

Meriton Group
Level 11, Meriton Tower, 528 Kent Street
Sydney NSW 2000

Ref: L115059_Flood_Assessment.docx

26 November 2015

Attention: Ms N Jones

Dear Norelle,

Re: Proposed Development at 180 George Street, Parramatta – Site Flood Assessment

1. INTRODUCTION

WMAwater was engaged to provide a site flood assessment for a planning proposal at 180 George Street, Parramatta (the site), which covers five Lots identified as Lot 201 DP1082194, Lot 202 DP1082194, Lot 203 DP1082194, Lot 204 DP1082194 and Lot SP74916. The site location is shown on Figure 1.

There are mixed use existing buildings on the site, which are aligned with the property boundary.

The proposal is to retain the existing building along Charles Street, demolish the remaining buildings and construct a 6-storey mixed-use podium building, with two 180 m residential tower buildings on top. The proposal comprises commercial premises and car park facilities on the ground floor, underground car park facilities and residential dwellings on Level 1 to Level 55. This assessment relies upon an indicative design of the proposed development as shown in Appendix A.

2. FLOOD-RELATED DEVELOPMENT CONTROLS

The development is subject to controls as specified in:

- The Parramatta Development Control Plan – Part 2.4.2.1 Flooding (Reference 1); and
- The Parramatta Development Control Plan – Part 4.3.3 Special Precincts – Parramatta City Centre (Reference 2).

The DCP provides a floodplain matrix of planning and development controls dependent upon the Flood Risk Precinct (FRP).

WMAwater Pty Ltd (Formerly Webb McKeown and Associates)

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The site is designated as within the Low Flood Risk Precinct (defined as an area above the 100 year ARI flood level and below the PMF flood level) and is a residential and commercial development, as such the following planning considerations are applicable:

Floor Level

Condition 2 applies. These are that:

- Habitable floor levels to be equal to or greater than the 100 year ARI flood level plus freeboard; and

Flood Affection

Condition 2 applies (however condition 2 references condition 1). These are that:

- An engineers report is required to certify that the development will not increase flood affection 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 potential developments in the vicinity; and
- The impact of the development on flooding elsewhere to be considered having regard to the three factors listed in consideration 1 above.

Car Parking and Driveway Access

Conditions 1, 3, 5 and 6 apply. These are that:

- The minimum surface level of open spaces or carports [above ground] shall be as high as practical, but no lower than 0.1 m below the 100 year ARI flood level. In the case of garages, the minimum surface level shall be as high as practical, but no lower than the 100 year ARI flood level;
- Garages capable of accommodating more than 3 motor vehicles on land zones for urban purposes, or enclosed car parking, must be protected from inundation by floods equal to or greater than the 100 year ARI flood. Ramp levels to be no lower than 0.5 m above the 100 year ARI flood level;
- The level of the driveway providing access between the road and [above-ground] parking spaces shall be no lower than 0.2 m below the 100 year ARI flood level; and
- Enclosed car parking and car parking areas accommodating more than 3 vehicles, with a floor below the 100 year ARI flood level, shall have adequate warning systems, signage, exits and evacuation routes.

Evacuation

Conditions 3 and 4 apply. These are that:

- Reliable access for pedestrians and vehicles is required from the site to an area of refuge above the PMF level, either on site (eg. second storey) or off site; and
- Applicant to demonstrate the development is consistent with any relevant flood evacuation strategy or similar plan.

3. FLOOD BEHAVIOUR

The site is located on the south bank of the Parramatta River; where the land rises steeply from approximately 1.5 m AHD on the banks of the Parramatta River up to approximately 6 m AHD at the lowest elevation on the north boundary of the site. Within the site, ground elevations are between approximately 6.7 m AHD and 8.1 m AHD.

Minor overland flow from local stormwater may occur in the vicinity of the site, originating from the urbanised catchment west of the site and conveyed along George Street. At the junction between George Street and Charles Street, the ground elevations rise to the north along Charles Street (approx. 0.5 m rise over a 50 m distance) and to the east along George Street (approx. 0.25 m rise over a 50 m distance). Ground elevations fall to the south along Charles Street (approx. 0.4 m fall over a 50 m distance) and form the primary conveyance path for overland flow exiting the junction of George and Charles Street. When runoff exceeds the capacity of sub-surface drainage network along the southern Charles Street flow path; localised overland flow will occur along this flow-path, with some minor depth of flow possibly backing up along the eastern George Street area and along the northern Charles Street area bordering the site. Based on available modelling information, the backwatering that occurs to the north and east is contained to the kerb and gutter system and has peak flood depths less than 0.1 m in the 1% AEP event.

4. ASSESSMENT METHODOLOGY

According to data provided by Parramatta City Council, the site is not affected by the 1% AEP flood level extent although the site is within the PMF flood level extent, for mainstream flooding of the Parramatta River. Further, Council have not deemed the site to be subjected to flooding from the local catchment (overland flow).

Given the site's PMF affectation, the site would be classified as within the Low Flood Risk Precinct for planning and development controls.

The following provides details about WMAwater's investigation of available flood model information for flood affection of the site.

4.1 Council Flood Information

Flood Information was provided by Parramatta City Council based upon the Lower Parramatta River Floodplain Risk Management Study – Flood Study Review (2005, SKM). From this, the site was found to be affected by mainstream flooding (summarised in Table 1), being with the PMF peak flood level of 10.0 m AHD.

Table 1: Flood Levels Provided by Parramatta City Council

Chainage	Flood Level (metres AHD)		
	5% AEP	1% AEP	PMF
3028	(4.77) Below site level	(5.42) Below site level	10.03 Above site level

4.2 Extraction of MIKE11 Hydraulic Model Results for Overland Flow

WMAwater reviewed the design flood behaviour of overland flow for the site has been estimated using output from the MIKE 11 (Version 2011, DHI) hydraulic model that was schematised on behalf of the Upper Parramatta River Catchment Trust (UPRCT).

This model indicated some minor overland flow along George St and Charles St in the vicinity of the site, for the 1% AEP flood event. WMAwater extracted the flow hydrographs for this overland flow, and used available LiDAR data to check to what extent this overland flow might affect the planning proposal for the site.

4.3 Verification of Cross-Sectional Area

Light Detection and Ranging (LiDAR) aerial survey was obtained from the NSW Land and Property Information (LPI), with the meta-data indicating that the data was collected in 2013. The LiDAR Digital Elevation Model (DEM) had a grid resolution of 1 m.

The cross-sectional area utilised in the MIKE 11 model was verified against those derived from LiDAR aerial survey at the chainages shown in Figure 2. The results of this verification process are shown in Figure 3. From this comparison it was found that the Mike 11 cross-sections provided a reasonable representation of the street flow paths near the site.

4.4 Verification of Peak Flood Depths

The Mannings equation was used to verify the peak flood depths due to overland flow along George Street and Charles Street. The cross-sections obtained from the LiDAR aerial survey and the 1% AEP flows obtained from the MIKE 11 model were verified by desktop calculation.

The results of this verification process are shown in Figure 4. From this, “Chainage GEORGE_32.50” and “Chainage CHARLES_344.40” (that each border the site) show that peak flood levels are contained within the kerb and gutter system and do not exceed depths of 0.1 m in the 100 year ARI event.

5. FLOOD IMPACT ASSESSMENT

As the proposed development is not affected by the 1% AEP flood extent and changes to the building configuration would be minimal, a detailed flood modelling assessment to determine the flood impacts is not required. The flood behaviour (including alterations to flood flow and increases in flood levels) for floods up to and including the 1% AEP event are considered to be unlikely. It is also unlikely there would be any significant redistribution of flows in the PMF event, given that the proposed buildings have a similar footprint configuration to the existing buildings.

6. FINISHED FLOOR LEVELS

There are no minimum floor level requirements arising from mainstream flood considerations, since the entire site is above the 1% AEP flood plus 0.5 freeboard level.

