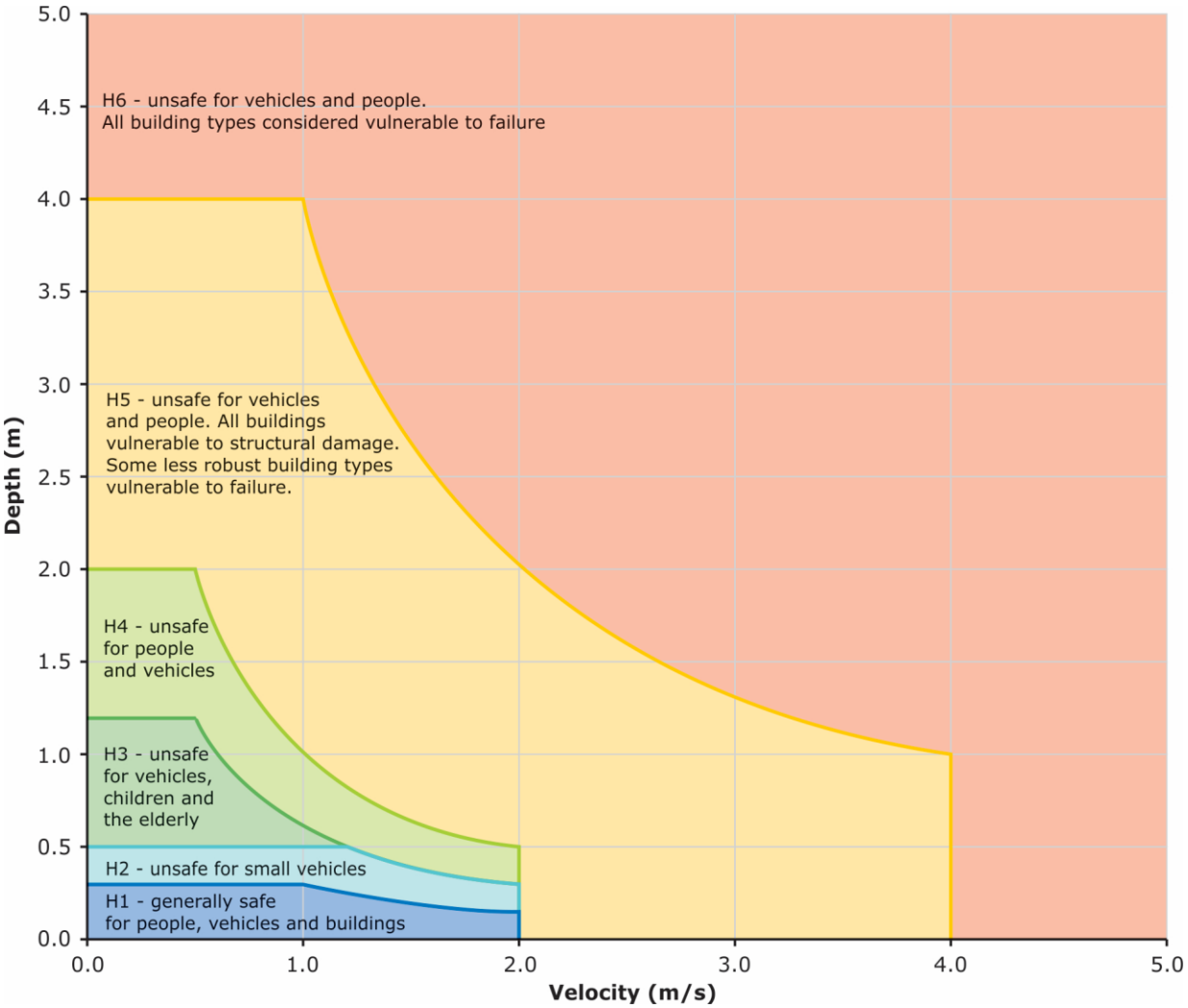
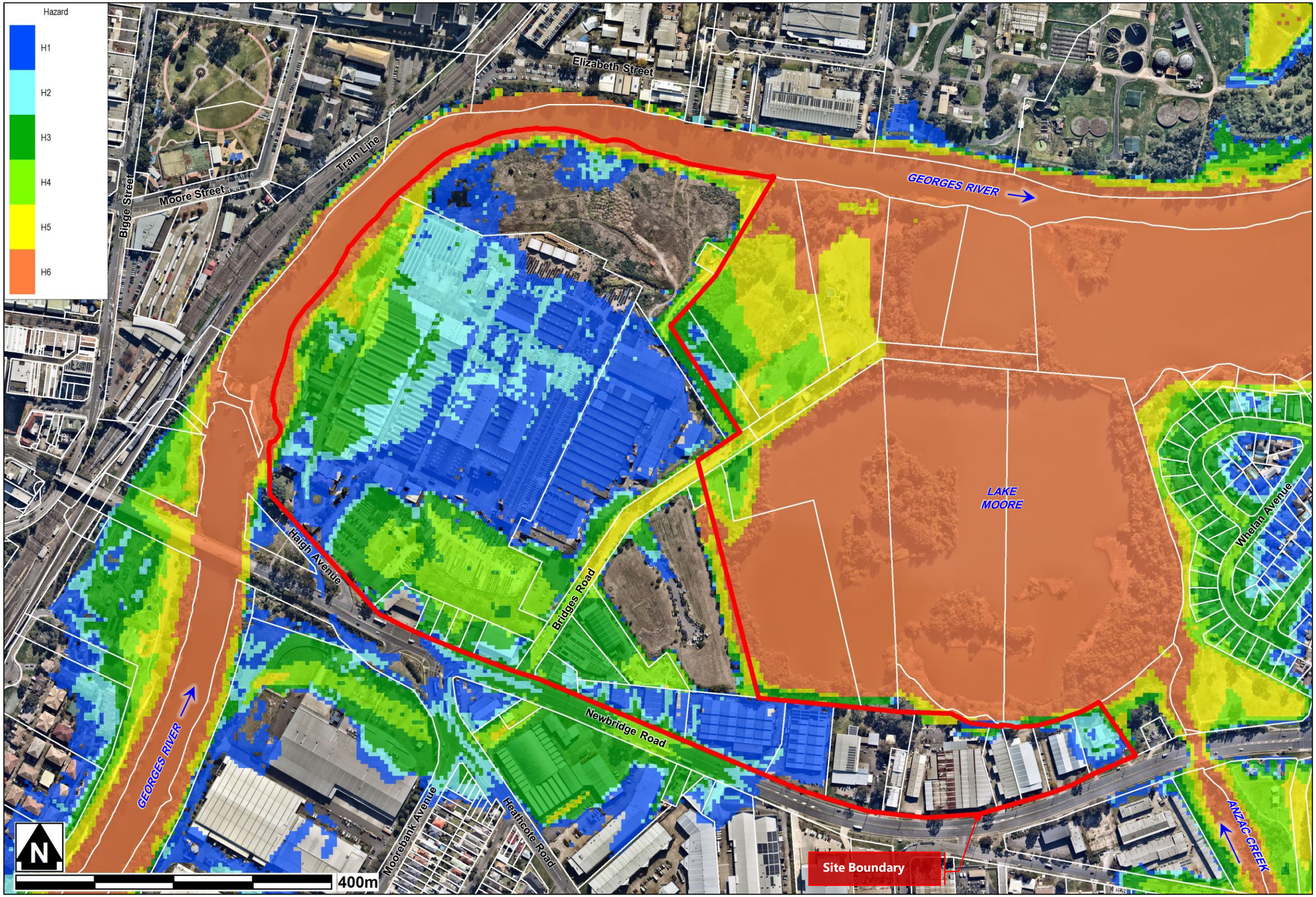


Plate 3.1 Flood Hazard Classification according to Australian Rainfall & Runoff 2019

FIGURE 3.18



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PREDICTED FLOOD HAZARD AT THE PEAK OF THE 1% AEP FLOOD FOR EXISTING CONDITIONS

3.3.5 Hydraulic Categories / Flood Function

The hydraulic category for a site identifies the potential for development to impact on existing flood behaviour. The NSW Government's '*Floodplain Risk Management Manual*' (2023) divides flood prone land into three hydraulic categories; namely floodway, flood storage and flood fringe.

The '*Georges River Flood Study*' (2020) includes an assessment of hydraulic categories based on the approach proposed by Thomas et al (2012). This approach, which is increasingly accepted within the industry, proposed a qualitative assessment of flood parameters such as flood depths, velocities, velocity-depth product and flow distributions to define the floodway corridor. The approach suggests that the floodway can generally be defined as the extent of floodplain required to convey around 80% of the total flood flow.

Although the 1% AEP event is typically adopted for this assessment, larger events such as the 1 in 200 and 1 in 500 AEP floods should be considered to identify flow breakouts that are critical to maintaining flow conveyance.

By applying the approach proposed by Thomas et al (2012), the 2020 Flood Study determined that the floodway corridor along the Georges River could be defined based on the mapping of areas with VxD of greater than 1 m^2/s. The criteria adopted by the 2020 Flood Study for defining floodway, storage and flood fringe is shown in **Plate 3.2**.

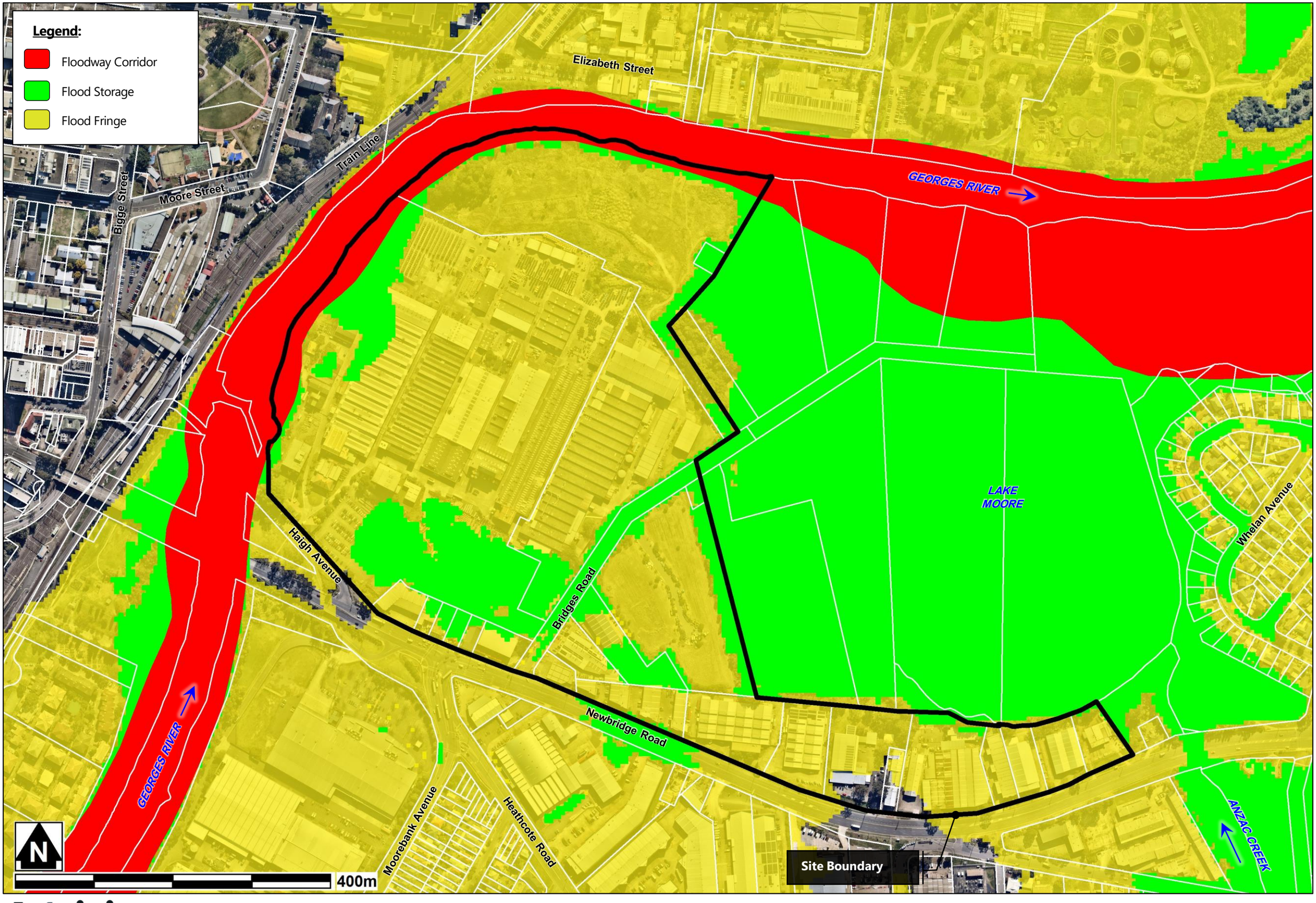
Hydraulic Category	Categorisation Criteria	Description
Floodway	VxD > 1.0 at the 1% AEP event	Areas and flowpaths where a significant proportion of floodwaters are conveyed (including all bank-to-bank river sections).
Flood Storage	VxD < 1.0 and d > 1.0 at the 1% AEP event	Areas where floodwaters accumulate before being conveyed downstream. These areas are important for detention and attenuation of flood peaks.
Flood Fringe	The extent of the Extreme Flood event floodplain not classified as floodway or flood storage	Areas that are low-velocity backwaters within the floodplain. Filling of these areas generally has little consequence to overall flood behaviour.

Plate 3.2 Criteria Adopted by the 2020 Flood Study for the Mapping of Flood Function
Source: 'Georges River Flood Study' (BMT, 2020)

Hydraulic category mapping has been prepared for the site based on application of the criteria outlined in **Plate 3.2**.

As shown in **Figure 3.19**, the Georges River floodway corridor is predicted to encroach into the Moore Point Precinct along the western and northern site boundary by up to 35 metres. The remainder of the site is mostly categorised as flood fringe, with approximately 20% categorised as flood storage.

FIGURE 3.19



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HYDRAULIC CATEGORY MAPPING FOR EXISTING CONDITIONS

3.3.6 Flood Risk Precincts

Flood risk relates to the varying degrees of hazard and danger that people and property could be exposed to on a floodplain. The degree of risk at any location is determined based on a combination of:

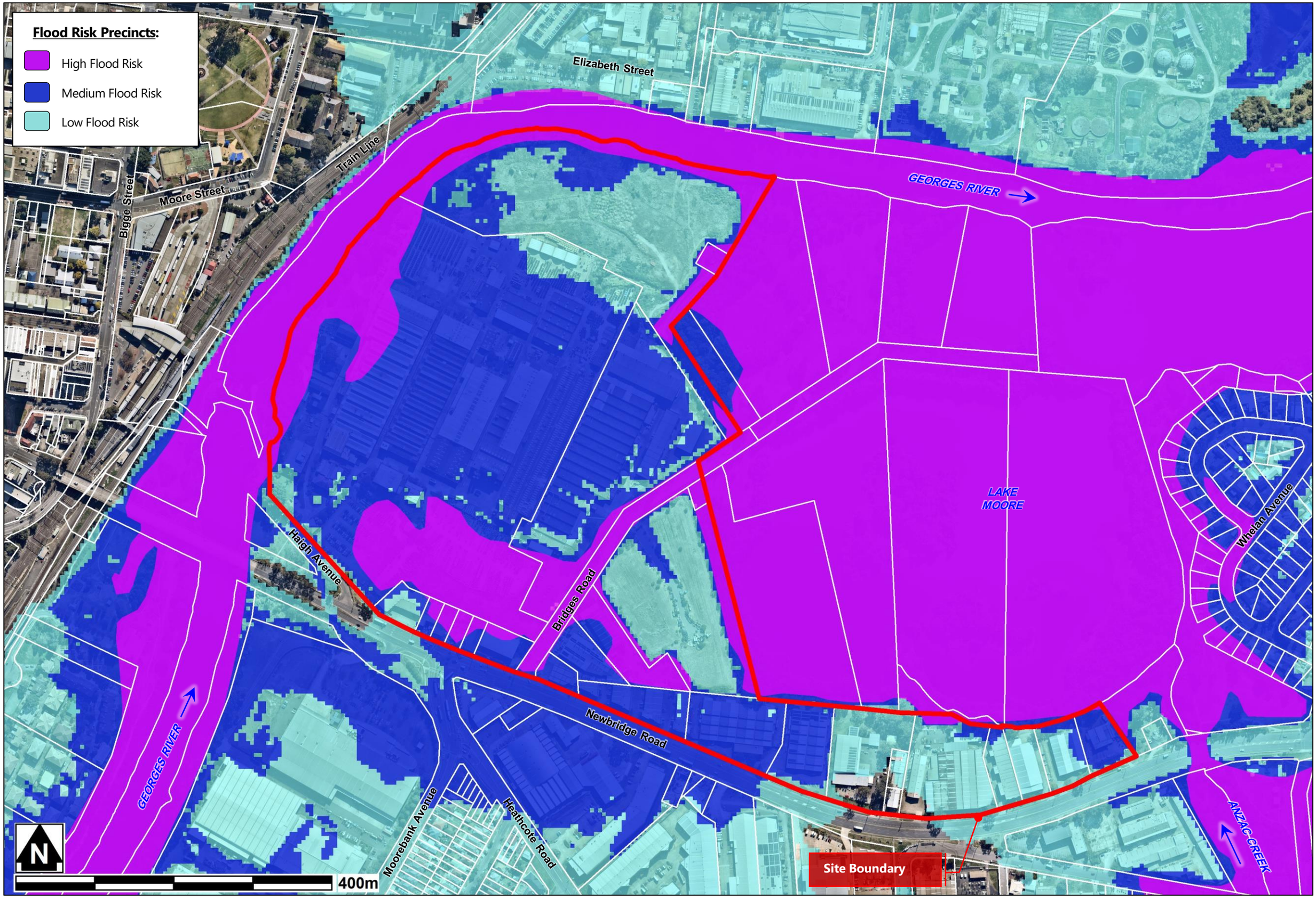
- the predicted flood hazard, which considers the predicted flood depths, velocities and the combined effects of both; and,
- the potential risks associated with limited warning time and evacuation difficulties such as potential for isolation.

Flood risk mapping for the Liverpool City Council LGA is based on the categorisation of flooding into three different grades – High, Medium and Low. The definitions of Flood Risk Precincts adopted by Council are as follows.

- **High Flood Risk Precinct** – Those parts of the floodplain below the predicted 1% AEP flood level and subject to a high flood hazard in the design 1% AEP flood (*in accordance with the provisional criteria outlined in the Floodplain Development Manual 2005*). The High Flood Risk Precinct is where significant flood damages, risk to life and evacuation constraints (*such as potential risk of isolation*) are predicted. Development is to be restricted in this precinct.
- **Medium Flood Risk Precinct** – Those parts of the floodplain below the predicted 1% AEP flood level and subject to low flood hazard in the design 1% AEP flood (*in accordance with the provisional criteria outlined in the Floodplain Development Manual 2005*). Flood risks are still significant in this zone however, with appropriate development controls and planning can be minimised.
- **Low Flood Risk Precinct** – Refers to all other Flood Prone Land (*i.e., up to and including the Probable Maximum Flood*) not identified as Medium or High Flood Risk. The potential for flood damages and risk to life are low within the Precinct.

Flood Risk Precinct mapping is presented in **Figures 3.20** for the Moore Point Precinct. The mapping is provisional only as it does not include a detailed review of evacuation constraints based on consideration of available warning times and any Flood Emergency Response Planning Classifications determined for the area by SES.

Figure 3.20 indicates that the majority of the Moore Point Precinct is categorised as having a 'Medium Flood Risk'. Although there are some areas of 'High Flood Risk', these are typically limited to the edges of the site or to areas of higher localised flood depths such as the area north of Newbridge Road.



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FLOOD RISK PRECINCTS FOR EXISTING CONDITIONS

3.3.7 Gateway Determination – Impact of Climate Change

The Gateway Determination report issued by DPE in April 2023, includes a recommendation stating that the impact of climate change on the development needs to be considered. In general, climate change is predicted to result in more frequent flooding and higher flood levels due to increases in the intensity and frequency of flood-producing rainfall events. Sea level rise is also predicted to lead to higher tidal levels which could influence predicted flood levels in the vicinity of Moore Point.

Section 2.6.2 of Guideline FB01 which is one of the supporting documents that form the Toolkit for the recently published NSW *Floodplain Risk Management Manual* (2023), provides some guidance on how climate change should be considered for new development. The guideline advocates a practical approach for studies completed under the Floodplain Management Program whereby the 1 in 200 AEP and/or 1 in 500 AEP design events are used as proxies for understanding the potential impact of climate change. This is based on the 1 in 200 and 1 in 500 AEP events typically having in the order of 15% and 30% more rainfall than the current estimate of the rainfall required to generate a present day 1% AEP flood.

Section 7.7 of the *Georges River Flood Study* (2020) provides an assessment of climate change that is based on an approach that is similar to the approach recommended in Guideline FB01. In that regard, the 2020 Flood Study proposed that the 1 in 200 and 1 in 500 AEP events be adopted as future climate change scenarios based on the 24-hour rainfall totals for each being 8-9% and 21-23% higher than the 1% AEP rainfall depths, respectively. These changes in rainfall match well to the forecast typical changes presented in Table 4 of FB01 for '*East Coast South*' region for years up to and including 2080.

Therefore, it is considered appropriate to adopt the 1 in 500 AEP event as being representative of the year 2080 1% AEP event, and for it to be used to characterise the potential impact of climate change on flooding along the Georges River and across the Moore Point Precinct.

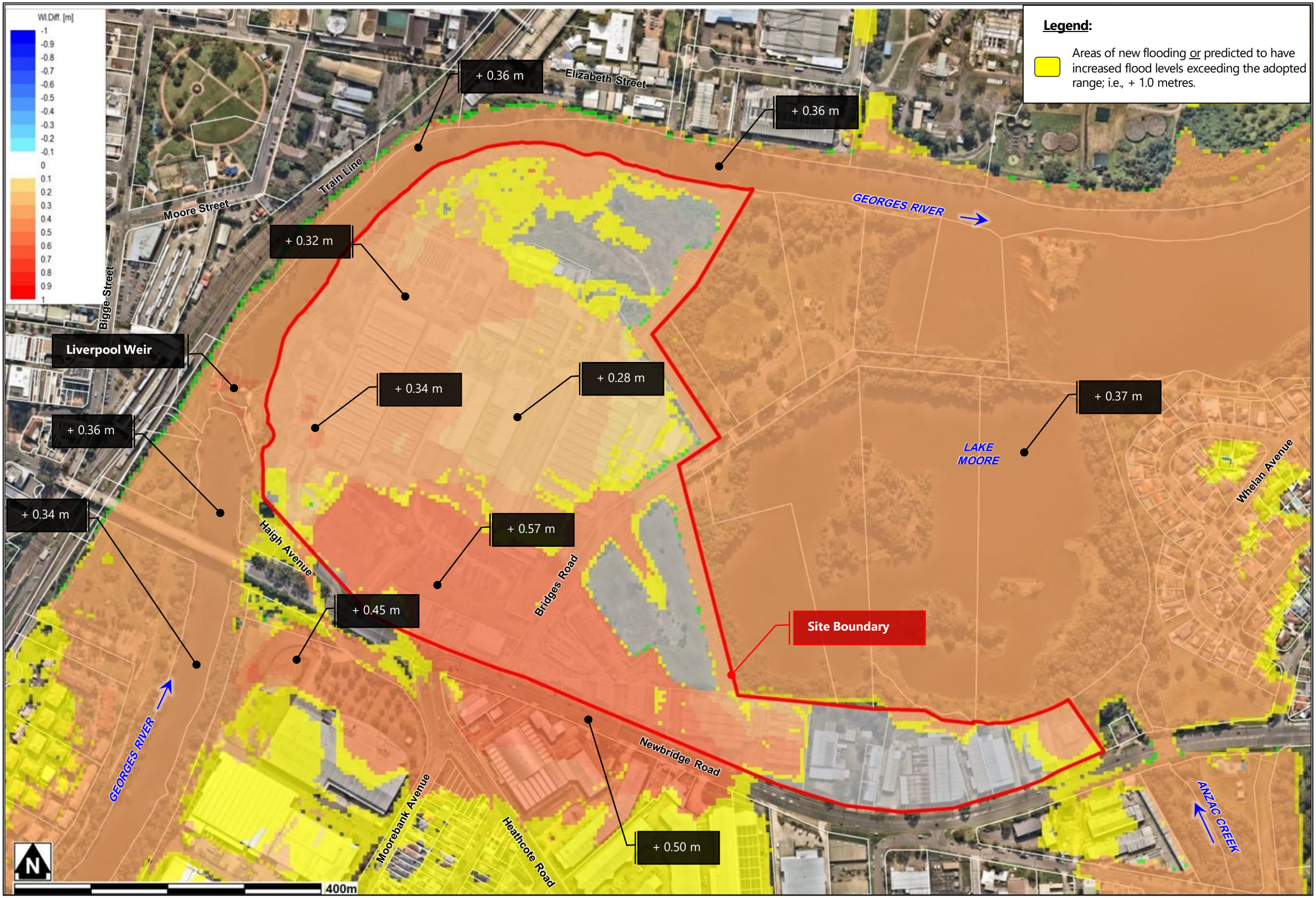
Predicted flood levels and extents for the 1 in 500 AEP flood are presented in **Figure 3.8**. The differences in flood levels between this climate change scenario and the present day 1% AEP flood are presented in **Figure 3.21**. The flood level difference mapping shows that climate change could lead to flood level increases that range between 0.28 and 0.57 metres across the Moore Point Precinct. The differences are highest across the southern parts of the site where the increase in flood flows reaching Newbridge Road leads to some backing up of floodwaters (*refer* **Figure 3.21**).

3.3.8 Gateway Determination – 1 in 5000 AEP Event

Consideration of extreme events in the management of flood risk is common practice and an existing requirement of many local and state government policies and guidelines, including the *NSW Flood Risk Management Manual* (2023). As a result, many government funded flood studies and floodplain risk management studies include the results of modelling of events rarer than the 1% AEP flood. It is common for floods such as the 1 in 200 AEP, 1 in 500 AEP and the Probable Maximum Flood (PMF) to be assessed and the results used to assist in determining requirements for flood emergency response management for flood affected communities.

The *Georges River Flood Study* (2020) and these investigations for the Moore Point Precinct are no exception to this with hydrologic and hydraulic modelling included for the 1 in 500 AEP and Probable Maximum Flood (PMF) events.

FIGURE 3.21



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PREDICTED CHANGE TO PEAK 1% AEP FLOOD LEVELS DUE TO CLIMATE CHANGE FOR EXISTING CONDITIONS

However, the Gateway Determination for the Moore Point Precinct Planning Proposal determined the need for the 1 in 5000 AEP event to also be assessed in order to provide a more complete understanding of the potential flood risk. It is understood that this requirement arose from a need to conform with '*Recommendation 18*' of the 2022 NSW Flood Inquiry (refer *2022 Flood Inquiry – Volume 2: Full Report* (2022)).

Recommendation 18 indicates that all future studies should incorporate a risk-based approach to determine the flood planning level and that this approach should take into consideration the 1% AEP, 1 in 5000 AEP and the PMF events; in addition to other development related considerations.

The recommendation for consideration of a 1 in 5000 AEP event appears to have arisen in response to the severity of flooding that occurred in the Wilsons and Richmond River valleys in February and March of 2022, particularly in the vicinity of Lismore. Analysis of rainfall recorded between 28th February and 4th March 2022 at 25 gauges located in the Wilsons and Richmond River Valleys, indicates that 13 of those gauges recorded rainfall which is estimated over 24 and 36 hour durations as having an annual exceedance probability in the order of 1 in 2000 (*Thomas, 2022*).

Flood levels along the Wilsons River at Lismore reached levels more than 2 metres higher than the 1954 flood which up until that time was the highest recorded flood and is approximately equivalent to the 1% AEP event. The flood in the Wilsons River at Lismore on 28th February 2022 is estimated to be between a 1 in 500 and a 1 in 1000 AEP event.

While analysis of events such as the 1 in 200 and 1 in 500 AEP floods is commonly undertaken for flood studies and flood risk planning, it is not customary to consider rarer floods between the 1 in 500 AEP and the PMF. The NSW Flood Inquiry determined that in light of the devastating floods in 2022 and their impact on communities, that the failure to adequately consider floods between the 1 in 500 AEP and the PMF is a major shortcoming of current practice. Accordingly, it was recommended that a rarer flood such as the 1 in 5000 AEP flood should be included in all future assessments to determine flood planning levels and for flood emergency response management.

The following sections outline the adopted inflows and results of simulations of a 1 in 5000 AEP flood in the upper Georges River.

Adopted Inflows – 1 in 5000 AEP Flood

Section 6.5.2 of the *Georges River Flood Study* (2020) provides information on the estimation of design flood flows along the Georges River for very rare and extreme flood events. The log chart shown in **Plate 3.3** has been extracted from the 2020 Flood Study. The chart provides an estimate of peak flows along the Georges River at Liverpool Weir (*adjacent to the Moore Point Precinct*) for very rare to extreme flood events. The estimate of flows is based on interpolation between flows derived for the 1 in 500 AEP event and the PMF.

As shown in **Plate 3.3**, the 2020 Flood Study estimates a peak flow of 2,440 m^3/s for the 1 in 5000 AEP event at Liverpool Weir. This flow is approximately 30% and 15% larger than the peak flows derived for the 1% AEP and 1 in 500 AEP events at the same location.

Therefore, a peak flow of 2,440 m^3/s was adopted for simulation of the 1 in 5000 AEP event. The design flood hydrograph for the 1 in 5000 AEP event was based on scaling up of the 1% AEP design flood hydrograph. All other local inflows to the truncated TUFLOW model were also scaled up by a similar factor.

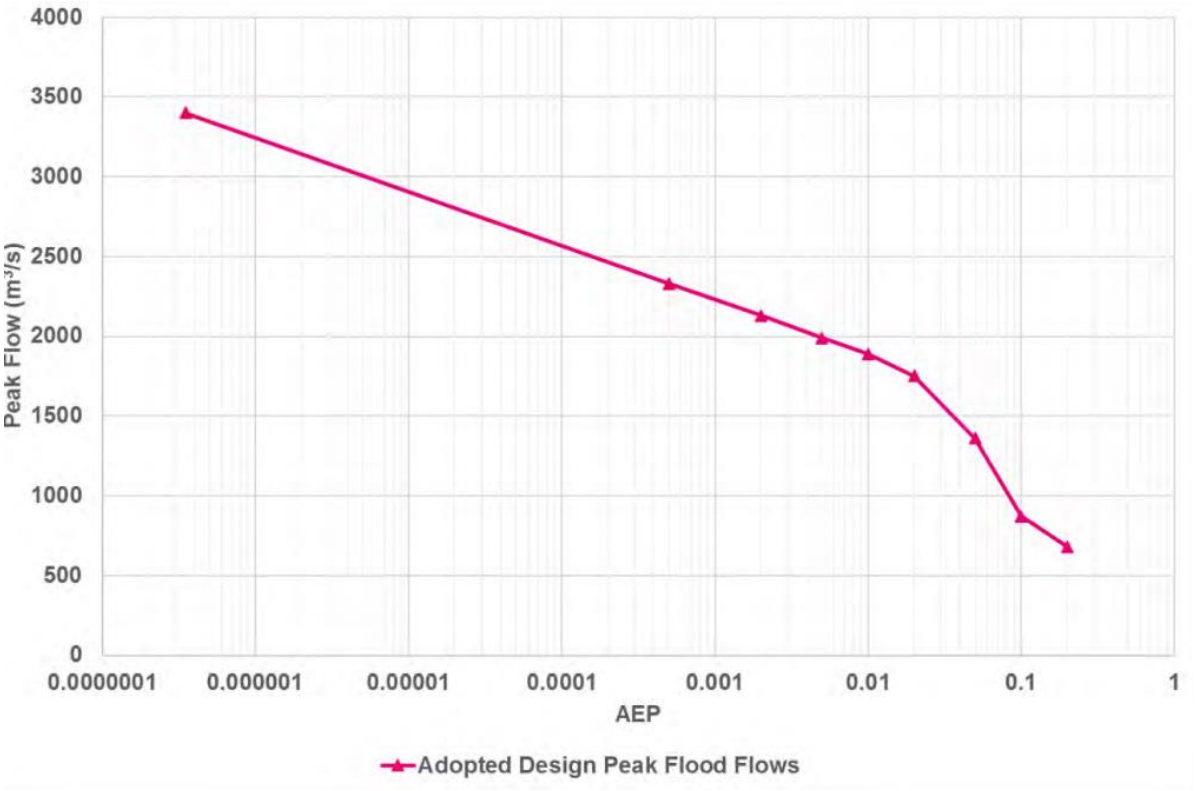


Plate 3.3 Estimation of Peak Flows for Very Rare to Extreme Flood Events for the Georges River at Liverpool Weir
Source: 'Georges River Flood Study' (BMT, 2020)

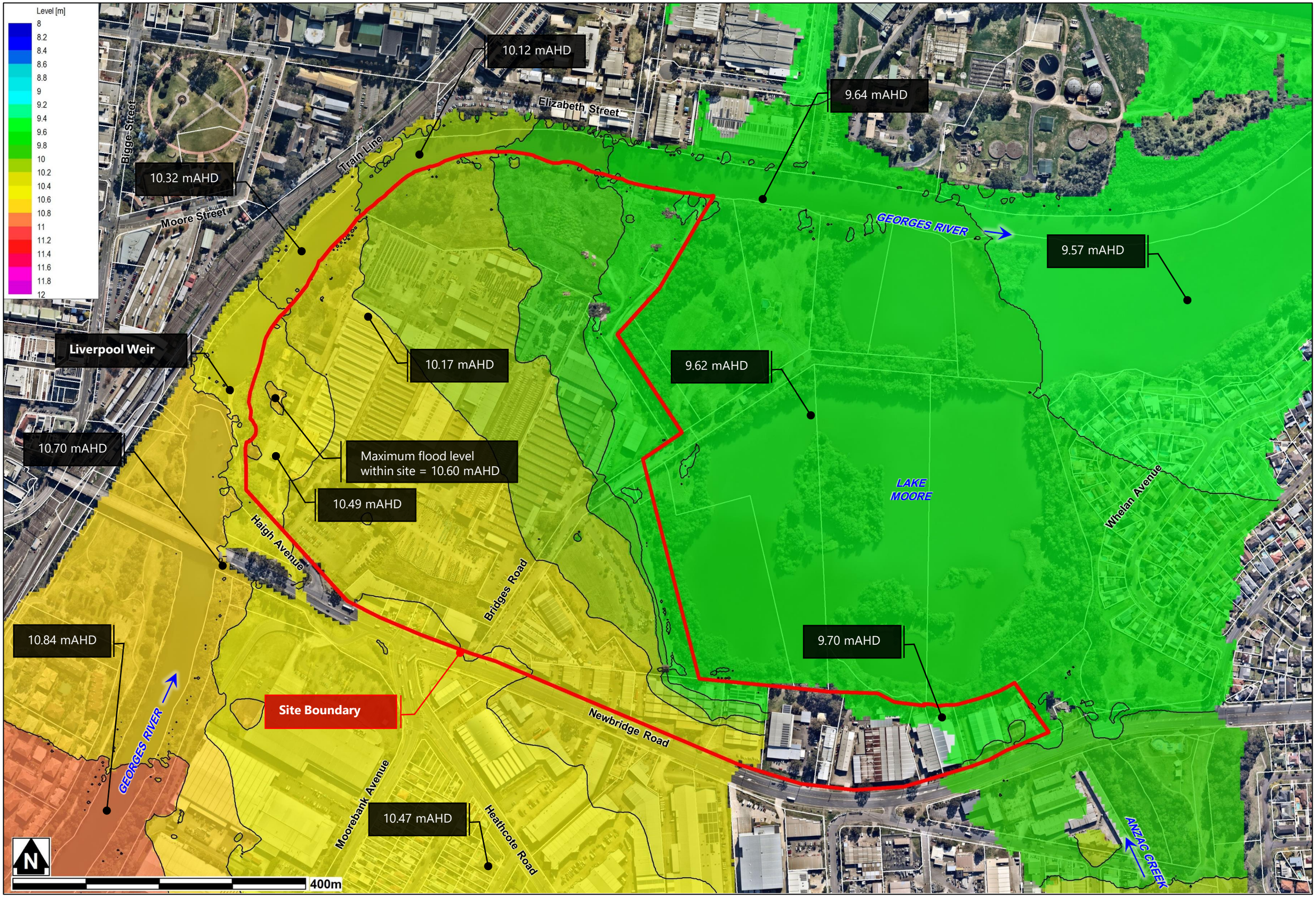
Modelling Results – 1 in 5000 AEP Flood

Predicted peak flood levels and extents for the 1 in 5000 AEP flood have been extracted from the modelling results and are presented in **Figure 3.22**. The mapping shows that floodwaters are predicted to inundate most of the site. Only a small area of the elevated section of Newbridge Road near the Georges River crossing is predicted to remain dry.

