20 December 2021

Group Architects
3.09/55 Miller Street
Pyrmont NSW 2009

Attention: Michael Munro

Dear Michael

1.0 Introduction

Akuna Engineering was engaged to assess the proposed Alterations and Additions at 95 Wimbledon Avenue, North Narrabeen in reference to potential risks and impacts connected with flooding. This report relies upon flooding information specific for the subject site provided by Council and uses architectural drawings to assess any impacts and risks.

1.1 Information Relied Upon

The following documentation has been used in the preparation of this overland flow assessment report:

- Survey and architectural drawings listed in Appendix A
- Council provided flood information in Appendix B

1.2 Description of the Site and Proposed Development

The subject site is located at 95 Wimbledon Avenue, North Narrabeen. The site (645m^2) slopes to the West, away from Wimbledon Avenue and down to Narrabeen Lagoon.

The proposed works consist of the construction of a new in-ground pool towards the rear of the, refer attached architectural plans.

2.0 Flooding

Council flood information (Appendix B) for the site identifies the property as being flood affected during the 1% annual exceedance probability (AEP) storm event. Council supplied flood information was used to determine flooding extents, impacts, and assess the associated risks to the development.

The development site is located within the High-Risk precinct flood hazard zone as identified within Northern Beaches (Pittwater) Council's Flood Hazard Map (Appendix B). Therefore, the site requires a Flood Management Report to be completed in accordance with Pittwater 21 Development Control Plan B3.11 Flood Prone Land to support the development.

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ACN: 636 447 866
M: 0456 785 125

2.1 Assessment of Impacts

All aspects of the proposed development are categorised as concessional and located within the High-Risk precinct. In accordance with Pittwater Council 21DCP sB3.11, flood controls are applicable to the development.

Based on the flood information contained within Appendix B, the predicted flood levels are summarised below:

- 1% AEP: 3.05 mAHD (Appendix B, Flood Map B)
- FPL: 3.55 mAHD (1% AEP flood level + 500mm)
- PMF: 5.03 mAHD (Appendix B, Flood Map D)

Table 1. DCP flood controls, High flood risk precinct, Residential

#	Prescriptive controls	Compliance with controls			Relevant Controls
		NA	Yes	No	
A	Flood effects caused by development		✓		A1, A2
B	Building components and structural		✓		B1,B2,B3
C	Floor levels		✓		C1, C3, C4, C6
D	Car parking	✓			D1, D2, D3, D4, D5, D6
E	Emergency response		✓		E1
F	Fencing		✓		F1
G	Storage of goods		✓		G1
H	Pools		✓		H1

NA – Not applicable

3.0 Addressing the Controls

Control A - Flood effects caused by development

A1. Complies - The development is not expected to adversely impact surrounding properties with regard to flood levels, velocities or hazard during 1% AEP event.

The proposed pool will be constructed to match the existing levels shown in the attached survey.

A2. Complies – No net filling is proposed within the 1% AEP extent, refer Control H1.

Control B – Building components and structural

B1. Complies - Pool will be below ground, fencing to comply with Control H1 and be constructed of flood compatible materials.

B2. Achievable - All new structures impacted by 1% AEP flood levels (below 3.05 mAHD) must be designed and constructed to ensure structural integrity up to the 1% AEP Flood event, taking into account the forces of floodwater, wave action,

flowing water with debris, buoyancy and immersion. Certification from a structural engineer must be provided as part of the CC works.

B3. Achievable - All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or located above the FPL.

Control C – Floor Levels

C1. Not applicable

C3. Complies – Pool will be in ground with surrounding levels constructed to match existing surface levels shown in the attached survey.

C4. Not applicable

C6. Not applicable

Control D – Car Parking

Not applicable

Control E – Flood emergency response

E1. In the event that floodwaters overtop the foreshore boundary at any point on the property, the recommended actions are:

- Emergency services shall be contacted stating the property's location; the situation faced, number of people on the property and any evacuation measures to be carried out.
- The occupants of the property shall evacuate the site and proceed up Wimbledon Avenue to the Wakehurst Parkway/ Wimbledon Avenue intersection. This area is approximately 5m above the PMF level.

Control F – Fencing

F1. Complies – A 1200mm high aluminium fence is propose to surround the pool. The proposed fence will be designed to have at least 50% openings from the natural ground level up to 1% AEP flood level (3.05 mAHD) to allow the passage of floodwater through the fence. Any openings will be a minimum of 75mm x 75mm.