Council has indicated that the site is not affected by local overland flow, however WMAwater recommends that ground floor level should be a minimum of 0.3 m above the adjacent roadway kerb to allow for obstructions (e.g. parked cars) which may affect the normal kerb/gutter drainage flow for very intense storms.

It would also be prudent to consider the relatively high consequences in terms of property damage and risk to life that can occur in the event of a basement car park flooding. As such, WMAwater recommends an internal driveway crest at least 0.5 m above the nearest external street kerb level prior to the ramp descending into the basement car park. This level would also apply for all other entry points into the basement car park, including (but not limited to):

- Stairwells;
- Lift lobbies; and
- Air vents.

Should the aforementioned recommendations be considered, the site development would be protected from flood events up to and including the 1% AEP flood level, but remain susceptible to PMF flood inundation.

7. FLOOD EVACUATION

As the proposed development is multi-storey, on-site evacuation or vertical evacuation to higher storeys would be a feasible option for pedestrians at ground level. Preparation of a detailed flood emergency management plan, for extreme events exceeding the 1% AEP flood, may be required as part of the development application for the site.

8. CONCLUSIONS

WMAwater has undertaken an investigation of flood constraints from the site and have found:

- While detailed modelling of impacts has not been undertaken, as the site is unaffected by mainstream or overland flooding up to the 1% AEP event, it will not cause changes to flood behaviour for these events, and significant impacts are unlikely in larger events due to the proposed building footprints being similar to existing footprints.;
- Based on the information provided in Council's Flood Inquiry Application for the site, minimum floor levels for flooding would not apply, however WMAwater recommends the ground floor levels be a minimum of 0.3 m above the nearest adjacent street kerb level.
- WMAwater recommends that entry ramps into basement car parking should include a ramp to a crest at least 0.5 m above the nearest adjacent street kerb level;
- Evacuation: on-site evacuation or vertical evacuation to higher storeys would be a feasible option for pedestrians on ground level. A flood emergency management plan may be required as part of any subsequent development application for the site

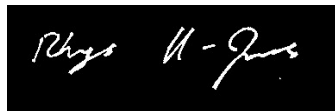
9. REFERENCES

1. Parramatta City Council, **Development Control Plan – Part 2.4.2.1 Flooding**, 2011.
2. Parramatta City Council, **Development Control Plan – Part 4.3.3 Special Precincts (Parramatta City Centre)**, 2011.
3. Pilgrim DH (Editor in Chief), **Australian Rainfall and Runoff – A Guide to Flood Estimation**, Institution of Engineers, Australia, 1987.
4. Institution of Engineers Australia, **Australian Rainfall and Runoff Revision Project 15 – Two-Dimensional Modelling in Urban and Rural Floodplains**, November 2012.
5. NSW Government, **Floodplain Development Manual**, April 2005.

Please do not hesitate to contact the undersigned for clarification of the above.

Yours faithfully,

WMAwater



Rhys Hardwick Jones
Associate

Figures:

Figure 1: Site Location

Figure 2: LiDAR

Figure 3: MIKE11 Cross-section Comparison

Figure 4: Mannings Equation Peak Flood Depth

Appendices:

Appendix A – Council Flood Information



Figures

FIGURE 1
SITE LOCATION



J:\Jobs\115059\ArcGIS\ArcMaps\Figure 01 Site Location.mxd

The Site

0 25 50 100 150 200
m

FIGURE 2
LiDAR SURVEY

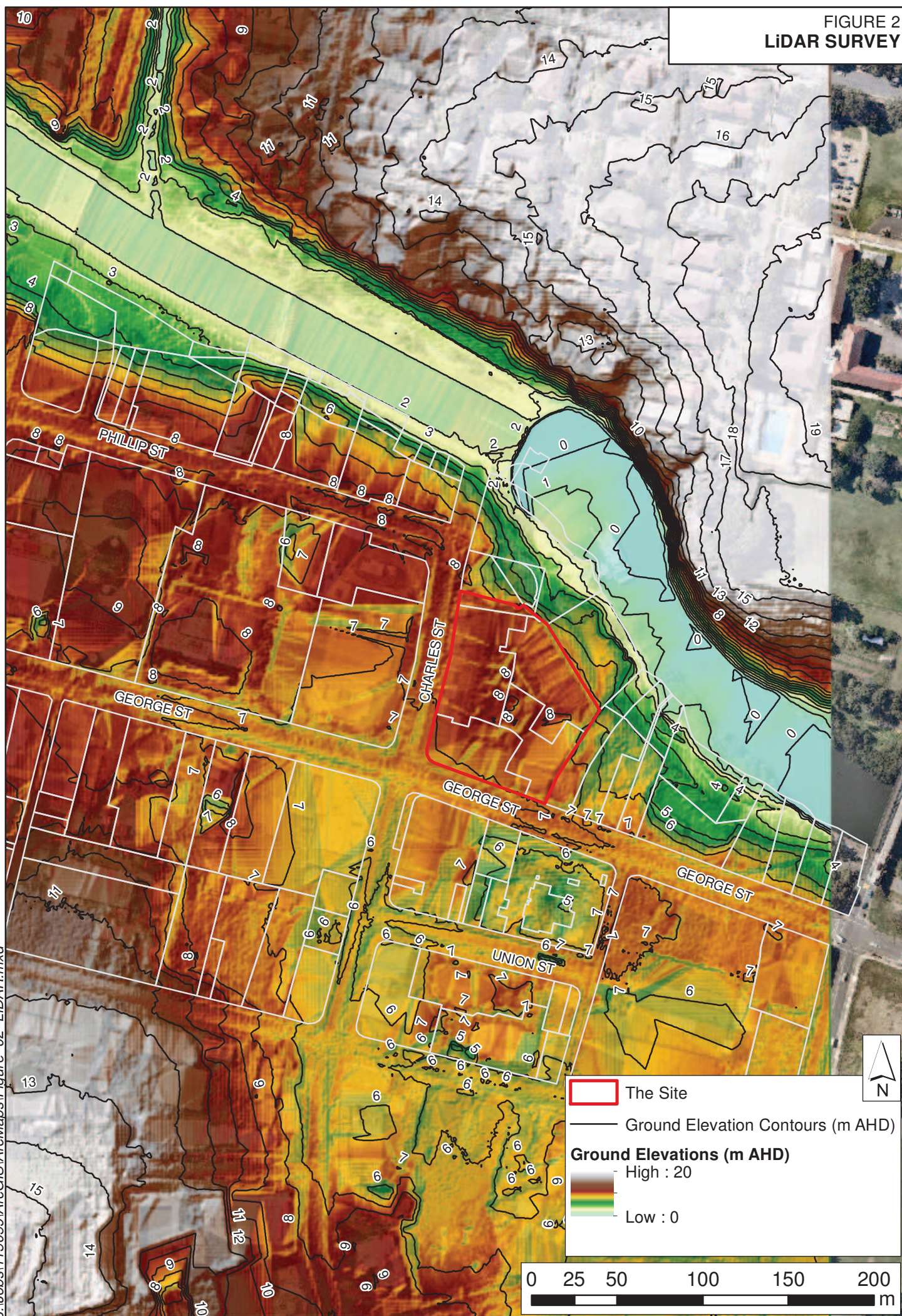
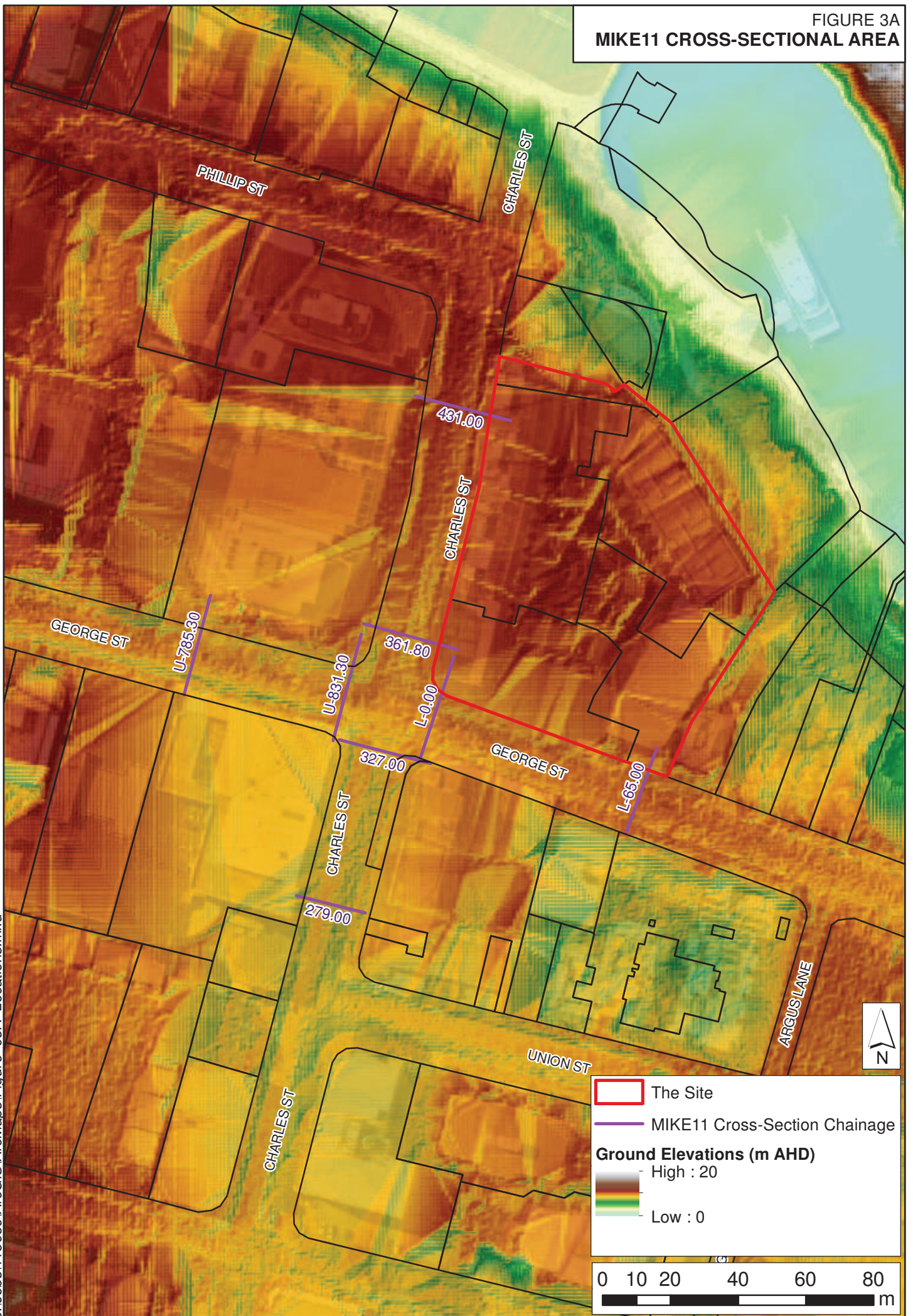