The results indicate that 1 in 5000 AEP flood levels are generally between 1.0 and 1.3 metres higher than for the 1% AEP flood. A maximum flood level of 10.60 mAHD is predicted across the Precinct.

Predicted flood depths and flow velocities have also been extracted from the modelling results and are presented in **Figure 3.23**. The mapping shows that flow velocities are highest around the peripheries of the Precinct and along Bridges Road. This is similar to the 1 in 500 AEP event and is influenced by the presence of the industrial building located in the centre of the Precinct which act as a significant barrier to overland flows which might otherwise short-circuit the meander bend downstream of Liverpool Weir and flow through the site.

FIGURE 3.22



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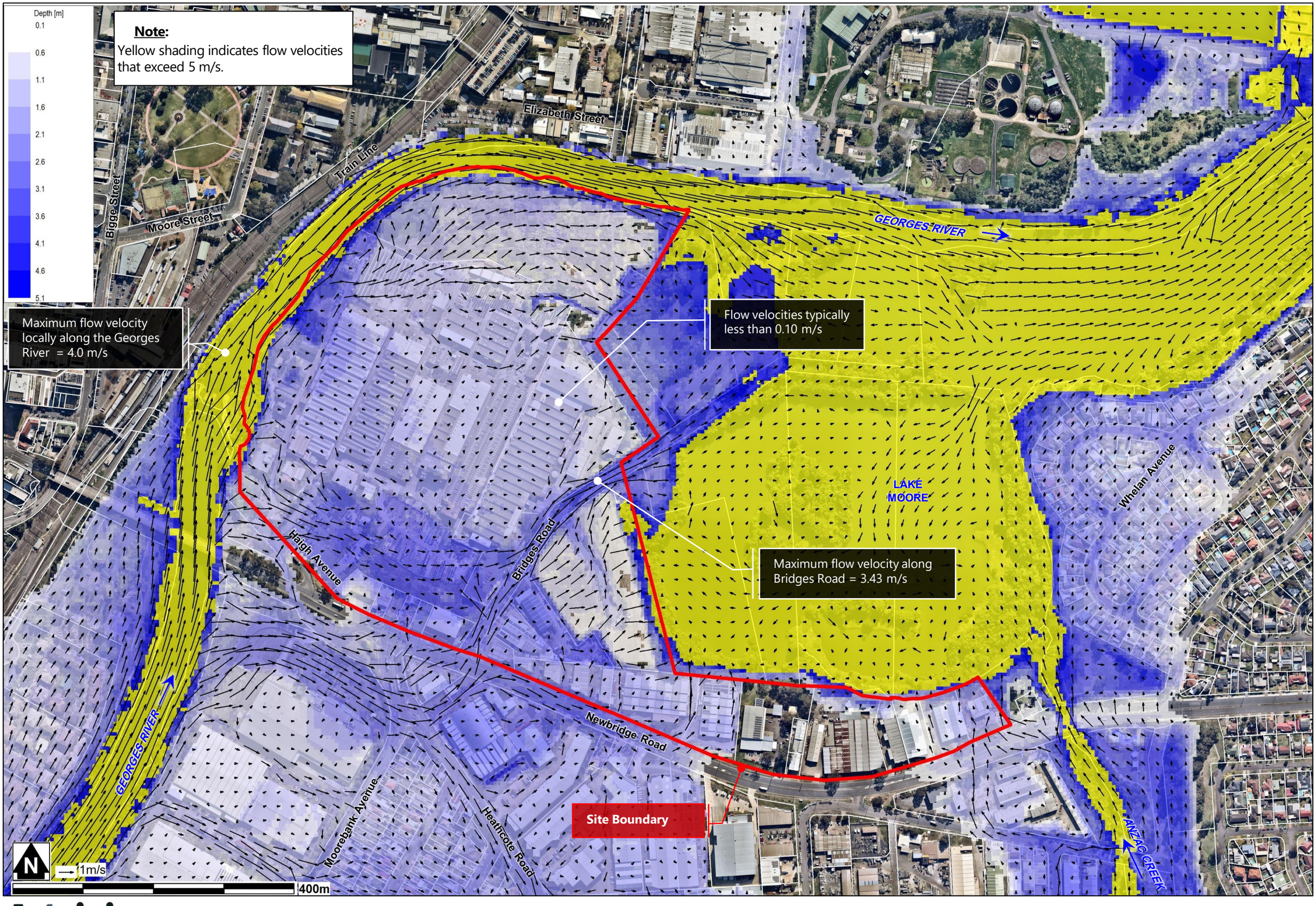
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 1 IN 5000 AEP DESIGN EVENT FOR EXISTING CONDITIONS

FIGURE 3.23



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PREDICTED FLOOD DEPTHS AND FLOW VELOCITIES AT THE PEAK OF 1 IN 5000 AEP DESIGN EVENT FOR EXISTING CONDITIONS

4 Impact of the Proposed Development on Flood Characteristics

4.1 Description of the Proposed Development

The proposed layout of the Moore Point Precinct development is shown in **Figure 4.1**. As shown, development is proposed across a large proportion of the Precinct with about 30% of the land area to be retained at its current elevation and used for open space. The development layout shows the internal road network, locations of landscaping, parks and paved areas as well as areas set aside for rehabilitation of the Georges River foreshore.

Under post-development conditions the Precinct will primarily be accessed via Newbridge Road with connections at Bridges Road and another unnamed road to the east. A further connection is proposed to Haigh Avenue to the west of the Precinct (*refer* **Figure 4.1**). Detailed master plan drawings showing the proposed redevelopment of the precinct are included in **Appendix A**.

The post-development landform proposed across the Moore Point Precinct is shown in **Figure 4.2**. The extent of filling and excavation required to achieve this landform is shown in **Figure 4.3**. The fill proposal has been designed to create a landform that is raised above the flood planning level where habitable structures are proposed. However, it has also been designed to improve bank stabilisation and provide safe access to the foreshore of the river.

As shown in **Figure 4.3**, excavation is proposed along the Georges River foreshore with depths of cut typically ranging between 2 and 3 metres. A maximum excavation depth of 4.6 metres is proposed along the foreshore near the north-eastern corner of the Precinct.

Filling is proposed across much of the remainder of the Precinct with typical depths of fill ranging between 0.5 and 1.5 metres. As shown in **Figure 4.3**, the greatest depths of fill are generally proposed to the north of Haigh Avenue and along Bridges Road. Depths of fill of up to 2.6 metres are proposed at both locations. A maximum depth of fill of 5 metres is proposed along the eastern Precinct boundary adjacent to the foreshore of Lake Moore.

4.2 Flood Mitigation

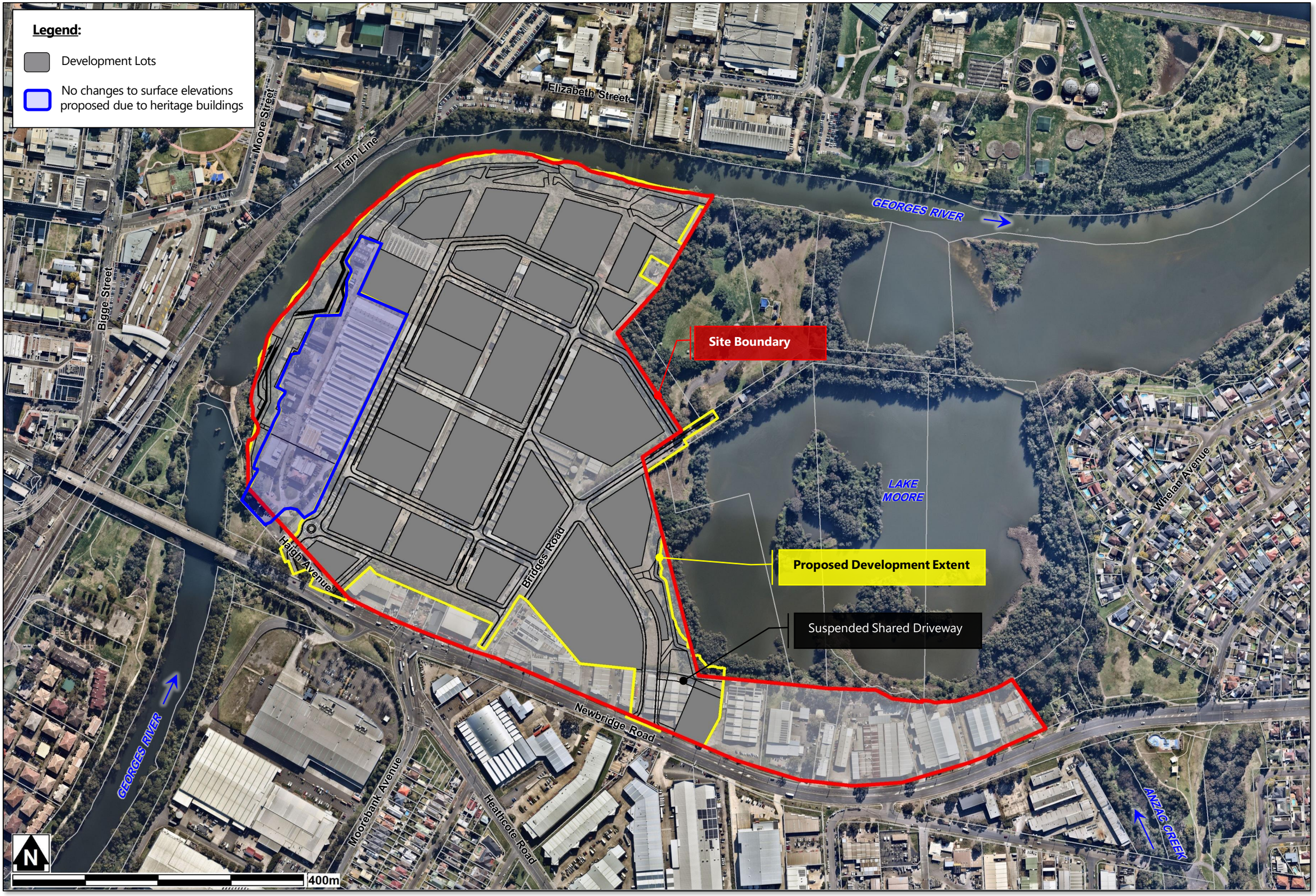
As established in **Section 3**, there is potential for floodwaters to break the banks of the Georges River leading to inundation of the Moore Point Precinct (in its present state). Although inundation is only minor for events up to the 1% AEP flood, the Precinct is predicted to be entirely inundated during the adopted PMF.

Based on the flow distributions discussed in **Section 3.3.1** and shown in **Figure 3.5**, it is evident that under existing conditions floodwaters flow through the Moore Point Precinct during floods including and exceeding a 1% AEP event. Although the magnitude of flow passing through the Precinct is initially low with only 10 m^3/s (0.6% of the flow) travelling overland during a 1% AEP event, this increases to 87 m^3/s (4.5%) and 220 m^3/s (circa 10%) during a 1 in 500 AEP event and the adopted PMF, respectively (*refer* **Figure 3.5**).

In recognising that the proposed development could reduce the magnitude of flow passing through the Precinct the following flood mitigation measures were incorporated into the development.

- Excavation of the Moore Point Precinct foreshore to provide compensatory flood storage and to offset any reduction in conveyance capacity through the Precinct; and,

FIGURE 4.1



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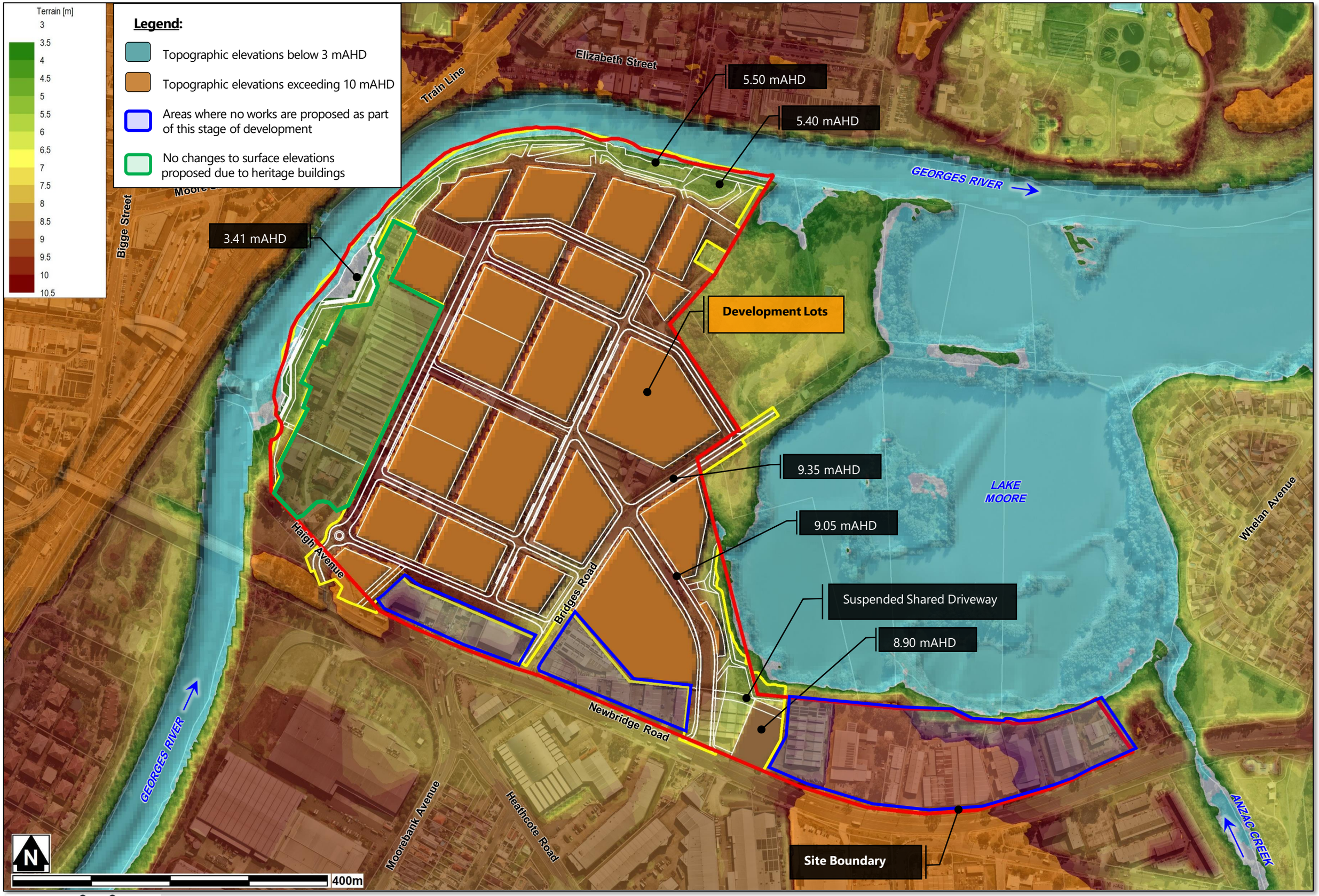
MOORE POINT PRECINCT
DEVELOPMENT LAYOUT

FIGURE 4.2



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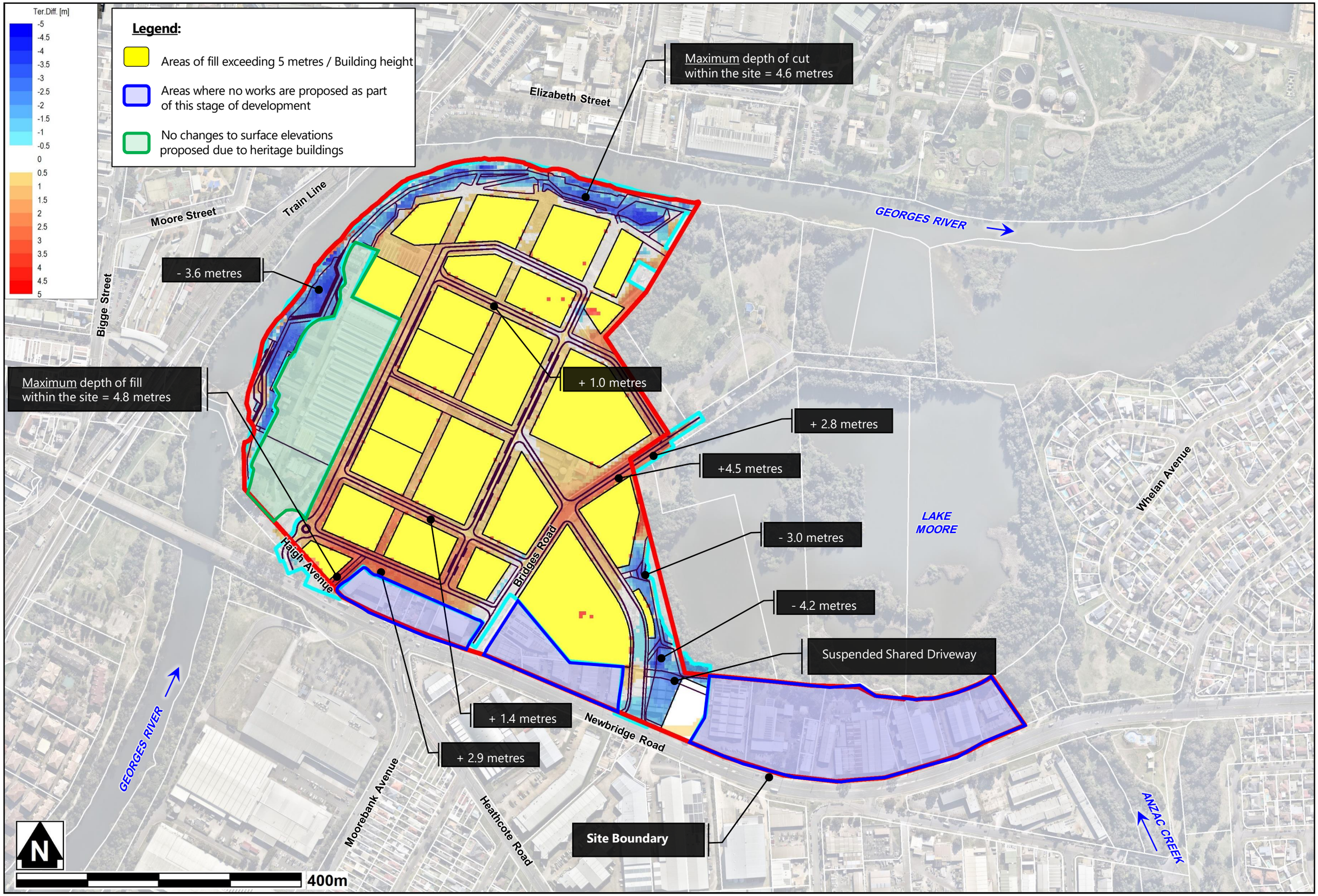
MOORE POINT PRECINCT
POST-DEVELOPMENT TOPOGRAPHY

FIGURE 4.3



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PROPOSED CUT AND FILL DEPTHS FOR THE POST-DEVELOPMENT SCENARIO

- Overland Flow Route between Newbridge Road and Lake Moore to allow floodwaters approaching from the south-west to escape to Lake Moore and onwards (*refer* **Plate 4.1**).

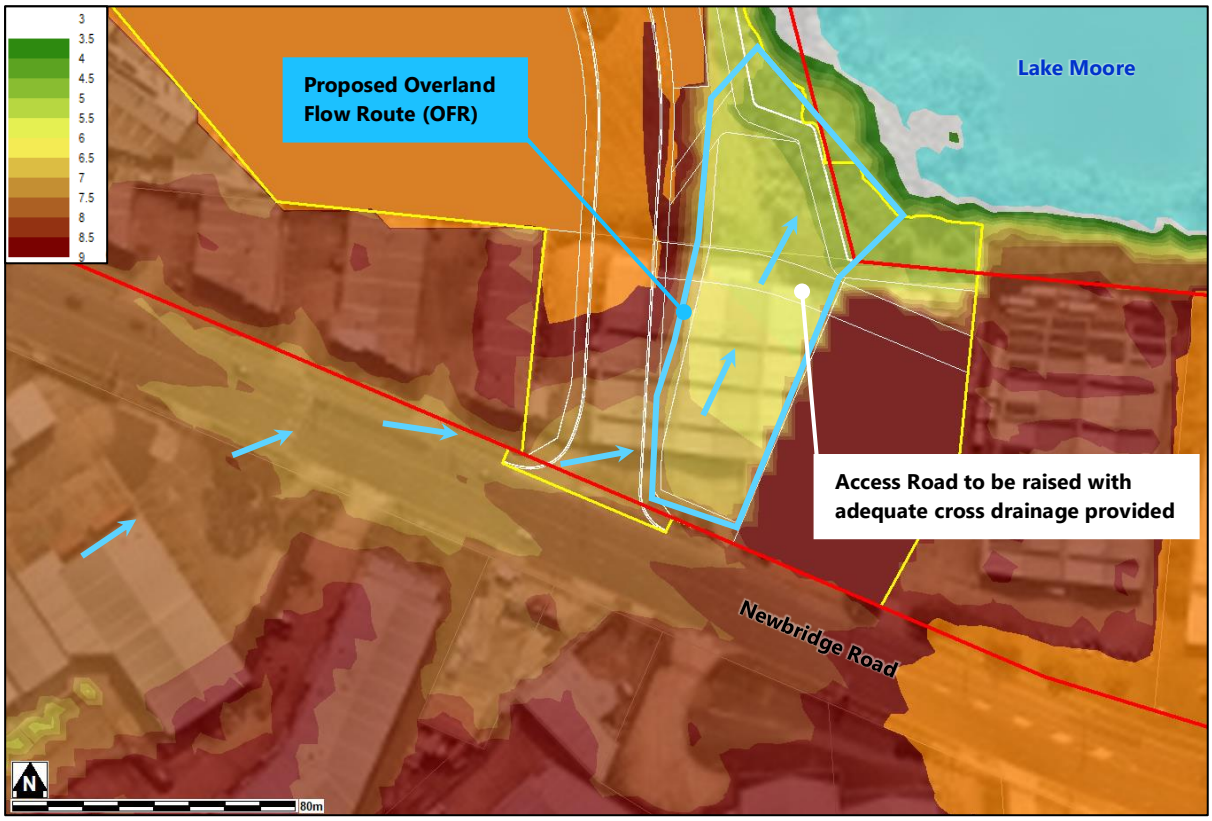


Plate 4.1 Topography along the Proposed Overland Flow Route Relative to the 'sag' along Newbridge Road

The proposed overland flow route will also benefit numerous industrial, commercial, and residential properties located on the floodplain upstream of Newbridge Road by reducing flood levels and extents. These properties are identified by Liverpool City Council as flood prone under existing conditions (*BMT,* 2020). Construction of the proposed overland flow route would reduce flood impacts experienced at these properties during floods of the magnitude of the 1% AEP and 1 in 500 AEP events.

The proposed overland flow route could also reduce local runoff and ponding issues along Newbridge Road at the 'sag' that exists to the south of the Precinct near the intersection with Bridges Road (*refer* **Plate 4.1**). Historically this section of Newbridge Road experiences local stormwater issues during heavy rain due to runoff being "trapped" in the the 'sag' point. Although not proposed for this purpose, the overland flow route could also alleviate this local stormwater issue.

Details of the proposed foreshore excavation, including the finished surface elevations and proposed depths of cut and/or fill are shown in **Figures 4.2** to **4.3**.

An alternate flood mitigation approach has been assessed for the development that incorporates a flood mitigation levee upstream of Newbridge Road in lieu of the overland flow route. Flood modelling results for this mitigation approach are documented in '*Moore Point Precinct, Liverpool – Flood Impact and Risk Assessment*' (July 2022) which was submitted with the Moore Point Precinct Planning Proposal (PP-2022-1602) that was lodged for Gateway Determination in May 2022.

Although the flood mitigation levee was found to be an effective measure that could benefit existing residential, commercial and industrial developments upstream of Newbridge Road, it would have required construction along the banks of the Georges River in an area outside of the Precinct. Hence, an investigation was undertaken to assess the viability of the overland flow route outlined above.

The results of the associated analysis established that the overland flow path alternative could deliver a similar reduction in flood affectation for properties upstream of Newbridge Road. In addition, the overland flow route has the potential to alleviate local stormwater issues along Newbridge Road caused by a trapped 'sag' in the roadway leading to an improvement to current conditions.

4.3 Methodology – Post Development Modelling

The truncated TUFLOW flood model that was adopted to simulate existing conditions was modified to incorporate the proposed development. This involved the following changes.

- Modification of surface elevations across the Moore Point Precinct based on the surface elevations presented in **Figure 4.2**.
- Modification of the material roughness across the Moore Point Precinct to reflect the post-development scenario. The variation in adopted roughness for the post-development scenario is shown in **Figure 4.4**.
- Surface elevations for all building footprints were raised above the PMF level. This approach is considered conservative as it completely blocks the passage of floodwaters across the building footprints and removes any flood storage afforded by assuming that floodwaters enter the buildings.
- The proposed overland flow route between Newbridge Road and Lake Moore was incorporated as shown in **Plate 4.1** and **Figure 4.2**. The raised access road across the overland flow route was included in the modelling as a suspended roadway with culverts spanning the width of the flow path. A 10% blockage factor was incorporated for the bank of culverts beneath the access road in accordance with Book 6 of Australian Rainfall and Runoff 2019.

No changes were made to inflow hydrographs and downstream boundary conditions for modelling of post-development conditions.

4.4 Flood Modelling Results – Post-Development Conditions

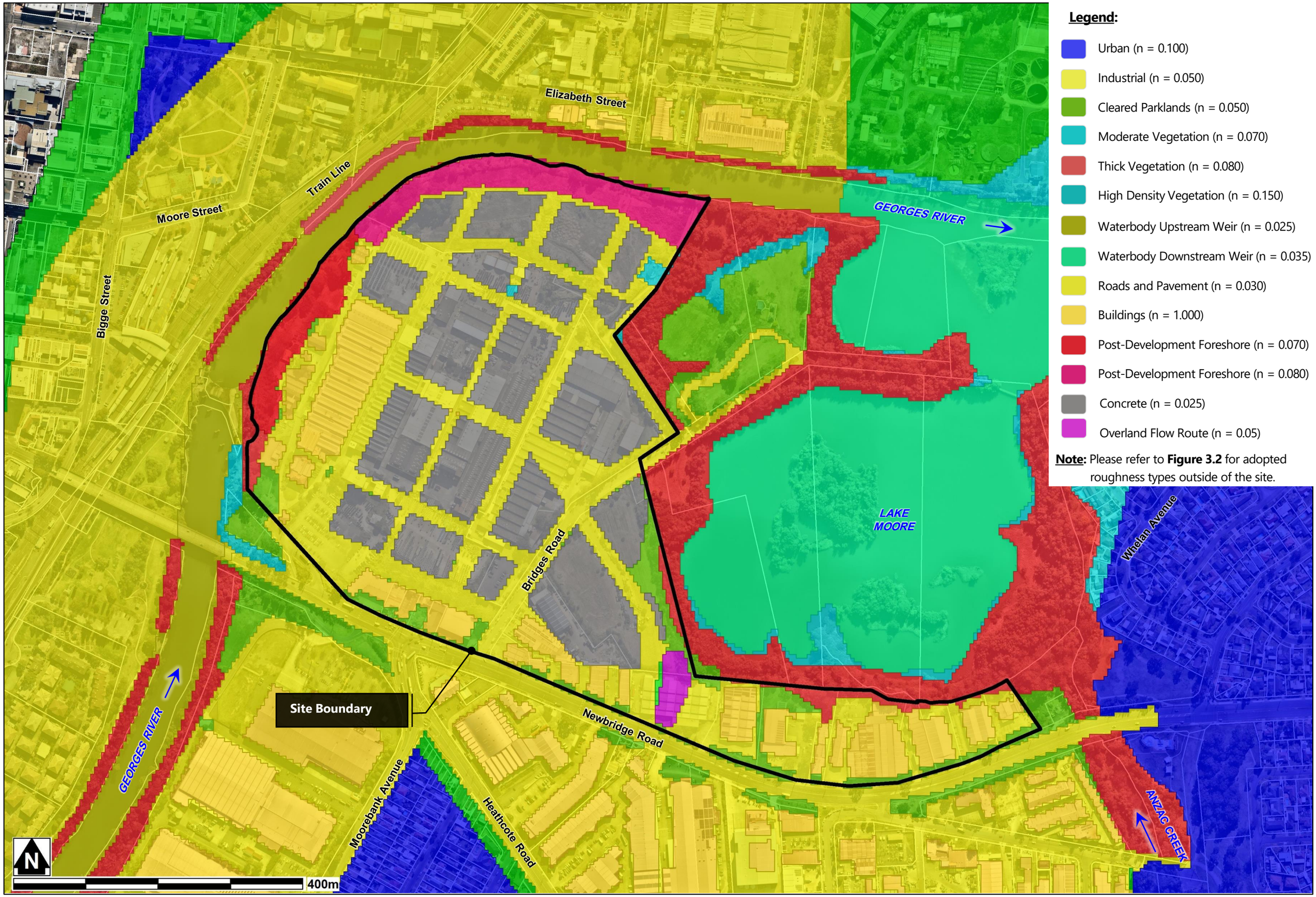
The truncated TUFLOW model for post-development conditions was used to simulate the 5%, 1% and 1 in 500 AEP design events and the adopted PMF.

The results of the modelling are discussed in the following sections in terms of the predicted peak post-development flood levels and extents and the magnitude of any changes to peak flood levels and flow velocities.

4.4.1 Peak Flood Levels and Extents

Peak flood levels for the adopted design events have been extracted from the flood modelling results and are shown in **Figures 4.5 to 4.8**.

FIGURE 4.4



Legend:

- Urban (n = 0.100)
- Industrial (n = 0.050)
- Cleared Parklands (n = 0.050)
- Moderate Vegetation (n = 0.070)
- Thick Vegetation (n = 0.080)
- High Density Vegetation (n = 0.150)
- Waterbody Upstream Weir (n = 0.025)
- Waterbody Downstream Weir (n = 0.035)
- Roads and Pavement (n = 0.030)
- Buildings (n = 1.000)
- Post-Development Foreshore (n = 0.070)
- Post-Development Foreshore (n = 0.080)
- Concrete (n = 0.025)
- Overland Flow Route (n = 0.05)

Note: Please refer to **Figure 3.2** for adopted roughness types outside of the site.

