St George Community Housing (SGCH)
Level 5, 38 Humphreys Lane
Hurstville NSW 2220

L180823_11GibbonsSt_SiteFloodAssessment

24 September 2018

Attention: Ms Kim Gray

Dear Kim,

Re: 11 Gibbons Street, Redfern

Site Flood Assessment

1. BACKGROUND

St George Community Housing (SGCH) proposes the redevelopment of 11 Gibbons Street, Redfern, bounded by Marian Street, William Lane and Gibbons Street. The site comprises Lots 1-11/8 DP4209 and is located within the Alexandra Canal catchment, for which WMAwater has recently completed the Alexandra Canal Catchment Flood Study Model Update for City of Sydney.

SGCH engaged WMAwater to assess the proposed development in the context of applicable flood-related development controls and the results from the Alexandra Canal Flood Study.

The subject site is shown in red on Diagram 1. The proposed development is for an 18 storey building comprising:

- Demolition;
- consolidation of lots;
- social and affordable housing units;
- retail/commercial space, community hub, SGCH office space and communal open space area;
- bicycle parking; and
- public domain works.

There is no basement level proposed.

Diagram 1 Site Location

2. AVAILABLE INFORMATION

2.1. Existing Ground Survey

Detailed survey levels of existing conditions surrounding the site were provided for this assessment in PDF format, attached in Appendix A. The survey was undertaken by Norton Survey Partners and dated 16th March 2018.

2.2. Proposed Building Design

The proposed building extent, finished floor and site grading levels used for this assessment were taken from the ground floor plan (11929-DA2000) provided by DKO Architects and dated 18th September 2018 (revision P2). A copy of the ground floor plan is included in Appendix A.

2.3. Source of Flood Information

There has been a range of previous flood studies of the catchment, undertaken for various purposes. The following is a brief list of the key studies:

a) *Green Square West Kensington Flood Study*, WMAwater, April 2008 (Reference 1).
b) *Alexandra Canal Catchment Flood Study*, Cardno, 2014 (Reference 2).
c) *Green Square Trunk Drain – Hydraulic and Flood Modelling*, UNSW Water Research Laboratory and WMAwater, August 2014 (Reference 3).
d) *Alexandra Canal Model Conversion*, BMT WBM, March 2016 (Reference 4).
e) *Alexandra Canal Catchment Flood Study Model Update,* WMAWater, 2018 (Reference 5).

Until recently, the 2013 Cardno report has been the adopted flood study for the area for the purposes of setting design flood levels for flood-related development controls. However, this study does not include several features of the catchment that are currently in planning or under construction, which may significantly affect flood behaviour in the vicinity of the site. WMAwater has recently prepared an update (Reference 5), which has become the adopted catchment-wide flood study. The model update involved the conversion of the SOBEK model to TUFLOW and the inclusion of several new commercial and residential precincts that have been planned and either constructed in the last few years, or will soon be constructed.

Two different scenarios were modelled – the base case, replicating 2013 catchment conditions (for comparison with the previous SOBEK model) and an ultimate development scenario, representing recent developments and a number of proposed (or approved) future developments as at 2017. The report was adopted by City of Sydney on June 2018.

Flood information used in this assessment is based on the results of the "Ultimate Development Scenario" from the Alexandra Canal Catchment Flood Study Model Update (Reference 5).

2.4. Available Flood Level Information

A summary of 1% AEP and PMF flood levels from (Reference 5) is provided in Table 1. Figure 2 shows peak flood depths and levels in the 1% AEP event, and results for the PMF are provided in Figure 3.

Table 1: Peak Flood Levels (from Reference 5)

Location	1% AEP Peak Level (mAHD)	PMF Peak Level (mAHD)
Gibbons Street near Marian St corner	25.35	25.45
William Lane	24.82	24.93

Table 1 shows flood levels adjacent to the site on Gibbons Street and William Lane. Gibbons Street slopes down from Marian Street south towards Margaret Street, falling approximately 0.5 m over the length of the site. Flow along Gibbons Street is shallow in the 1% AEP and PMF events, generally less than 150 mm deep in the 1% AEP event and limited to around 200 mm in the PMF event. The peak level noted in Table 1 occurs at the northern end of the site. The shallow flow and separation from low points leads to this the site being classified as 'outside floodplain' on the Gibbons and Marian Street frontages , and therefore the flood planning level requirements depend on the adjacent bottom of kerb level (as described in Section 3).

On the other side of the site, a trapped low point at the southern end of William Lane causes water to pond to depths of up to 0.8 m in the 1% AEP event. The dead-end lane is drained via a 300 mm pipe that conveys flows east to join the Regent Street stormwater drainage network. When runoff exceeds the capacity of this pipe, stormwater ponds in William Lane until it reaches a depth sufficient to flow overland through 23 Gibbons Street to the south. Given the depth of ponding in this area, the site is classified as being subject to 'mainstream flooding' for areas less than 0.5 m above the 1% AEP flood level at this location.

3. IMPACT ON EXISTING FLOOD BEHAVIOUR

The proposed development involves filling of an existing above ground carpark (Lots 1-8/8/DP4209) and replacement of existing buildings and sheds on Lots 9-11/8/DP4209. A new connecting driveway is to be constructed between Gibbons Street and William Lane to the south of the site. As the proposed development changes the existing building footprints, and given the flood affectation at the rear of the site on William Lane, an impact assessment was undertaken to determine whether the proposed development has the potential to cause off-site flood impacts.

3.1. Refinements to Base Case

The model developed by WMAwater for the Alexandra Canal Catchment Flood Study Model Update project (Reference 5) was used to undertake the impact assessment. To ensure the model was appropriately representing the local topography in the vicinity of the site, several refinements were made to the model, and the base case re-established. The refinements included:

- Incorporation of detailed survey data for the subject site (undertaken by Norton Survey Partners on the 16th March 2018);
- Minor adjustments to local features identified during a site visit by WMAwater on the 22nd of May 2018;
- Representation of kerbs and gutters in the area around the site, from Redfern street to Boundary street;

The resulting base case peak flood depths and levels for the 1% AEP and PMF are shown on Figure 2 and Figure 3 respectively.