FIGURE 3A
MIKE11 CROSS-SECTIONAL AREA



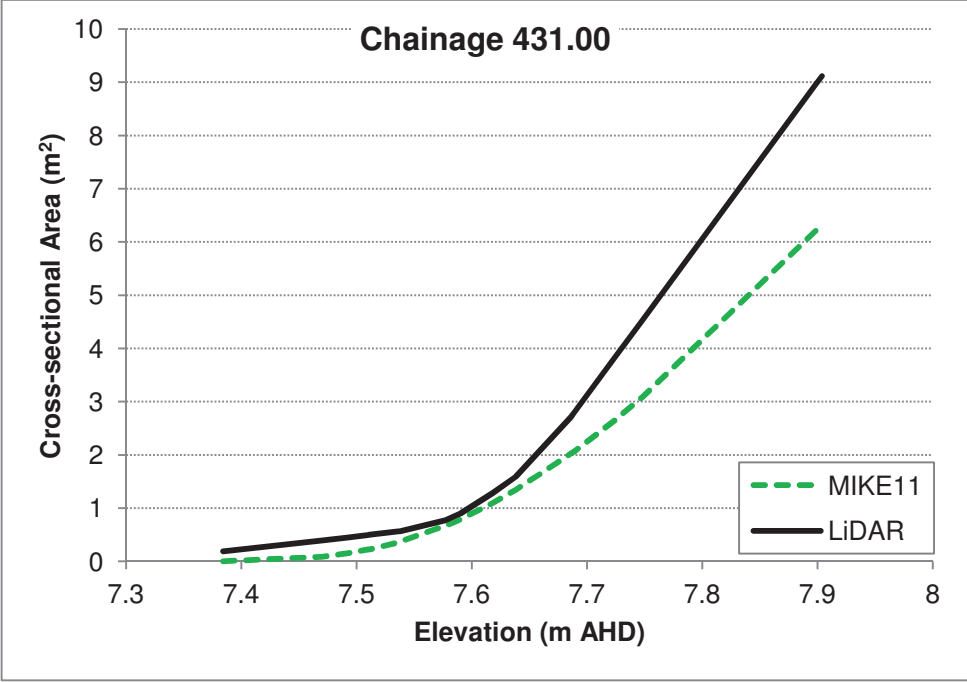
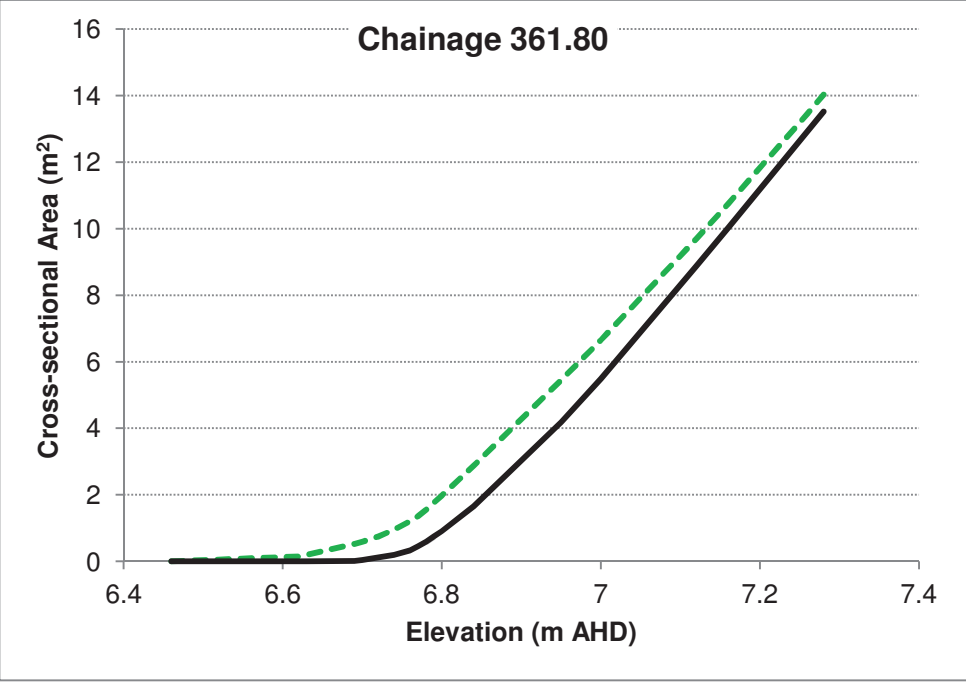
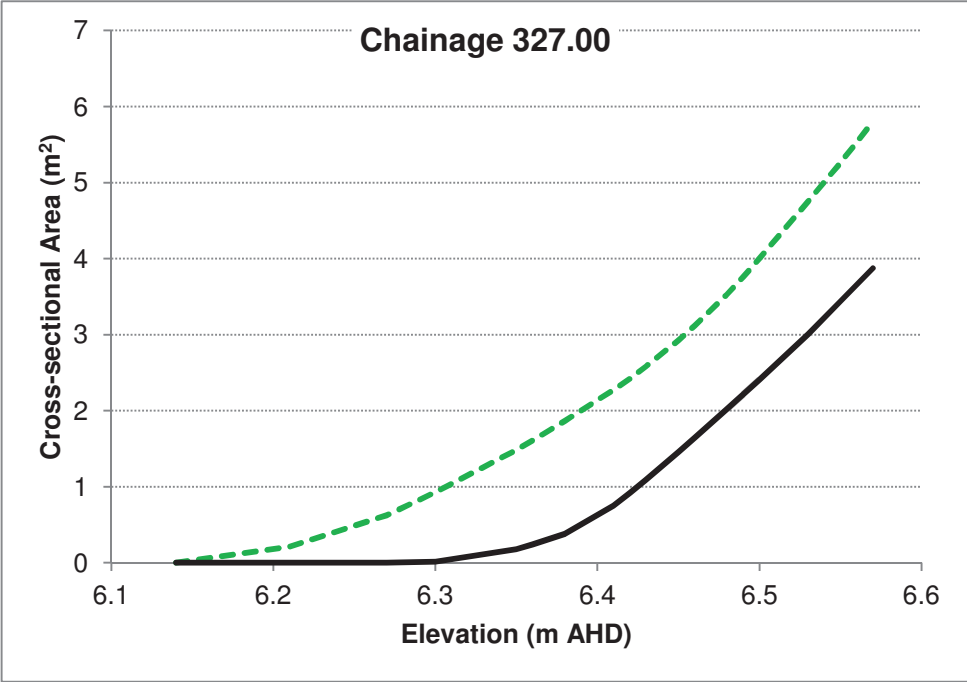
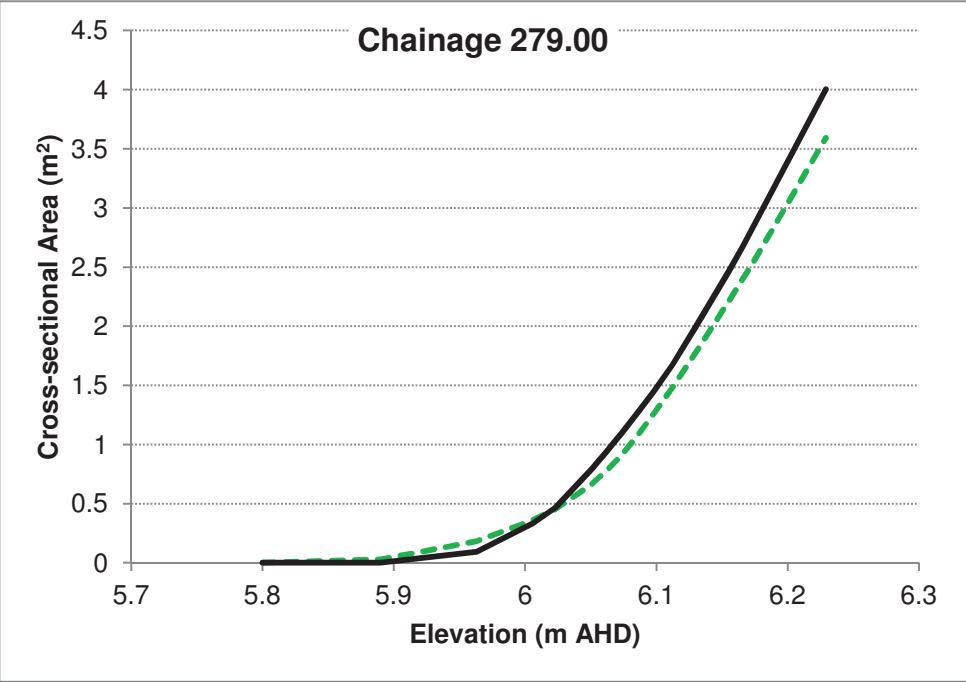