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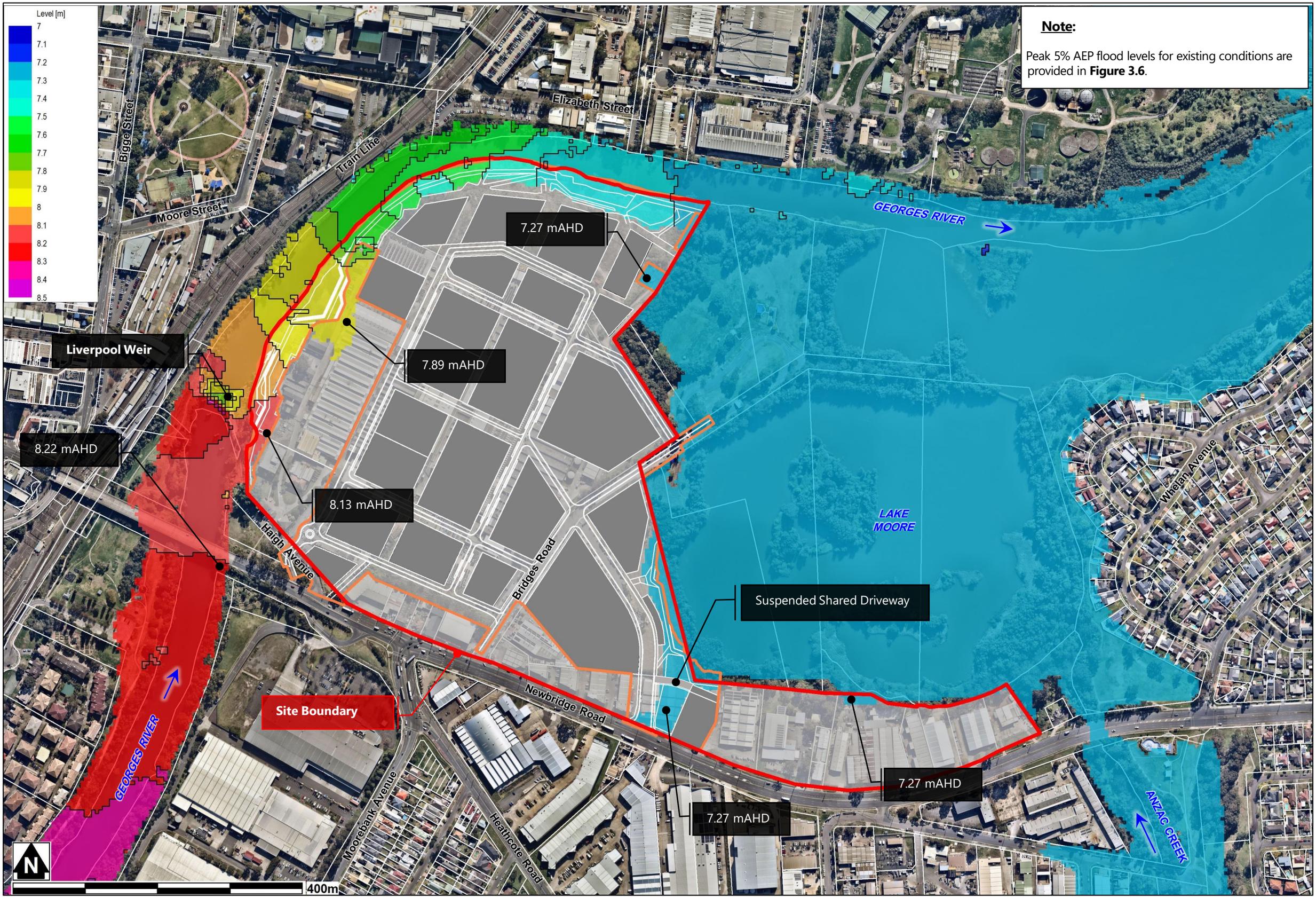
POST-DEVELOPMENT ROUGHNESS TYPES ADOPTED IN THE TRUNCATED TUFLOW MODEL

FIGURE 4.5



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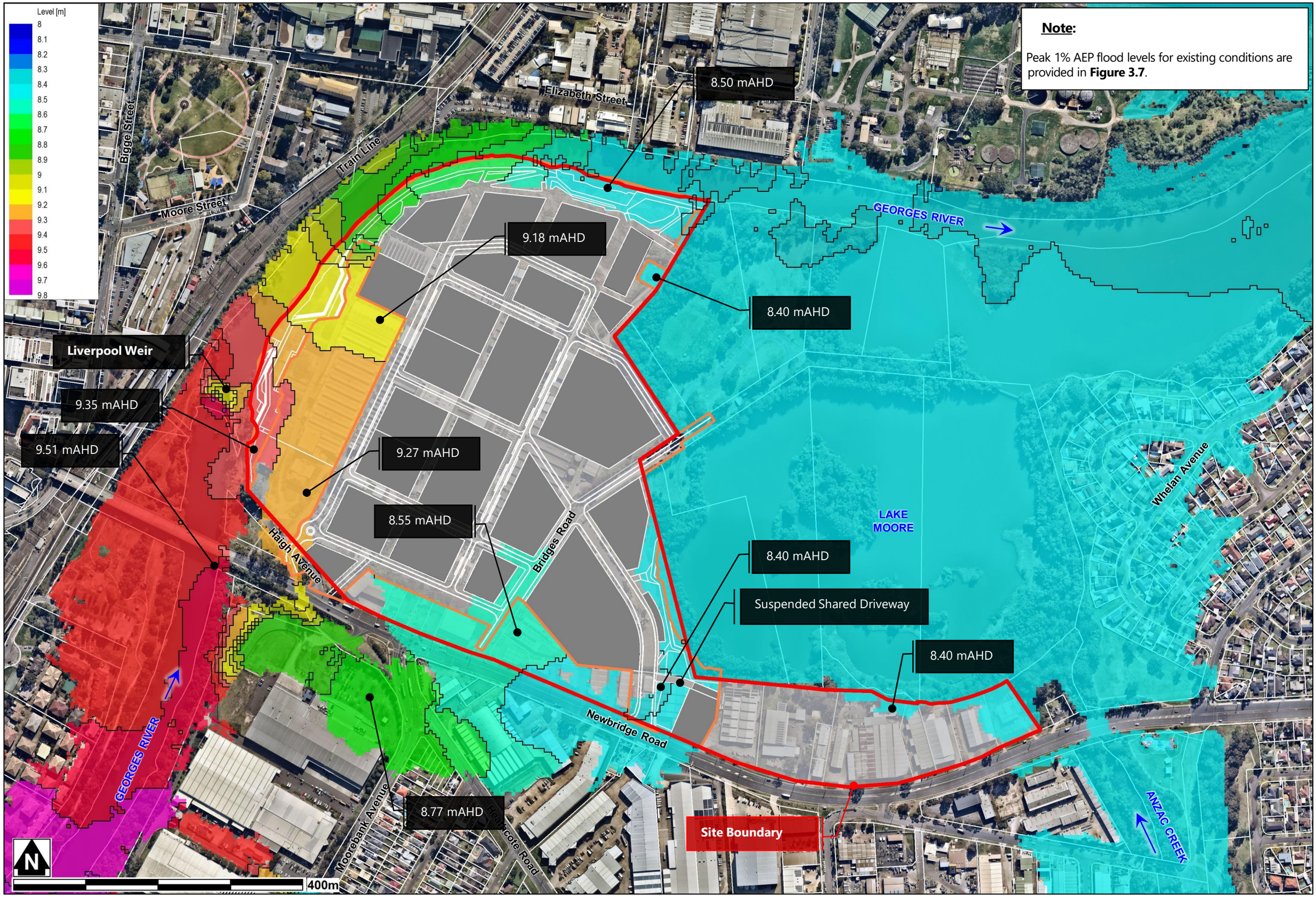
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 5% AEP DESIGN EVENT FOR POST-DEVELOPMENT CONDITIONS



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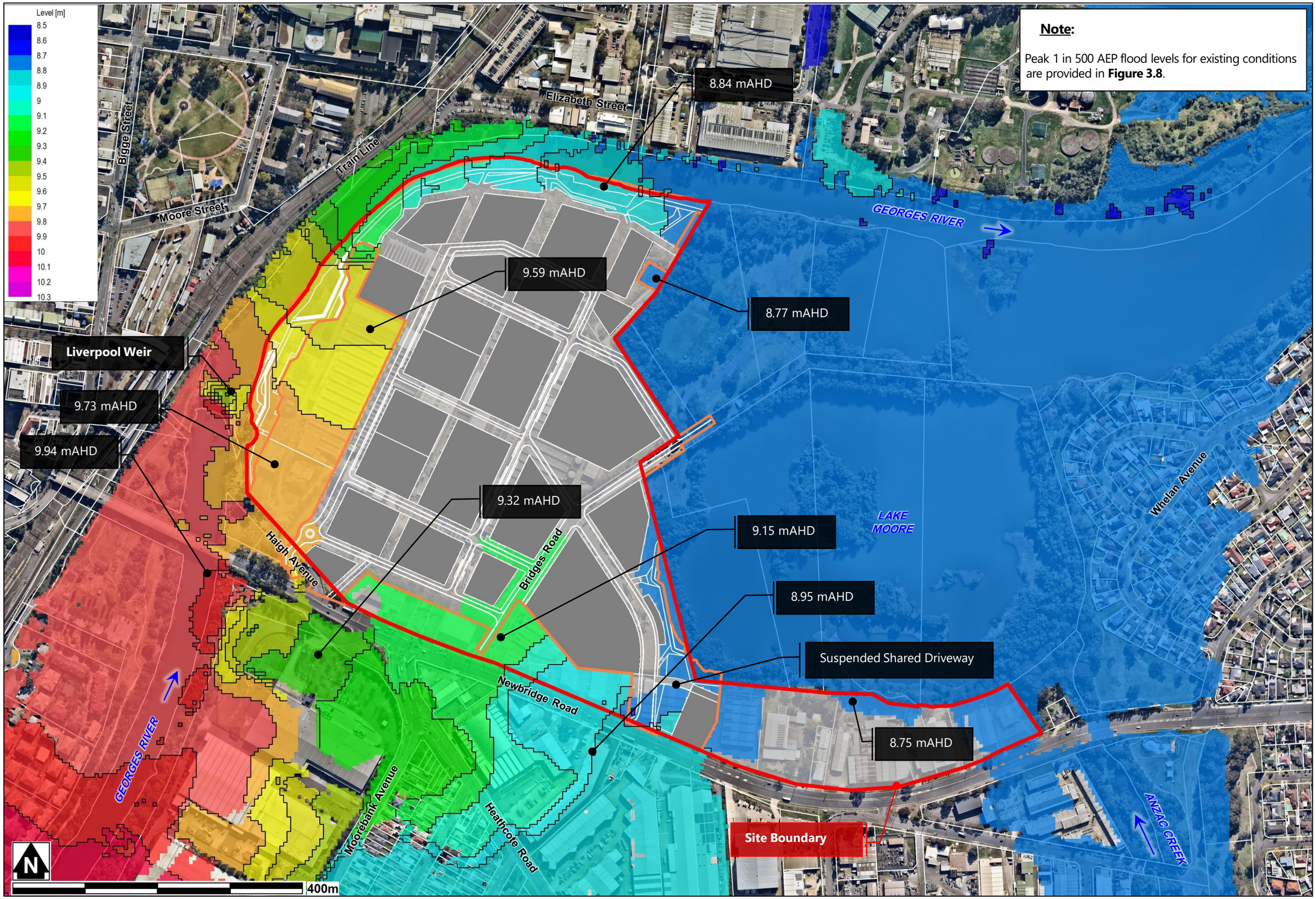
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 1% AEP DESIGN EVENT FOR POST-DEVELOPMENT CONDITIONS



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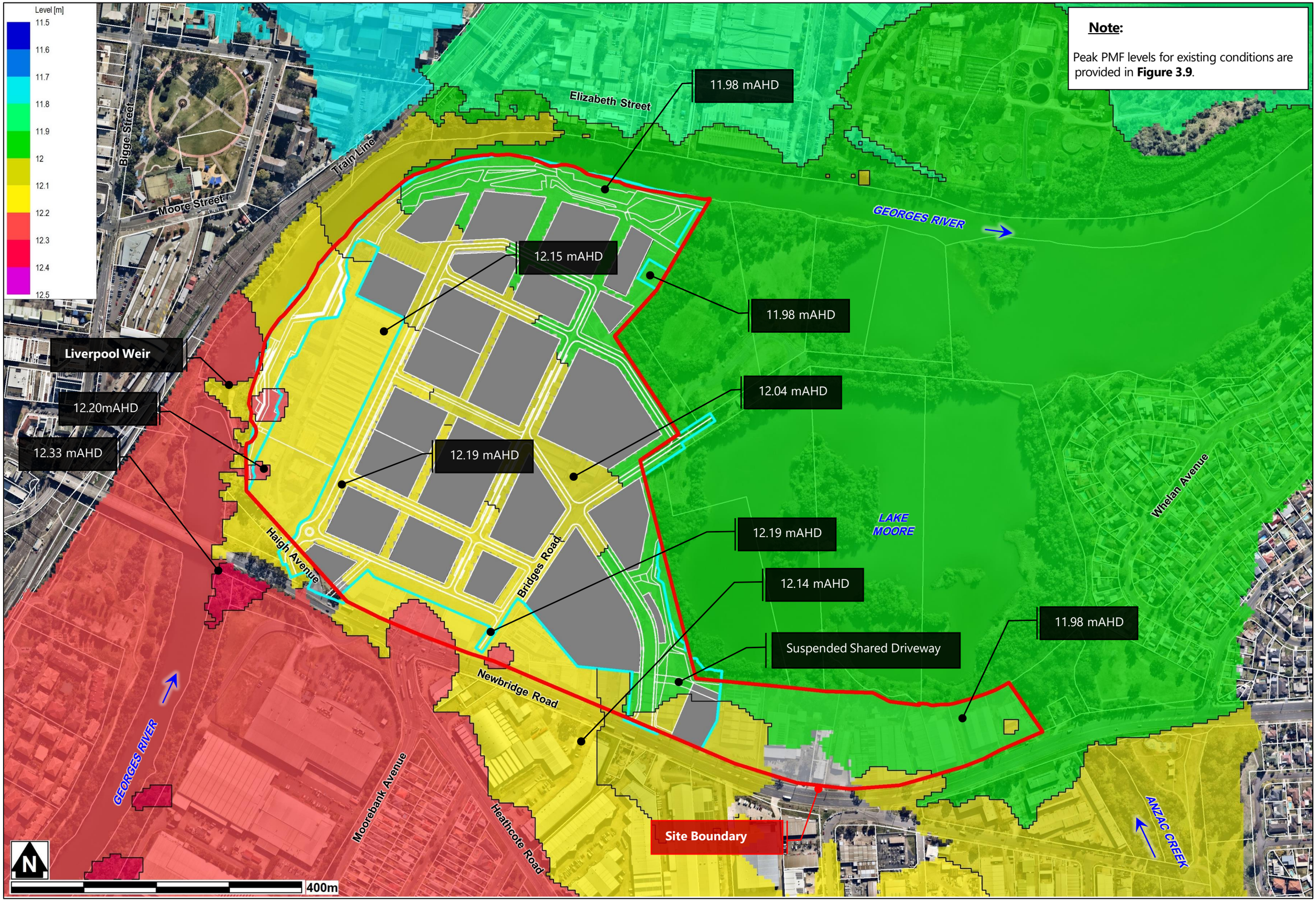
PREDICTED FLOOD LEVELS AT THE PEAK OF THE 1 IN 500 AEP DESIGN EVENT FOR POST-DEVELOPMENT CONDITIONS

FIGURE 4.8



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PREDICTED FLOOD LEVELS AT THE PEAK OF THE PMF DESIGN EVENT FOR POST-DEVELOPMENT CONDITIONS

The mapping shows that the Moore Point Precinct is predicted to remain largely flood free during floods up to and including the 1 in 500 AEP event. As shown in **Figure 4.8** for the 1 in 500 AEP event, only minor flooding is predicted to occur across the Precinct the associated inundation is limited to parts of the foreshore and areas nearest to Newbridge Road and the proposed overland flow route.

The overland flow route is predicted to alleviate flooding along Newbridge Road and in areas that connect the development site to the arterial road network, by allowing a greater volume of floodwaters to escape to Lake Moore, instead of ponding and flowing east and south-east to Anzac Creek through areas of dense existing development (*compare mapping shown on* **Figure 3.8** *and* **Figure 4.8**).

A comparison between pre and post-development flows at the locations indicated on **Plate 4.2** is included in **Table 4.1**. The flow comparison shows that the overland flow route would reduce the peak flow being diverted south by over 600%. The benefits of this on peak flood levels is discussed in the following sections.

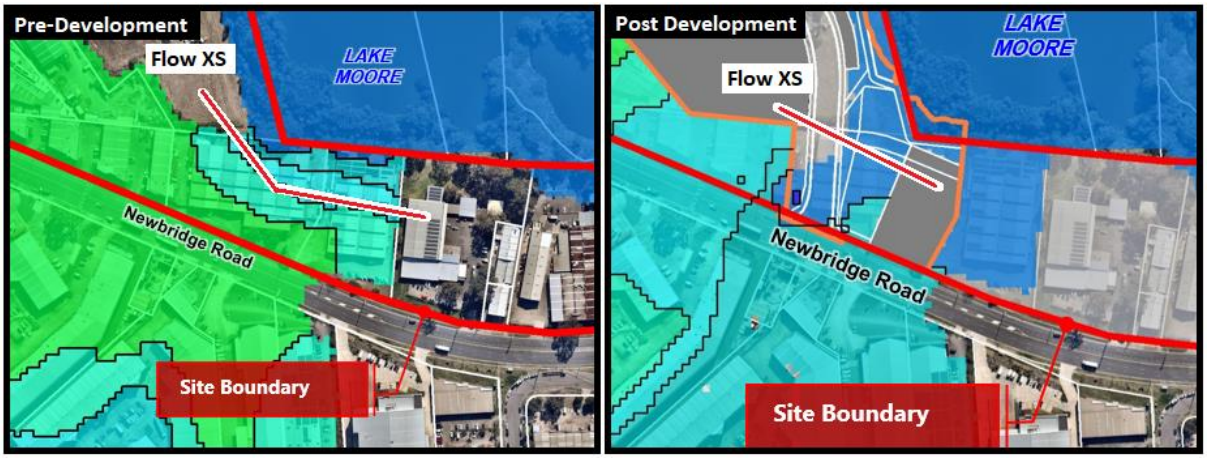


Plate 4.2 Alignment of Flow Extraction Cross-sections to Assess Performance of the Proposed Overland Flow Route

Table 4.1 Predicted Peak Flows Escaping to Lake Moore from Newbridge Road

Design Event	Predicted Peak Flow (m^3/s)	
	Pre-Development	Post-Development (*with overland flow path*)
5% AEP	NA	NA
1% AEP	1	28
1 in 500 AEP	14	86

The development is predicted to remain largely flood free during a 1 in 500 AEP event, with only the foreshore, existing heritage buildings and proposed overland flow route predicted to be inundated. Two internal roads to the south of the site are also predicted to be inundated near their respective intersection with Newbridge Road. This occurs as the raised internal roads grade back to existing elevations along Newbridge Road (*refer* **Figure 4.7**).

As shown in **Figure 4.8**, none of the areas proposed for development are inundated during a PMF. Only the roads and open space areas would experience inundation during an event of this magnitude. This demonstrates that the master plan has been developed recognising that the post-developed landform may well experience some inundation in an event as rare as the PMF, but that none of the habitable residential areas will be inundated.

4.4.2 Impact on Peak Flood Levels

Flood level difference mapping was prepared from the modelling results to quantify any changes to peak flood levels that are predicted to occur as a result of the proposed development. This effectively creates a contour map of predicted changes in peak flood levels (*i.e., increases and decreases*) and allows visual assessment of the impact of the development on existing peak flood levels.

The predicted impacts of the development on peak flood levels are discussed in the following sections for the 5%, 1% and 1 in 500 AEP events.

5% AEP Event

Flood level difference mapping for the 5% AEP event is presented in **Figure 4.9**. The mapping indicates that the proposed development would result in flood level decreases upstream of Liverpool Weir by up to 0.05 metres. Reductions of up to 0.04 metres are predicted to extend 900 metres upstream of the weir and reduce to 0.03 metres at the South Western Motorway (*M5*) bridge crossing. These reductions to peak 5% AEP flood levels are predicted to occur as a result of the proposed foreshore works which create additional flow conveyance capacity along the western and northern edges of the Precinct.

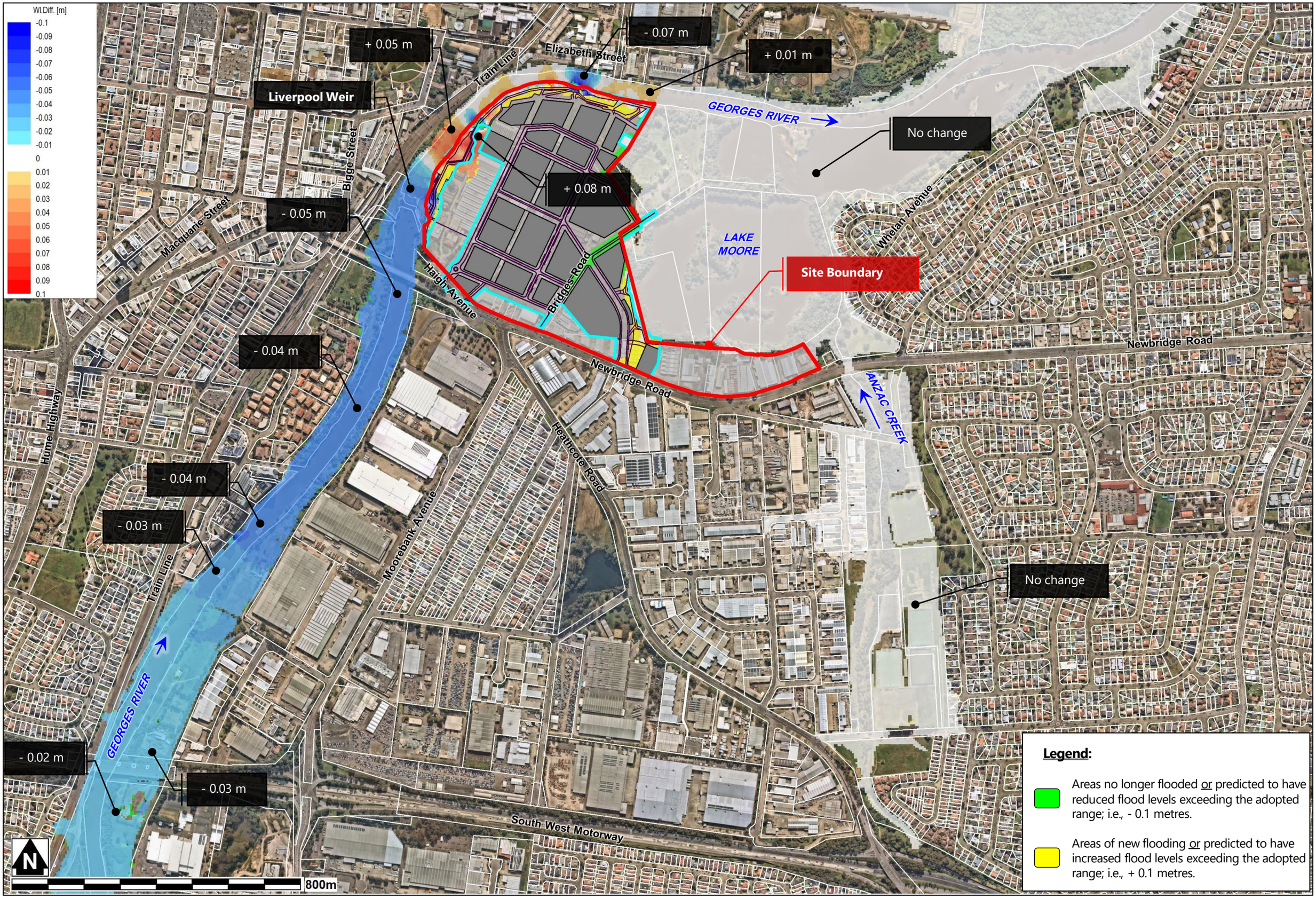
The flood level difference mapping also shows that the proposed development would result in a maximum increase in peak 5% AEP flood levels of 0.08 metres. However, this maximum increase is predicted to occur within the Moore Point Precinct in a localised area to the north-east of Liverpool Weir (*refer* **Figure 4.9**).

The maximum flood level increase that is predicted to occur outside of the Precinct has a magnitude of 0.05 metres. As shown in **Figure 4.9**, this increase is predicted to occur downstream of Liverpool Weir and occurs almost entirely within the bank to bank channel of the Georges River. No impact is predicted on adjoining properties.

Other patches of flood level increases are predicted to occur further downstream and to the north of the Moore Point Precinct. These increases do not exceed 0.04 metres in areas outside of the Precinct boundaries or more than 0.01 metres in areas beyond the bank-to-bank extent of the channel of the Georges River (*refer* **Figure 4.9**).

The development is predicted to result in no change to peak 5% AEP flood levels across Lake Moore and Anzac Creek.

FIGURE 4.9



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PREDICTED CHANGE TO PEAK 5% AEP FLOOD LEVELS AS A RESULT OF THE PROPOSED DEVELOPMENT (View 1 of 1)

1% AEP Event

Flood level difference mapping for the 1% AEP event is presented in **Figure 4.10** and **Figure 4.11**. **Figure 4.10** shows the predicted impacts across a larger spatial extent and with a smaller impact interval; i.e., showing changes to levels at intervals of 10 mm and up to +/- 0.1 metres. **Figure 4.11** focuses on the Moore Point Precinct and its immediate surrounds. A larger scale of impact is presented with intervals of 20 mm adopted for the zoomed in view in order to capture the higher impacts that are predicted within the site in the area to the east of Liverpool Weir.

As shown in **Figure 4.10**, the proposed development is predicted to result in decreases in peak 1% AEP flood levels upstream of Liverpool Weir. The decreases are predicted to be largest in the vicinity of the weir where reductions of up to 0.06 metres are predicted to occur. Decreases of up to 0.07 metres are predicted upstream of Newbridge Road and up to 0.03 metres in areas upstream of the South West Motorway (M5) crossing.

Decreases in flood levels of up to 0.20 metres are also predicted across the commercial and residential properties located to the east of the Georges River. As shown in **Figure 4.11**, the decreases of up to 0.20 metres are predicted to occur upstream of Newbridge Road and the proposed overland flow route. Elsewhere and further south of Newbridge Road, the decreases in flood levels are typically between 0.04 and 0.05 metres (*refer* **Figure 4.10**). These decreases are directly related to the decreased flood levels predicted along the Georges River between the South West Motorway (M5) and Newbridge Road which is attributed to the foreshore regrading and the proposed overland flow route.

Figure 4.10 also shows that peak 1% AEP flood levels will remain unchanged across Lake Moore and Anzac Creek with the predicted changes in level no greater than +/- 0.01 metres.

As shown in **Figure 4.11**, the development is predicted to cause a maximum increase to peak 1% AEP flood level of 0.72 metres. This increase is predicted to occur within the Moore Point Precinct in an area to the east of the weir. This increase occurs because the proposed development will block a flow path that was active under existing conditions leading to a local build-up of floodwaters. However, it is noted that the increase is localised and occurs within the boundaries of the Precinct.

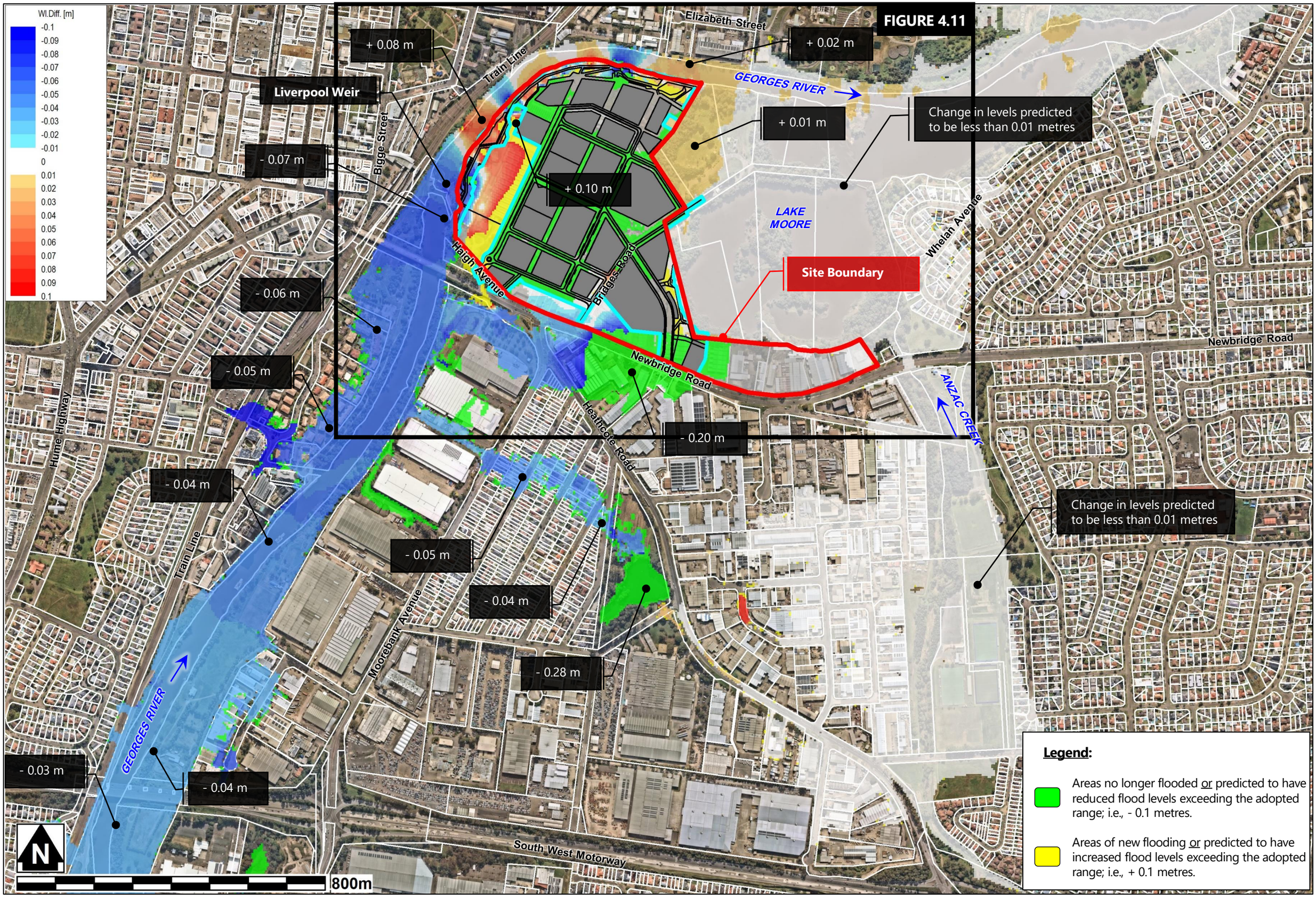
A maximum flood level increase of up to 0.08 metres is predicted outside of the site in a localised area approximately 150 metres downstream of Liverpool Weir. As shown in **Figure 4.11**, this increase is largely contained within the channel of the Georges River. The impact of this flood level increase would be negligible as it occurs in an area immediately adjacent to a steeply graded railway embankment.

Predicted increases in peak 1% AEP flood levels elsewhere are typically less than 0.02 metres and are largely contained within the Moore Point Precinct or within the channel of the Georges River.

1 in 500 AEP Event

The 1 in 500 AEP event was modelled for post-development conditions to determine the extent of impacts that could arise in a flood rarer than the flood used for planning purposes (ie., the 1% AEP flood).

Flood level difference mapping for the 1 in 500 AEP event is included as **Figure 4.12** and **Figure 4.13**. **Figure 4.12** shows that the development would lead to decreases in predicted peak 1 in 500 AEP flood levels upstream of Newbridge Road, both along the Georges River and across the Industrial, commercial and residential areas to the east.



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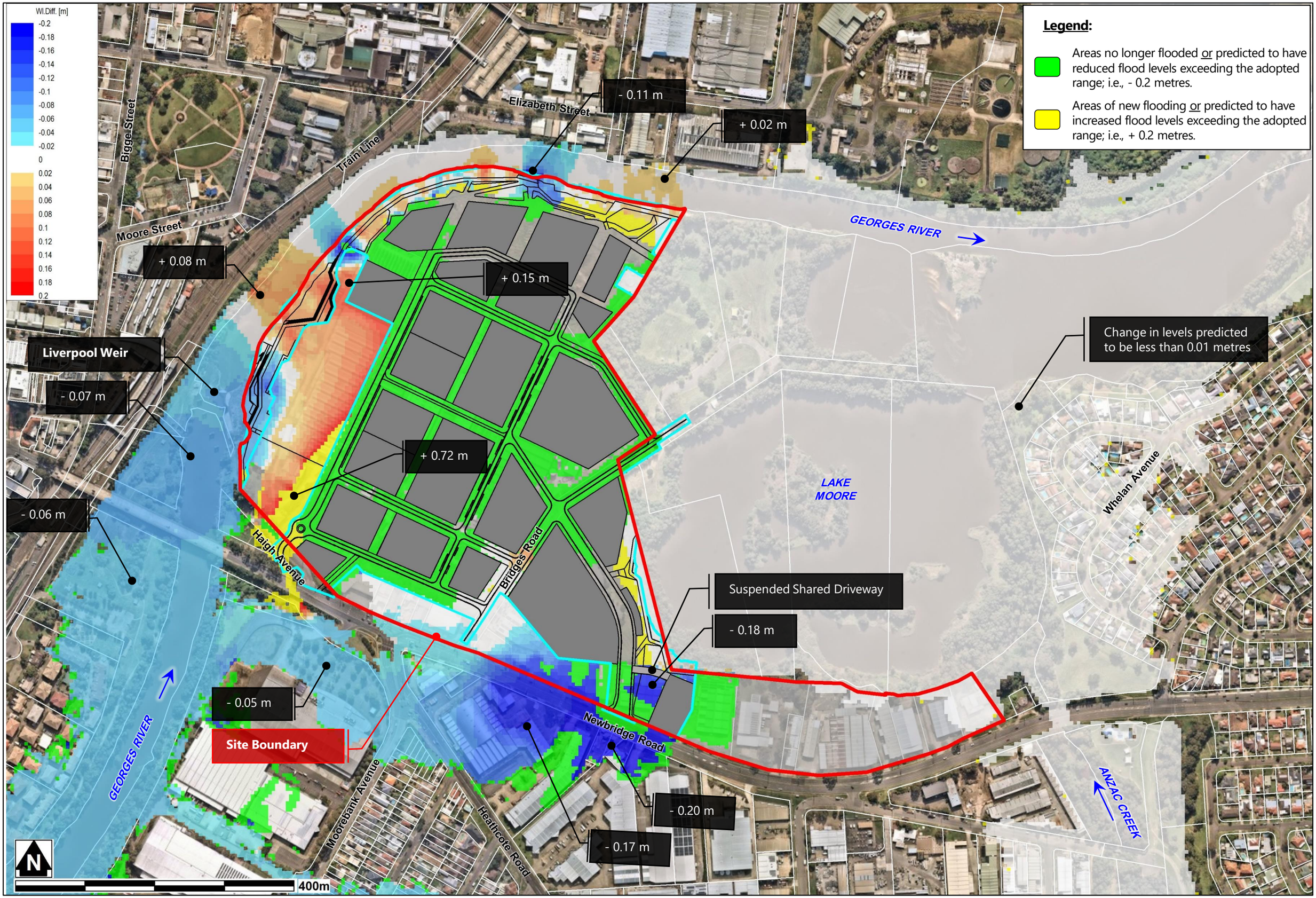
PREDICTED CHANGE TO PEAK 1% AEP FLOOD LEVELS AS A RESULT OF THE PROPOSED DEVELOPMENT (View 1 of 2)



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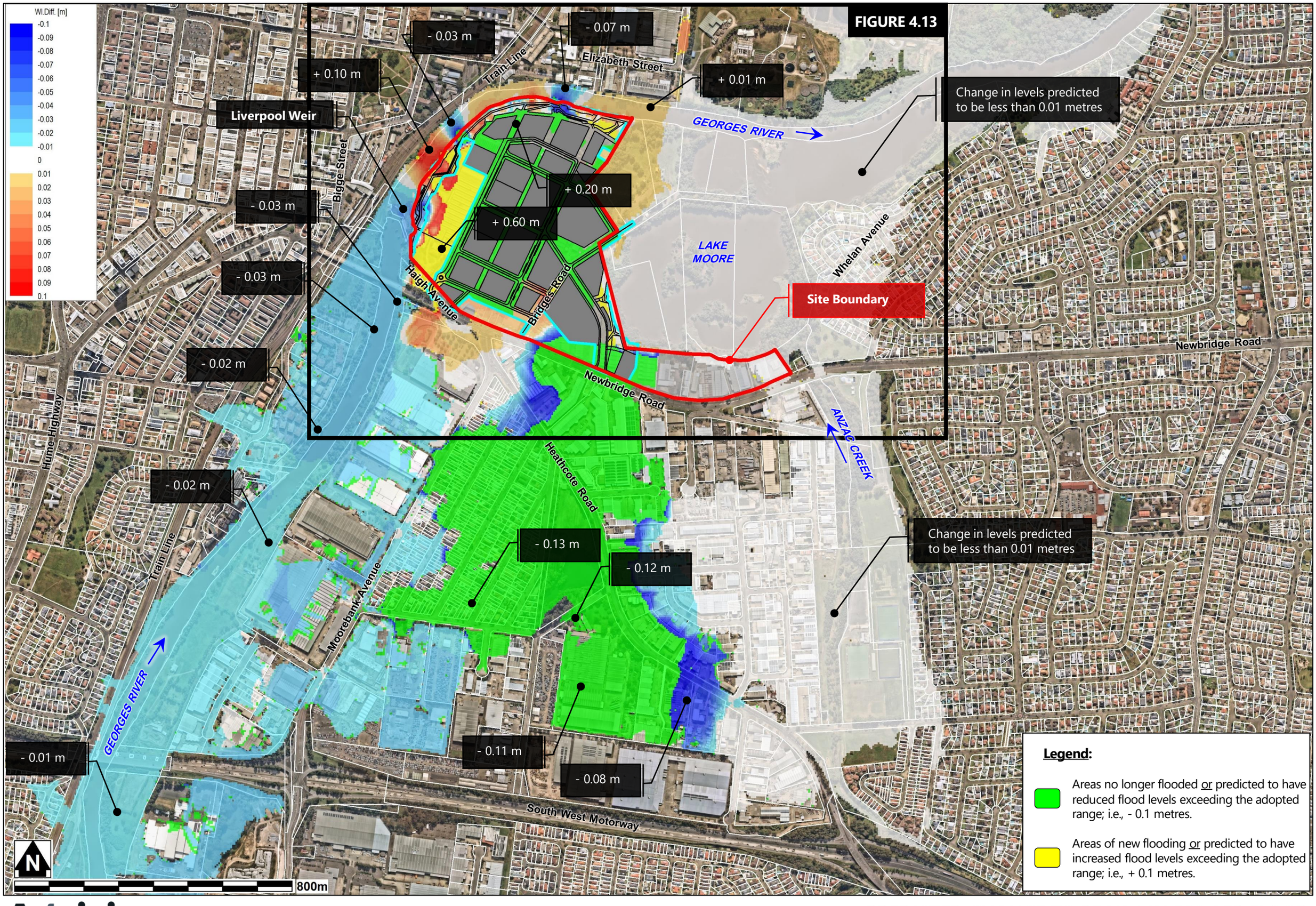
PREDICTED CHANGE TO PEAK 1% AEP FLOOD LEVELS AS A RESULT OF THE PROPOSED DEVELOPMENT (View 2 of 2)



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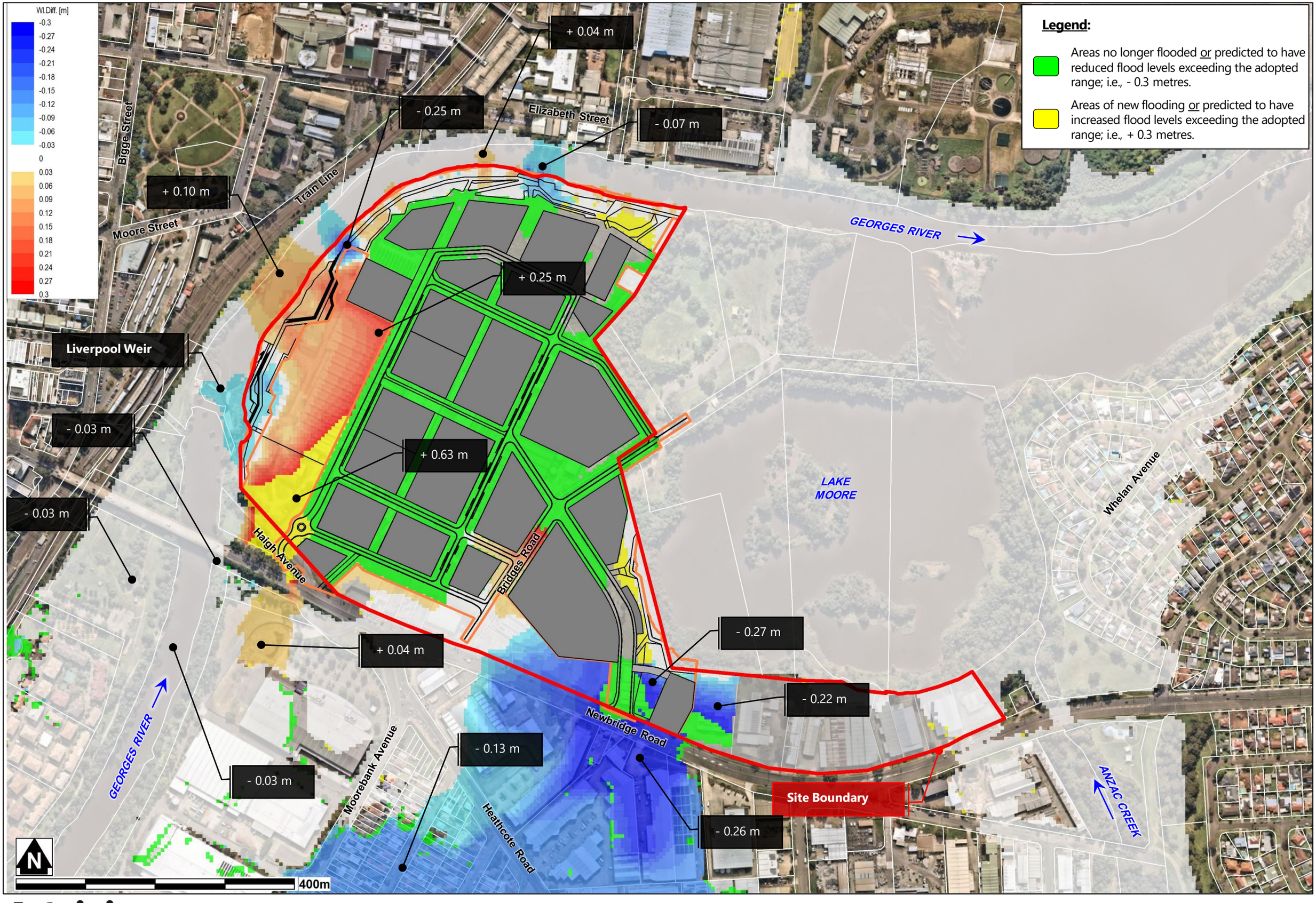
PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOOD LEVELS AS A RESULT OF THE PROPOSED DEVELOPMENT (View 1 of 2)



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PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOOD LEVELS AS A RESULT OF THE PROPOSED DEVELOPMENT (View 2 of 2)

This pattern of flood level changes indicates that during a 1 in 500 AEP event the development would result in a minor increase in conveyance capacity for areas downstream of Newbridge Road. This occurs as a function of the proposed foreshore regrading and the overland flow route that is proposed between Newbridge Road and Lake Moore. The foreshore regrading is the primary reason for the decreased flood levels west of Moorebank Avenue (*refer* **Figure 4.12**).