3.2. Representation of Proposed Design

Once the refined base case was established, the model was modified to represent the proposed building footprint and driveway arrangement. Figure 4 shows details of the plan to represent the proposed development. Key features of the new development include:

- A new driveway at the southern end of the site linking William Lane and Gibbons Street;
- The building footprint covering space that is currently open car parking (with open fencing), and which is inundated by shallow overland flow from Gibbons Street under existing conditions.

Peak flood depths and levels for the proposed development scenario are shown in Figure 5 and Figure 6 for the 1% AEP and PMF events. Hydraulic hazard categories for the 1% AEP Base Case and Proposed Case are shown in Figure 7 and Figure 8 respectively.

3.3. Impact Assessment Results

The peak flood levels for the refined base case and developed case were compared, with the results shown on Figure 9. The results indicate that, as expected, flow no longer enters the site through the open fencing, and this area is accordingly shown as “no longer flooded”. The new driveway acts to replace and attenuate the existing minor overland flow path, and reduces peak flood levels in William Lane by 0.08 m. Peak flood levels in the courtyard of the existing building downstream in 13-23 Gibbons Street by 0.02 m. Peak flood levels on Gibbons Street remain unchanged (within ±0.01 m). The impacts of blocking flow onto the existing carpark are mitigating by the construction of the new driveway and allowing some flow to traverse from Gibbons Street to William Lane along this flow path.

The proposed design does not cause adverse flood impacts outside of the site. The primary impacts that occur as a result of the development are a reduction in flood levels on William Lane, and in the courtyard of the adjacent property.

4. FLOOD PLANNING LEVELS

4.1. Flood Planning Requirements

The site is subject to 'mainstream flooding' on William Lane as it is adjacent to a trapped low point. The Gibbons Street side of the site however is subject only to shallow flow and is not connected to the trapped low point, so an 'outside floodplain' classification applies here. Relevant flood considerations include:

a) Flood planning levels for the site are to be determined in accordance with the *Sydney Local Environment Plan* and *Sydney Development Control Plan 2012*, and based on flood modelling results from previous catchment-wide flood investigations (discussed above); and
b) The development will also need to comply with floor level requirements (Table 2) specified in the *City of Sydney Interim Floodplain Management Policy*.

Table 2: Flood Planning Levels (from City of Sydney Interim Floodplain Management Policy)

Entry Point[1]	Development		Requirement
William Lane Mainstream or Local Drainage Flooding	Residential	Habitable Rooms	1% AEP level + 0.5 m
	Industrial or Commercial	Business Floor Level	Merits approach presented by the applicant with a minimum of the 1% AEP flood level.
		Retail Floor Levels	Merits approach presented by the applicant with a minimum of the 1% AEP flood level. The proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation
	Above ground carpark	Enclosed car parks	1% AEP level
		Open car parks	5% AEP level
Gibbons Street Outside Floodplain	Residential, commercial and retail	Habitable Rooms, Commercial and retail floors	Minimum of 0.3 m above the surrounding surface[2]

[1]Entry point refers to any building access points as well as ventilation openings.

[2]Further clarification sought from City of Sydney indicated the following: ***"****The flood planning levels must comply with the City of Sydney Floodplain Management Policy. At a minimum, all ground floor levels/flood planning levels should be set at a minimum 300mm above the surrounding surface or invert gutter (i.e. adjacent bottom of kerb).*"

5. ASSESSMENT OF COMPLIANCE WITH COUNCIL REQUIREMENTS

Table 3: Assessment of FPL Compliance

Development Type (and entry point)	Invert of gutter from detail survey (mAHD)	1% AEP Depth of flow (m)	Classification	Proposed FFL (mAHD)	Comment
Retail/ Commercial Space – Entry from Gibbons Street	24.9	< 0.1	Outside Floodplain	25.0	Meets requirements for commercial
Café and Lobby – Gibbons Street	25.0	< 0.1	Outside Floodplain	25.4	Meets requirements for residential (0.3m above adjacent gutter level)
Community Hub – Gibbons/Marian Streets	25.3	< 0.1	Outside Floodplain	25.6	Meets requirements for commercial
SGCH Office – Marian Street	25.5	< 0.1	Outside Floodplain	25.6	Meets requirements for commercial
Lobby and lift entries off William Lane	Not applicable (mainstream)	Not applicable (mainstream)	Mainstream	25.4	Meets requirements for residential (Above William Lane 1% AEP level + 0.5m freeboard)
Chamber Substation	Not applicable (mainstream)	Not applicable (mainstream)	Mainstream	24.9	Floor level is above William Lane 1% AEP level. See notes on electrical equipment below.
Pump Rooms, Fire Control Room, Gas Cupboard, Cleaner's Sore, Comms Room, Main Switch Room	Not applicable (mainstream)	Not applicable (mainstream)	Mainstream	24.5	Floor level is 0.32 m below Williams Lane 1% AEP level. There is no specific minimum requirement for the floor level, but electrical equipment must be installed in a flood compatible fashion (see notes below).

Notes on electrical equipment:

1. **Main Power Supply** – Main commercial power service equipment, including metering equipment, should be above the FPL of 25.4 mAHD
2. **Wiring** – All wiring, power outlets, switches, and electrical equipment will need to be above the FPL of 25.4 mAHD. All electrical wiring installed below this level should be suitable for continuous underwater immersion and should contain no fibrous components. Conduits located below 25.4 mAHD should be installed so they are self-draining if subjected to flooding.
3. **Electrical equipment** – equipment below or partially below the 25.4 mAHD FPL should be capable of disconnection by a single plug and socket assembly.

It is recommended that in the rooms with floor levels below the 25.4 mAHD FPL, a sign should be affixed clearly indicating the line of the FPL height, and indicating the flood-proofing requirements for electrical equipment in these rooms.

6. CONCLUSIONS

WMAwater undertook a site-specific flood assessment for the proposed development at 11 Gibbons Street, Redfern.

The effects of the proposed development on flood behaviour were modelled, and it was found that the development will not increase peak flood levels outside the site more than 0.01 m, which is within the tolerance of the modelling to assess.