FIGURE 3B
CROSS-SECTION COMPARISON
CHARLES STREET

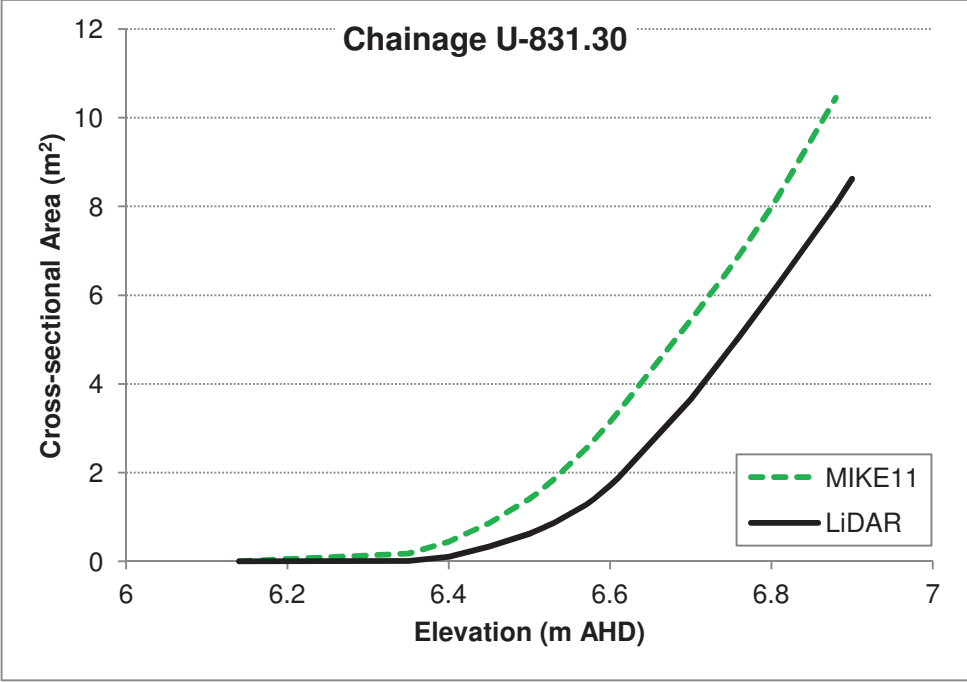
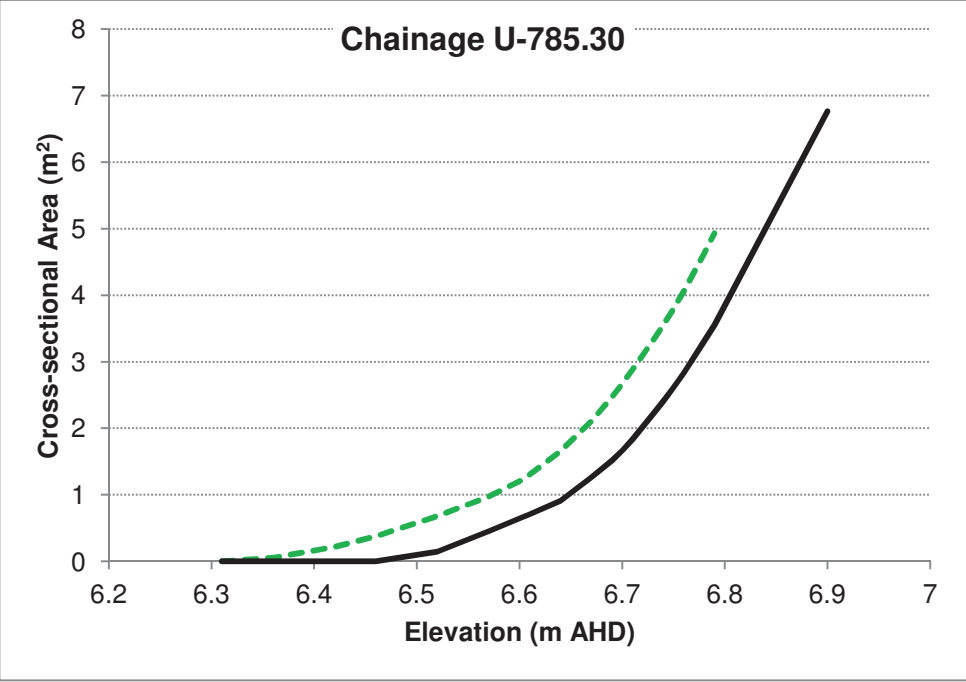