The modelling results indicate that the proposed overland flow route provides significant benefits for areas upstream of Newbridge Road and to the east of Moorebank Avenue. As shown in **Figure 4.12**, the overland flow route allows floodwaters to escape north to Lake Moore instead of building up and flowing south into heavily developed areas. This leads to a decrease in peak 1 in 500 AEP flood levels of up to 0.26 metres in the area to the south of Newbridge Road (*refer* **Figure 4.13**).

A review of aerial photography and property data indicates that the proposed development could lead to reductions in peak 1 in 500 AEP flood levels for about 250 properties. These properties are all located upstream of the site and to the south of the Newbridge Road bridge crossing. The following decreases in peak 1 in 500 AEP flood levels are predicted:

- Up to 0.26 metres at six (6) commercial/industrial properties
- Up to 0.13 metres at twelve (12) commercial/industrial properties and over two hundred (200) residential properties
- Up to 0.02 metres at six (6) commercial/industrial properties and at over forty-one (41) residential properties

A maximum increase in peak 1 in 500 AEP flood level of up to 0.63 metres is predicted to occur within the Moore Point Precinct. As shown in **Figure 4.13**, this increase is predicted to occur at the same location as the increase predicted for the 1% AEP event (*refer* **Figure 4.11**).

An increase in peak 1 in 500 AEP flood levels of up to 0.10 metres is predicted to occur along the Georges River downstream of the Liverpool Weir. As shown in **Figure 4.13**, the increase is almost entirely confined to the Georges River channel and extends less than 15 metres into the western floodplain and the railway embankment.

4.4.3 Impact on Peak Flow Velocities

Difference mapping was also created to quantify any changes in peak flow velocities associated with the proposed development. The predicted impacts of the development on peak flow velocities are discussed in the following sections for the 5%, 1% and 1 in 500 AEP events.

5% AEP Event

Changes to peak 5% AEP flow velocities as a result of the proposed development are shown in **Figure 4.14**. The mapping shows that the development would cause localised increases to peak flow velocities that would largely be contained within the foreshore of the Moore Point Precinct. These changes are expected given the development includes excavation along the foreshore designed to offset any losses to conveyance capacity associated with the development.

The above cause for the higher and localised velocity increases is similar for other locations along the foreshore. In that regard, the foreshore works act to streamline the topography along the foreshore by removing localised impediments that act to impede overbank flows.

Increases in peak 5% AEP flow velocities outside of the site are predicted to be less than 0.19 m/s. As shown in **Figure 4.14**, this maximum increase occurs to the north of the precinct.

The proposed development is also predicted to cause a decrease to flow velocities along the Georges River of up to 0.4 m/s. As shown in **Figure 4.15**, this decrease occurs downstream of the Liverpool Weir at the same location as the development is predicted to cause an increase to flood levels (*refer* **Figure 4.9**).

1% AEP Event

Flow velocity difference mapping for the 1% AEP event is shown in **Figure 4.15**. The changes to flow velocities are similar to those predicted for the 5% AEP event, with the majority of increases contained within the Moore Point Precinct and along the Georges River foreshore. As discussed above, the velocity changes along the foreshore are expected given the excavation that is proposed (*refer* **Figure 4.3**).

As shown in **Figure 4.15**, the proposed development is predicted to cause a maximum increase to peak 1% AEP flow velocities of 1.20 m/s. This increase occurs within the precinct and along the foreshore approximately 500 metres downstream of the Liverpool Weir. The percentage increase of 400% is high due to the increase occurring at a location where existing flow velocities are low and only 0.3 m/s. Accordingly, the absolute magnitude of velocities under post-development conditions increase to only 1.2 m/s which is similar and consistent with those predicted to occur nearby under existing conditions.

Flow velocities of up to 0.8 m/s are also predicted to occur at the location of the proposed overland flow route (*refer* **Figure 4.15**). The magnitude of these velocity increases are high due to the area acting as flood storage during existing conditions. In that regard, flow velocities for existing conditions are not predicted to exceed 0.1 m/s during a 1% AEP event.

Flow velocities are predicted to occur outside of the site at a number of localised locations. As shown in **Figure 4.15**, increases outside of the precinct are predicted to be typically less than 0.3 m/s and occur away from any existing development.

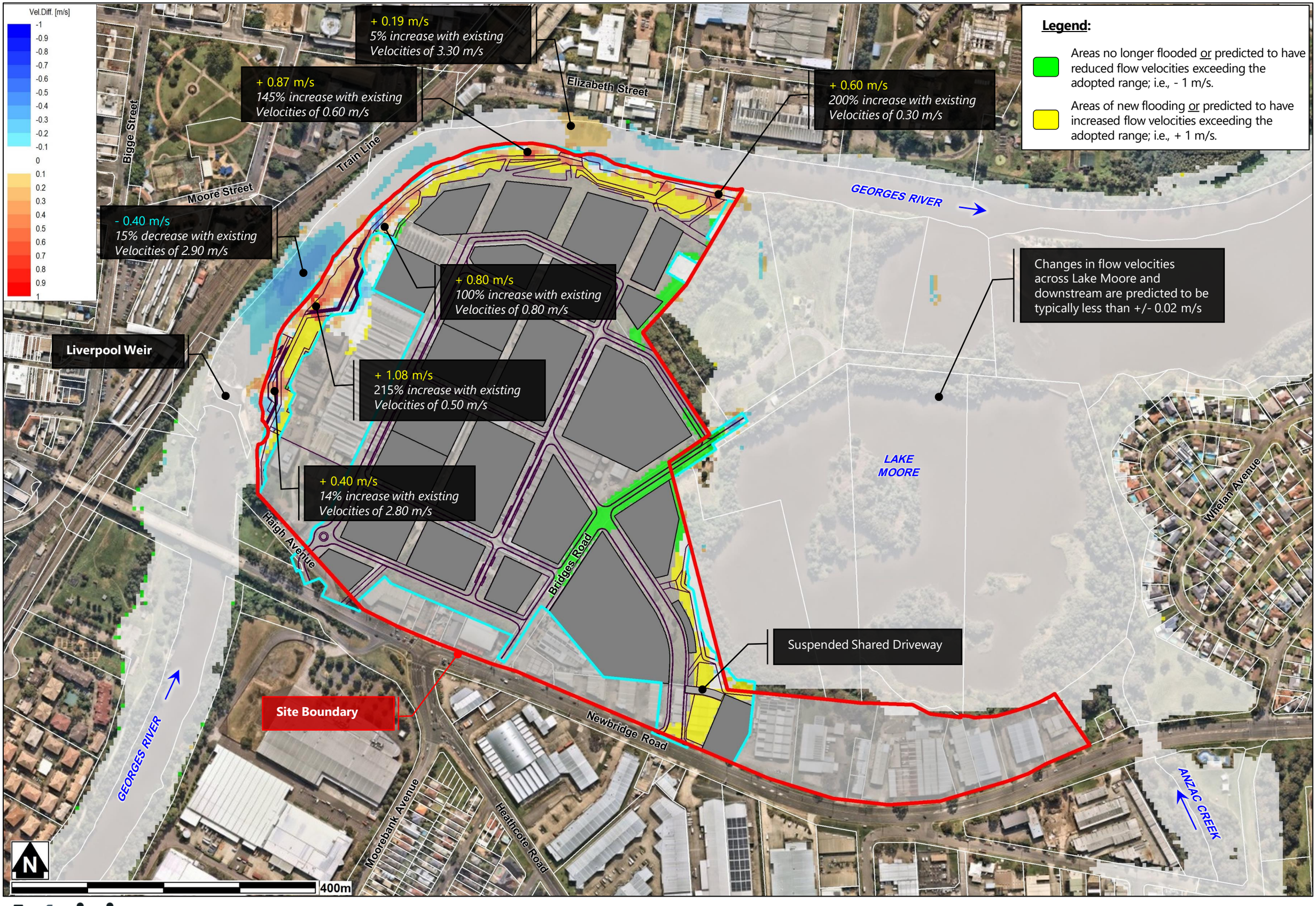
A localised increase of up to 0.65 m/s is predicted to occur along Newbridge Road to the south-west of the proposed overland flow route. The change in flow velocities represents an 160% increase to existing velocities at the location of the impact (*refer* **Figure 4.15**).

1 in 500 AEP Event

Flow velocity difference mapping for the 1 in 500 AEP event is presented in **Figure 4.16**. The predicted impacts are similar to those discussed above for the 1% AEP event with the majority of changes contained within the precinct and to the extent of proposed foreshore works.

The magnitude of velocity increases are typically greatest in the vicinity of the proposed overland flow route. This is due to flow velocities being low here under existing conditions as they encounter existing development to the north of Newbridge Road that is raised above the road surface. The overland flow route creates a flow path that allows floodwaters to escape north to Lake Moore. This leads to flow velocity increases of up to 1.40 m/s along Newbridge Road and up to 1.52 m/s within the overland flow route (*refer* **Figure 4.16**). Velocities are also predicted to increase downstream of the overland flow route by up to 0.55 m/s.

FIGURE 4.14



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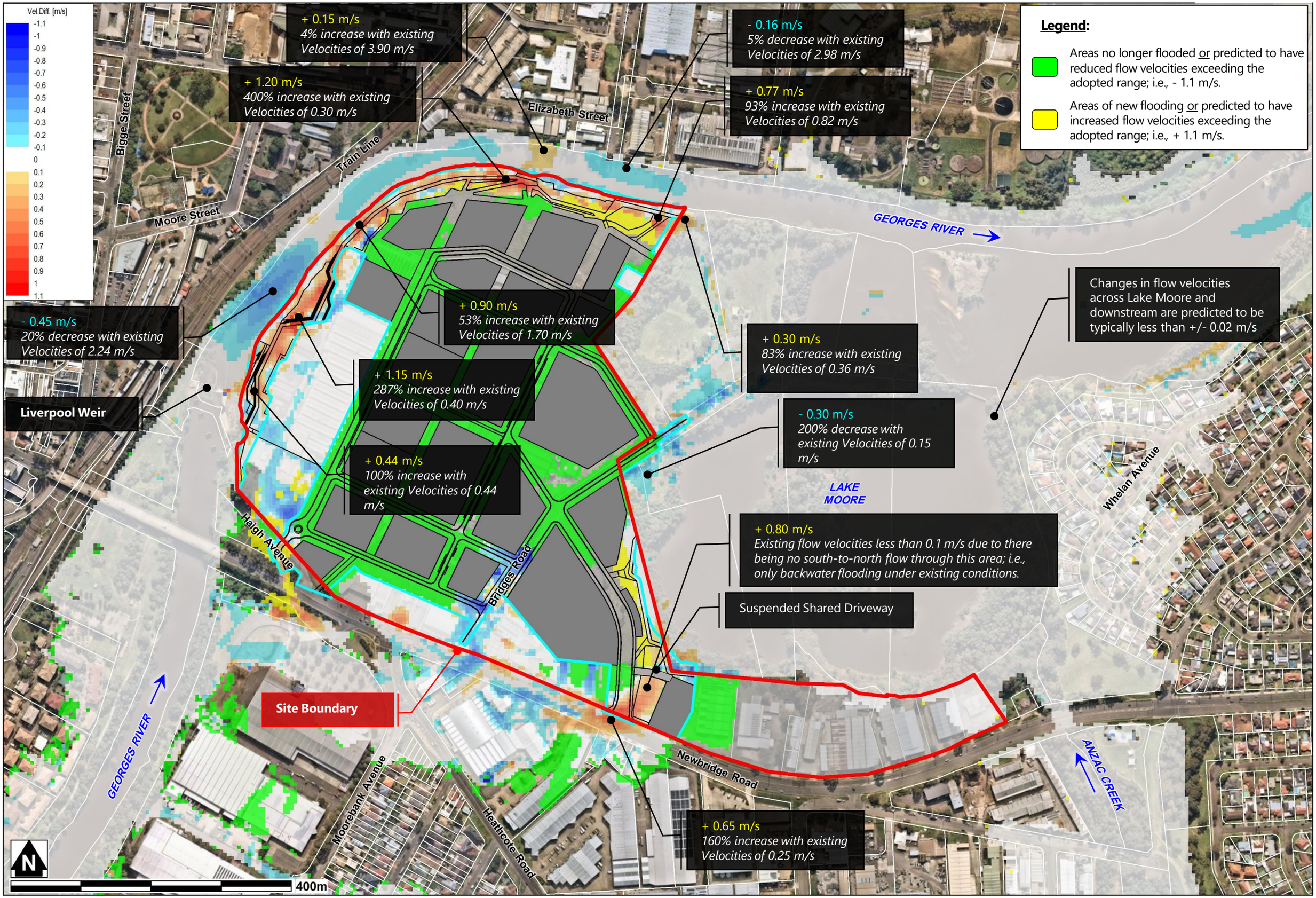
PREDICTED CHANGE TO PEAK 5% AEP FLOW VELOCITIES AS A RESULT OF THE PROPOSED DEVELOPMENT

FIGURE 4.15



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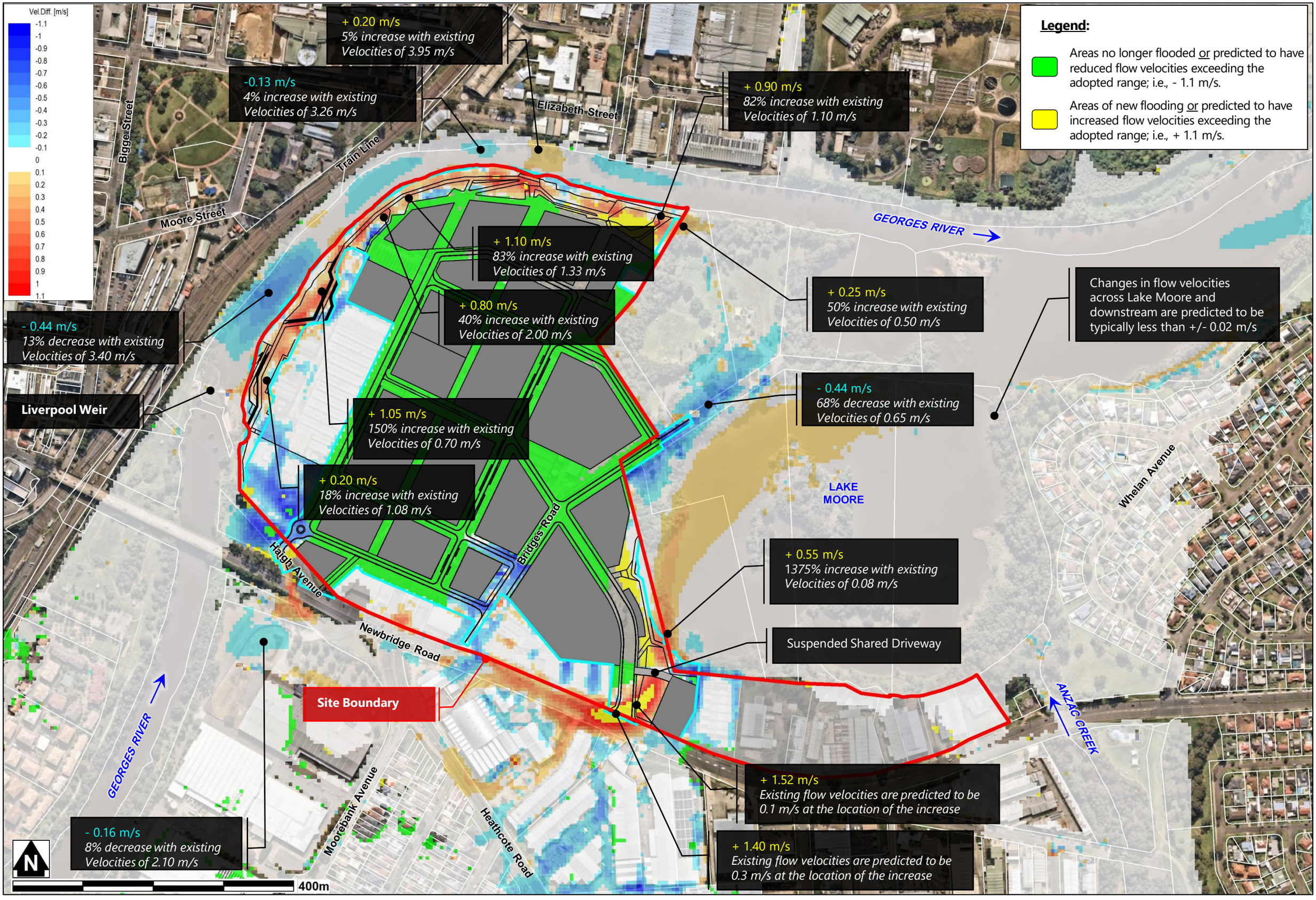
PREDICTED CHANGE TO PEAK 1% AEP FLOW VELOCITIES AS A RESULT OF THE PROPOSED DEVELOPMENT

FIGURE 4.16



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PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOW VELOCITIES AS A RESULT OF THE PROPOSED DEVELOPMENT

The magnitude of velocity changes outside of the site are typically much lower and less than 0.30 m/s at localised locations. The more widespread and erratic nature of the velocity changes reflects the size of the event which results in significant overbank flooding and inundation of the floodplain (*refer* **Figure 4.16**).

4.5 Assessment of a Potential Future Ultimate Development Scenario

The consideration of future changes to the floodplain in the management of flood risk is common practice and an existing requirement of many local and state government policies and guidelines, including the *NSW Flood Risk Management Manual* (2023). As a result, many government floodplain risk management studies include a requirement for assessment of potential future development scenarios. These scenarios are typically based on considering existing land use mapping, rezoning proposals, known development proposals and potential development that could arise, and are often referred to as cumulative development scenarios. No such assessment has been made to-date by Liverpool City Council for the Georges River floodplain.

The potential for cumulative impacts to manifest is considered low because across the floodplain extending upstream and around the Moore Point Precinct has largely been fully developed. Although re-development may occur in the future, it would most likely occur on a small scale and on a lot-by-lot basis. Therefore, the potential for cumulative impacts due to the future re-development of the floodplain is considered negligible.

There is however potential for additional development to occur at the Moore Point Precinct across those parts of the Precinct outside of the current development extent. As shown in **Figure 4.17** these areas are limited to the southern parts of the Precinct that front Newbridge Road. These parcels of land are suitable for inclusion as a future development scenario.

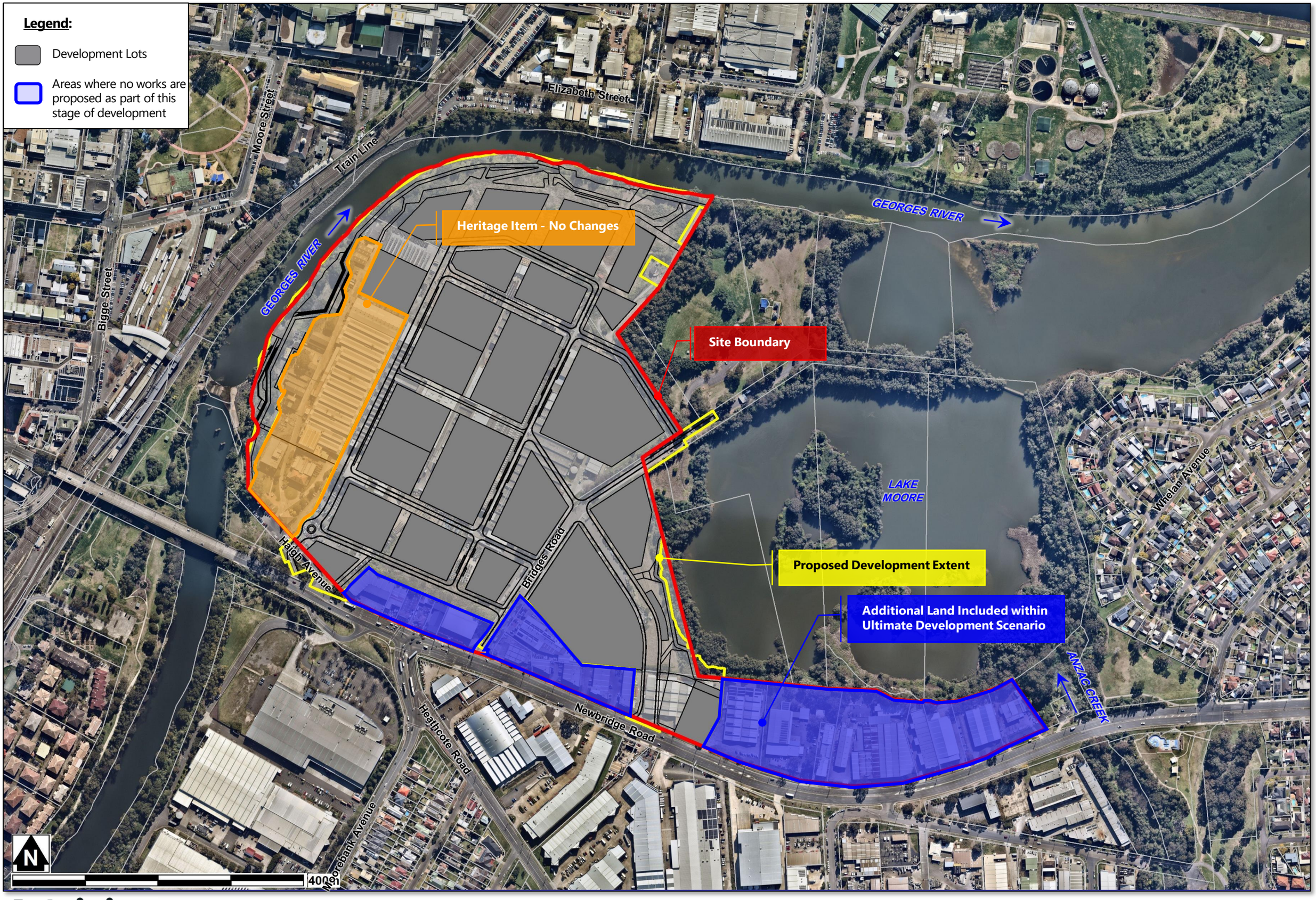
The Gateway Determination report includes a recommendation that an assessment of the '*whole Moore Point Precinct*' be undertaken prior to public exhibition (*refer 1.a on page 69 of the Gateway Determination report*). This refers to what could be considered an ultimate development scenario for the Precinct, that includes those remaining parts of the Precinct located outside the current development extent and which are not heritage listed. As shown in **Figure 4.17**, the areas that could be included as part of the ultimate development scenario are limited to the remaining properties to the south of the Precinct which front Newbridge Road.

The results of the ultimate development scenario modelling are discussed in the following sections in terms of the magnitude of any changes to peak flood levels and flow velocities. All additional development areas have been modelled with surface elevations that are above the predicted peak 1 in 500 AEP flood level.

4.5.1 Impact on Peak Flood Levels

Flood level difference mapping was prepared from the modelling results to quantify any changes to peak flood levels that are predicted to occur as a result of the ultimate development scenario (*refer* **Figure 4.17**). The flood level differences are presented based on comparison to flood levels predicted for existing and proposed conditions. The comparison to proposed conditions allows for an easier assessment of the incremental change in impacts that would be caused by the additional components of the ultimate development scenario only.

The predicted impacts of the ultimate development scenario on peak flood levels are discussed in the following sections for the 5%, 1% and 1 in 500 AEP events.



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MOORE POINT PRECINCT
ULTIMATE DEVELOPMENT LAYOUT

5% AEP Event

Flood level difference mapping for the 5% AEP event is presented in **Figure 4.18** and **Figure 4.19**, based on a comparison to existing and proposed conditions, respectively. **Figure 4.19** shows that the additional development incorporated as part of the ultimate development scenario will not lead to any additional changes to flood levels beyond those predicted for the development proposal. This indicates that the remaining parts of the Precinct could be developed without causing any impacts to peak 5% AEP flood levels.

Based on the above and **Figure 4.19**, it follows that the flood level difference mapping presented in **Figure 4.18** will match that produced for the proposed development and shown as **Figure 4.9** and discussed in **Section 4.4.2**.

1% AEP Event

Flood level difference mapping for the 1% AEP event is presented in **Figure 4.20** and **Figure 4.21**, based on a comparison to existing and proposed conditions, respectively. **Figure 4.21** shows that the additional development incorporated as part of the ultimate development scenario will lead to impacts to the south of the Precinct and Newbridge Road of up to 0.06 metres. These impacts are predicted to occur due to the removal of the temporary flood storage available across the new development areas located to the east and west of Bridges Road (*refer* **Figure 4.21**). The flood level difference mapping indicates that the additional development areas would not result in any further changes to flood levels along the Georges River or across Lake Moore that exceed 0.01 metres.

Flood level difference mapping generated from results for the ultimate development scenario and existing conditions is presented as **Figure 4.20**. The difference mapping shows that the ultimate development scenario will still lead to reductions to peak 1% AEP flood levels upstream of the Liverpool Weir and along the Georges River of up to 0.06 metres.

Figure 4.20 shows that there would be a minor increase to peak 1% AEP flood levels across Lake Moore and the Anzac Creek floodplain of around 0.01 metres. Flood level increases of this magnitude are negligible and within the tolerances of the model.

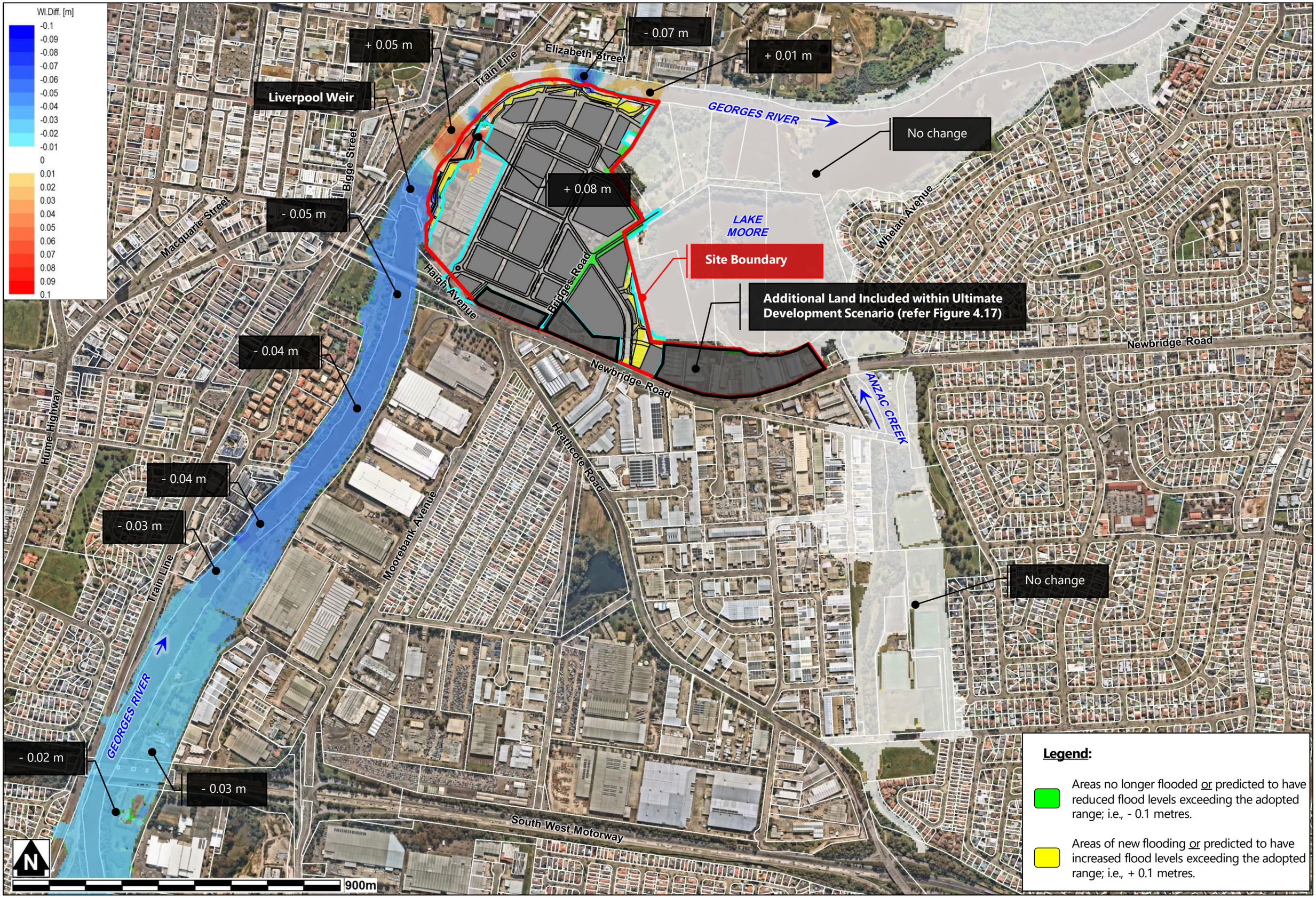
1 in 500 AEP Event

The 1 in 500 AEP event was modelled for the ultimate development scenario to determine the extent to which a rarer flood than the flood used for planning purposes (ie., the 1% AEP flood) could cause more significant impacts. It was not undertaken or reported on to contribute to the specification of any more stringent planning controls for the site.

Flood level difference mapping for the 1 in 500 AEP event is presented in **Figure 4.22** and **Figure 4.23**, based on a comparison to existing and proposed conditions, respectively. **Figure 4.23** shows that the additional development incorporated as part of the ultimate development scenario will lead to impacts to the south of the Precinct and Newbridge Road of up to 0.10 metres, but typically less than 0.03 metres. These additional impacts are predicted to occur due to the following two factors:

- Removal of the temporary flood storage available across the new development areas located to the east and west of Bridges Road; and
- Filling of areas that previously conveyed floodwaters to the proposed overland flow path thus leading to a reduction in its efficiency and conveyance capacity.