Control G – Storage of goods

G1. Complies – Refer control H1

G2. Complies – Refer control H1

Control H – Pools

H1. Complies – the proposed pool will be generally constructed with the pool coping and surround levels design to match the existing levels shown in the attached survey. A small area of the pool surround to the south will require some minor fill of 150 to 200mm, it is anticipated that this fill would be offset by the flood storage created by the pool due to the difference in the working water level of the pool and surrounding FFL (typically 100mm).

All electrical equipment associated with the pool (including pool pumps) is to be waterproofed and/or located at or above the Flood Planning Level.

All chemicals associated with the pool are to be stored at or above the Flood Planning Level.

4.0 Conclusion

Council's flood data predicts that during the 1% AEP rain event, the site will be completely inundated with floodwaters arising from Narrabeen Lagoon. The floodwaters on and surrounding the site are classified as High Hazard and Flood Storage (Map J & Map F respectively, refer to Appendix B).

The proposed development has been assessed against the relevant Council flood controls and provided that the recommendations contained within this report are adopted:

- The proposed development complies with the applicable flood controls outlined in sB3.11 of Northern Beaches Council's Development Control Plan (Pittwater21 DCP).
- No additional adverse flooding impacts are expected to occur to the neighbouring upstream and downstream properties as a result of the proposed development.
- The proposed development is consistent with the flood risk hazard of the land.

Please contact me if you have any questions.

Kind regards,

Logan English-Smith
Senior Engineer – Flooding & Stormwater

Appendix A – Survey and Architectural Plans

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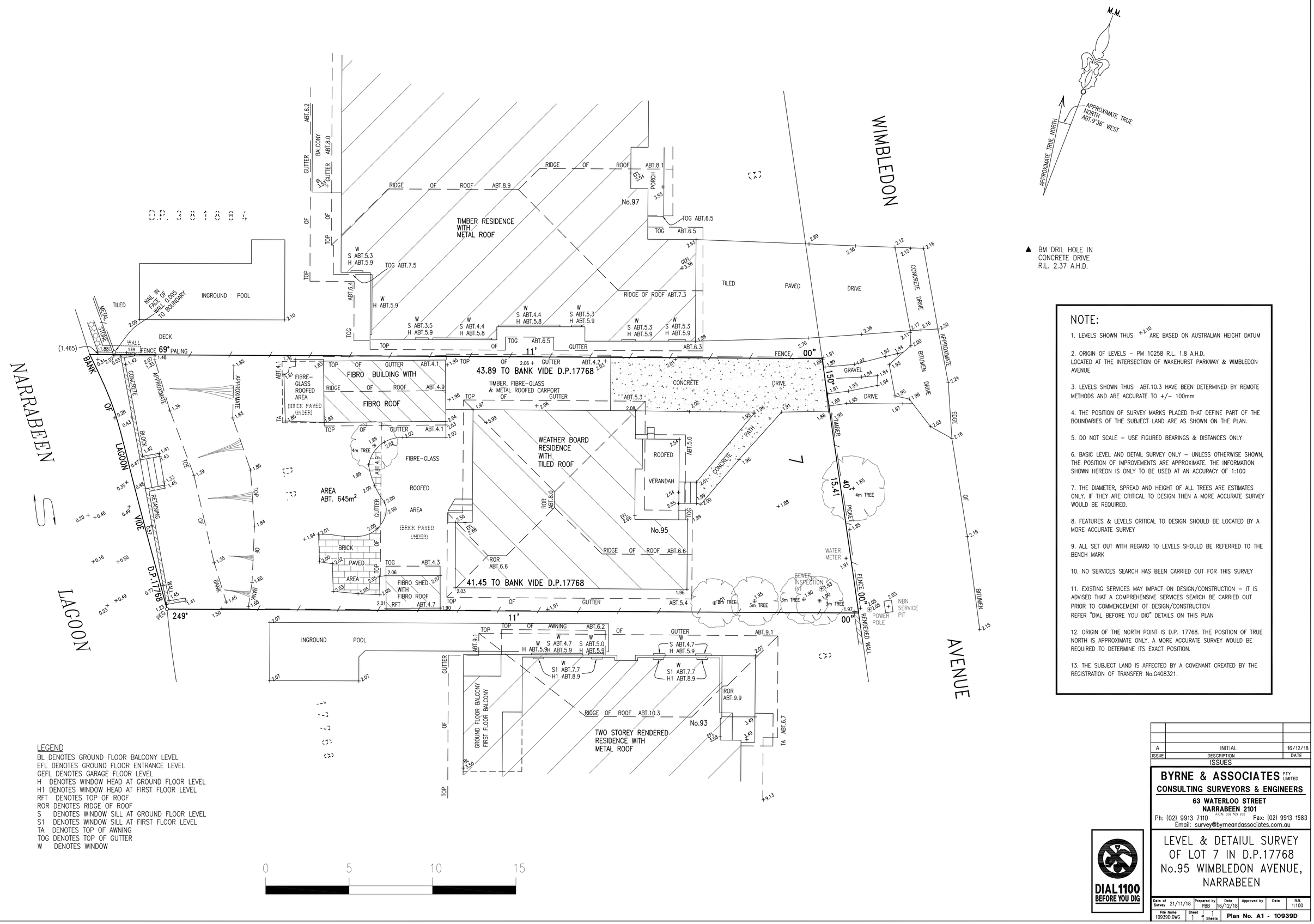