The proposed floor levels were assessed against the Flood Planning Level requirements from City of Sydney's Interim Floodplain Management Policy (see Table 3). The proposed floor levels are compliant with the policy, although several of the plant rooms on William Lane will contain electrical equipment that will need to be installed above the FPL, or otherwise appropriately flood-proofed. To ensure this occurs, and the requirement is clear into the future, it is recommended that in the rooms with floor levels below the 25.4 mAHD FPL, a sign should be affixed clearly indicating the line of the FPL height, and describing the flood-proofing requirements for City of Sydney's policy for electrical equipment in these rooms.

Please contact the undersigned for clarification of the above.

Yours Sincerely,

WMAwater

Rhys Hardwick-Jones

Senior Associate

References

1. Webb McKeown & Associates Pty Ltd
   Green Square - West Kensington (Sheas Creek Victoria Branch) Flood Study
   City of Sydney & Randwick City Council, April 2008

2. Cardno
   Alexandra Canal Catchment Flood Study (Final)
   City of Sydney, May 2014

3. Water Research Laboratory & WMAwater
   Green Square Trunk Drain – Hydraulic and Flood Modelling
   WRL Technical Report 2014/18
   City of Sydney & Sydney Water, August 2014

4. BMT WBM
   Alexandra Canal Model Conversion
   City of Sydney, 25 June 2013

5. WMAwater
   Alexandra Canal Catchment Flood Study Model Update

City of Sydney, June 2018

6. City of Sydney
Local Environment Plan
2012

7. City of Sydney
Development Control Plan
2012

8. City of Sydney
Interim Floodplain Management Policy
May 2014

Figures:

Figure 1 Study Area
Figure 2 Peak Flood Levels and Depths – Base Case – 1% AEP Event
Figure 3 Peak Flood Levels and Depths - Base Case – PMF Event
Figure 4 Proposed Case Model Schematisation
Figure 5 Peak Flood Levels and Depths – Developed Case – 1% AEP Event
Figure 6 Peak Flood Levels and Depths – Developed Case – PMF Event
Figure 7 Hydraulic Hazard - Base Case – 1% AEP Event
Figure 8 Hydraulic Hazard - Developed Case – 1% AEP Event
Figure 9 Peak Flood Level Impact – 1% AEP Event

Attached:

Detail Survey – Norton Survey Partners
Ground Floor Plan – DKO Architects

FIGURE 1
11 GIBBONS STREET, REDFERN
STUDY AREA

J:\Jobs\118038\Arc\ArcMaps\Working\FigureXX_Site_Area.mxd

FIGURE 2
11 GIBBONS STREET, REDFERN
PEAK FLOOD DEPTH AND LEVEL CONTOUR
EXISTING CASE - 1% AEP EVENT

J:\Jobs\118038\Arc\ArcMaps\180920_ReportRev\Figure02_PeakFlood_Levels_&_Depths_100Y_BaseCase.mxd