FIGURE 4.18



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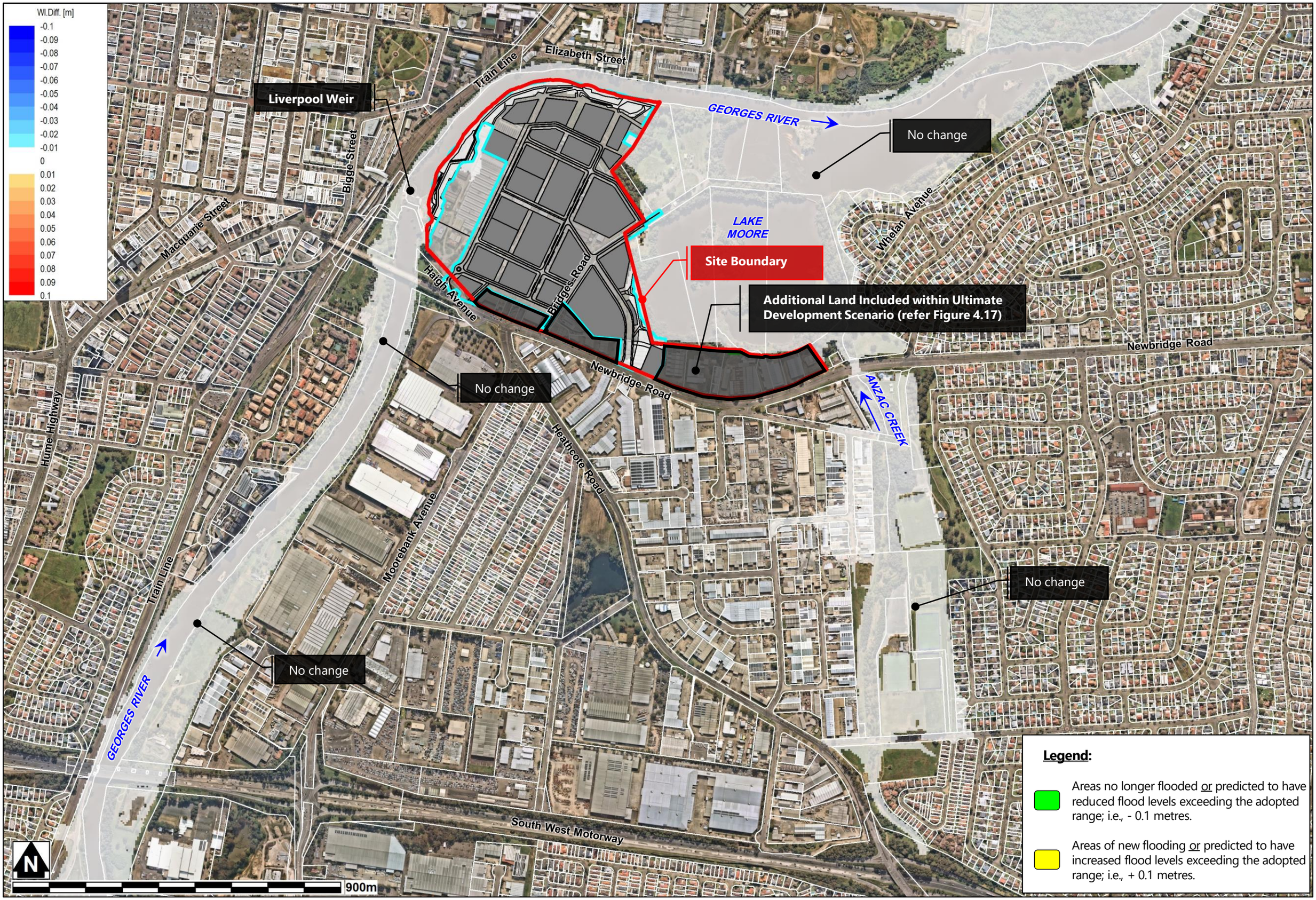
PREDICTED CHANGE TO PEAK 5% AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Levels Predicted for Existing Conditions)

FIGURE 4.19



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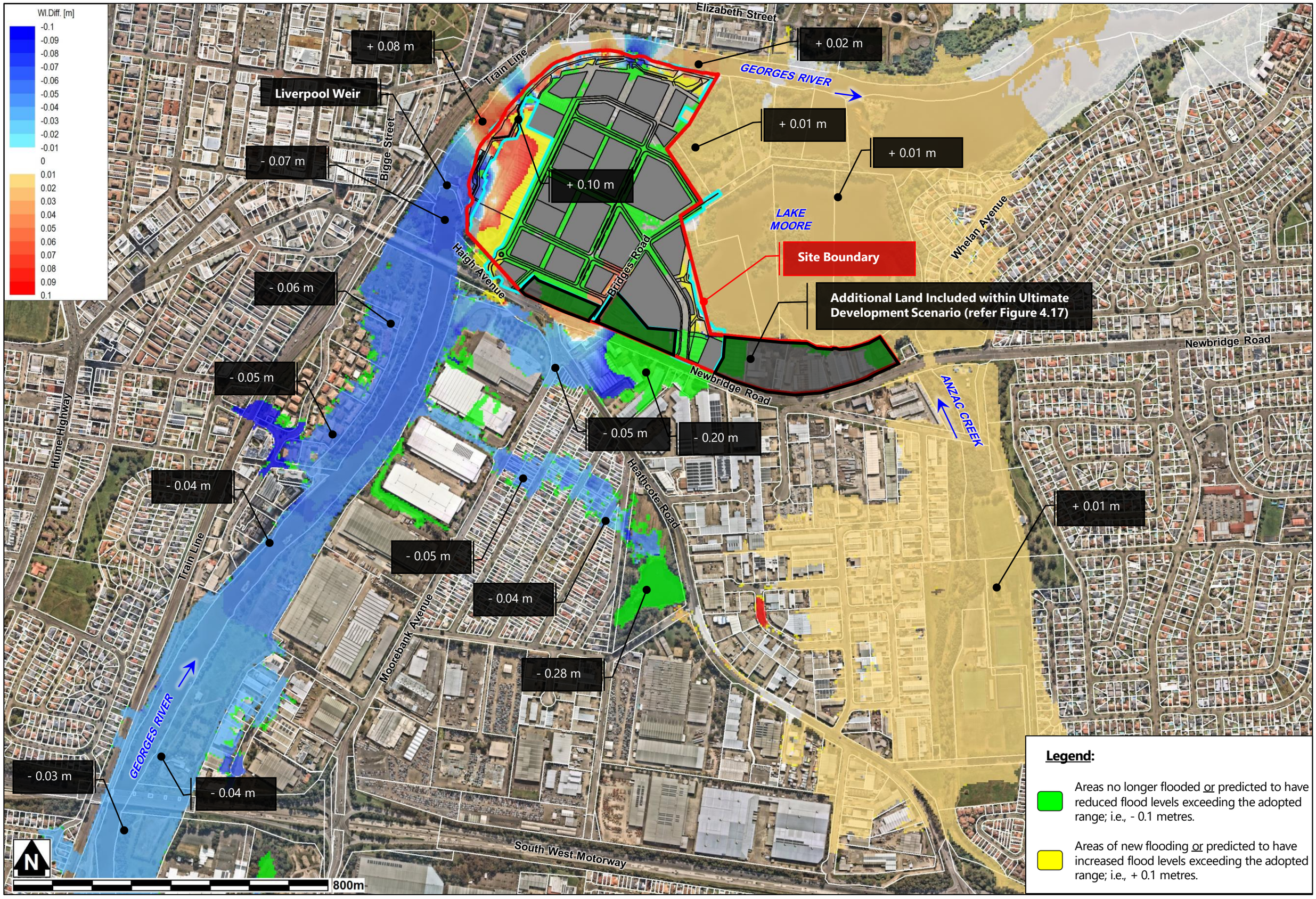
PREDICTED CHANGE TO PEAK 5% AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Levels Predicted for Proposed Conditions)

FIGURE 4.20



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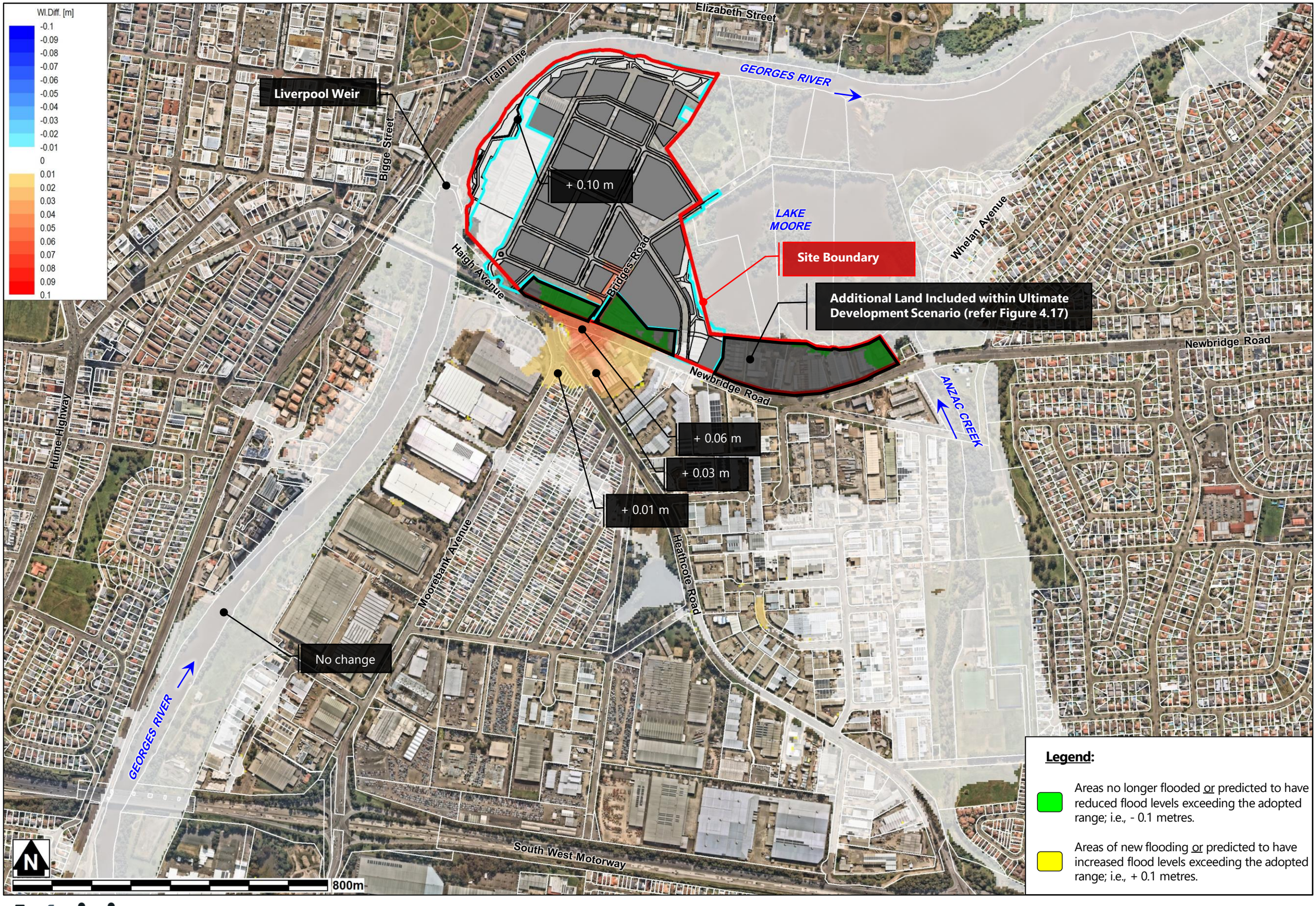
PREDICTED CHANGE TO PEAK 1% AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO

(Compared to Levels Predicted for Existing Conditions)

FIGURE 4.21



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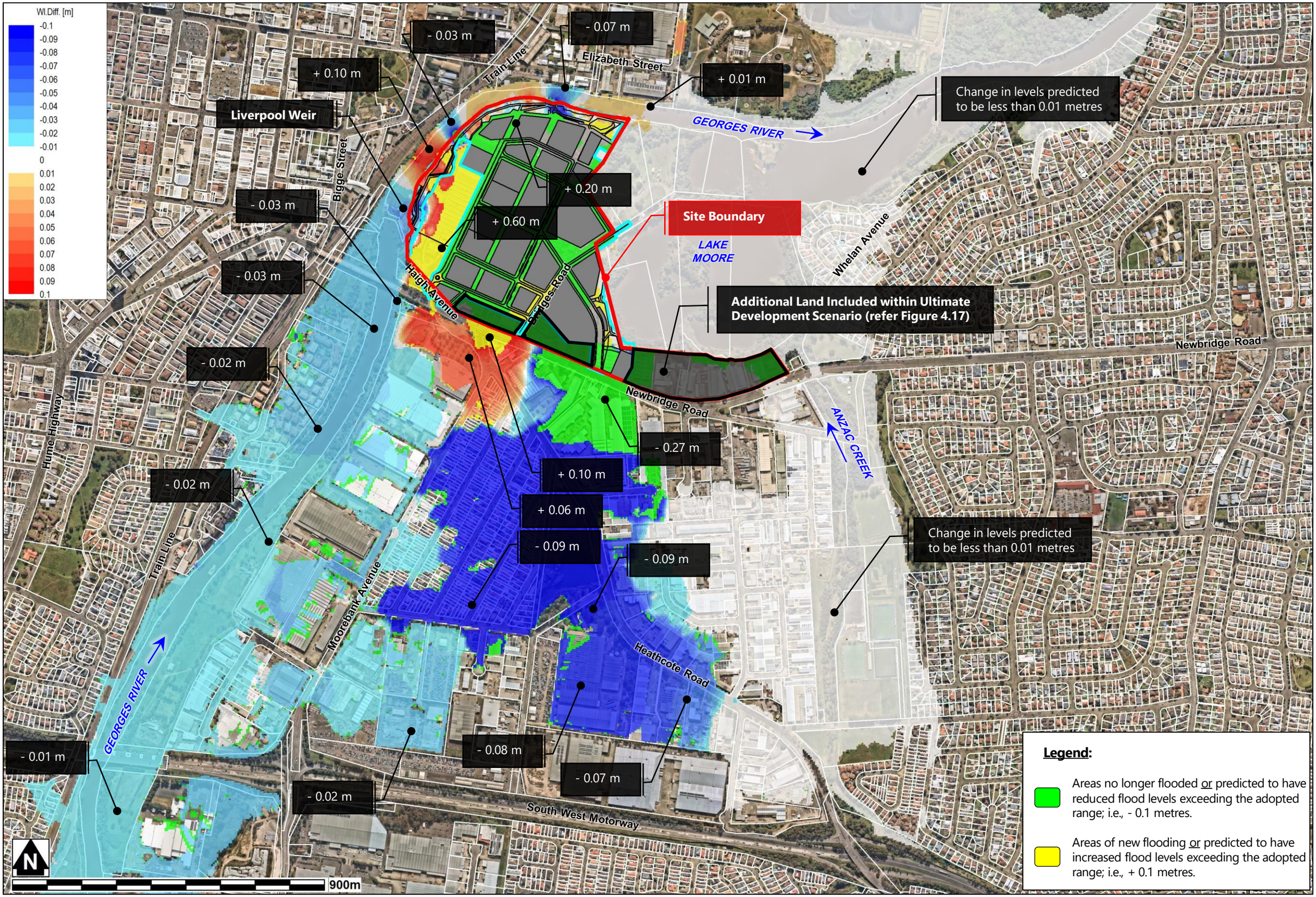
PREDICTED CHANGE TO PEAK 1% AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Levels Predicted for Proposed Conditions)

FIGURE 4.22



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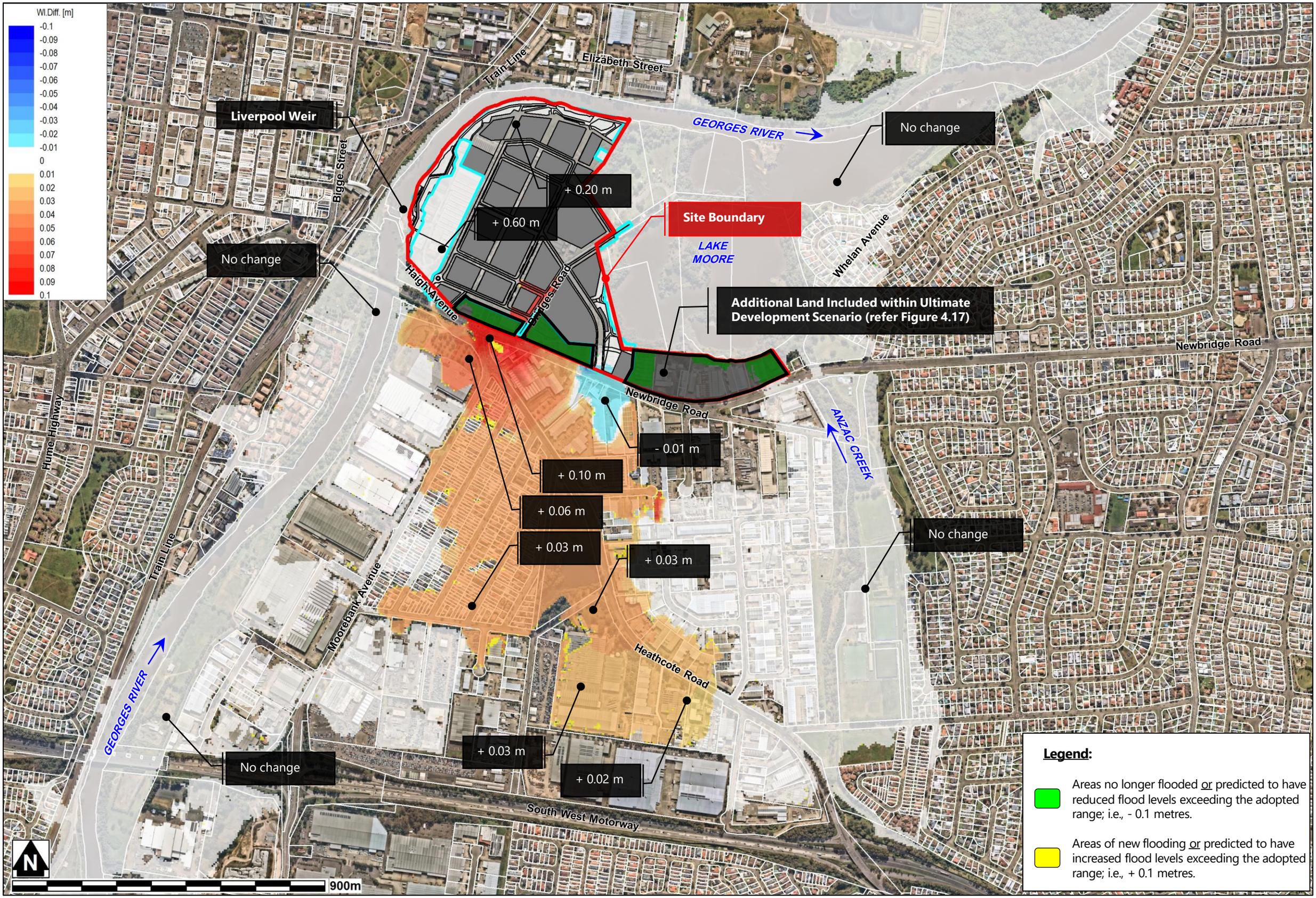
PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Levels Predicted for Existing Conditions)

FIGURE 4.23



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PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOOD LEVELS AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Levels Predicted for Proposed Conditions)

Figure 4.22 indicates that the ultimate development scenario would still lead to a reduction in peak 1 in 500 AEP flood levels to the south of the Precinct and Newbridge Road of between 0.09 and 0.27 metres. Flood level differences elsewhere remain largely consistent with those predicted for proposed conditions (*refer* **Figure 4.10** *and* **Section 4.4.2**).

4.5.2 Impact on Peak Flow Velocities

Difference mapping was also created to quantify any changes in peak flow velocities associated with the additional development proposed as part of the ultimate development scenario. The predicted impacts of the additional development on peak flow velocities are discussed in the following sections for the 5%, 1% and 1 in 500 AEP events.

5% AEP Event

Changes to peak 5% AEP flow velocities as a result of the additional development are shown in **Figure 4.24**. The mapping shows that the development along Newbridge Road would not cause any additional changes to peak 5% AEP flow velocities.

1% AEP Event

Changes to peak 1% AEP flow velocities as a result of the additional development are shown in **Figure 4.25**. The mapping shows that the development along Newbridge Road would lead to an increase in peak flow velocities of up to 0.25 m/s. These increases occur along Newbridge Road to the south-west of the proposed overland flow route. Interrogation of the results indicates that the increase in flow velocities is associated with the additional development pushing a greater proportion of localised flood flows into the road reserve. This is supported by the decrease in flow velocities shown immediately to the north and against the additional development (*refer* **Figure 4.25**).

It is envisaged that the increased flow velocities along Newbridge Road could be mitigated by offsetting or 'pulling-back' the development from Newbridge Road. This would allow floodwaters to reach the proposed overland flow route without being pushed onto Newbridge Road.

The additional development along Newbridge Road is not predicted to result in any changes to flow velocities along the Georges River and across Lake Moore (*refer* **Figure 4.25**).

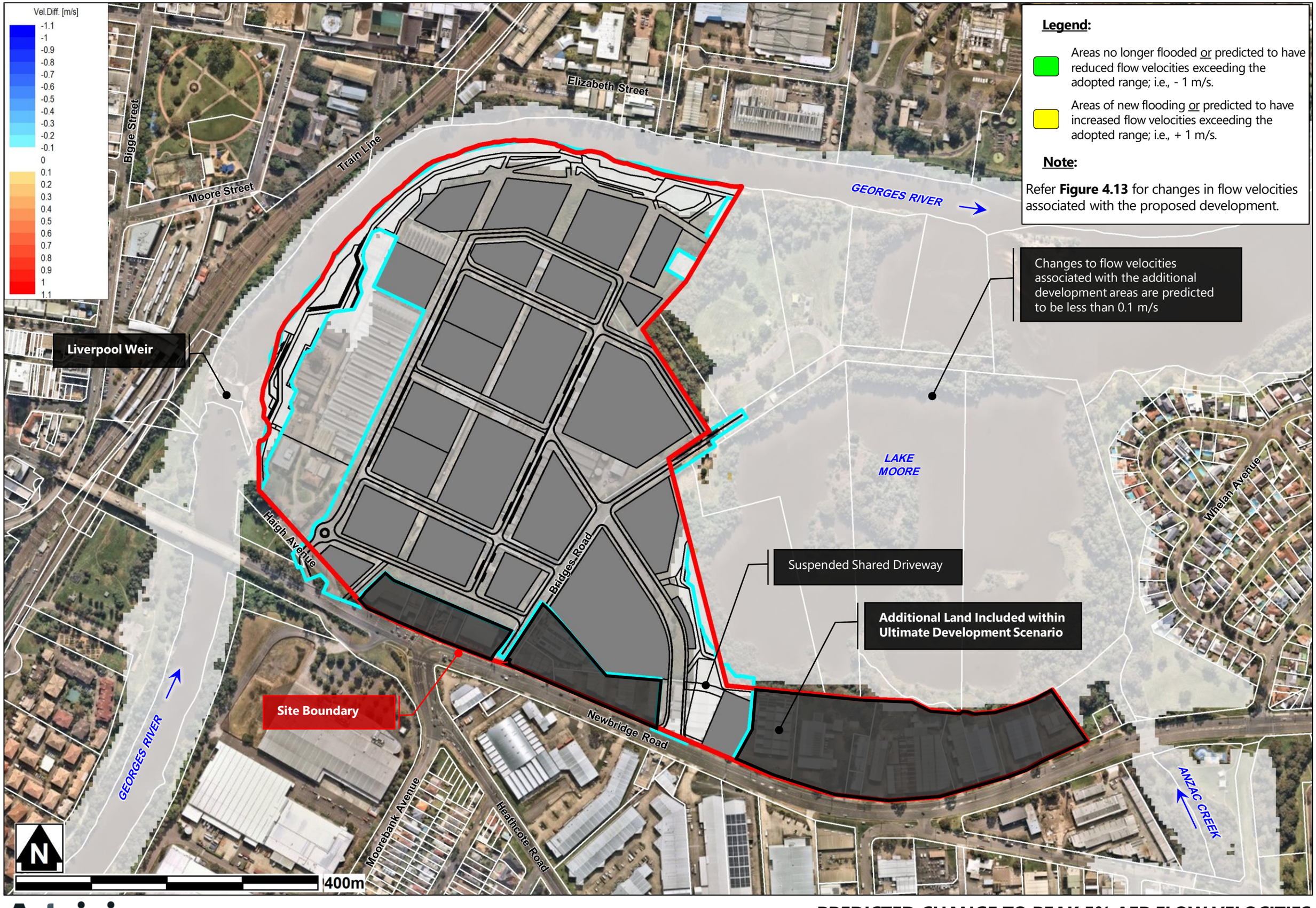
1 in 500 AEP Event

Changes to peak flow velocities for the 1 in 500 AEP event are shown in **Figure 4.26**. The mapping shows that the additional development along Newbridge Road would lead to an increase in peak flow velocities of up to 0.32 m/s. This maximum increase occurs along Newbridge Road to the south-west of the proposed overland flow route. These increases in flow velocities are caused by the additional development pushing a greater proportion of localised flood flows into the road reserve. This is supported by the decrease in flow velocities shown immediately to the north and against the additional development (*refer* **Figure 4.26**).

Minor increases to peak 1 in 500 AEP flow velocities are also predicted along Heathcote Road. As shown in **Figure 4.26**, these increases are localised and are not predicted to exceed 0.12 m/s.

The additional development along Newbridge Road is not predicted to result in any changes to flow velocities along the Georges River and across Lake Moore (*refer* **Figure 4.26**).

FIGURE 4.24



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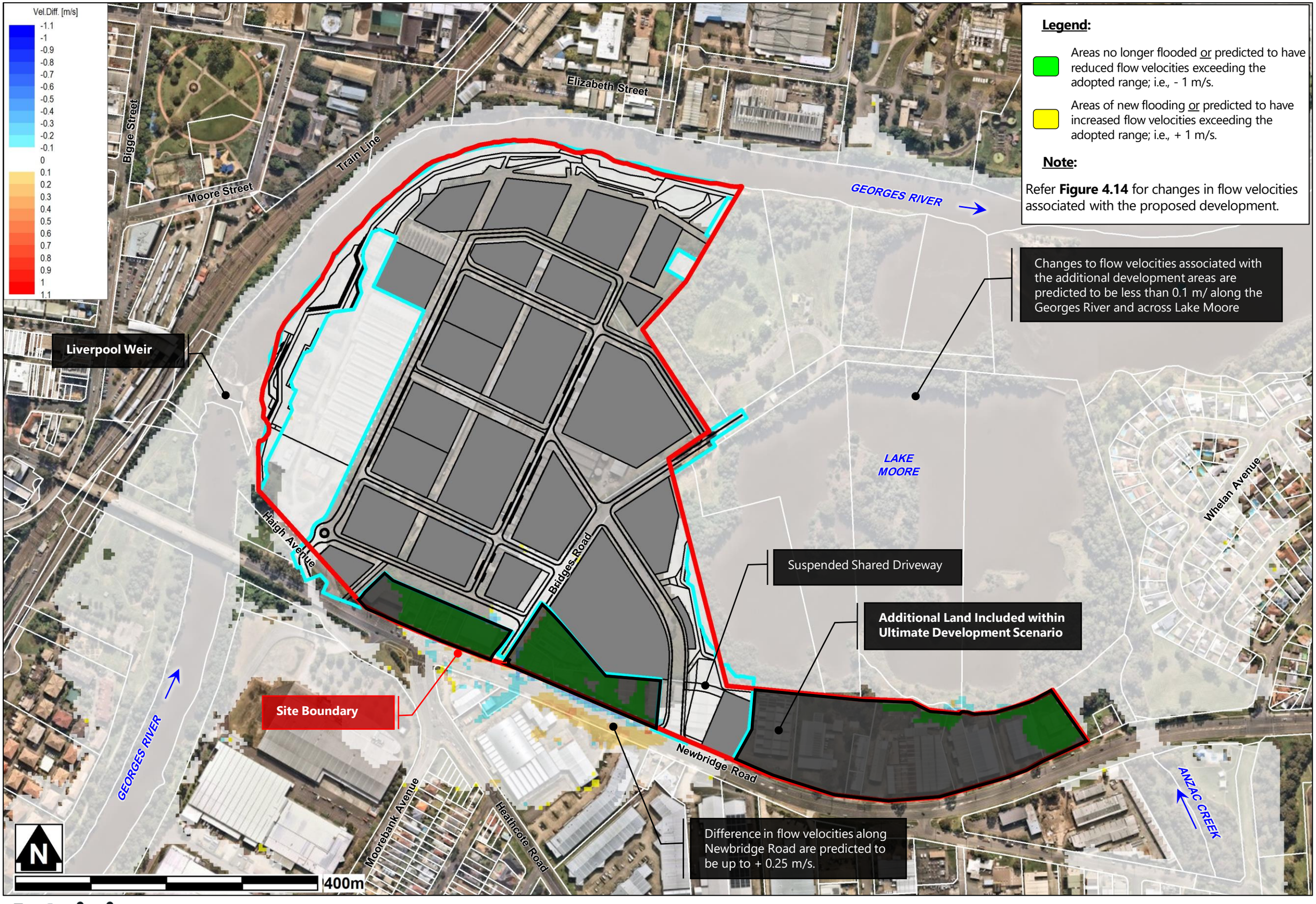
PREDICTED CHANGE TO PEAK 5% AEP FLOW VELOCITIES AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Velocities Predicted for Proposed Conditions)

FIGURE 4.25



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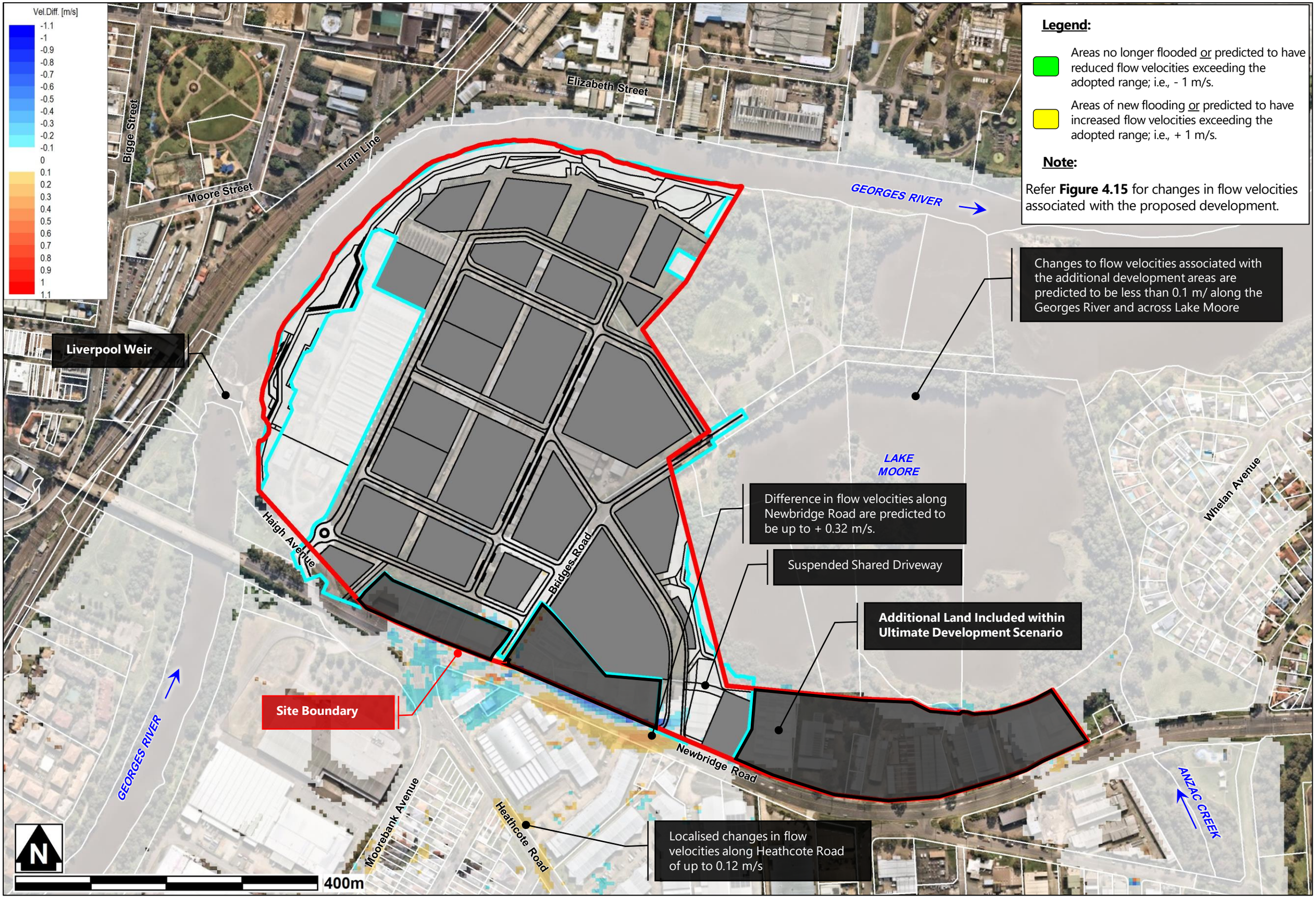
PREDICTED CHANGE TO PEAK 1% AEP FLOW VELOCITIES AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Velocities Predicted for Proposed Conditions)



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PREDICTED CHANGE TO PEAK 1 IN 500 AEP FLOW VELOCITIES AS A RESULT OF THE ULTIMATE DEVELOPMENT SCENARIO
(Compared to Velocities Predicted for Proposed Conditions)

5 Assessment of Impacts Relative to Flood Related Planning Controls

5.1 Assessment Criteria

The Liverpool Development Control Plan (2008) (Liverpool DCP) outlines a number of objectives and controls that apply to the Moore Point Precinct based on its location near a watercourse and due to it being on the Georges River floodplain. Accordingly, the objectives of 'Section 7 - Development near a Watercourse' and 'Section 9 – Flood Risk,' apply to the development.

The following sections consider the proposed development and predicted impacts with reference to the relevant objectives of the Liverpool DCP.

5.1.1 Development near a Watercourse

The following objectives are outlined within Section 7 of the Liverpool DCP.

- *Objective 1 – To protect, restore and maintain ecological processes, natural systems and biodiversity in wetlands and waterfront areas*

  This objective is not relevant to flooding and therefore is not addressed as part of this report.

- *Objective 2 – To maintain watercourse bed and bank stability.*

  The flow velocity difference mapping prepared for the 5%, 1% and 1 in 500 AEP events shows that the development will result in velocity increases along the overbank areas adjacent to the inside bend of the Georges River that adjoins the precinct (refer **Figures 4.14 to 4.16**). These changes are to be expected given the excavation and foreshore reshaping that is proposed as part of the development.

  As shown in **Figures 4.2** and **4.3**, the foreshore works will include excavation to depths of up to 4.6 metres and typically between 2 and 3 metres. In addition, the foreshore works will involve rehabilitation and stabilisation of the river bank through the planting of native vegetation and the installation of bank protection systems, where required. The Precinct Masterplan includes a concept design for these works.

  It is expected that any locations at risk of bank erosion or bank instability will be addressed as part of the detailed design of the foreshore works. Accordingly, the foreshore protection works will be designed to cater for the post-development flood flow velocities.

  With regard to bed stability along the Georges River, the flood modelling shows that there would be minimal change to peak flow velocities across the width of the river channel. This is predicted for the full range of design events as shown in **Figures 4.14** to **4.16**.

  Results for an ultimate development scenario for the Precinct show no further increases in peak flow velocities along the foreshore and across the river channel (*refer* **Figures 4.24**, **4.25** *and* **4.26**). Accordingly, construction of the ultimate development scenario will not adversely impact bed and bank stability of the section of the Georges River between the Newbridge Road bridge crossing and Lake Moore.

- *Objective 3 - To minimise sedimentation and pollution of watercourses and wetlands.*

  This objective is more relevant to a *Water Cycle Management Plan* (WCMP).

- *Objective 4 – Ensure conservation and long term maintenance of existing native vegetation in waterfront areas.*

  This objective is not relevant to flooding and therefore has not been addressed in this report.

- *Objective 5 – To maintain lateral connectivity between waterways and riparian vegetation.*

  This objective is not relevant to flooding and therefore has not been addressed in this report.

- *Objective 6 – To protect the visual amenity of the water and land interface.*

  This objective is not relevant to flooding and therefore has not been addressed in this report.

5.1.2 Flood Risk

Section 9 of Liverpool DCP outlines the objectives and relevant controls for development proposed within the floodplain. The DCP follows a process to identify the controls relevant to a development based on:

- sensitivity of a land use to flooding;
- severity of a flood impact on site; and,
- specific floodplain in which a site is located.

The controls relevant to the development have been identified based on the site and proposed development being categorised as:

- affected by 'Medium Flood Risks' (*refer* **Section 3.3.6** *and* **Figure 3.20**).
- having a land Use Risk Category of 'subdivision'; and,
- comprising a site and proposed development that is located within the Georges River floodplain.

Based on the above, the relevant controls for the development are outlined in Table 4 of the Liverpool DCP. The relevant planning controls with regard to 'Flood Effects' are outlined in the following.

- **Flood Effects Control 1**

  Engineer's report required to certify that the development will not increase flood effects elsewhere having regard to: (i) loss of flood storage; (ii) changes in flood levels, flows and velocities caused by alterations to flood flows; and (iii) the cumulative impact of multiple similar developments in the floodplain.

- **Flood Effects Control 4**

  A floodway or boundary of significant flow may have been identified in this catchment. This area is the major conveyance area for floodwaters through the floodplain and any structures placed within it are likely to have a significant impact on flood behaviour. Within this area no structures other than concessional development, open type structure or small non habitable structures (not more than 30 sqm) to support agricultural uses ill normally be permitted. Development outside the boundary of Significant Flow may still increase flood effects elsewhere and therefore be unacceptable.