NOTE:

1. LEVELS SHOWN THUS $^{+2.10}$ ARE BASED ON AUSTRALIAN HEIGHT DATUM

2. ORIGIN OF LEVELS – PM 10258 R.L. 1.8 A.H.D. LOCATED AT THE INTERSECTION OF WAKEHURST PARKWAY & WIMBLEDON AVENUE

3. LEVELS SHOWN THUS ABT.10.3 HAVE BEEN DETERMINED BY REMOTE METHODS AND ARE ACCURATE TO +/– 100mm

4. THE POSITION OF SURVEY MARKS PLACED THAT DEFINE PART OF THE BOUNDARIES OF THE SUBJECT LAND ARE AS SHOWN ON THE PLAN.

5. DO NOT SCALE – USE FIGURED BEARINGS & DISTANCES ONLY

6. BASIC LEVEL AND DETAIL SURVEY ONLY – UNLESS OTHERWISE SHOWN, THE POSITION OF IMPROVEMENTS ARE APPROXIMATE. THE INFORMATION SHOWN HEREON IS ONLY TO BE USED AT AN ACCURACY OF 1:100

7. THE DIAMETER, SPREAD AND HEIGHT OF ALL TREES ARE ESTIMATES ONLY. IF THEY ARE CRITICAL TO DESIGN THEN A MORE ACCURATE SURVEY WOULD BE REQUIRED.

8. FEATURES & LEVELS CRITICAL TO DESIGN SHOULD BE LOCATED BY A MORE ACCURATE SURVEY

9. ALL SET OUT WITH REGARD TO LEVELS SHOULD BE REFERRED TO THE BENCH MARK

10. NO SERVICES SEARCH HAS BEEN CARRIED OUT FOR THIS SURVEY

11. EXISTING SERVICES MAY IMPACT ON DESIGN/CONSTRUCTION – IT IS ADVISED THAT A COMPREHENSIVE SERVICES SEARCH BE CARRIED OUT PRIOR TO COMMENCEMENT OF DESIGN/CONSTRUCTION
REFER "DIAL BEFORE YOU DIG" DETAILS ON THIS PLAN

12. ORIGIN OF THE NORTH POINT IS D.P. 17768. THE POSITION OF TRUE NORTH IS APPROXIMATE ONLY. A MORE ACCURATE SURVEY WOULD BE REQUIRED TO DETERMINE ITS EXACT POSITION.

13. THE SUBJECT LAND IS AFFECTED BY A COVENANT CREATED BY THE REGISTRATION OF TRANSFER No.G408321.

LEGEND

BL DENOTES GROUND FLOOR BALCONY LEVEL
EFL DENOTES GROUND FLOOR ENTRANCE LEVEL
GEFL DENOTES GARAGE FLOOR LEVEL
H DENOTES WINDOW HEAD AT GROUND FLOOR LEVEL
H1 DENOTES WINDOW HEAD AT FIRST FLOOR LEVEL
RFT DENOTES TOP OF ROOF
ROR DENOTES RIDGE OF ROOF
S DENOTES WINDOW SILL AT GROUND FLOOR LEVEL
S1 DENOTES WINDOW SILL AT FIRST FLOOR LEVEL
TA DENOTES TOP OF AWNING
TOG DENOTES TOP OF GUTTER
W DENOTES WINDOW

ISSUE	DESCRIPTION	DATE
A	INITIAL	16/12/18

ISSUES

BYRNE & ASSOCIATES PTY LIMITED
CONSULTING SURVEYORS & ENGINEERS
63 WATERLOO STREET
NARRABEEN 2101
Ph: (02) 9913 7110 A.C.N. 002 109 202 Fax: (02) 9913 1583
Email: survey@byrneandassociates.com.au