FIGURE 3
11 GIBBONS STREET, REDFERN
PEAK FLOOD DEPTH AND LEVEL CONTOUR
EXISTING CASE - PMF EVENT

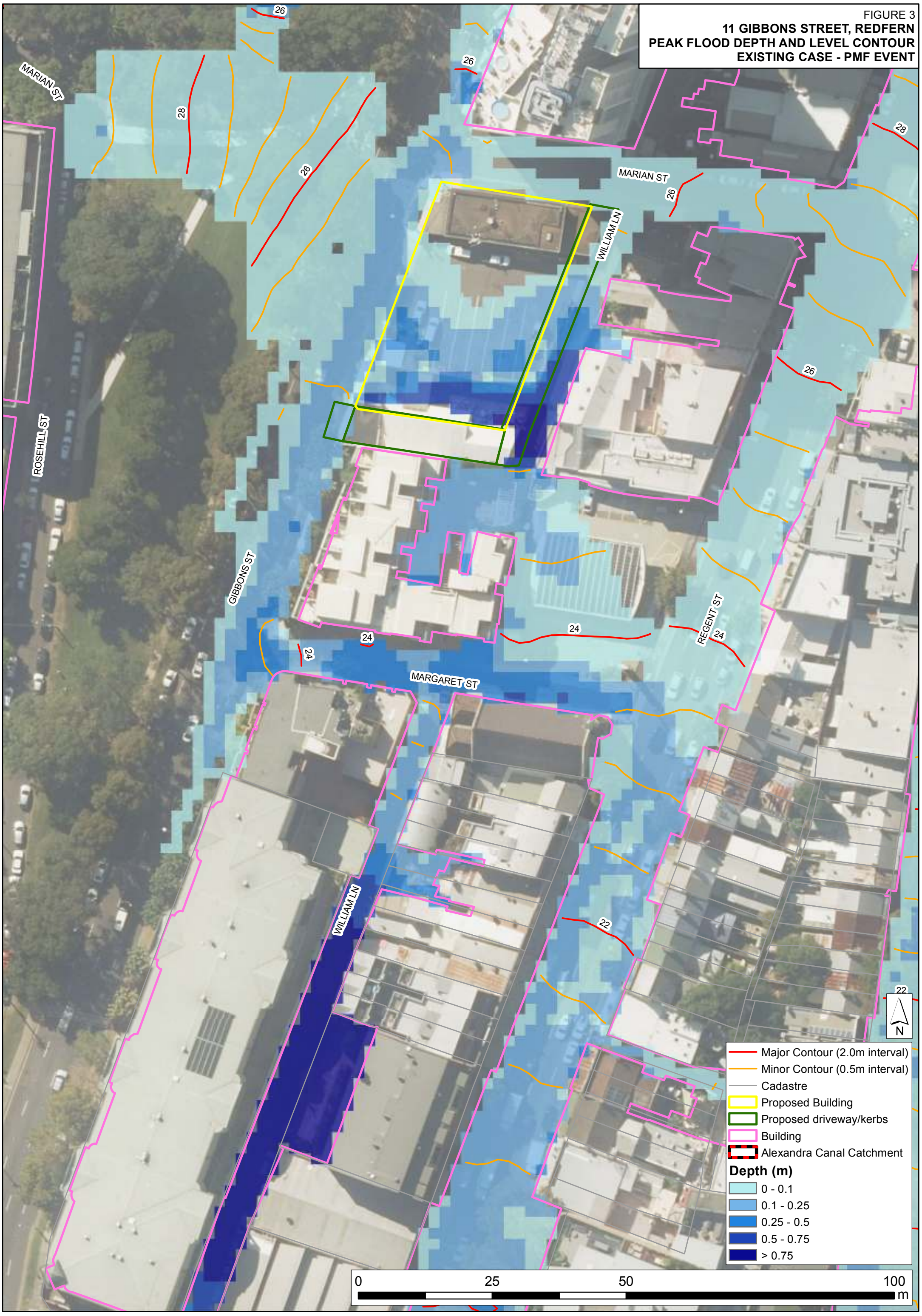

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FIGURE 4
11 GIBBONS STREET, REDFERN
PROPOSED CASE
MODEL SCHEMATISATION

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FIGURE 5
11 GIBBONS STREET, REDFERN
PEAK FLOOD DEPTH AND LEVEL CONTOUR
PROPOSED CASE - 1% AEP EVENT

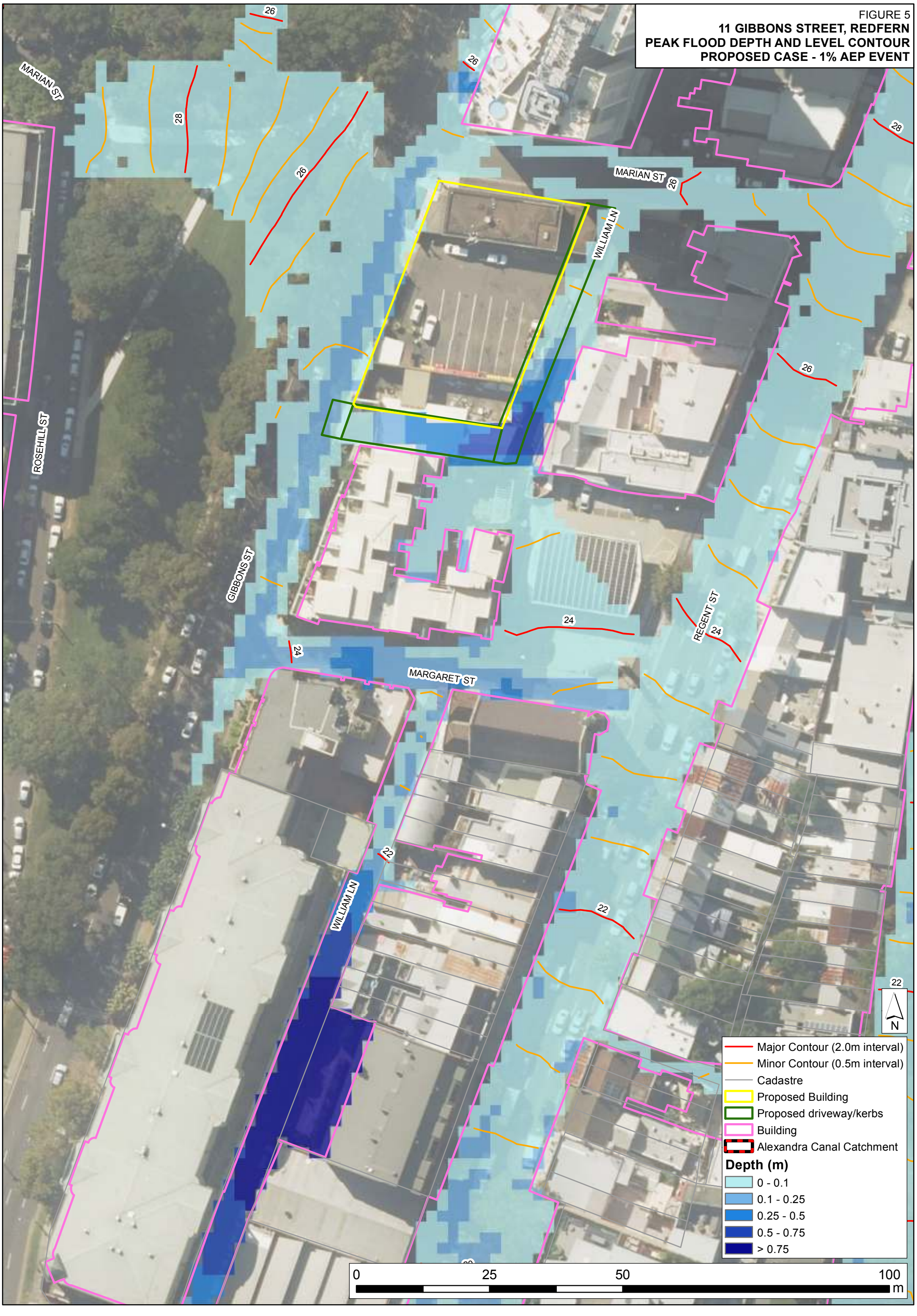

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FIGURE 6
11 GIBBONS STREET, REDFERN
PEAK FLOOD DEPTH AND LEVEL CONTOUR
PROPOSED CASE - PMF EVENT