- **Flood Effects Control 5**

Any filling within the 1% AEP flood will normally be considered unacceptable unless compensatory excavation is provided to ensure that there is no net loss of floodplain storage below the 1% AEP flood.

Interrogation of Controls 1, 4 and 5 allows the key flood related planning requirements to be identified. These requirements are outlined below with an associated commentary that details how they are addressed by this flood impact assessment.

1. *The development will not increase flood effects elsewhere having regard to:*

   a. *Loss of floodplain storage*

   The available flood storage volumes for pre and post-development conditions have been extracted from the flood modelling results and are listed in **Table 5.1**. The storage volumes have been extracted for those parts of the floodplain bound by the Newbridge Road crossing of the Georges River and the downstream boundary of Lake Moore. This extent of the floodplain is considered to be 'local' to the site.

Table 5.1 Floodplain Storage Available for Pre and Post-Development Conditions

Design Event (AEP)	Available 'Local' Storage Volumes ^		Difference in Storage Volumes	Percentage Difference
	Existing Conditions	Post-Development Conditions		
5%	3,404,200	3,440,400	+ 36,200	+ 1.06%
1%	4,263,500	4,228,200	- 35,300	- 0.83%
1 in 500	4,623,300	4,525,900	- 97,400	- 2.10%

^ Local flood storage limited to the floodplain between Newbridge Road to the downstream boundary of Lake Moore

As shown in **Table 5.1**, the proposed development will result in a net gain in flood storage of 36,200 m^3 during a 5% AEP design event. This represents a 1% increase in the available flood storage in a 5% AEP event.

The development will result in a small reduction in flood storage of up to 35,300 m^3 during a 1% AEP flood. This loss in volume equates to only 0.83% of the total storage volume available locally to the site (*refer* **Table 5.1**) in an event of this magnitude. A 0.83% loss in storage is minor and is reflected in the results of the flood modelling which show no change to peak post-development 1% AEP flood levels downstream of the site and across Lake Moore (*refer* **Figure 4.11**).

The proposed redevelopment of the site will also lead to a 2.1% reduction in flood storage during a 1 in 500 AEP event. As shown in **Figure 4.12**, the modelling indicates that this minor loss in flood storage is inconsequential and would actually result in no measurable change to peak 1 in 500 AEP flood levels across Lake Moore.

Modelling undertaken for this investigation also shows that further excavation of the foreshore would lead to increases in predicted flood levels in Lake Moore because the associated works would increase the flow conveyance along the Georges River, thereby delivering floodwaters to Lake Moore at faster rate than is currently the case. Therefore, further excavation of the foreshore

for the sole purpose of achieving a balance of cut to fill, would lead to impacts that would outweigh any perceived benefits.

In addition, the whole concept of providing compensatory earthworks to offset loss of storage due to floodplain filling is designed to be applied to offset the impact that could be caused by small scale development where complex flood modelling is not economical. Flood modelling is a more reliable way of assessing the impact of a filling proposal as it takes account of all areas of flood storage, the gradient of the flood surface and flow conveyance.

This investigation has applied a 2D mathematical modelling tool that has been validated against recorded flood data to assess the impact of the development on flood characteristics and therefore provides more appropriate tool for assessing the impact of cut and fill than a 'rule of thumb' approach that only focusses on floodplain storage.

Accordingly, a requirement that a balance of cut to fill be achieved is not considered necessary for this location.

b. Changes in flood levels, flows and velocities

The changes to peak flood levels and flow velocities predicted as a result of the proposed development are discussed in **Sections 4.4.2** and **4.4.3**, respectively.

The main conclusions that can be drawn from the modelling with regard to flood level impacts are as follows.

- The proposed development is predicted to cause both decreases and increases in flood levels in areas outside of the site boundary for the 5%, 1% and 1 in 500 AEP events.
- For the 5%, 1% and 1 in 500 AEP events, the development is predicted to result in reductions to flood levels upstream of the site by up to 0.06 and 0.03 metres that extend beyond the South West Motorway, respectively (*refer* **Figure 4.9**, **Figure 4.10** *and* **Figure 4.12**).
- The reduction in flood levels upstream of Newbridge Road during a 1% AEP event is predicted to benefit over fifty (50) residential properties, consisting of both apartment buildings to the west of the Georges River and residential properties to the east of Moorebank Avenue (*refer* **Figure 4.10**). Approximately ten (10) industrial/commercial properties would also benefit from the reduction in flood levels predicted upstream of Newbridge Road.
- The development is also predicted to cause flood level increases outside of the site during the 5% and 1% AEP flood events of up to 0.05 and 0.08 metres, respectively. As shown in **Figure 4.9** and **Figure 4.11**, the extent of these maximum impacts is largely limited to the Georges River channel and the adjacent railway embankment. Accordingly, the flood level increases would have no impact on existing residential, commercial or industrial development. Nor would they compromise the development potential of any currently undeveloped land.
- During a significant flood event such as the 1 in 500 AEP flood, the proposed development is predicted to generate both increases and decreases to flood levels outside of the site. As shown in **Figure 4.12**, the extent and magnitude of the predicted decreases exceed the impacts that occur across areas in close proximity to the Georges River.
- The reduction in flood levels upstream of Newbridge Road during a 1 in 500 AEP event is predicted to benefit over two hundred (200) residential properties, consisting of both apartment buildings to the west of the Georges River and residential properties to the east of Moorebank Avenue, with reduced peak flood levels of up to 0.13 metres (refer Figure 4.12).

Over twenty (20) industrial/commercial properties would also benefit with flood levels predicted to reduce by between 0.02 and 0.26 metres.

Further to the above benefits to existing residential and commercial/industrial properties, the predicted impacts are considered acceptable based on:

- the 1 in 500 AEP event being a much rarer event than the event used for planning purposes; that is, than the 1% AEP flood;
- there being no planning requirement that increases in peak 1 in 500 AEP flood levels need to be less than a specified threshold, or for that matter, negligible;
- the extensive benefits that will be afforded by the overall proposal to a number of existing properties in the form of reduced flood levels; and,
- the scale of the proposed development which represents an ultimate development scenario for this reach of the Georges River.

The main conclusions that can be drawn from the modelling with regard to flow velocity impacts are discussed below.

- The proposed development is predicted to cause minor increases to peak flow velocities during the 5%, 1% and 1 in 500 AEP events for the majority of areas outside of the development site. As shown in **Figures 4.14**, **4.15** and **4.16**, the vast majority of velocity increases are predicted to occur within the site and along the Georges River foreshore. These localised increases are expected based on the excavation and foreshore re-shaping that is proposed.
- The following maximum changes to peak flow velocities are predicted outside of the site for the 5%, 1% and 1 in 500 AEP events.
  - Localised increase of up to 0.19 m/s at the peak of the 5% AEP design event (*refer* **Figure 4.14**). This impact represents a 5% increase relative to existing velocities at the location of the impact.
  - Localised increase of up to 0.65 m/s at the peak of the 1% AEP design event (*refer* **Figure 4.15**). This impact is predicted to occur along Newbridge Road to the south-west of the proposed overland flow route. The change in flow velocities represents an 160% increase to existing velocities at the location of the impact.
  - Localised increase of up to 1.40 m/s at the peak of the 1 in 500 AEP design event (*refer* **Figure 4.16**). This impact occurs along Newbridge Road as a result of floodwaters discharging toward the proposed overland flow route. Existing velocities are typically low at this location, less than 0.1 m/s, due to their being no escape route for floodwaters until they pond to a level sufficient to flow south.

c. *The cumulative impact of multiple similar developments within the floodplain*

The development of the Moore Point Precinct is proposed across a consolidated land holding covering approximately 38 hectares. There are no other development proposals of this scale proposed for land in and adjacent to the floodplain of the Georges River between the South West Motorway crossing and Lake Moore. Of those that are proposed, none have reached Gateway determination with the Department of Planning & Environment.

Therefore, the potential for 'multiple similar developments' in the region is low and the impact of the development proposed as part of the Moore Point Precinct is considered to make up the majority of the cumulative impact that could arise into the future.

As outlined in preceding sections of this report, the impact of the Moore Point Precinct development on flood characteristics in events up to and including the 1% AEP flood is negligible or within acceptable tolerances for flood modelling. Accordingly, it follows that any cumulative impacts associated with a realistic consideration of potential future development will also be negligible.

2. *No filling or structures are permitted within the floodway corridor or 'boundary of significant flow'.*

   Hydraulic category mapping has been prepared for the site and local floodplain showing the extent of the floodway corridor (*refer* **Figure 3.19**). The proposed development has been "pulled back" from the floodway corridor so that no structures or filling will occur within the floodway. Only excavation associated with the foreshore revitalisation is proposed in the floodway corridor, which will serve to improve flow conveyance.

3. *Filling is typically not permitted without compensatory excavation to ensure no net loss of storage.*

   Compensatory excavation to achieve no net loss of storage is discussed above under Point 1 and is not considered necessary in this section of the floodplain of the Georges River where flow the maintenance of flow conveyance has a more significant influence on peak flood levels.

6 Conclusions

The Planning Proposal for the Moore Point Precinct at Liverpool will involve the redevelopment of a site that has been used for a range of industrial land uses. The redevelopment will involve the creation of a mixed use precinct that will provide new homes, jobs and open space in an area that adjoins the Georges River and which is connected to the Liverpool CBD. Its proximity to the river and Lake Moore is a defining feature of the proposal. The river and it's eastern foreshore is viewed as an asset that will provide a vista that will allow the built form of the development to blend with extensive areas of open space making the precinct an appealing place to work and live.

Due to its proximity to the river, there is potential for some areas of the site to be flooded, although history suggests that this would only occur in very rare events.

Flood affectation at the site and across adjoining areas is documented in the *Georges River Flood Study* which was published by Liverpool City Council in 2020. The 2020 Flood Study is based on the results of flood modelling which confirms that during major floods there is potential for floodwaters to 'spill' from the Georges River and inundate parts of the site.

Investigations undertaken for this report have used an updated version of the TUFLOW flood model that was developed for the 2020 Flood Study to:

- assess the risk of flooding at the site;
- assist in the creation of a design landform for the site that will provide building platforms and a streetscape where habitable buildings can be built to meet local and state government flood planning control criteria; and to,
- assess the potential flood impacts associated with that design landform.

The findings from these investigations are as follows.

Existing Conditions

(i) Under existing conditions, the site remains largely flood free during events up to and including 5% AEP flood (refer **Figure 3.10**).

(ii) Flooding in a 1% AEP event will result in shallow flooding across parts of the existing site with typical depths of no greater than 0.3 metres (refer **Figure 3.11**).

Post-development Conditions

(iii) The proposed redevelopment of the site involves filling to raise those areas of the precinct proposed for residential land uses to the flood planning level (1% AEP plus 0.5 m) which is at least 0.1 m above the predicted peak level of the 1 in 500 AEP flood. This will ensure that the majority of the proposed development will remain flood free during floods up to and including the 1 in 500 AEP event.

(iv) Flooding of the developed site in a 1 in 500 AEP flood will be limited to lower lying areas that adjoin Newbridge Road.

(v) No habitable areas within the precinct will be inundated in the occurrence of the PMF adopted by Liverpool City Council.

(vi) The proposed redevelopment of the site includes excavation and bank stabilisation along the eastern and southern banks of the Georges River between the Newbridge Road crossing and Lake Moore, which is to be designed to revitalise the shoreline and provide safe access to the waterway.

(vii) The development will include an overland flow route between Newbridge Road and Lake Moore to prevent floodwaters from ponding along the southern side of the roadway and discharging to the south and through existing residential areas. The overland flow route will reduce flood affectation for existing development to the south and have the potential to alleviate stormwater ponding caused by the trapped sag point present along Newbridge Road.

(viii) Flood modelling to assess the potential impacts of the design landform proposed as part of the development has established that it will have minimal impact on existing flood characteristics. Relevant findings for the 1% AEP flood are as follows.

- As shown in **Figure 4.10**, the proposed development is predicted to result in decreases in peak 1% AEP flood levels upstream of the Liverpool Weir. Decreases of up to 0.06 metres are predicted upstream of Newbridge Road and up to 0.03 metres in areas upstream of the South West Motorway (M5) crossing.

- Decreases in flood levels of between 0.04 and 0.20 metres are also predicted across commercial and residential properties on the eastern floodplain of the Georges River upstream from Newbridge Road (*refer* **Figure 4.10**).

- **Figure 4.10** also shows that peak 1% AEP flood levels will remain materially unchanged for Lake Moore and Anzac Creek with the predicted change in level no greater than +/- 0.01 metres which is within the limits of reliability for flood modelling.

- As shown in **Figure 4.11**, the development is predicted to cause some increases in peak 1% AEP flood level within the Moore Point Precinct to the east of the weir. This increase is localised and for the most part occurs within the boundaries of the Precinct.

  As shown in **Figure 4.11**, a maximum flood level increase of up to 0.08 metres is predicted within the Georges River channel about 100 m downstream of Liverpool Weir. The impact of this flood level increase would be negligible as it occurs along and adjacent to the rock protected railway embankment that serves as the river boundary along the outside meander bend downstream from the weir.

  There is also a localised area adjacent to the south-west corner of the Precinct near Haigh Avenue where increases in peak 1% AEP flood level are predicted. These increases are largely contained within the Haigh Avenue road reserve and arise as a consequence of the earthworks proposed in the area immediately adjacent. Currently the road reserve that is impacted is only used as an access from Newbridge Road to the existing industrial buildings that will be demolished as part of the site redevelopment.

  The increases do extend upstream along the road reserve which becomes an underpass that provides access to the southern side of Newbridge Road. These increases quickly reduce to acceptable levels in the area immediately south of Newbridge Road (refer **Figure 4.11**) and do not impact any privately owned land.

  The increases are somewhat irrelevant as this road reserve will be closed as part of the new access solution for the Precinct. .

- Predicted increases in peak 1% AEP flood levels elsewhere are typically less than 0.02 metres and largely contained within the Moore Point Precinct or within the Georges River channel. Increases of this magnitude are within acceptable tolerances for flood impact assessment modelling.

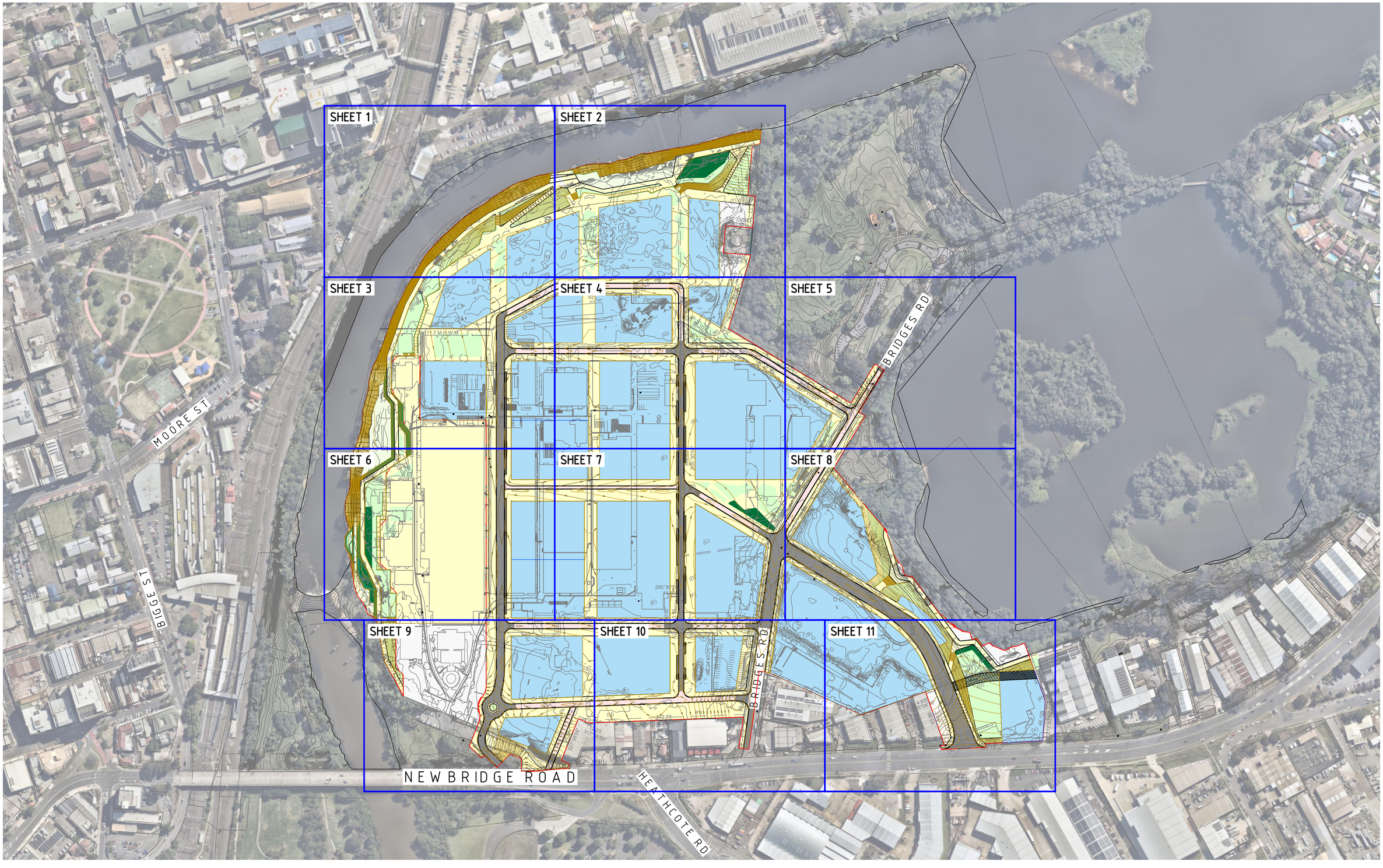
This report documents the results of additional analysis undertaken to address the recommendations outlined in the Department's Gateway Determination Report dated March 2023. The investigation has also considered compliance with flood planning criteria outlined in relevant planning instruments, most notably the Liverpool DCP 2008. A detailed assessment of compliance with the various flood planning criteria detailed in the DCP 2008 is provided in **Section 5**.

In summary, the assessment confirms that the development presented in the Master Plan complies with relevant flood criteria and for some adjoining areas, will provide a better flood affectation outcome than is the case for existing conditions. The development proposal detailed in the Master Plan for the Moore Point Precinct is compatible with the flood risk at the site and is designed to ensure negligible adverse flood impacts in floods up to and including the 1% AEP event. It has also been shown to have minimal impact on flood characteristics in rarer events up to the 1 in 500 AEP flood. The modelling also indicates that the post-development landform combined with the proposed overland flow path will reduce 1 in 500 AEP flood levels at more than two hundred (200) properties located upstream of the Precinct.

7 References

- Advisian Pty Ltd (*2022*), '*Moore Point Precinct, Liverpool – Flood Impact and Risk Assessment*', prepared for Leamac Property Group and Coronation Property Co. Pty Ltd
- Australian Institute for Disaster Resilience (*2017*), '*Australian Disaster Resilience Handbook 7 Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia*'; © Commonwealth of Australia 2017 third edition.
- Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors), (*2019*), *'Australian Rainfall and Runoff: A Guide to Flood Estimation, Commonwealth of Australia*'
- Bewsher Consulting (*1997*), '*Georges River Flood Model Study*'
- Bewsher Consulting (*2004*), '*Georges River Floodplain Risk Management Study and Plan*', prepared for Georges River Floodplain Management Committee
- BMT Australia Pty Ltd (*2020*), '*Georges River Flood Study*, prepared for Canterbury Bankstown and Liverpool City Council.
- Greater Sydney Commission (*2018*), '*Collaboration Area – Liverpool Place Strategy*'
- J Wyndham Prince (*2016*), '*Liverpool Waterfront Water Cycle and Flood Management Strategy*', prepared for Leamac and Coronation Joint Venture Pty Ltd
- Liverpool City Council (*2008*), '*Liverpool Development Control Plan 2008'*, amended 1st February 2021.
- Liverpool City Council (*2020*), '*Connected Liverpool 2040 – Liverpool's Local Strategic Planning Statement – A Land Use Vision to 2040*'.
- NSW Government (*2005*), '*Floodplain Development Manual: the Management of Flood Liable Land*'; ISBN 0 7347 5476 0
- NSW Government (*2007*), '*Floodplain Risk Management Guideline – Floodway Definition'*; prepared by NSW Office of Environment & Heritage
- NSW Government (*2023*), '*Moore Point – Flood Planning Advice Report*'; prepared by NSW Department of Planning and Environment
- NSW Government (*2023*), '*Moore Point – Gateway Determination Report – PP-2022-1602*'; prepared by NSW Department of Planning and Environment
- Office of Environment & Heritage (*2019*), '*Review of ARR Design Inputs for NSW*', prepared by WMAwater.
- Public Works Department (*1991*), '*Georges River Flood Study*'
- Thomas C R & Golaszewski, R (*2012*), *'Refinement of Procedures for Floodway Definition'*;. Proceedings of 52nd Annual Floodplain Management Authorities Conference, Narooma, February 2012
- Thomas C R, Golaszewski R & Cox R (*2018*), *'Methodology for Determining Floodway / Flow Conveyance Extent in Australian Floodplains'*, Proceedings of Hydrology and Water Resources Symposium, Melbourne, December 2018

Appendix A
Masterplan Drawings
(Prepared by Northrop)



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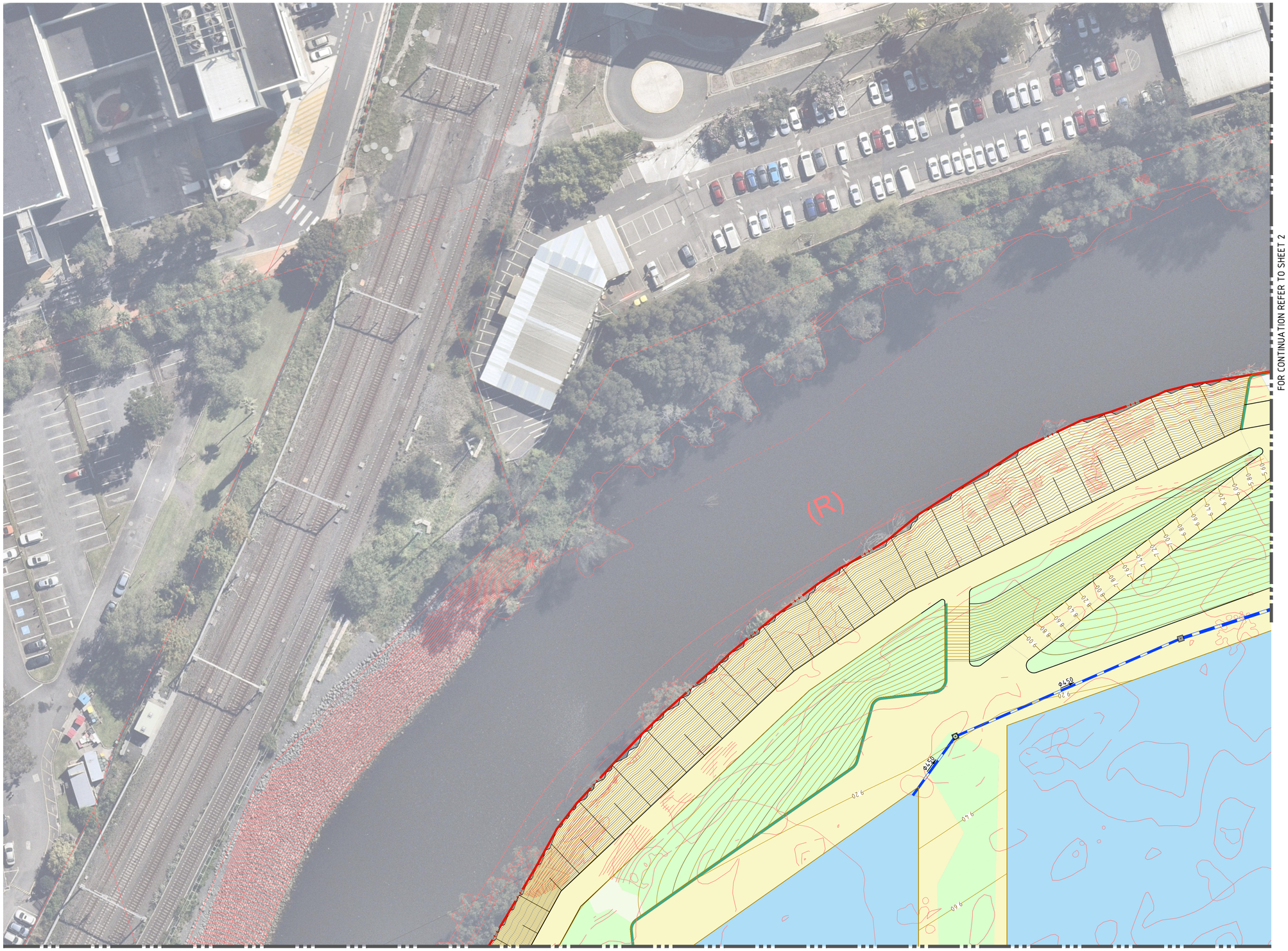

LEGEND

- EXISTING CADASTRAL BOUNDARY LINE (SOURCED FROM SIXMAPS)
- PROPOSED KERB
- KO — KERB ONLY
- KG — KERB AND GUTTER
- FK — FLUSH KERB
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- FLEXIBLE / RIGID PAVEMENT - TYPE 1
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- SHARED ZONE PAVEMENT
- LANDSCAPING
- BIO RETENTION BASINS
- FORESHORE LANDSCAPED AREA - REFER LANDSCAPE ARCHITECT FOR FURTHER DETAIL

EXISTING SERVICES INFORMATION
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- G — EXISTING GAS
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- O — EXISTING OPTUS
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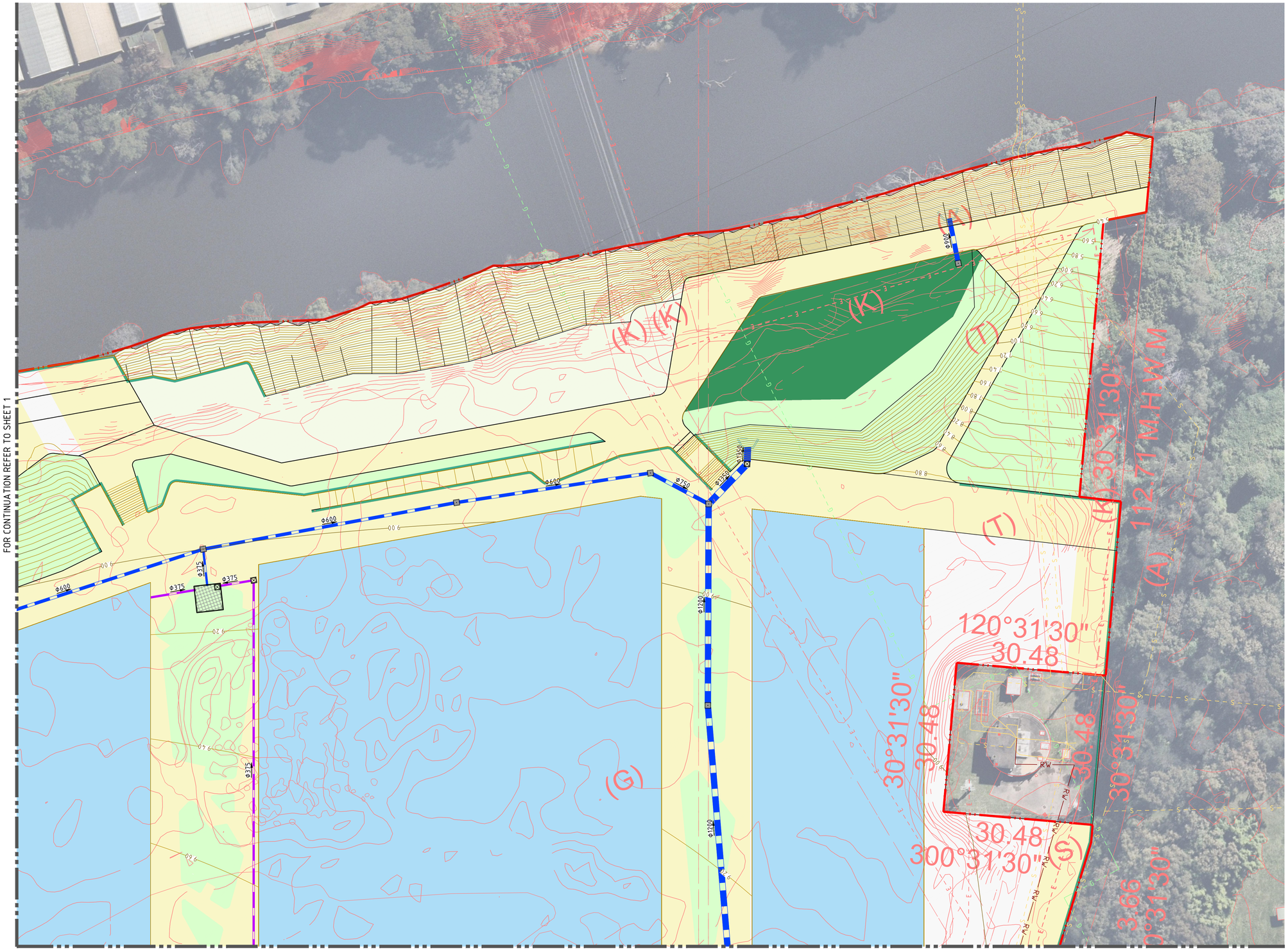

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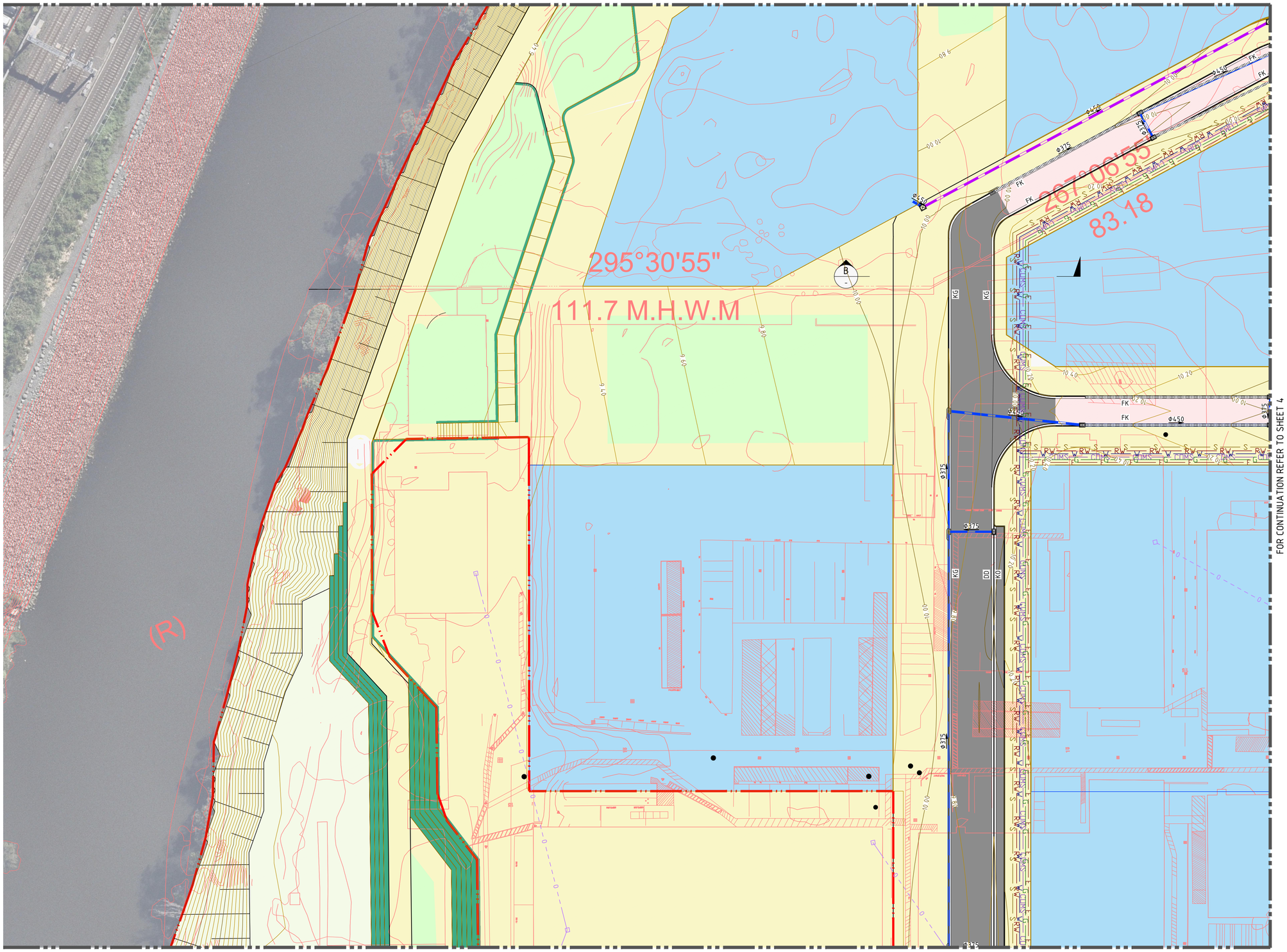

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- LANDSCAPING
- BIO RETENTION BASINS
- FORESHORE LANDSCAPED AREA - REFER LANDSCAPE ARCHITECT FOR FURTHER DETAIL

EXISTING SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- E — EXISTING ELECTRICITY
- G — EXISTING GAS
- COMS — EXISTING TELECOMUNICATIONS
- O — EXISTING OPTUS
- W — EXISTING WATER
- D — EXISTING DRAINAGE
- S — EXISTING SEWER

PROPOSED SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- E — PROPOSED ELECTRICITY
- G — PROPOSED GAS
- COMS — PROPOSED TELECOMMUNICATIONS
- W — PROPOSED WATER
- RW — RECYCLED WATER
- S — PROPOSED SEWER

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

CLIENT: LEAMAC PROPERTY GROUP / CORONATION

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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT: MOORE POINT
3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 03