DIAL 1100 BEFORE YOU DIG

LEVEL & DETAIUL SURVEY OF LOT 7 IN D.P.17768 No.95 WIMBLEDON AVENUE, NARRABEEN

Date of Survey	Prepared by	Date	Approved by	Date	R.R.
21/11/18	PBB	16/12/18			1:100

File Name 10939D.DWG | Sheet 1 of 1 Sheets | **Plan No. A1 - 10939D**

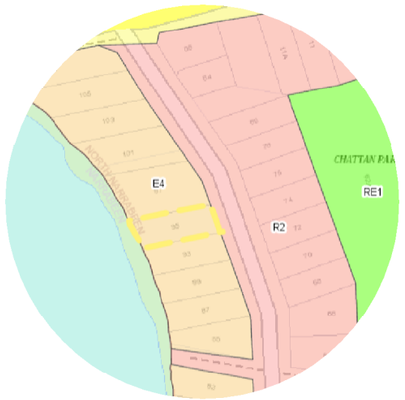
DA PLAN

95 WIMBLEDON AVE, NARRABEEN

LOT 7 / DP17768

ZONE E4: ENVIRONMENTAL LIVING

PROJECT LOCATION



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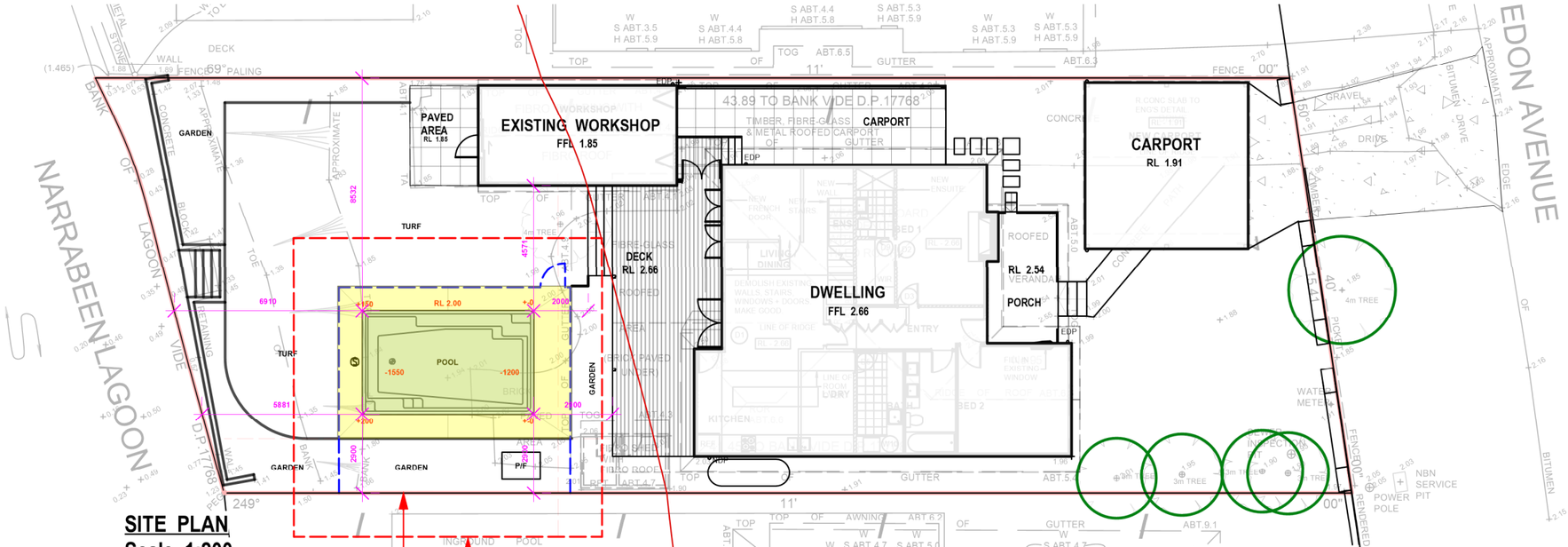

PROPOSED POOL AREA

2M GARDEN TO BE MAINTAINED BETWEEN POOL COPING AND SOUTHERN BOUNDARY

0 10 M

WORKS REQUIRING APPROVAL

ISSUE	DATE	COMMENT
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Drawing Title	SITE PLAN	Scale	1:200@A3
		Drawing No.	7017