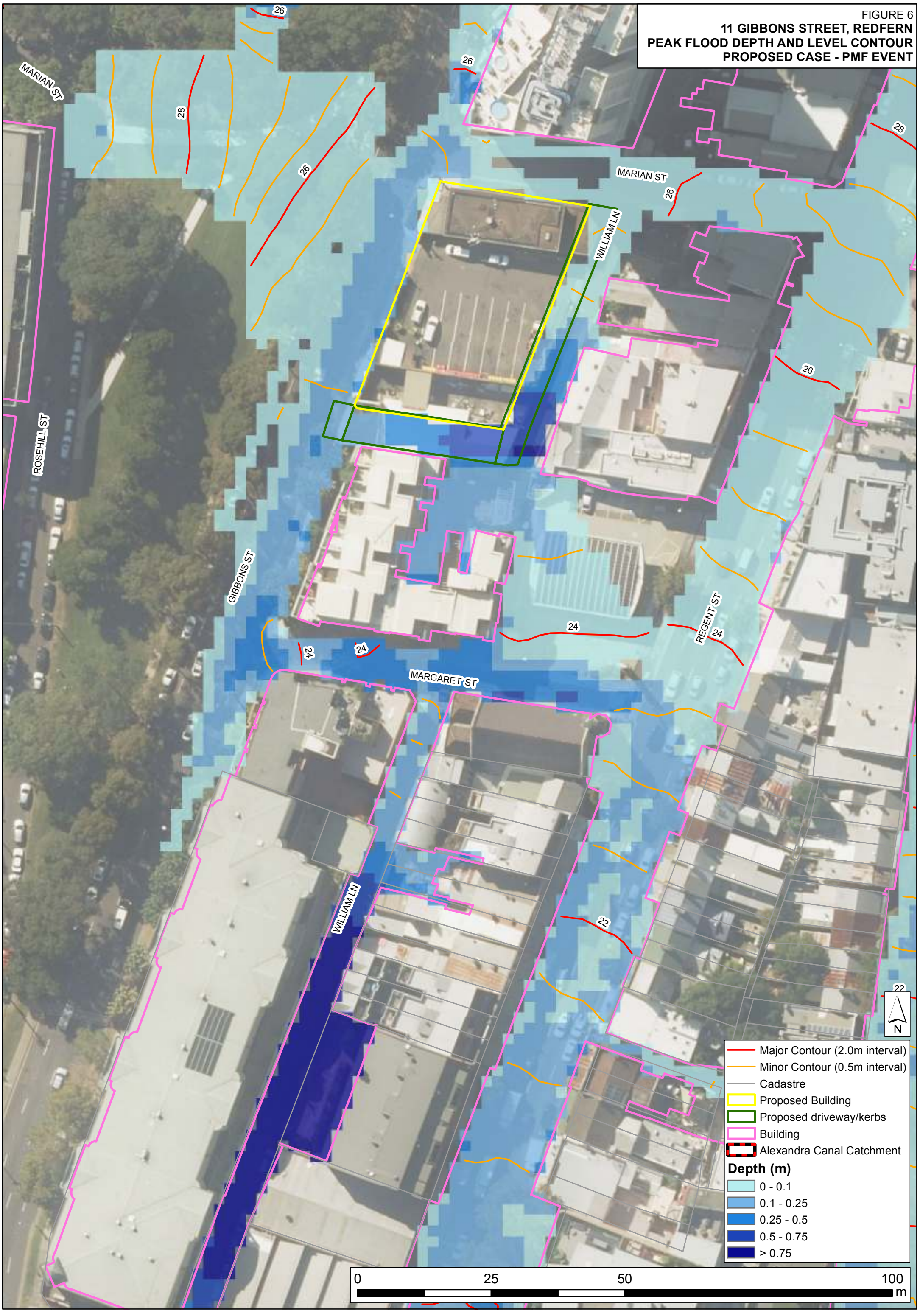

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FIGURE 7
11 GIBBONS STREET, REDFERN
PROVISIONAL HYDRAULIC HAZARD
BASE CASE - 1% AEP EVENT