JOB NUMBER: 212498
DRAWING NUMBER: C04.13
REVISION: 03
DRAWING SHEET SIZE = A1

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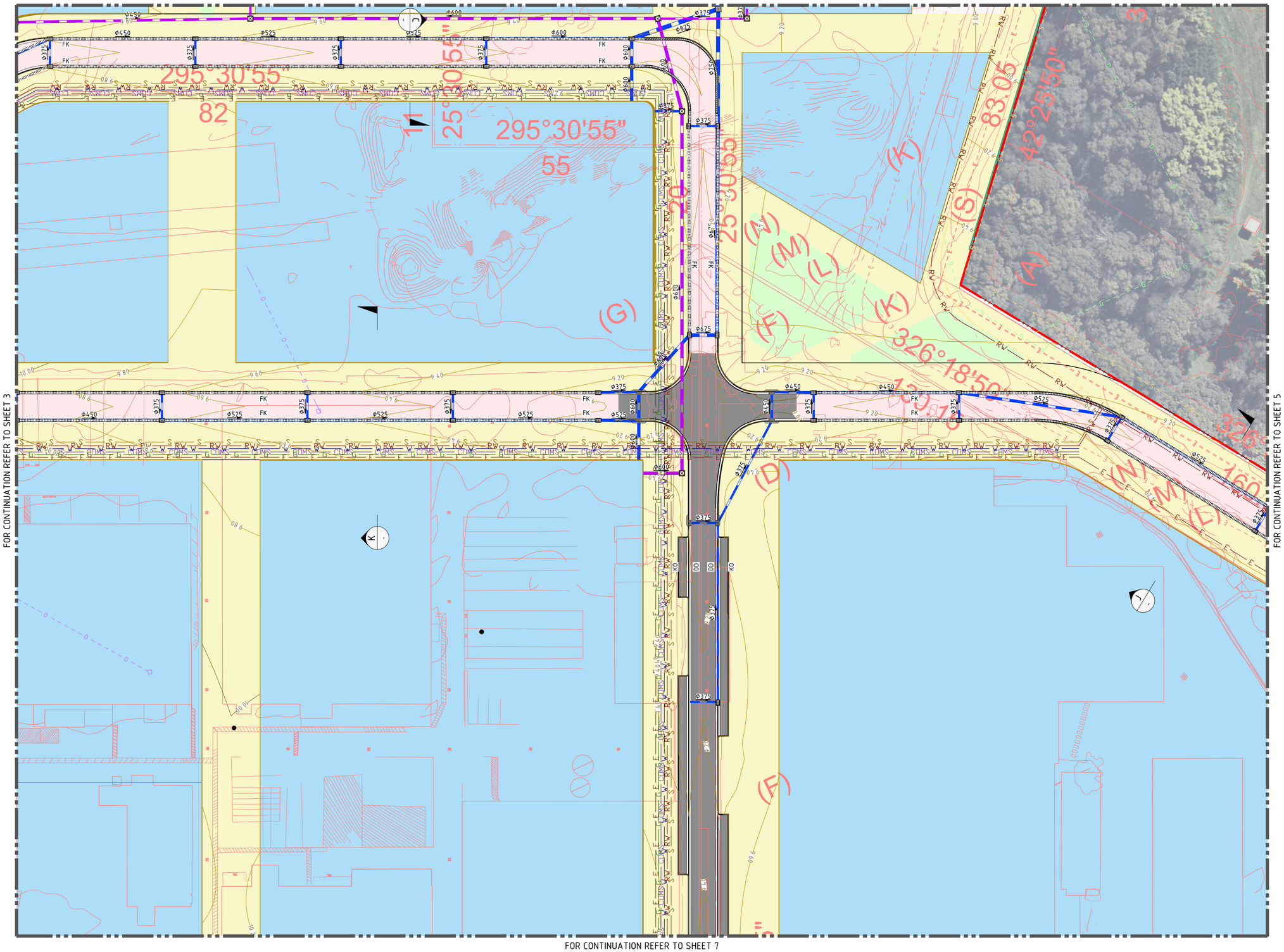
Date :16.04.2020 2:24 PM

FOR CONTINUATION REFER TO SHEET 2



FOR CONTINUATION REFER TO SHEET 3

FOR CONTINUATION REFER TO SHEET 5

FOR CONTINUATION REFER TO SHEET 7

LEGEND

- EXISTING CADASTRAL BOUNDARY LINE (SOURCED FROM SIXMAPS)
- PROPOSED KERB
- KO — KERB ONLY
- KG — KERB AND GUTTER
- FK — FLUSH KERB
- BATTERS
- PROPOSED CONTOURS
- EXISTING CONTOURS
- FPL — FLOOD PLANNING LEVEL
- Φ150 — STORMWATER PIPE
- ROOF RAINWATER RE-USE NETWORK
- GRATED INLET PIT (NEW / EXTG)
- KERB INLET PIT (NEW / EXTG)
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- GRATED TRENCH DRAIN
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DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
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DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 04

JOB NUMBER 212498
DRAWING NUMBER C04.14
REVISION 03
DRAWING SHEET SIZE = A1

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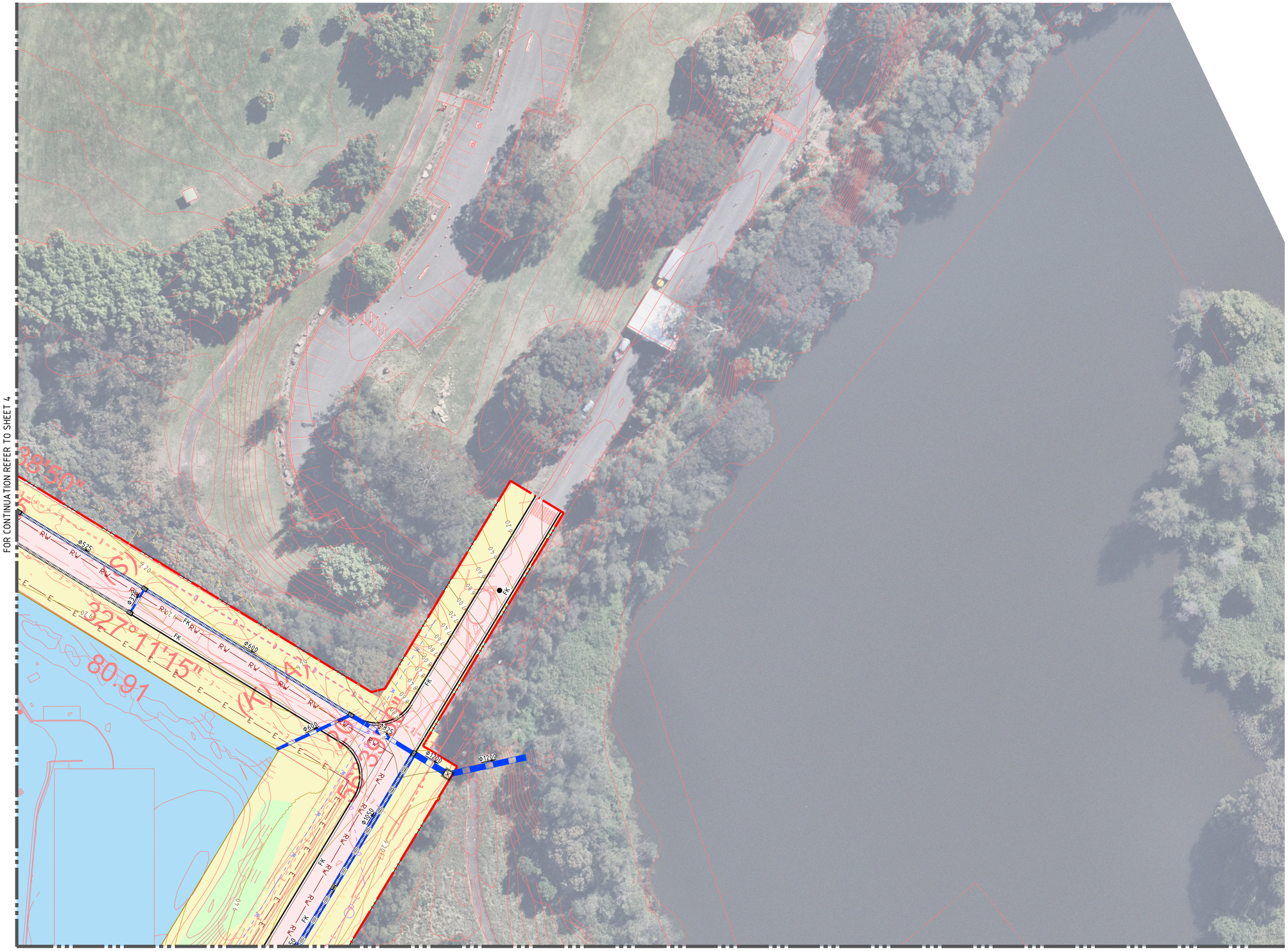

LEGEND

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EXISTING SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- EXISTING ELECTRICITY
- EXISTING GAS
- EXISTING TELECOMUNICATIONS
- EXISTING OPTUS
- EXISTING WATER
- EXISTING DRAINAGE
- EXISTING SEWER

PROPOSED SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- PROPOSED ELECTRICITY
- PROPOSED GAS
- PROPOSED TELECOMMUNICATIONS
- PROPOSED WATER
- PROPOSED RECYCLED WATER
- PROPOSED SEWER

DRAWN: A.FALLINS DESIGNED: B.LAWRENCE JOB MANAGER: B.LAWRENCE VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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DRAWING TITLE: CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 05

JOB NUMBER: 212498
DRAWING NUMBER: C04.15
REVISION: 03
DRAWING SHEET SIZE = A1

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Date : 16.04.2020 2:24 PM

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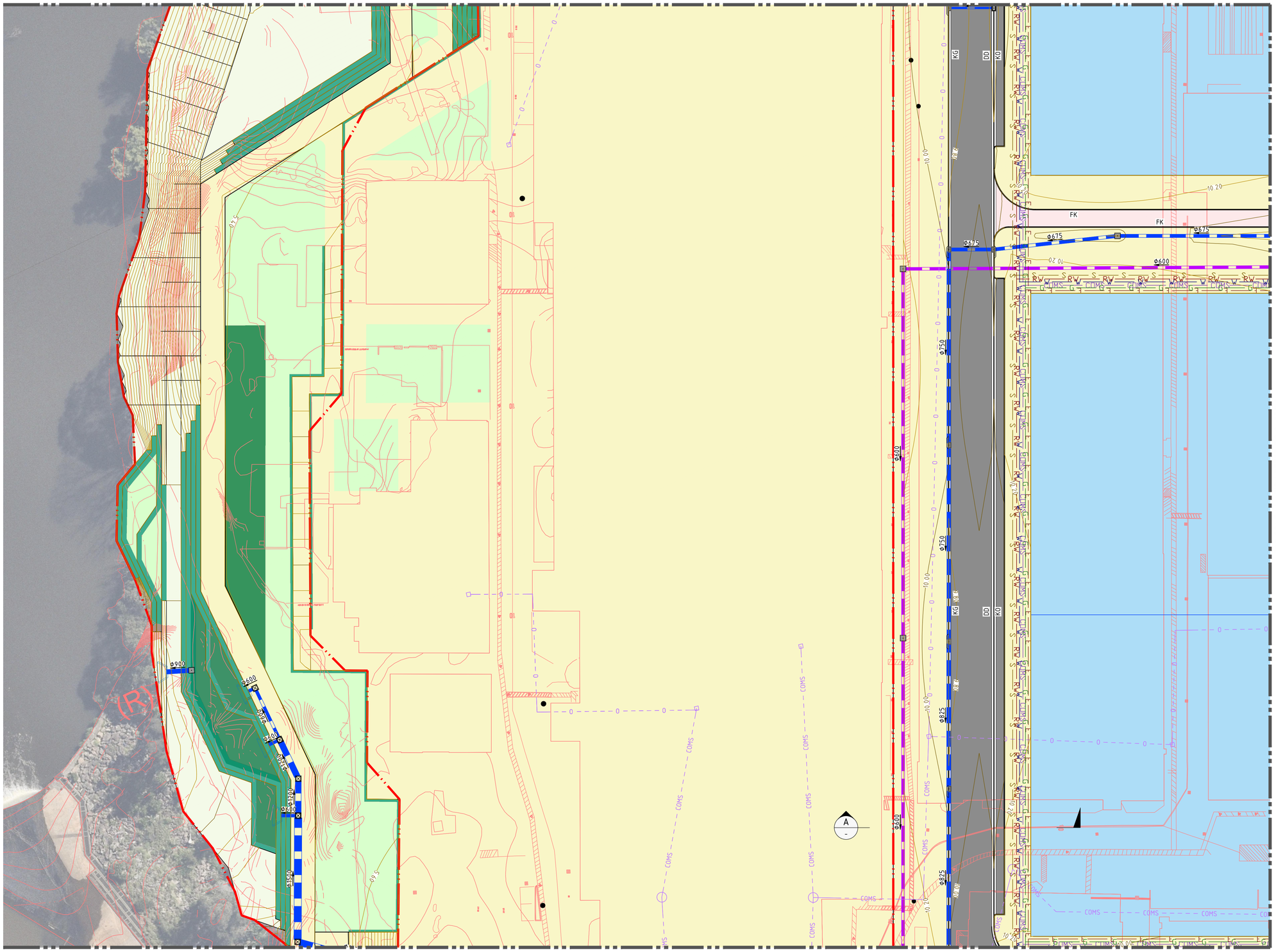

FOR CONTINUATION REFER TO SHEET 7

FOR CONTINUATION REFER TO SHEET 9

LEGEND

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- S — PROPOSED SEWER

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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PROJECT
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3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 06

JOB NUMBER **212498**
DRAWING NUMBER **C04.16**
REVISION **03**
DRAWING SHEET SIZE = A1

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FOR CONTINUATION REFER TO SHEET 6

FOR CONTINUATION REFER TO SHEET 8

FOR CONTINUATION REFER TO SHEET 10

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

LEGEND

- EXISTING CADASTRAL BOUNDARY LINE (SOURCED FROM SIXMAPS)
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EXISTING SERVICES INFORMATION (PROVIDED BY MOTT MACDONALD)

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PROPOSED SERVICES INFORMATION (PROVIDED BY MOTT MACDONALD)

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01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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PROJECT: MOORE POINT
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MOOREBANK, NSW, 2170

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 07

JOB NUMBER: 212498
DRAWING NUMBER: C04.17
REVISION: 03
DRAWING SHEET SIZE = A1

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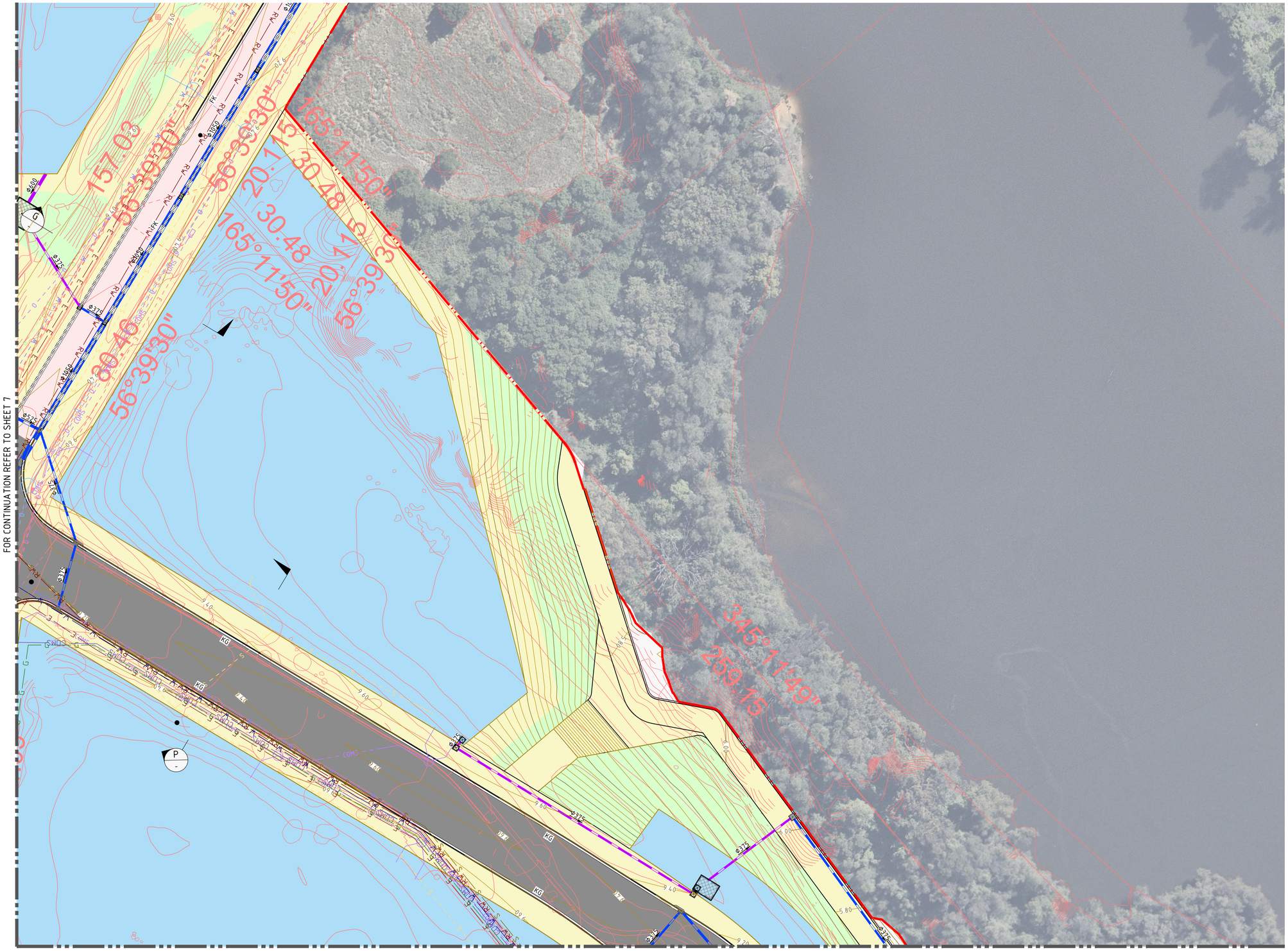

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PROPOSED SERVICES INFORMATION
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- PROPOSED TELECOMMUNICATIONS
- PROPOSED WATER
- RECYCLED WATER
- PROPOSED SEWER

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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PROJECT
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3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 08

JOB NUMBER: 212498
DRAWING NUMBER: C04.18
REVISION: 03
DRAWING SHEET SIZE = A1

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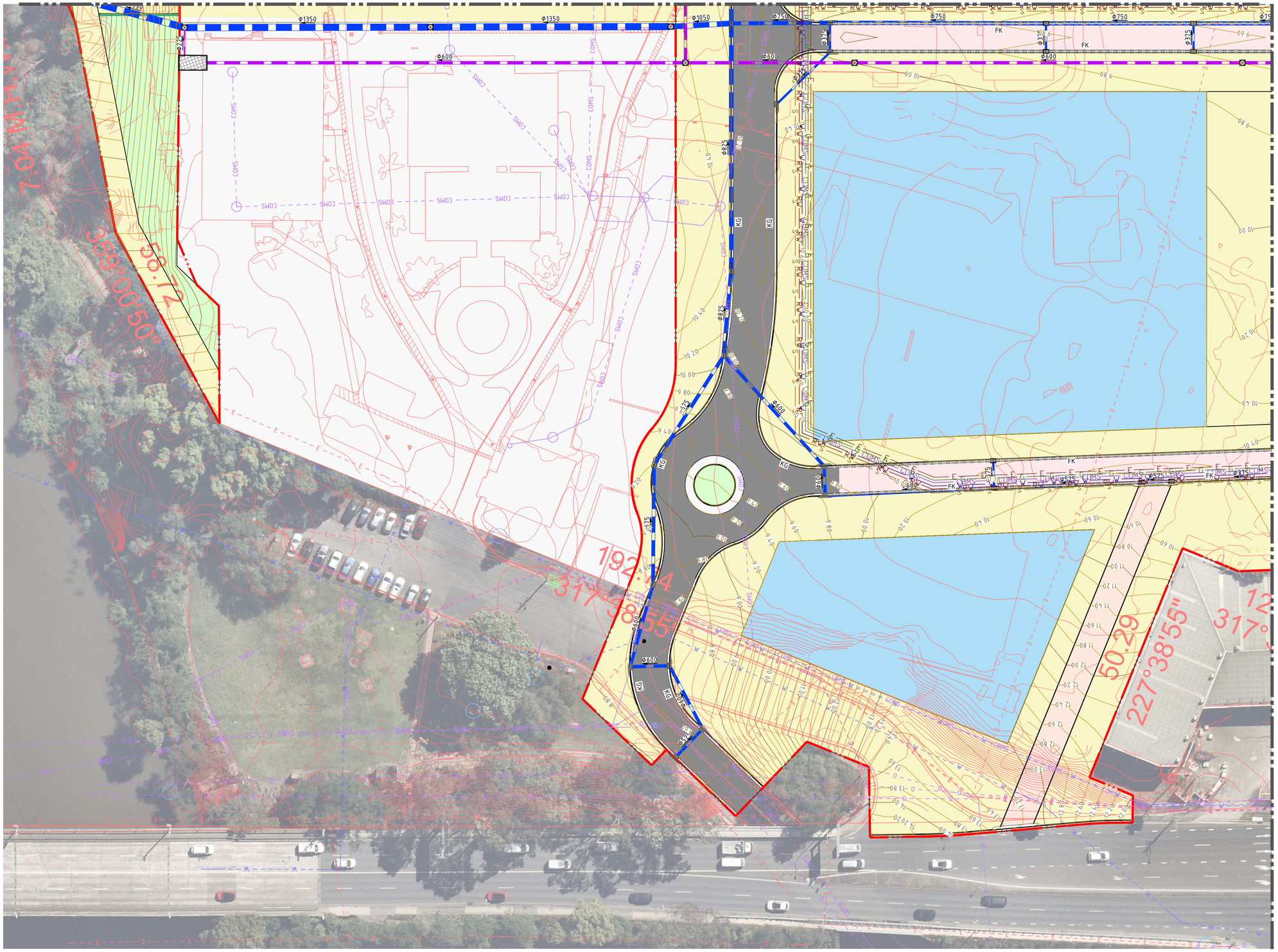
FOR CONTINUATION REFER TO SHEET 6

FOR CONTINUATION REFER TO SHEET 7

FOR CONTINUATION REFER TO SHEET 10



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DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
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PROJECT: MOORE POINT
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MOOREBANK, NSW, 2170

DRAWING TITLE: CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 09

JOB NUMBER: 212498
DRAWING NUMBER: C04.19
REVISION: 03
DRAWING SHEET SIZE = A1

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FOR CONTINUATION REFER TO SHEET 7

FOR CONTINUATION REFER TO SHEET 8

FOR CONTINUATION REFER TO SHEET 9

FOR CONTINUATION REFER TO SHEET 11

LEGEND

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- JUNCTION PIT (NEW / EXTG)
- GRATED TRENCH DRAIN
- RWT RAINWATER HARVESTING TANK
- RETAINING WALL
- FLEXIBLE / RIGID PAVEMENT - TYPE 1
- FOOTPATH PAVEMENT
- SHARED ZONE PAVEMENT
- LANDSCAPING
- BIO RETENTION BASINS
- FORESHORE LANDSCAPED AREA - REFER LANDSCAPE ARCHITECT FOR FURTHER DETAIL

EXISTING SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- E EXISTING ELECTRICITY
- G EXISTING GAS
- COMS EXISTING TELECOMUNICATIONS
- O EXISTING OPTUS
- W EXISTING WATER
- D EXISTING DRAINAGE
- S EXISTING SEWER

PROPOSED SERVICES INFORMATION
(PROVIDED BY MOTT MACDONALD)

- E PROPOSED ELECTRICITY
- G PROPOSED GAS
- COMS PROPOSED TELECOMMUNICATIONS
- W PROPOSED WATER
- RW RECYCLED WATER
- S PROPOSED SEWER

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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SCALE 1:400@ A1 (0 4 8 12 16 20m)

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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT
MOORE POINT
3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

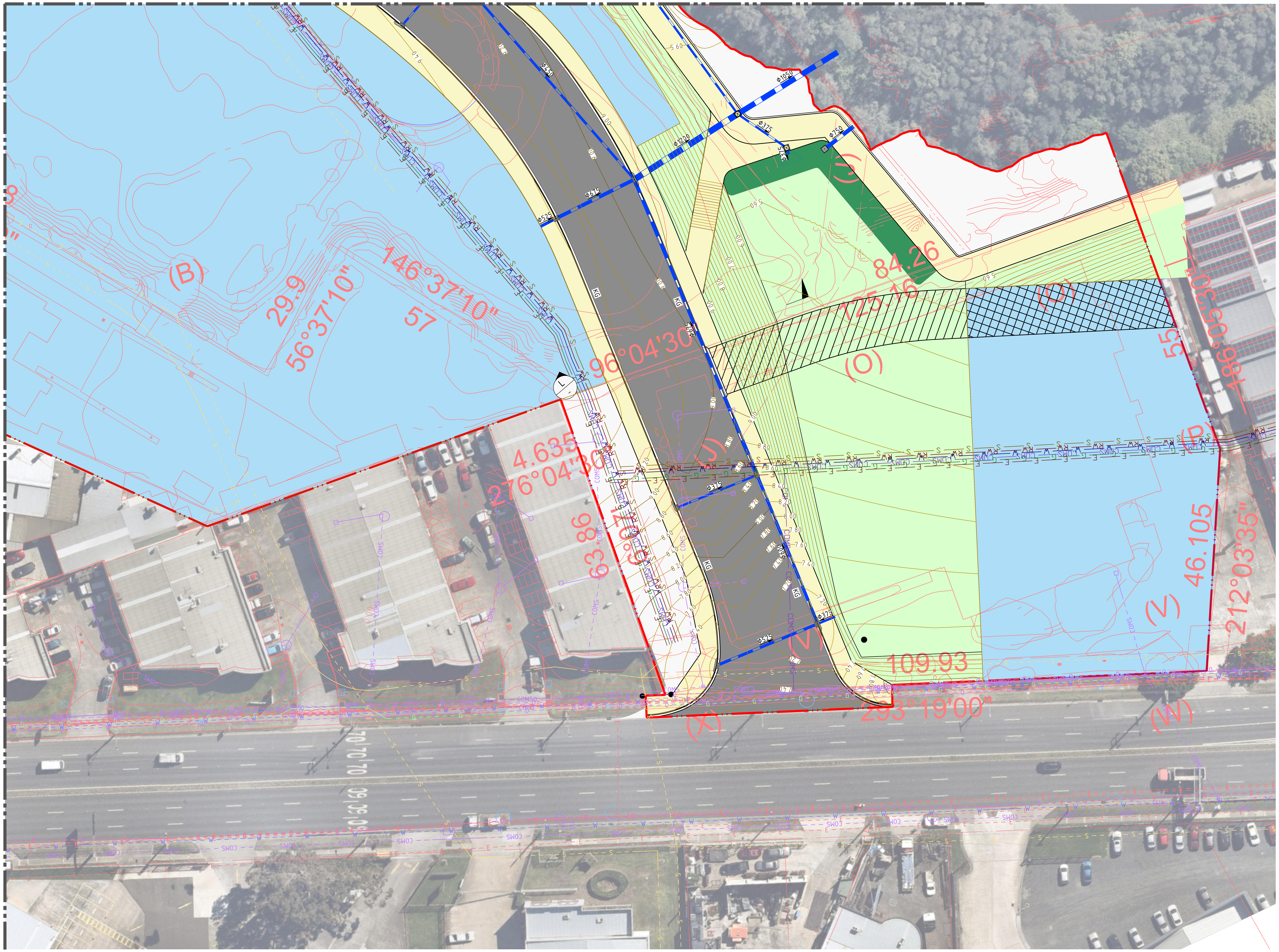
DRAWING TITLE
CIVIL ENGINEERING PACKAGE
SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 10

JOB NUMBER 212498
DRAWING NUMBER C04.20
REVISION 03
DRAWING SHEET SIZE = A1

Date: 16.04.2020 2:24 PM
Plotted By: UTTAM MANDAL
Found: C:\1265\data\Northrop\SYN\212498 - Moore Point Masterplan_110\212498-CAD\01-CONCEPT DA\212495_C04.11.dwg

FOR CONTINUATION REFER TO SHEET 8

FOR CONTINUATION REFER TO SHEET 10



LEGEND

	EXISTING CADASTRAL BOUNDARY LINE (SOURCED FROM SIXMAPS)
	PROPOSED KERB
KO	KERB ONLY
KG	KERB AND GUTTER
FK	FLUSH KERB
	BATTERS
	PROPOSED CONTOURS
	EXISTING CONTOURS
FPL	FLOOD PLANNING LEVEL
Ø150	STORMWATER PIPE
	ROOF RAINWATER RE-USE NETWORK
	GRATED INLET PIT (NEW / EXTG)
	KERB INLET PIT (NEW / EXTG)
	JUNCTION PIT (NEW / EXTG)
	GRATED TRENCH DRAIN
RWT	RAINWATER HARVESTING TANK
	RETAINING WALL
	FLEXIBLE / RIGID PAVEMENT - TYPE 1
	FOOTPATH PAVEMENT
	SHARED ZONE PAVEMENT
	LANDSCAPING
	BIO RETENTION BASINS
	FORESHORE LANDSCAPED AREA - REFER LANDSCAPE ARCHITECT FOR FURTHER DETAIL

EXISTING SERVICES INFORMATION (PROVIDED BY MOTT MACDONALD)

E	EXISTING ELECTRICITY
G	EXISTING GAS
COMS	EXISTING TELECOMUNICATIONS
O	EXISTING OPTUS
W	EXISTING WATER
D	EXISTING DRAINAGE
S	EXISTING SEWER

PROPOSED SERVICES INFORMATION (PROVIDED BY MOTT MACDONALD)

E	PROPOSED ELECTRICITY
G	PROPOSED GAS
COMS	PROPOSED TELECOMMUNICATIONS
W	PROPOSED WATER
RW	RECYCLED WATER
S	PROPOSED SEWER

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22

DRAWN: A.FALLINS DESIGNED: B.LAWRENCE JOB MANAGER: B.LAWRENCE VERIFIER:

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PROJECT: MOORE POINT, 3 BRIDGES ROAD, MOOREBANK, NSW, 2170

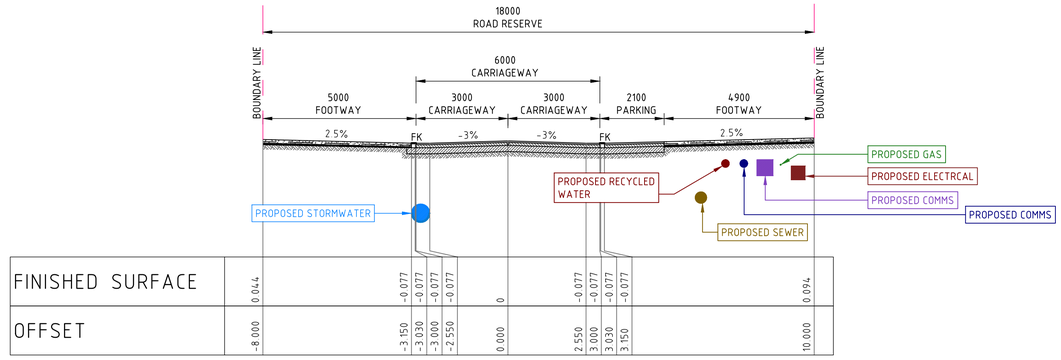
DRAWING TITLE: CIVIL ENGINEERING PACKAGE — SITEWORKS AND STORMWATER MANAGEMENT PLAN - SHEET 11

JOB NUMBER: 212498

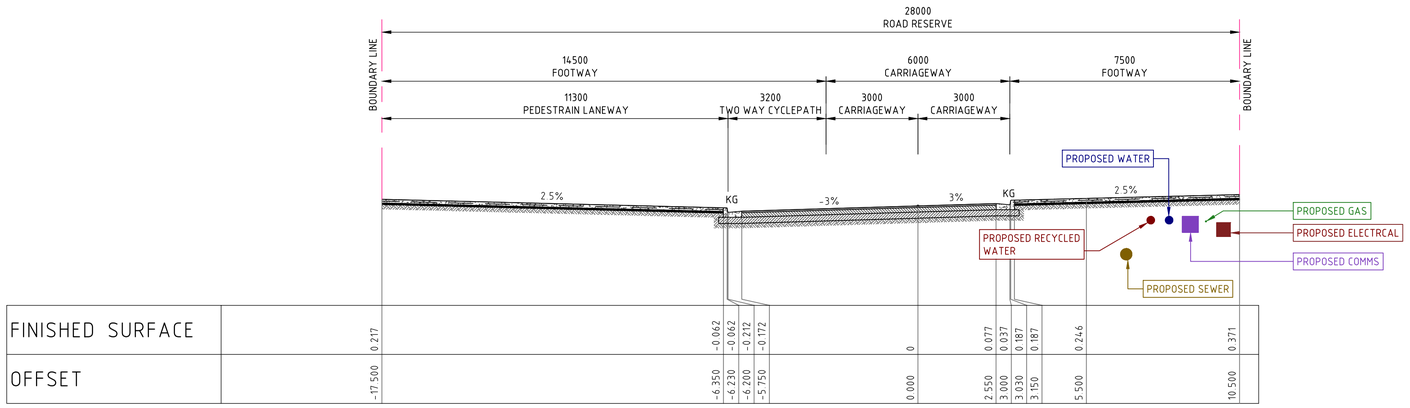
DRAWING NUMBER: C04.21 REVISION: 02

DRAWING SHEET SIZE = A1

NOTE: PROPOSED SERVICES INFORMATION SUPPLIED BY MOTT MACDONMALD. EXISTING SERVICES INFORMATION NOT SHOWN (REFER PLAN FOR DETAILS)



SECTION C
SCALE 1:100



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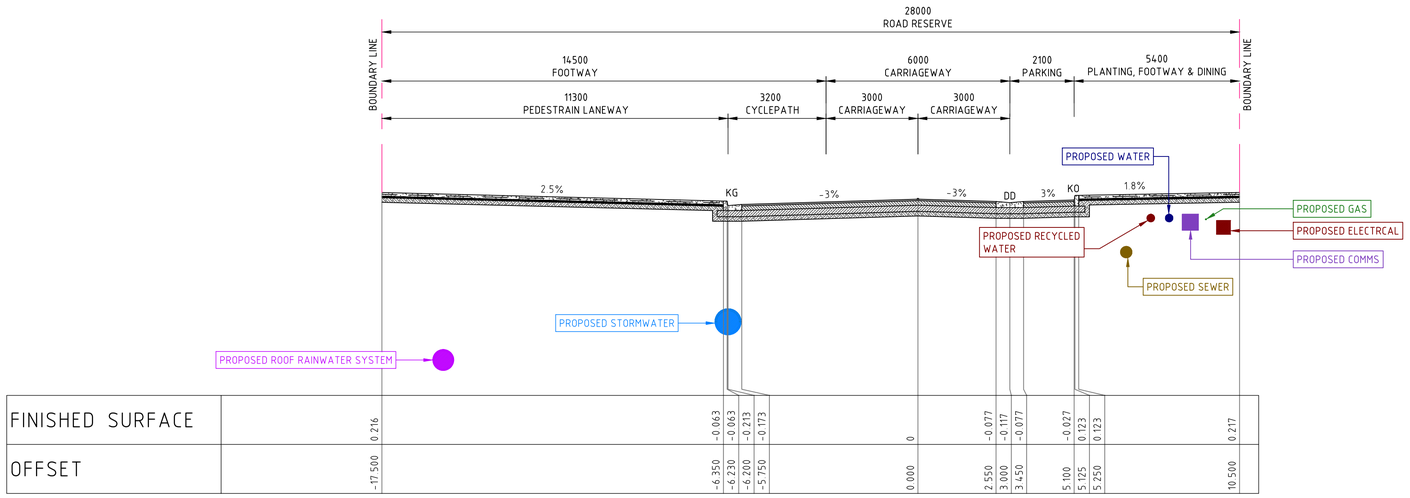

SECTION A
SCALE 1:100

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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PROJECT
MOORE POINT
3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 01

JOB NUMBER **212498**
DRAWING NUMBER **C06.01**
REVISION **03**
DRAWING SHEET SIZE = A1

Found : C:\12GISdata\NorthropSYN\212498 - Moore Point Masterplan_110\212498-CADD\1-CONCEPT DA\212498_C06.01.dwg
Plotted By : UTTAM MANDAL
Date : 16.04.2020 2:24 PM