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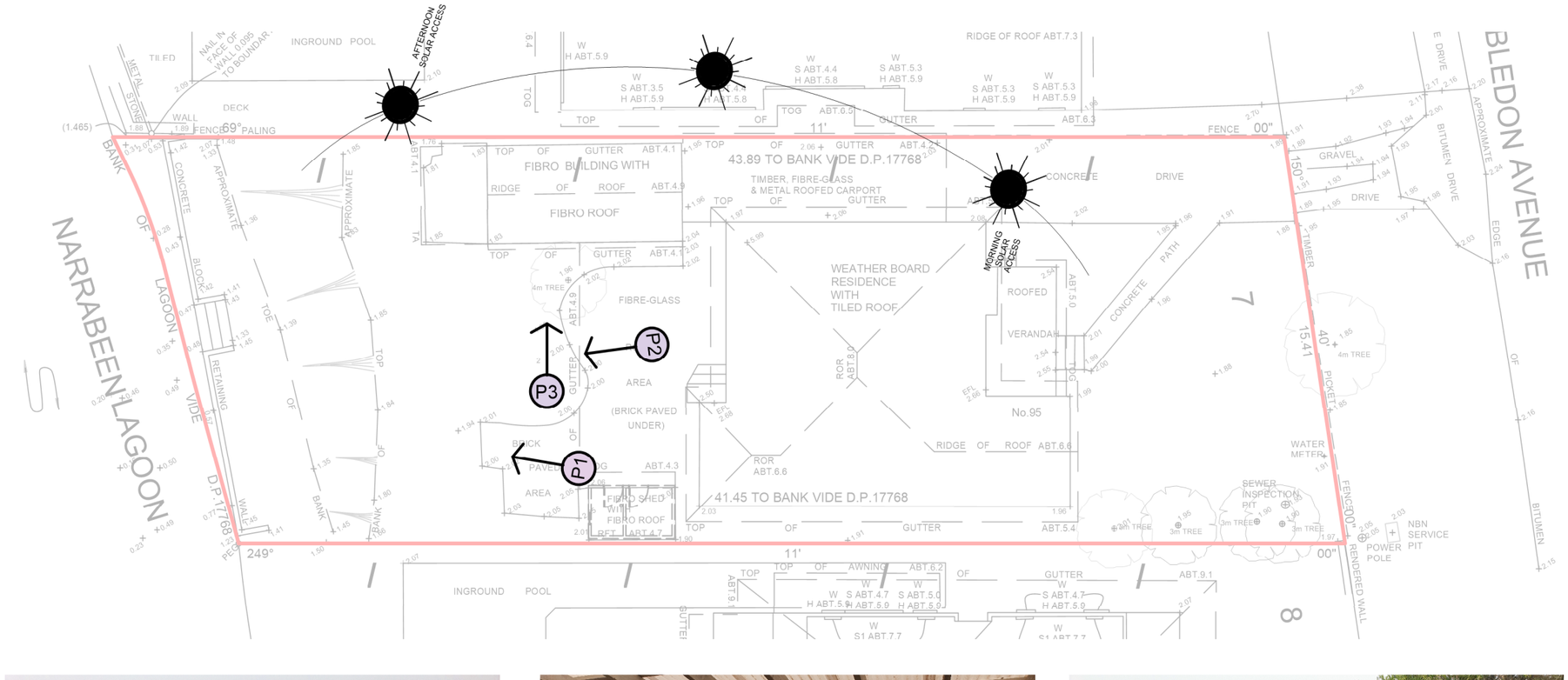
0 10 M



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P2

P3

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GENERAL NOTES

All work to be carried out in accordance with the Building Code of Australia, all Local and State Government Ordinances, relevant Australian Standards, Local Authorities Regulations and all other relevant Authorities concerned.
All structural work and site drainage to be subject to Engineer's details or certification where required by Council. This shall include r.c. slabs and footings, r.c. and steel beams & columns, wind bracing to AS 1170
and AS4055, anchor rods or bolts, tie downs, fixings etc., driveway slabs and drainage to Council's satisfaction. All timbers to be in accordance with SAA Timber Structure Code AS1720 and SAA Timber Framing Code AS 1684. All work to be carried out in a professional and workman- shiplike manner according to the plans and specification.
NOTE
Do not scale off the drawings unless otherwise stated and use figured dimensions in preference.
All dimensions are to be checked and verified on site before the commencement of any work; all dimensions and levels are subject to final survey and set-out
No responsibility will be accepted by Sitedesign for any variations in design, builder's method of construction or materials used, deviation from specification without permission or accepted work practices resulting in inferior construction. Locate and protect all services prior to construction.
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Drawing No. 7017