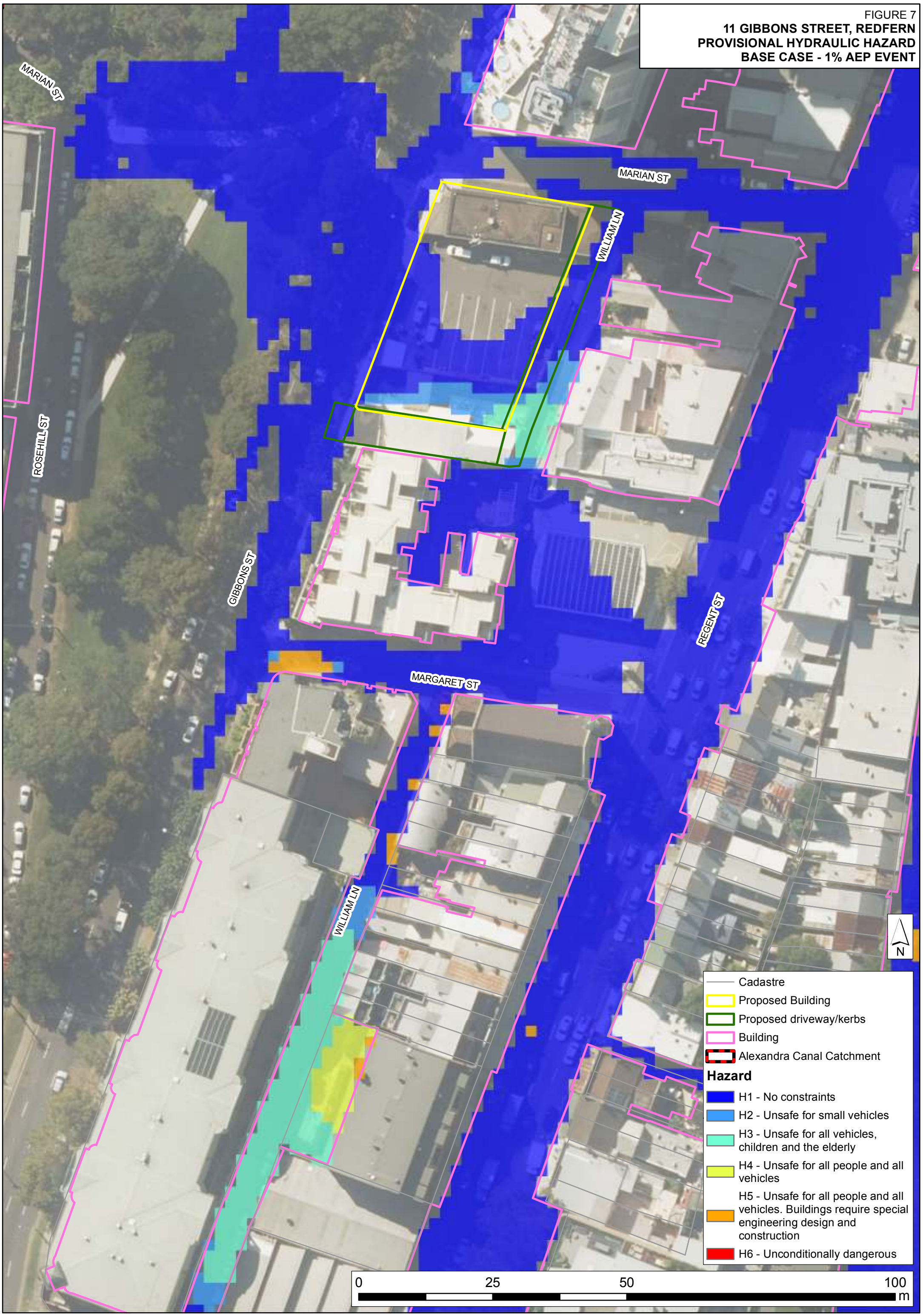

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FIGURE 8
11 GIBBONS STREET, REDFERN
PROVISIONAL HYDRAULIC HAZARD
PROPOSED CASE - 1% AEP EVENT

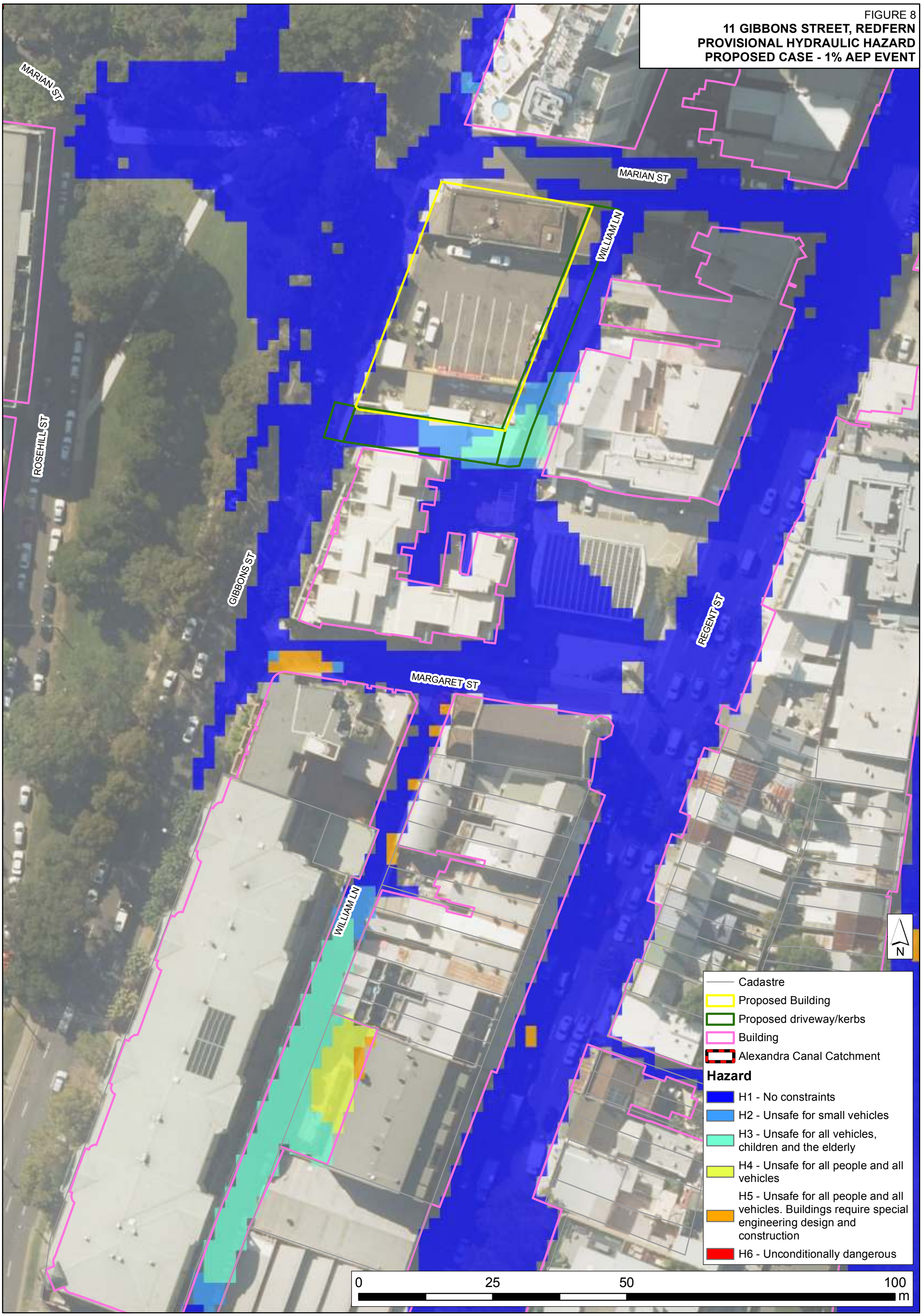

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FIGURE 9
11 GIBBONS STREET, REDFERN
CHANGE IN PEAK FLOOD LEVEL
PROPOSED CASE - 1% AEP EVENT

MARIAN ST
MARIAN ST
WILLIAM LN
ROSEHILL ST
GIBBONS ST
REGENT ST
MARGARET ST
WILLIAM LN

N

Cadastre
Proposed Building
Proposed driveway/kerbs
Building
Alexandra Canal Catchment

Impact (m)
<-0.1
-0.1 to -0.05
-0.05 to -0.03
-0.03 to -0.01
-0.01 to 0.01
0.01 to 0.02
0.02 to 0.03
0.03 to 0.04
0.04 to 0.05
> 0.05
Newly flooded
No longer flooded