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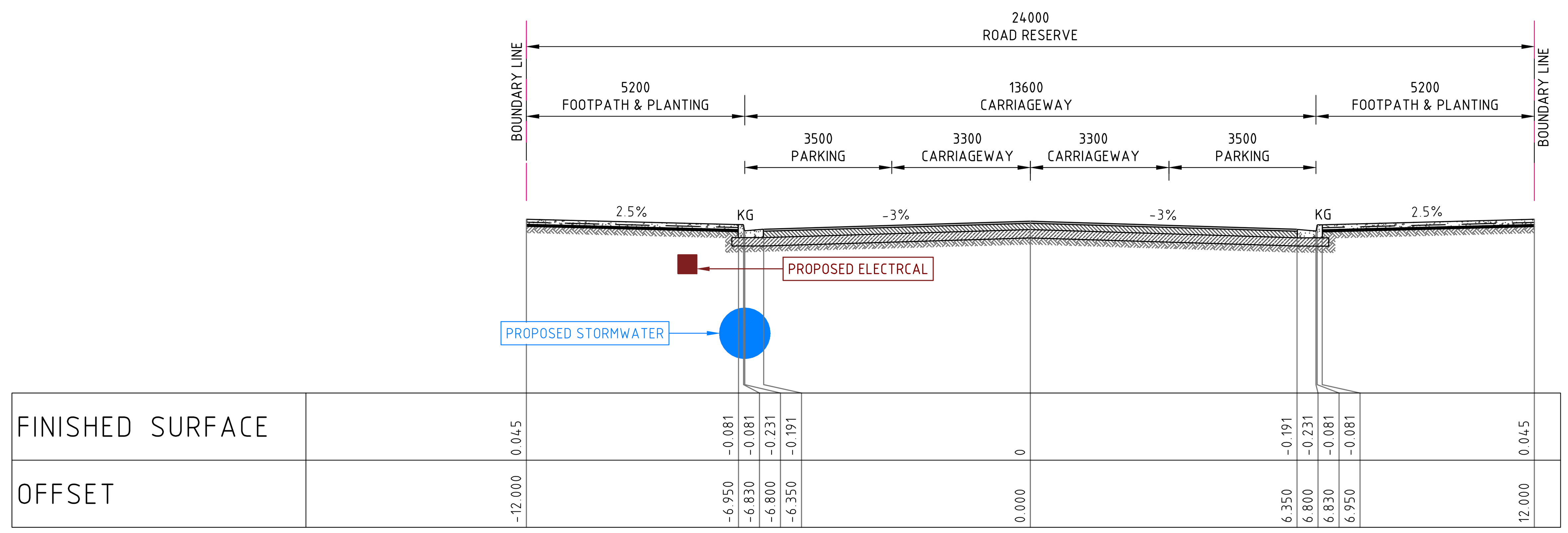
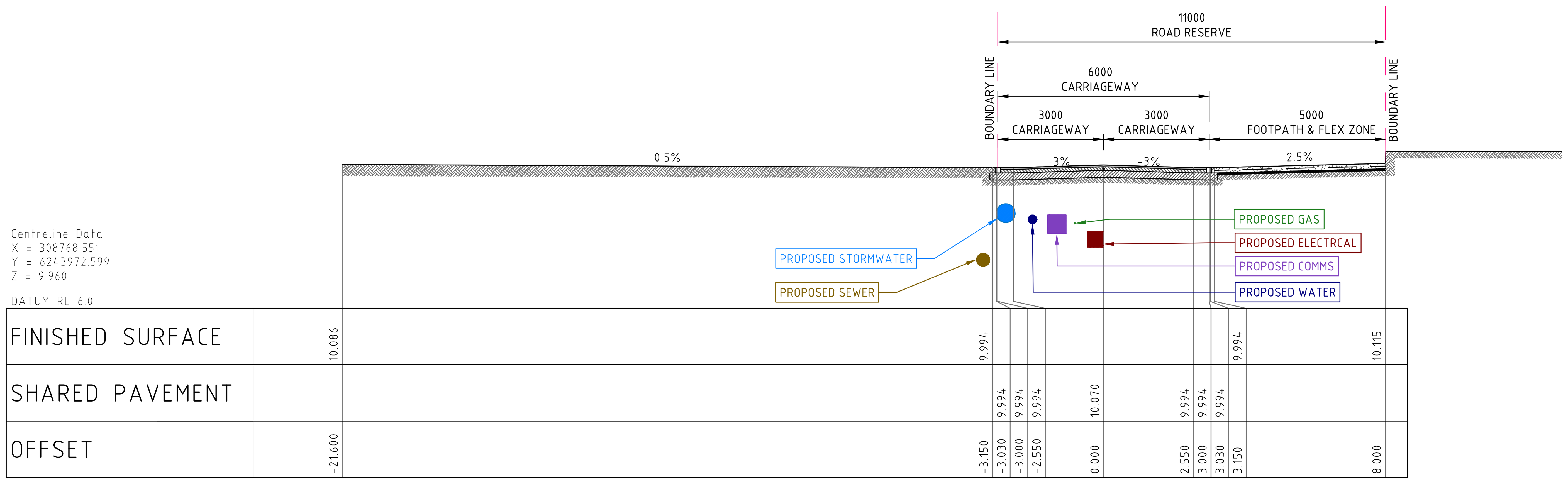
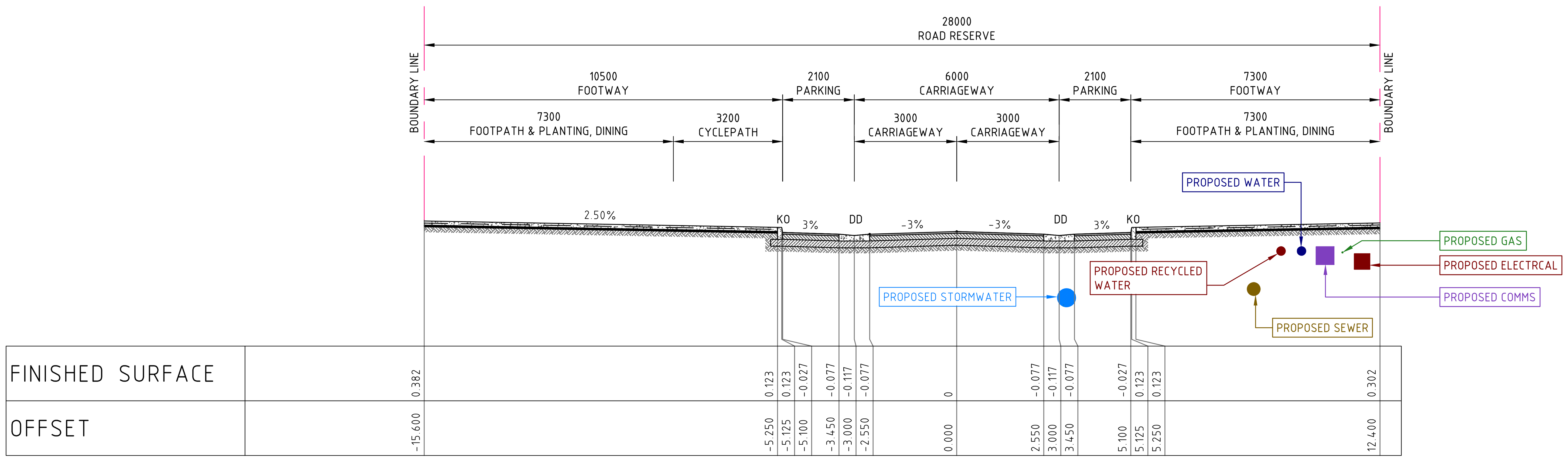


SECTION F
SCALE 1:100



SECTION E
SCALE 1:100



SECTION D
SCALE 1:100

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
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DRAWING TITLE
CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 02

JOB NUMBER 212498
DRAWING NUMBER C06.02
REVISION 03
DRAWING SHEET SIZE = A1

Plotted By : UTTAM MANDAL
Date : 16.04.2020 2:24 PM

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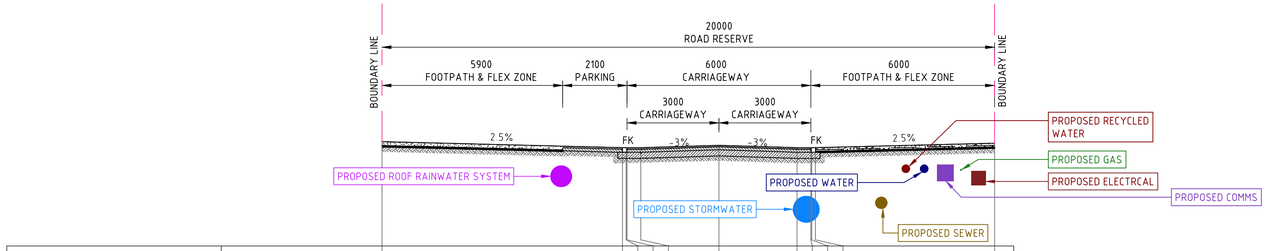

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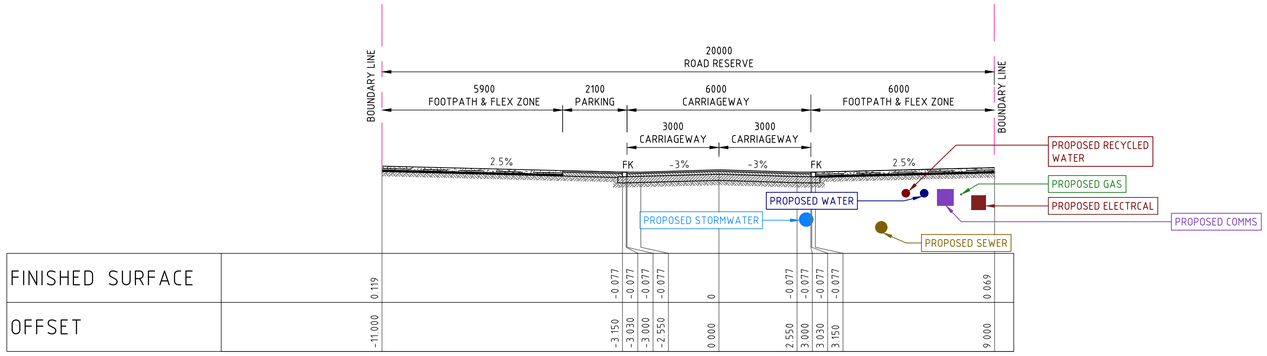
SCALE 1:100



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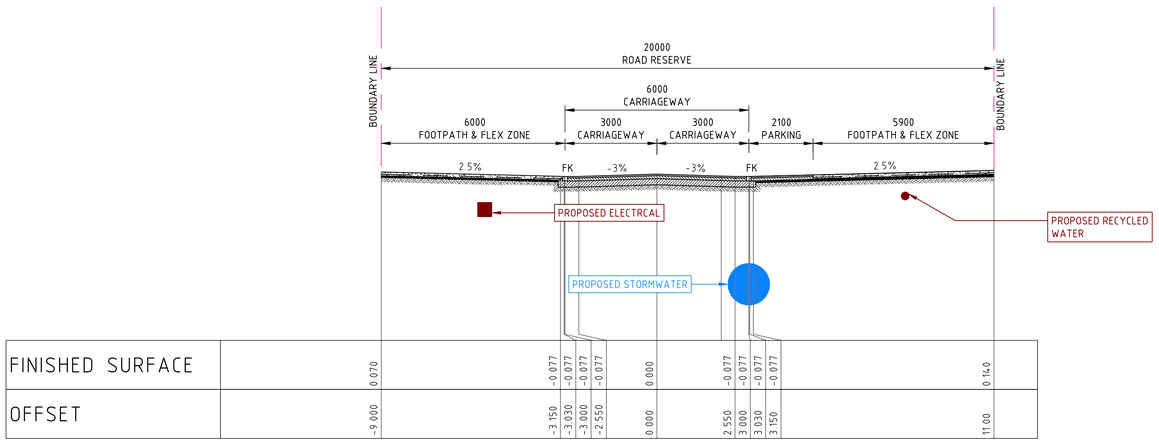
SCALE 1:100



SECTION G
SCALE 1:100

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE
TYPICAL CROSS SECTIONS - SHEET 03

JOB NUMBER **212498**
DRAWING NUMBER **C06.03**
REVISION **03**
DRAWING SHEET SIZE = A1

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Plotted By : UTTAM MANDAL
Date : 16.04.2020 2:24 PM

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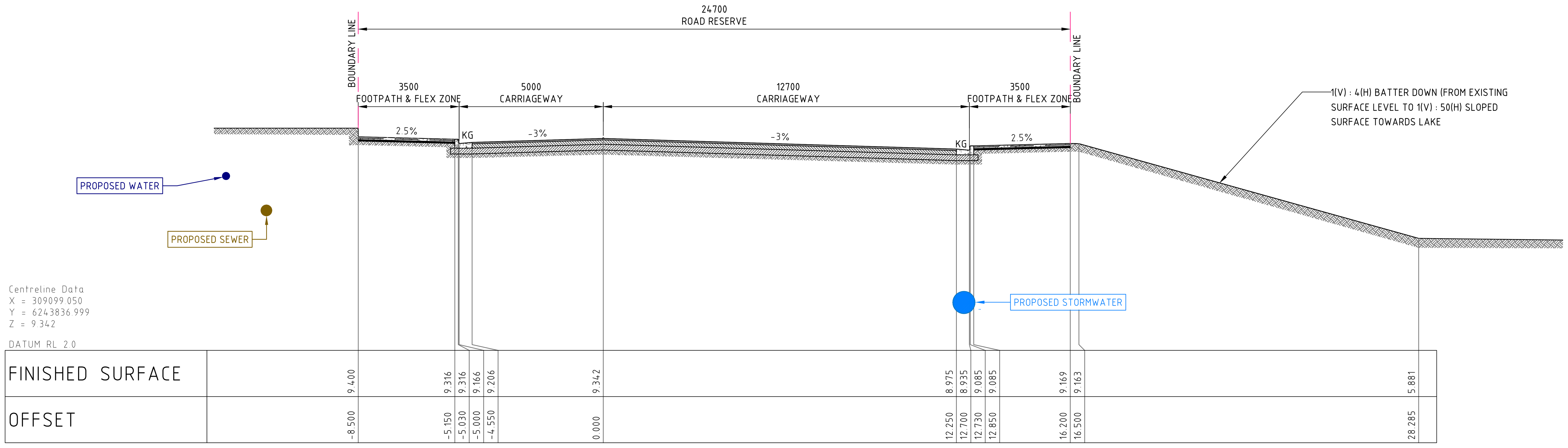

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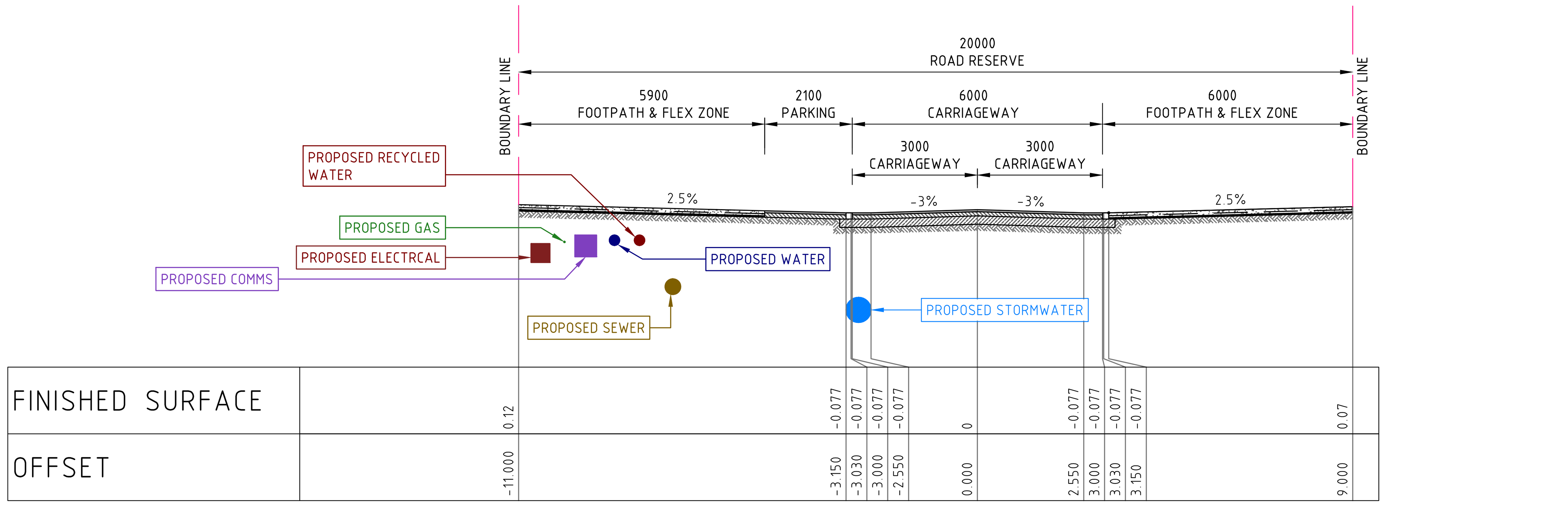
SCALE 1:100



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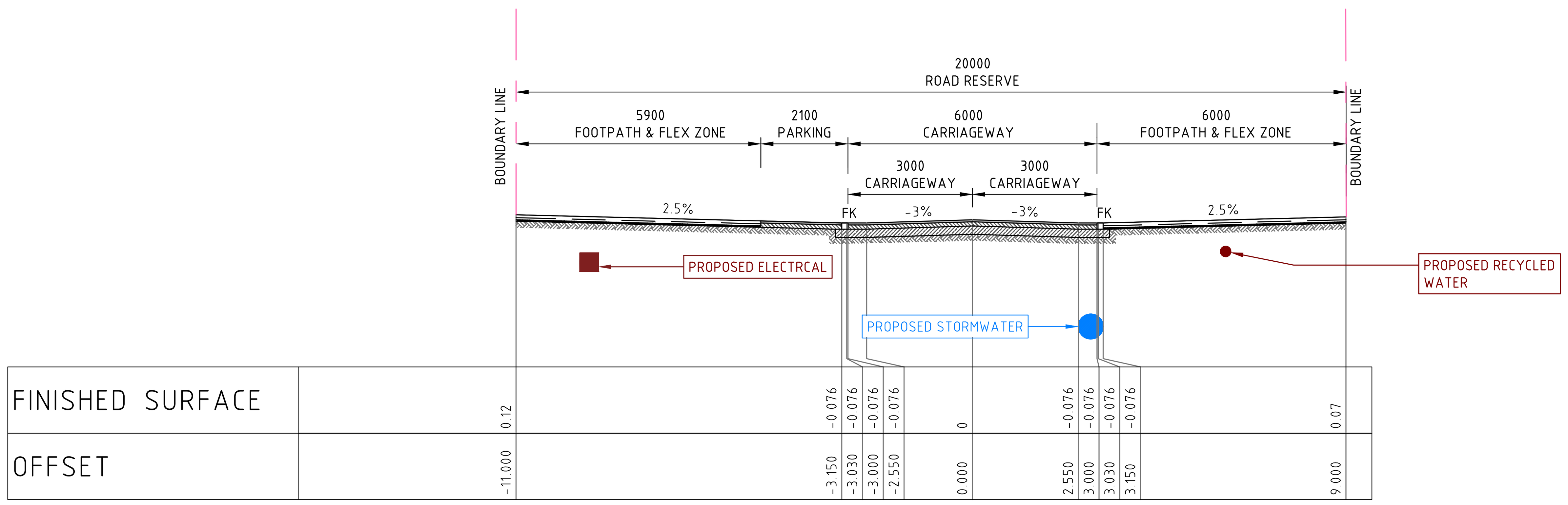
SCALE 1:100



SECTION J
SCALE 1:100

DRAWN: A.FALLINS DESIGNED: B.LAWRENCE JOB MANAGER: B.LAWRENCE VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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DRAWING TITLE
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TYPICAL CROSS SECTIONS - SHEET 04

JOB NUMBER 212498
DRAWING NUMBER C06.04
REVISION 03
DRAWING SHEET SIZE = A1

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Date : 16.04.2020 2:24 PM

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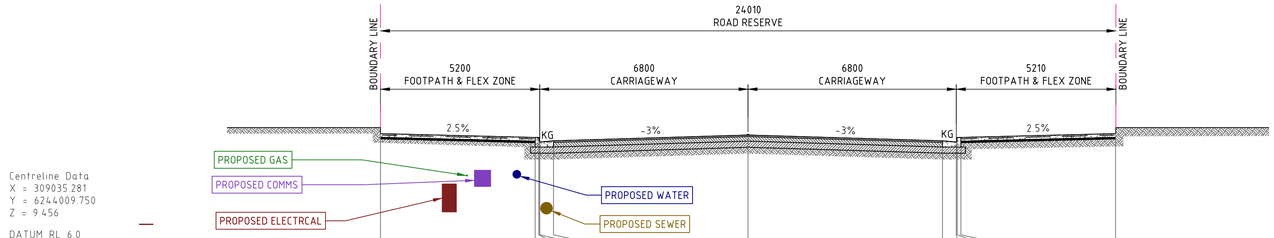
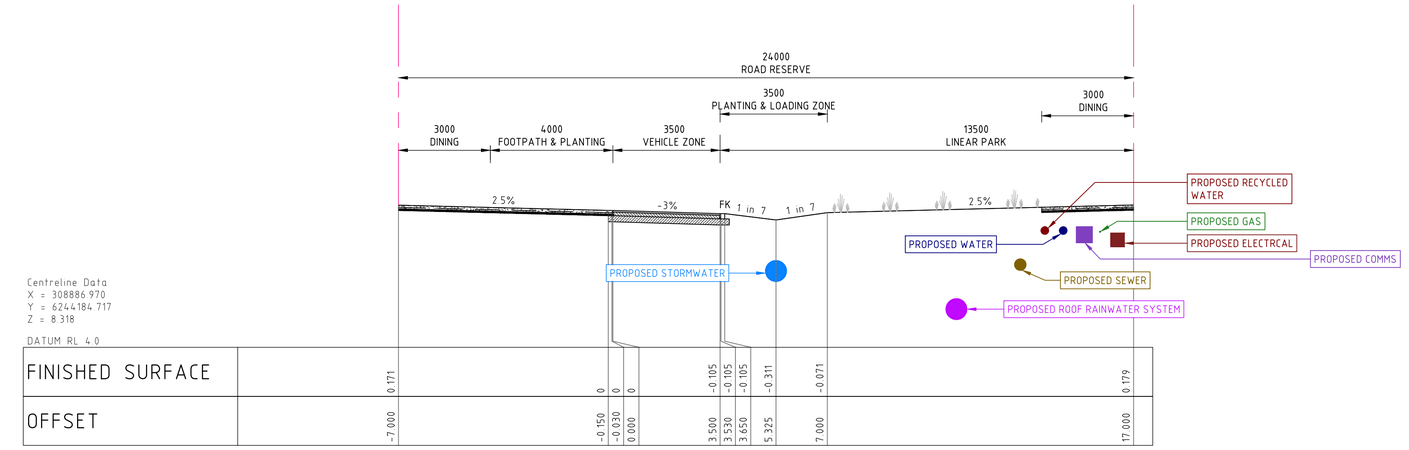


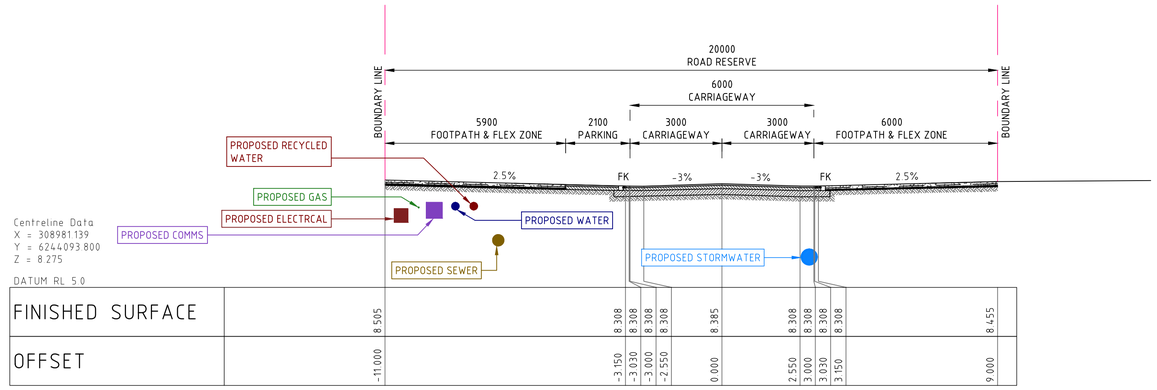
FINISHED SURFACE	9.502	9.375	9.375	9.225	9.265	9.456	9.265	9.225	9.375	9.375	9.502
OFFSET	-12.000	-6.950	-6.830	-6.800	-6.350	0.000	6.350	6.800	6.830	6.950	12.000

SECTION P
SCALE 1:100



FINISHED SURFACE	0.171	0	0	0	-0.105	-0.105	-0.105	-0.311	-0.071	0.179
OFFSET	-7.000	-0.150	-0.030	0.000	3.500	3.530	3.650	5.325	7.000	17.000

SECTION O
SCALE 1:100



FINISHED SURFACE	8.505	8.308	8.308	8.308	8.308	8.385	8.308	8.308	8.308	8.455
OFFSET	-11.000	-3.150	-3.030	-3.000	-2.550	0.000	2.550	3.000	3.030	3.150	9.000

SECTION M
SCALE 1:100

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 05

JOB NUMBER 212498
DRAWING NUMBER C06.05
REVISION 03
DRAWING SHEET SIZE = A1

Plotted By : UTTAM MANDAL
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Date : 16.04.2020 2:24 PM

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

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PROJECT
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3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE
CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 06

JOB NUMBER **212498**
DRAWING NUMBER **C06.06**
REVISION **03**
DRAWING SHEET SIZE = A1

Plotted By : UTTAM MANDAL
Found : C:\12&Data\NorthropSYN\212498 - Moore Point Masterplan_11\212498-CADd\1-CONCEPT DA\212498_C06.01.dwg
Date : 16.04.2020 2:24 PM

DRAWN: A.FALLINS DESIGNED: B.LAWRENCE JOB MANAGER: B.LAWRENCE VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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LEAMAC PROPERTY GROUP

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PROJECT

MOORE POINT
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DRAWING TITLE

CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 07

JOB NUMBER **212498**

DRAWING NUMBER **C06.07**

REVISION **01**

DRAWING SHEET SIZE = A1

Plotted By : UTTAM MANDAL Found : C:\12&Data\NorthropSYN\212498 - Moore Point Masterplan_1\212498-CADd\1-CONCEPT DA\212498_C06.01.dwg Date : 16.04.2020 2:24 PM

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
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Email sydney@northrop.com.au ABN 81 094 433 100

PROJECT

MOORE POINT
3 BRIDGES ROAD,
MOOREBANK, NSW, 2170

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 08

JOB NUMBER **212498**

DRAWING NUMBER **C06.08**

REVISION **01**

DRAWING SHEET SIZE = A1

Plotted By : UTTAM MANDAL
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Date : 16.04.2020 2:24 PM

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21

CLIENT

LEAMAC PROPERTY GROUP
CORONATION

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DRAWING TITLE
CIVIL ENGINEERING PACKAGE

TYPICAL CROSS SECTIONS - SHEET 09

JOB NUMBER **212498**

DRAWING NUMBER **C06.09**

REVISION **01**

DRAWING SHEET SIZE = A1

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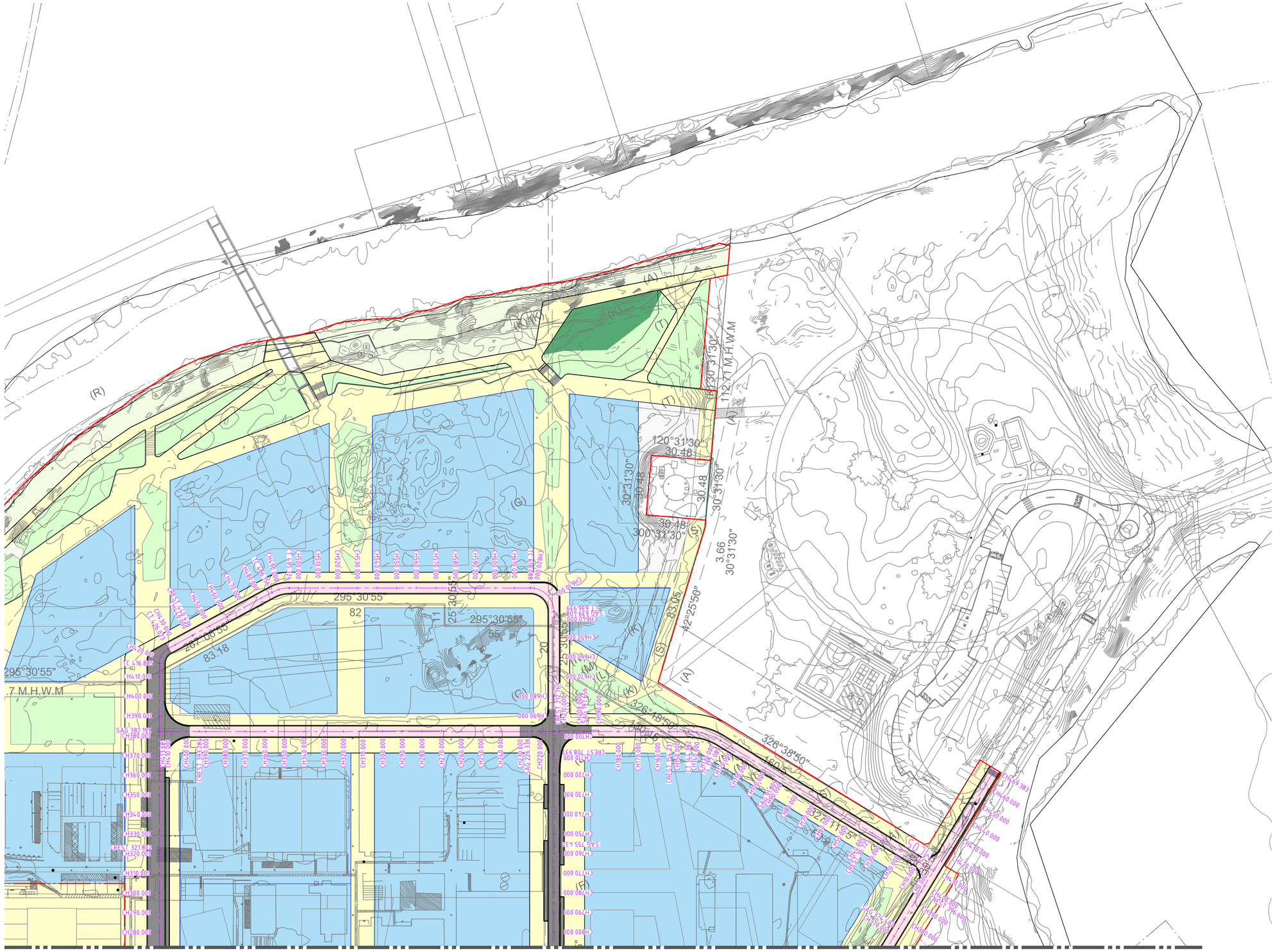
Date : 16.04.2020 2:24 PM



LEGEND

- EXISTING CADASTRAL BOUNDARY LINE (SOURCED FROM SIXMAPS)
- MC09 — CONTROL LINE
- CH190.000 — CHAINAGE
- TC180.000 — TANGENT POINT

DRAWN: A.FALLINS
DESIGNED: B.LAWRENCE
JOB MANAGER: B.LAWRENCE
VERIFIER:

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

CLIENT: LEAMAC PROPERTY GROUP / CORONATION

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ARCHITECT: SJB

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SCALE 1:1000 @ A1

0 10 20 30 40 50m

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PROJECT: MOORE POINT
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MOOREBANK, NSW, 2170

DRAWING TITLE: CIVIL ENGINEERING PACKAGE

ROAD ALIGNMENT CONTROL PLAN - SHEET 01

JOB NUMBER: 212498

DRAWING NUMBER: C07.01

REVISION: 03

DRAWING SHEET SIZE = A1

Plotted By: UTTAM MANDAL
Date: 16.04.2020 2:24 PM
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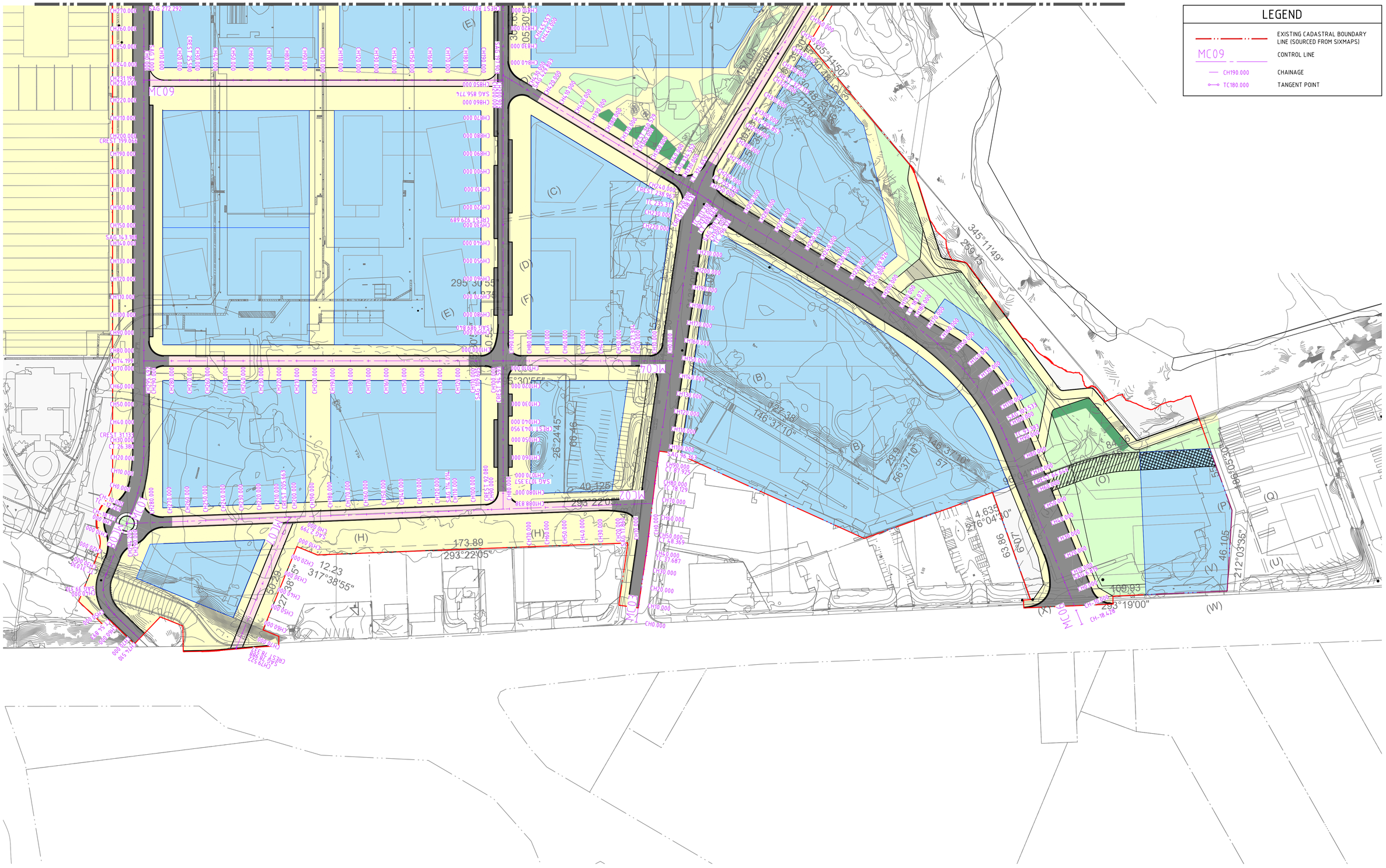
FOR CONTINUATION REFER TO SHEET 01



DRAWN: A.FALLINS DESIGNED: B.LAWRENCE JOB MANAGER: B.LAWRENCE VERIFIER:

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REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DRAFT REVIEW	AF		BL	23.12.21
02	ISSUED FOR DEVELOPMENT APPLICATION	RG		BL	24.02.22
03	ISSUED FOR BOQ ASSESSMENT	UM		ML	22.11.23

CLIENT
LEAMAC PROPERTY GROUP
CORONATION

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ARCHITECT
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SCALE 1:1000 @ A1

0 10 20 30 40 50m

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DRAWING TITLE
CIVIL ENGINEERING PACKAGE

ROAD ALIGNMENT CONTROL PLAN - SHEET 02

JOB NUMBER **212498**

DRAWING NUMBER **C07.02** REVISION **03**

DRAWING SHEET SIZE = A1

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