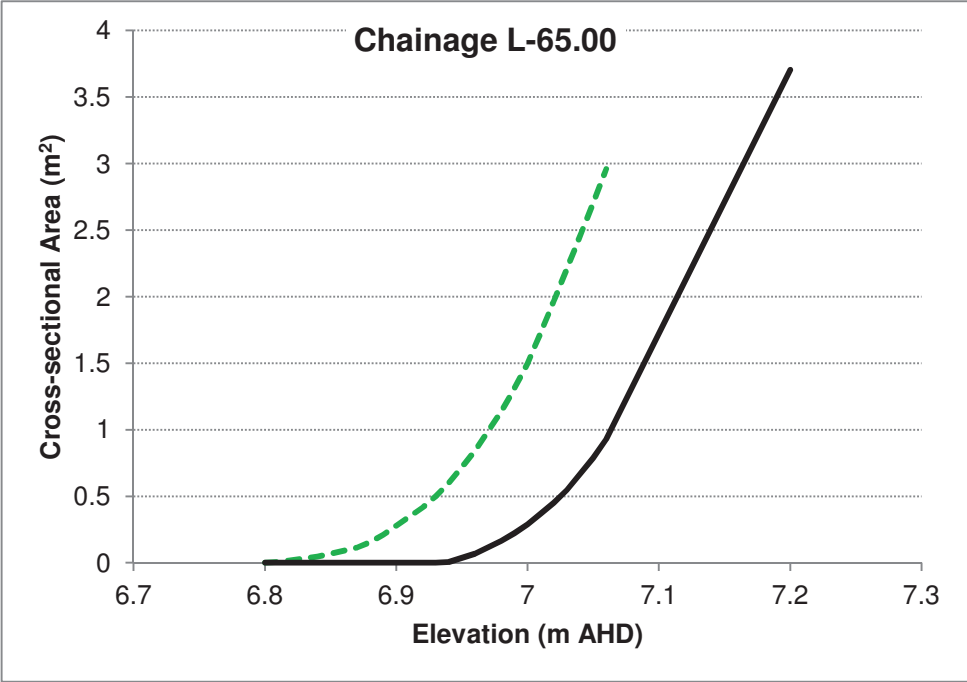
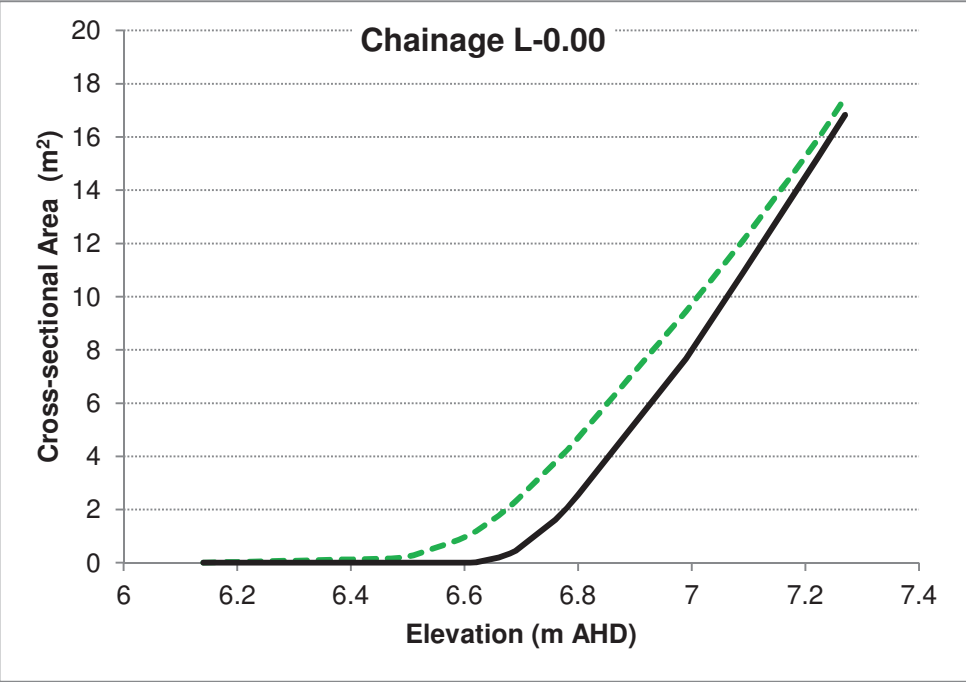
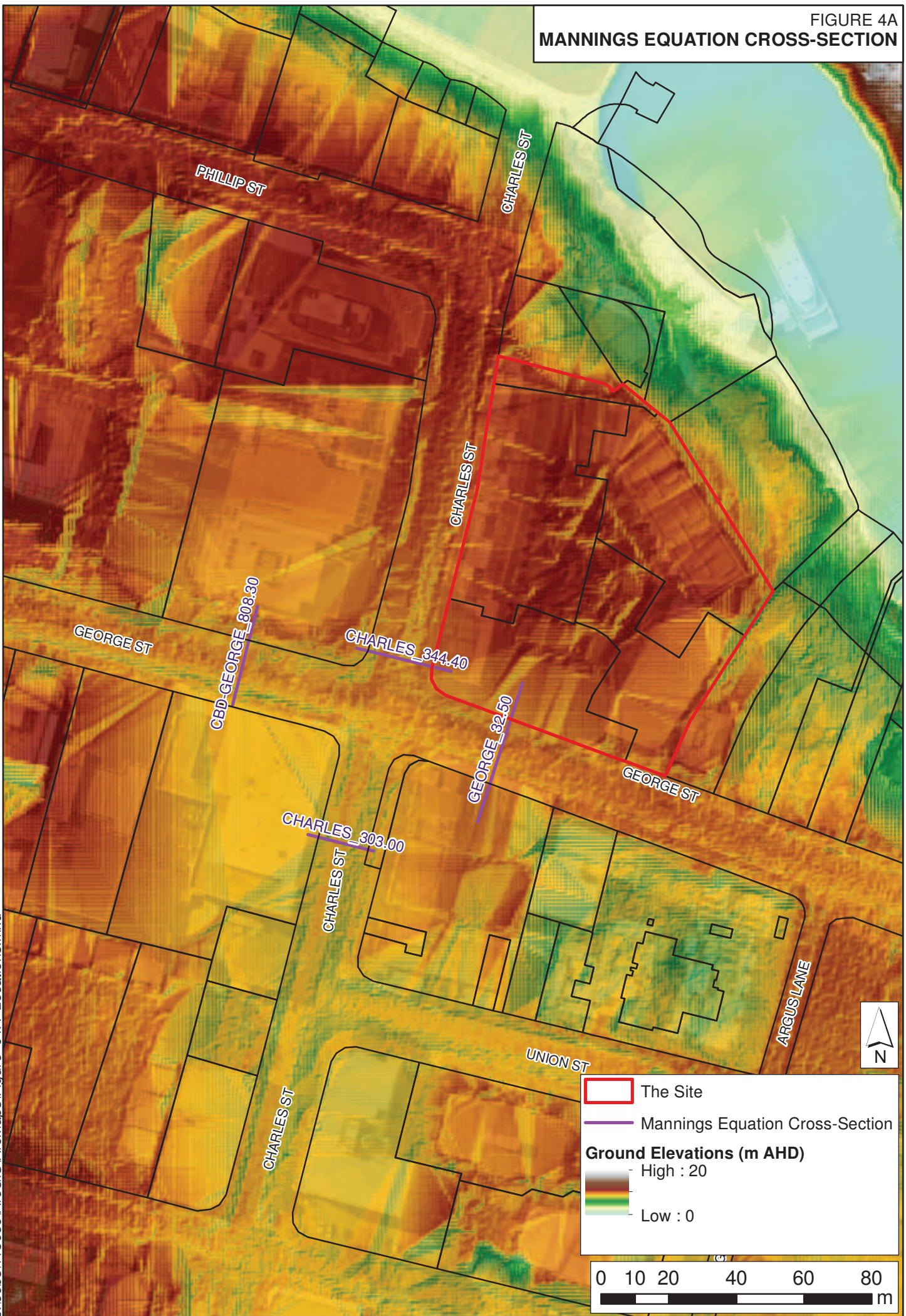