0 25 50 100 m

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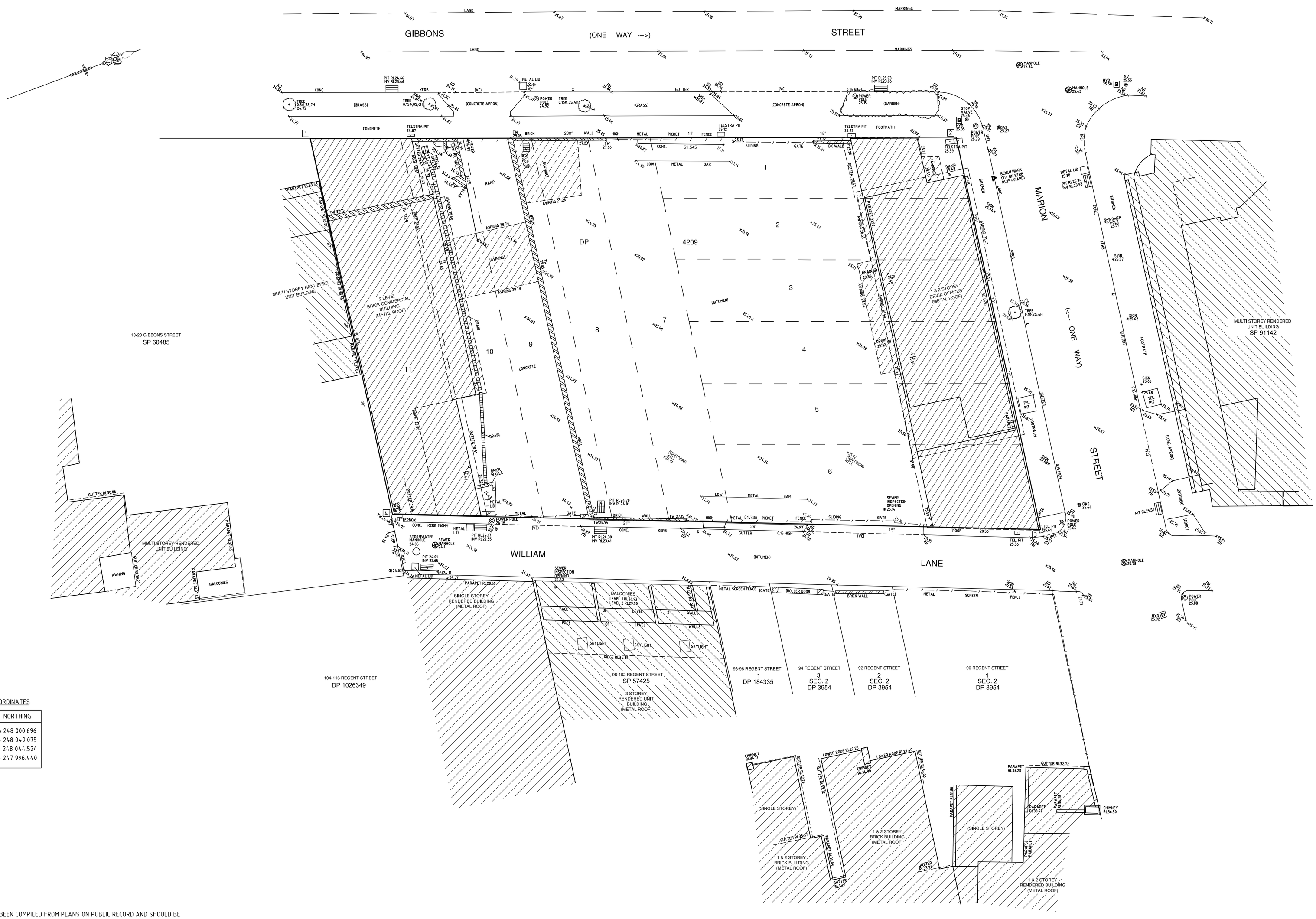


BOUNDARY CO-ORDINATES

	EASTING	NORTHING
1	334 238.700	6 248 000.696
2	334 256.487	6 248 049.075
3	334 288.187	6 248 044.524
4	334 269.097	6 247 996.440

NOTES:

1) BOUNDARIES HAVE BEEN COMPILED FROM PLANS ON PUBLIC RECORD AND SHOULD BE CONFIRMED BY SURVEY, PRIOR TO COMPLETION OF DESIGN WORKS. BOUNDARY REDEFINITION HAS NOT BEEN UNDERTAKEN.
2) ORIGIN OF LEVELS: PM 53328 RL28.866 (A.H.D.) SCIMS
3) SITE COMPRISES LOTS 1- 11 IN DP 4209
4) SITE AREA 1578.7 m^2 BY TITLE DIMENSIONS.
5) UNDERGROUND SERVICES HAVE NOT BEEN INVESTIGATED.
6) (G) DENOTES GUTTER LEVEL. 0.3Ø10S,8H DENOTES INDICATIVE TREE SIZE 0.3 TRUNK DIAMETER, 10 SPREAD, 8 HIGH.
7) TREE NAMES SHOWN CONSTITUTE OUR OPINION ONLY. IF TREE SPECIES IDENTIFICATION IS IMPORTANT FOR DESIGN OR HERITAGE REASONS THEY SHOULD BE DETERMINED BY A QUALIFIED ARBORIST.