FIGURE 3C
CROSS-SECTION COMPARISON
GEORGE STREET

FIGURE 4A
MANNINGS EQUATION CROSS-SECTION



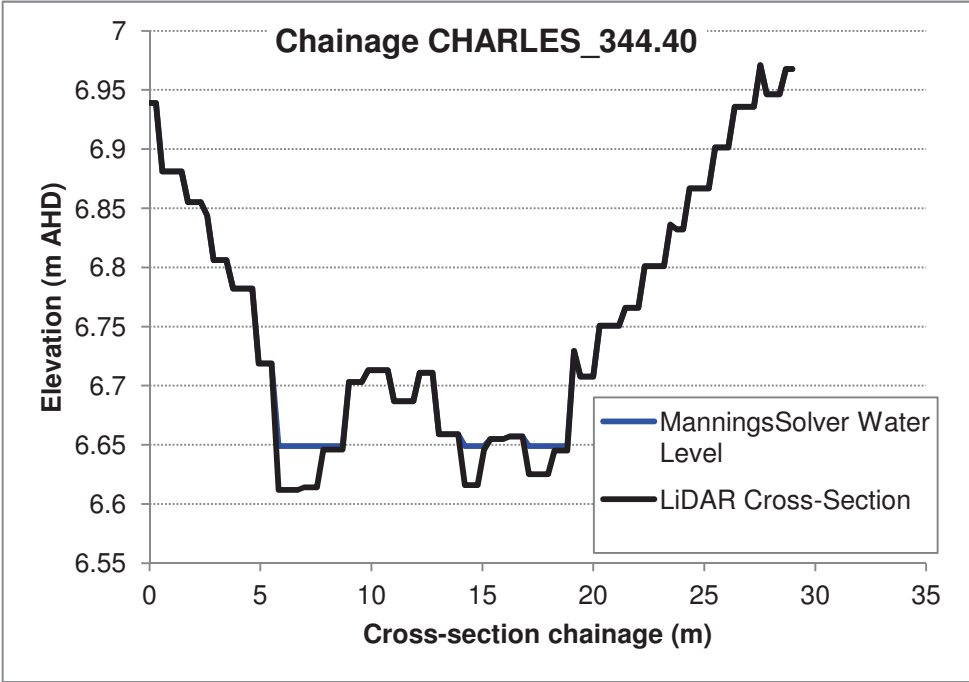
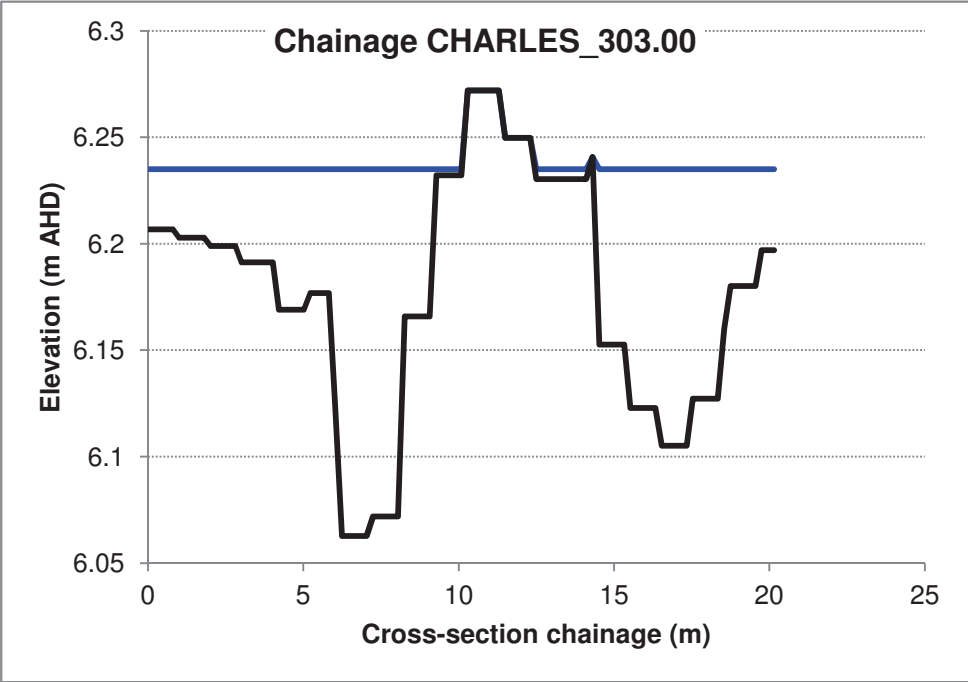
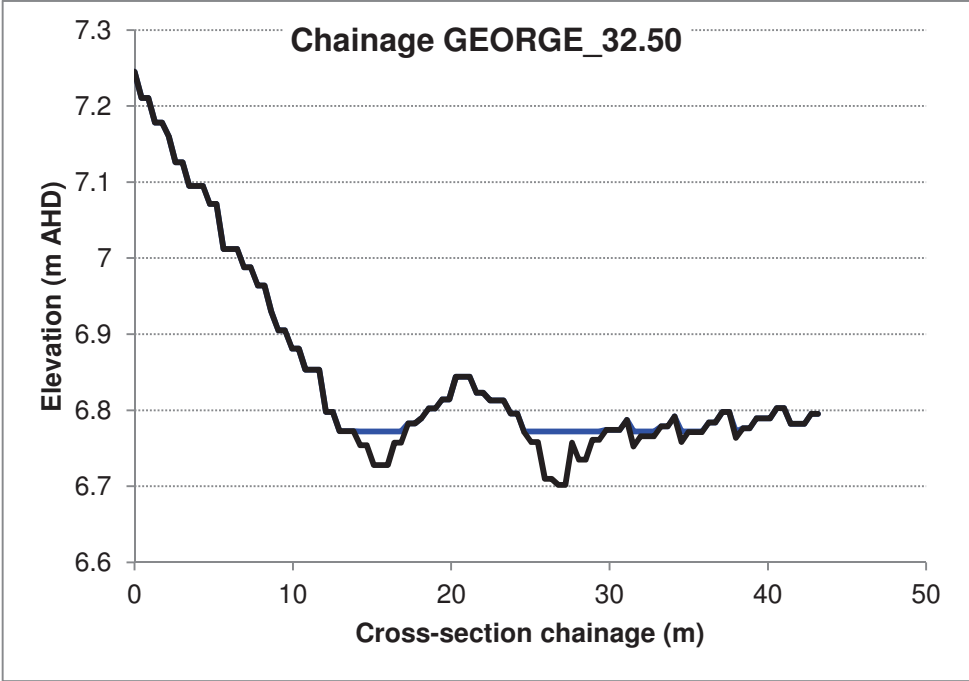
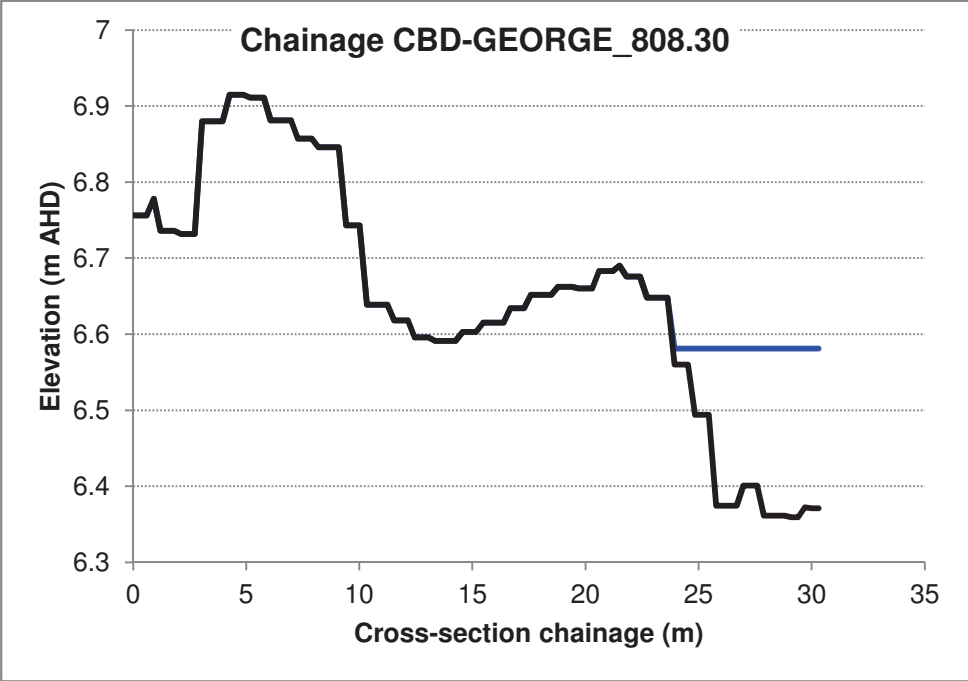
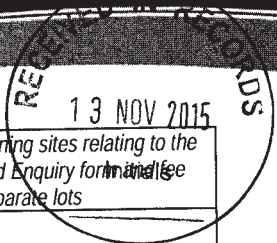


FIGURE 4B
MANNINGS EQUATION - PEAK FLOOD LEVEL
100 YEAR ARI EVENT





Flood Enquiry Application 2015 / 2016



Property Details

Address	House No: 180	<i>This form applies for up to three adjoining sites relating to the same development. A separate Flood Enquiry form and fee will be required for more than 3 or separate lots</i>	
	Street: GEORGE STREET		
	Suburb: PARRAMATTA		Postcode:
	Are you the owner of this property? ☒ Yes ☐ No		

Applicant Details

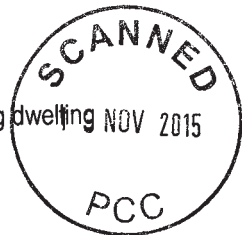
Name	Family Name (or Company Name) KARIMBLA PROPERTIES (No. 13) PTY LTD	
	Given Name:	
	OR Company Contact Person: NORELLE JONES	
Contact Details	Address: LEVEL 11, 521 KENT STREET SYDNEY 2000	
	Home Phone:	Office Phone: 9287 2509
	Mobile:	Fax:
	Email: NORELLEJ@MERITON.COM.AU	Date: 9 NOVEMBER 2015

How would you like this information to be provided to you (Please tick)

☐ Collection ☐ Posted ☒ Emailed ☐ Faxed

Reason for Enquiry (Please tick)

- | | |
|---|---|
| ☒ Proposed re-development of property | ☐ Alterations and additions to existing dwelling |
| ☐ Purchase of property | ☐ Property Valuation |
| ☐ Flood drainage investigation | ☐ Subdivision |
| ☐ Change of use within an existing development | ☐ Owner Enquiry |
| ☐ Other (Please specify) | |



Property Type (Please tick)

**** GST not applicable from 1 July 2013 ****

Residential (single residential dwelling and/or granny flat)	☐ \$188.50
Development Duplex (includes other residential such as dual occupancies, multi-unit housing and residential flat building)	☐ \$257.70
Commercial (including industrial and mixed use)	☒ \$452.50

Disclaimer: Flood levels and flood extent lines are based on current information held by Council. Council does not accept responsibility for the accuracy of this information. Any pipe sizes and location of pits and pipe lines should be confirmed by site investigation. The flood levels shown on the back of this form are only an approximate guide and have been derived using the current computer simulated model. The information provided in this document is presented in good faith to assist the public in understanding Council's drainage requirements that apply within the Parramatta Local Government Area. It is the responsibility of each individual using this information to undertake their own checks and confirm this information prior to its use.

Parramatta City Council, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above.

Customer Acknowledgement: I hereby acknowledge that I have read and understood the above Disclaimer:

Signature	<i>Jones</i>	Date	9 NOVEMBER 2015
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Office Use Only - RC 682

Amount	Receipt No.	Date	Accepted By:
\$ 452.50	4527435	12/11/15	<i>Amelia</i>

Refer to back of this form for level information issued

Flood Enquiry Information Issued *(To be completed by Council Officer)*

Mainstream Flooding

Is this property affected by mainstream flooding? 180 George Street, Parramatta		☒ Yes ☐ No
Flood Levels	Closest Cross Sections: <i>(Please refer to Flood Study):</i> Refer to Flood Map	
☐ 1:20 year ARI	m AHD	Comments: See Note on Flood / Hazard Map
☐ 1:100 Year ARI	(RL 5.4) m AHD	
☒ PMF	RL 10 m AHD	
☒ Refer to flood maps provided for detailed flood levels.		
The above flood level information is obtained from the following flood study report:: Lower Parramatta River Floodplain Risk Management Study – Flood Study Review, 2005 (SKM) (Upper Parramatta River Flood Study – Draft 8 (UPRCT))		

Note: Flood inundation can be verified by detail survey to AHD undertaken by a Registered Surveyor.

Local Flooding

Is the property located within a Hatched Grey Area? <i>Properties located within a Hatched Grey Area are subjected to flooding from the local catchment.</i>	☐ Yes ☒ No
Is the property located within a Grey Area? <i>Properties located within a Grey Area are subjected to additional site drainage controls to manage flooding in the local catchment.</i>	☐ Yes ☒ No
Is the property likely to be affected by overland stormwater run-off from the local catchment? Note: No site inspection conducted for this assessment. Based solely on the information supplied for this flood enquiry application.	☐ Yes ☒ No
Note: You are required to contact Council's Development Service Engineer for any details and requirements relating to development that is affected by local flooding.	