ISSUE	DATE	AMENDMENT

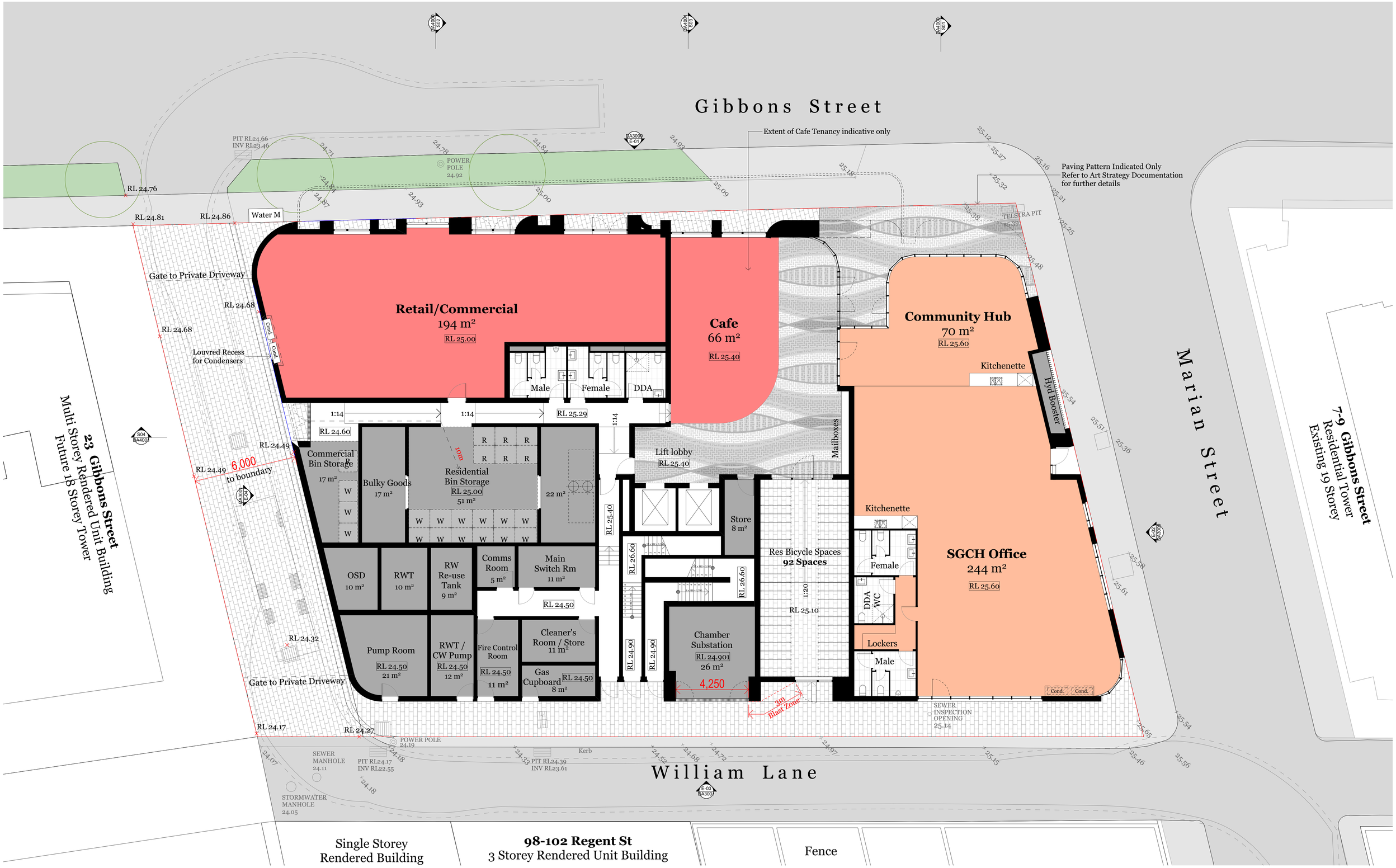
TITLE: PLAN SHOWING SELECTED DETAIL & LEVELS OVER No11 GIBBONS STREET, REDFERN

LGA: CITY OF SYDNEY | REFERENCE: 37891

CLIENT : SGCH | DATE: 16-3-18 | SHEET 1 of 2

SCALE (AT A1) 1:150 | DATUM : AHD | SURVEYOR: HD

Norton Survey Partners
SURVEYORS & LAND TITLE CONSULTANTS
A.C.N. 618 980 475
SUITE 1
670 DARLING STREET
ROZELLE N.S.W. 2039
PH +61 2 9555 2744
office@nspartners.com.au



Consultants

Access - Morris Goding
David Goding
david@mgac.com.au
0407 246 115

Acoustic - Renzo Tonin
Tony Wong
tony.wong@renzotonin.com.au
8218 0515

Building Services - Arrow
Brian Calcutt
bcalcutt@arrowee.com.au
0416 082 260

Civil - ABC Consultants
Ryan Campbell
ryan@abc-consultants.com.au
0402 343 139

Communication - Straight Talk
Jessica Stapleton
jessica@straight-talk.com.au
0433 522 069

ESD - Northrop
Amir Girgis
AGirgis@northrop.com.au

Fire - Core Engineering
Neil Campbell
neil@coreengineering.com.au
0410 610 928

Flood - WMA Water
Catherine Goonan
goonan@wmawater.com.au
9299 2855

HAZMAT - Greencap
James Stewart
james.stewart@greencap.com.au
0427 701 502

Geotechnical - CES
Tristan Goodbody
8569 2200

Heritage - Artefact
Sandra Wallace
Sandra.Wallace@artefact.net.au
0403 565 086

Landscape - In View
Isabel Lester
Isabel@inviewdesign.com.au
0416 110 058

Surveyor - Norton Survey
Andrew Whitfield
awhitfield@nsqpartners.com.au
0418 255 972

Planner - Keylan
Michael Woodland
michael@keylan.com.au
0448 726 214

QS - WT Partnership
Paul Elphick
pelphick@wtpartnership.com.au
0407 243 711

Site Contamination - JBS&G
Daniel Denaro
DDenaro@jbsg.com.au
0468 425 921

Traffic - TTM
Callum Hutchenson
CHutchenson@ttmgroup.com.au
0402 095 356

Waste - TTM
Arthur Stamatiou
astamatiou@ttmgroup.com.au
(07) 3327 9500

Wind - Windtech
Simon Ronald
simon@windtechglobal.com
9503 0308

SGCH
St George Community Housing

Rev.	Date	By	Ckd	Description
P1	07/09/18	RY	KL	Plans for Review
P2	18/09/18	RY	SO	Arch Set for Review

DKO Architecture (NSW) Pty Ltd
119 Redfern Street
Redfern, NSW 2016
T +61 2 8346 4500
info@DKO.com.au
www.DKO.com.au
ABN: 81956706590

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NSW: Nominated Architects
Koos de Keijzer 5767 | David Randerson 8542

DKO

Project Name	11 Gibbons street	Project Number	11929
Project Address	11 Gibbons Street, Redfern, NSW 2016	Drawing Name	Ground Level
		Scale	1:100@A1
		Date	September 2018
Client	SGCH	Drawing Number	DA2000
		Revision	P2