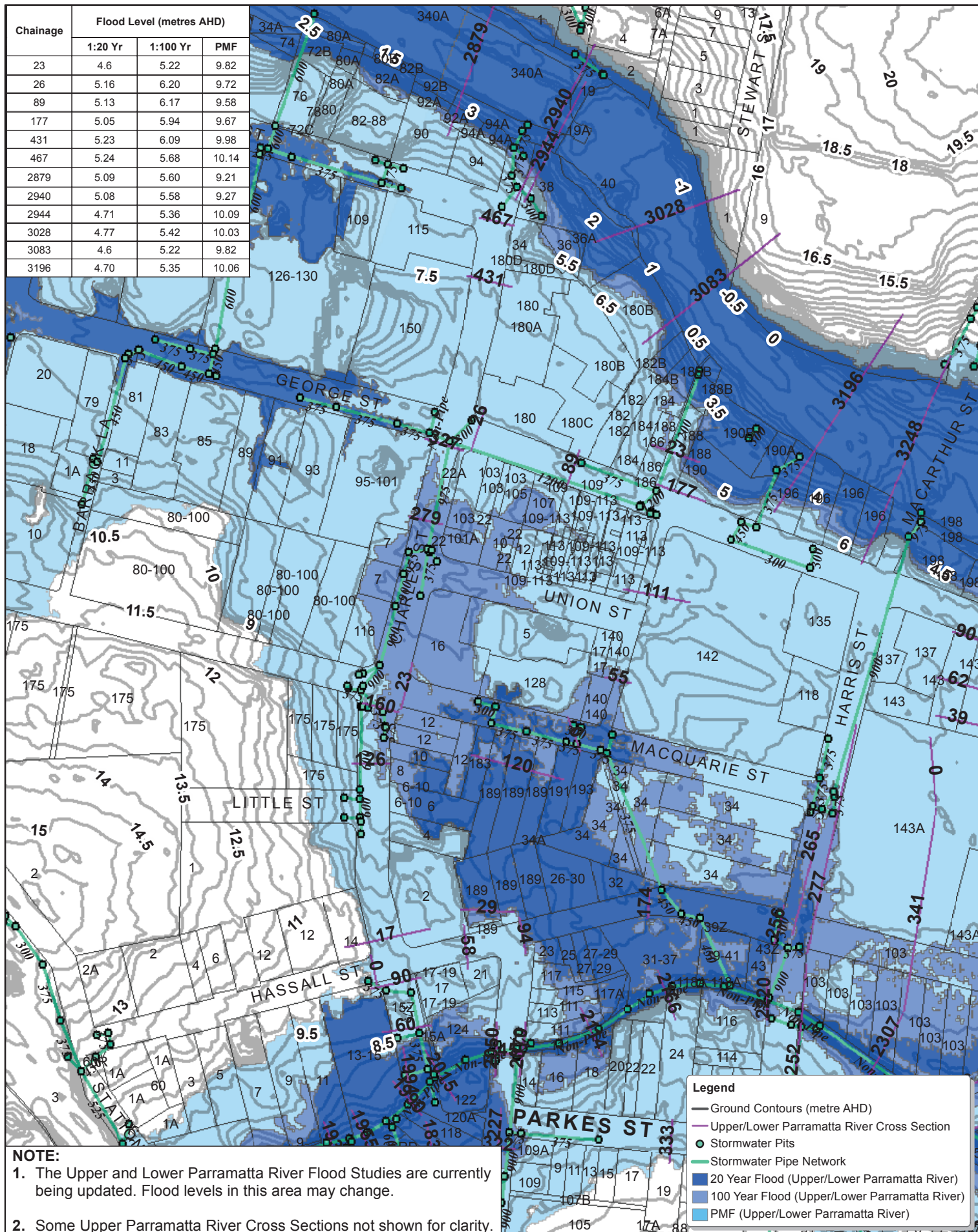
Additional Recommended Actions

☒	The Applicant needs to discuss the proposal to re-develop this site with Council's Town Planner and Development Services Engineer.
☒	The Applicant needs to contact Council's Town Planner and organise a pre-lodgement meeting to discuss any proposal to redevelop this property.
☒	The Applicant needs to refer to Council's Local Floodplain Risk Management policy for details relating to developing a land affected by flooding.

Definitions: *(As per NSW Floodplain Development Manual dated April 2005)*

- AHD** – a common national surface level datum approximately corresponding to mean sea level.
- ARI** – the long term average number of years between the occurrences of a flood as big as or larger than, the selected event.
- PMF** – is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
- AEP** – Annual Exceedance Probability is the chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage.

Chainage	Flood Level (metres AHD)		
	1:20 Yr	1:100 Yr	PMF
23	4.6	5.22	9.82
26	5.16	6.20	9.72
89	5.13	6.17	9.58
177	5.05	5.94	9.67
431	5.23	6.09	9.98
467	5.24	5.68	10.14
2879	5.09	5.60	9.21
2940	5.08	5.58	9.27
2944	4.71	5.36	10.09
3028	4.77	5.42	10.03
3083	4.6	5.22	9.82
3196	4.70	5.35	10.06



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24/11/2015

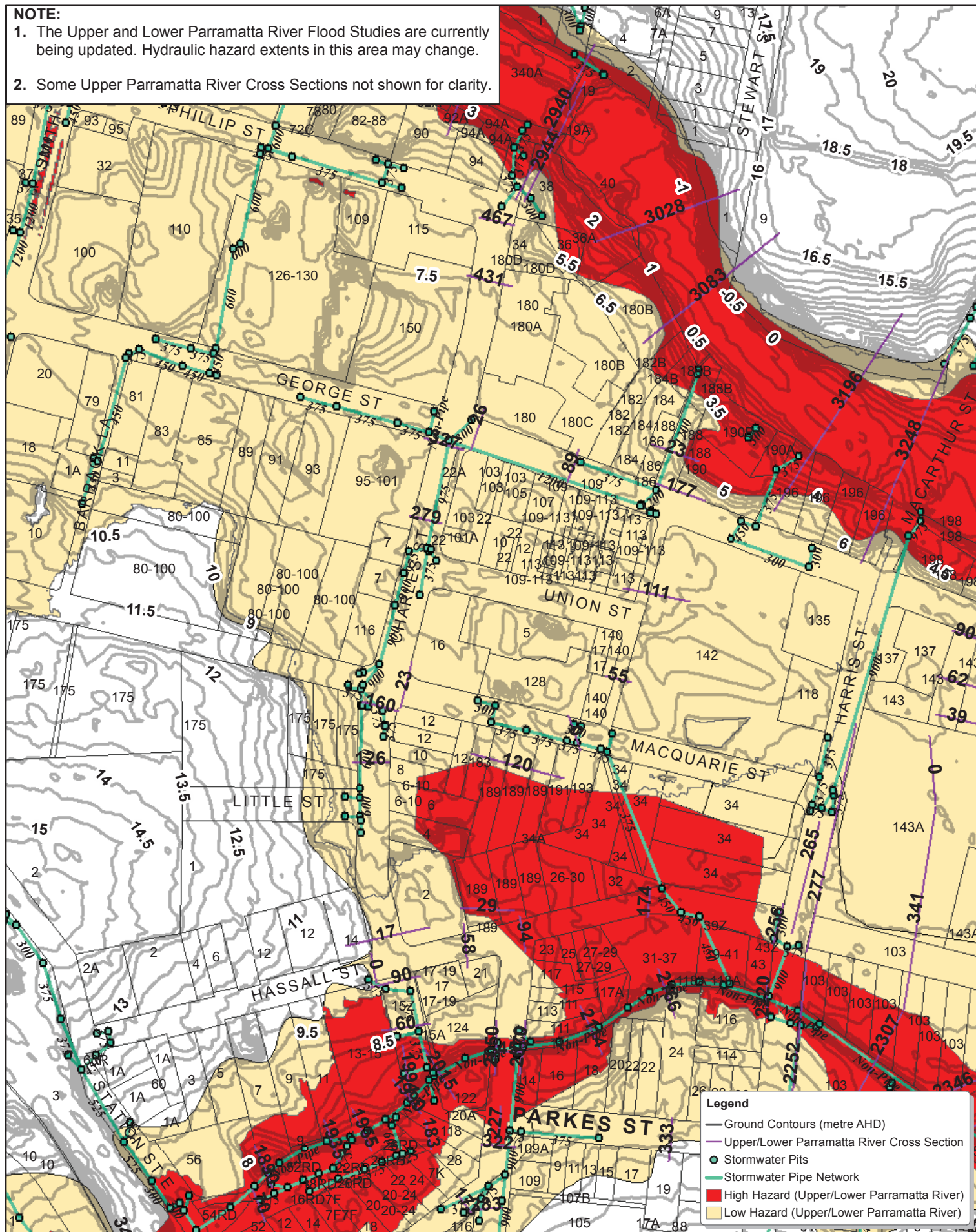
Parramatta City Council Flood Map

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1:3,000

DISCLAIMER: Flood levels and flood extent lines are based on current information held by Council. Council does not accept responsibility for the accuracy of this Information. Any pipe sizes and location of pits and pipe lines should be confirmed by site investigation. The flood levels provided are only an approximate guide and have been derived using the current computer simulated model. The information provided on this document is presented in good faith. It is the responsibility of each individual using this information to undertake their own checks and confirm this information prior to its use. Parramatta City Council, its agents and employees are not liable (whether by reason of negligence, lack of care or otherwise) to any person for any damage or loss whatsoever which has occurred or may occur in relation to that person taking or not taking (as the case may be) action in respect of any representation, statement, or advice referred to above.

NOTE:

1. The Upper and Lower Parramatta River Flood Studies are currently being updated. Hydraulic hazard extents in this area may change.
2. Some Upper Parramatta River Cross Sections not shown for clarity.



Printed
24/11/2015

Parramatta City Council Hydraulic Hazard Map

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1:3,000

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