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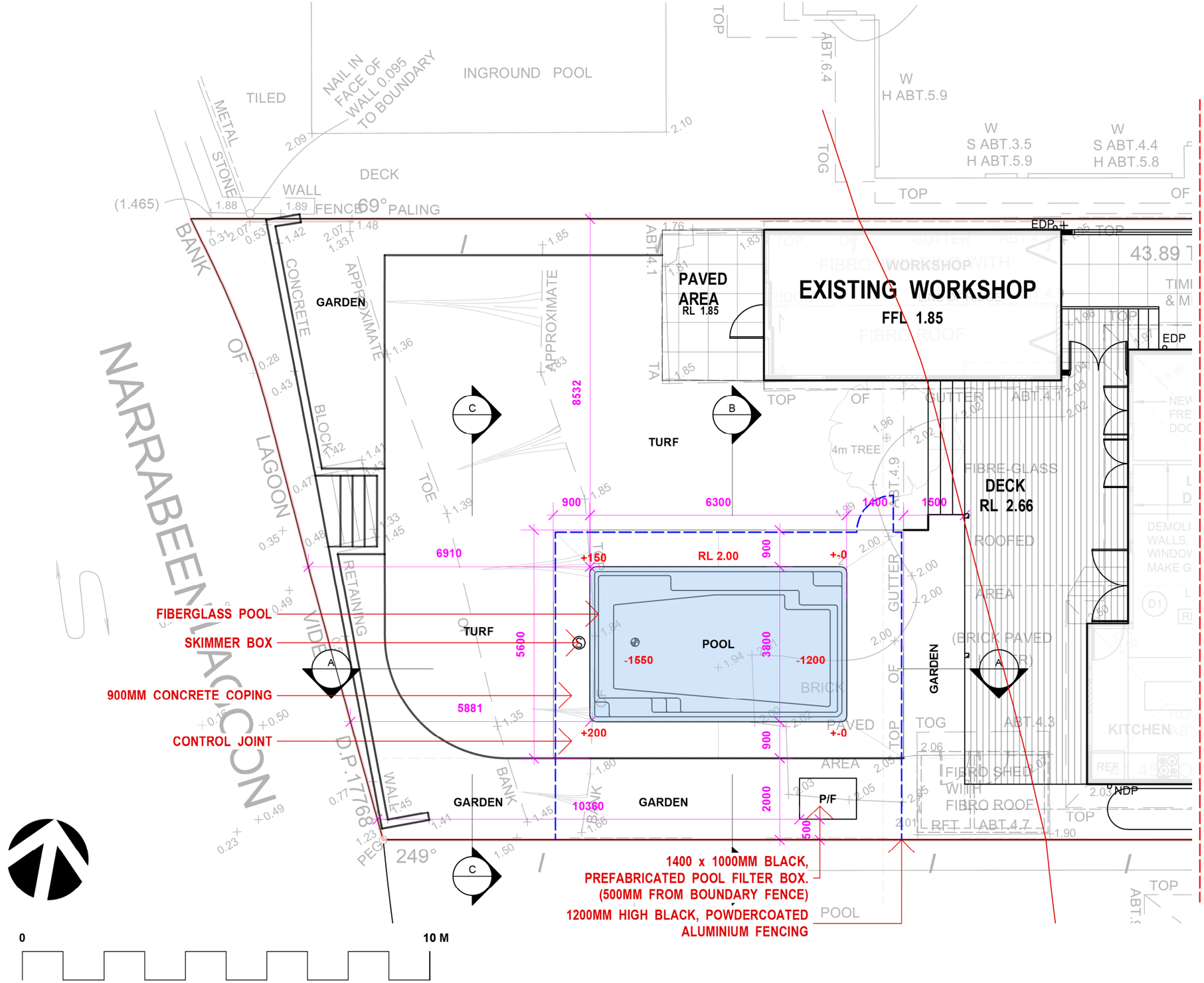

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and AS4055, anchor rods or bolts, tie downs, fixings etc., driveway slabs and drainage to Council's satisfaction. All timbers to be in accordance with SAA Timber Structure Code AS1720 and SAA Timber Framing Code AS 1684. All work to be carried out in a professional and workman- shiplike manner according to the plans and specification.
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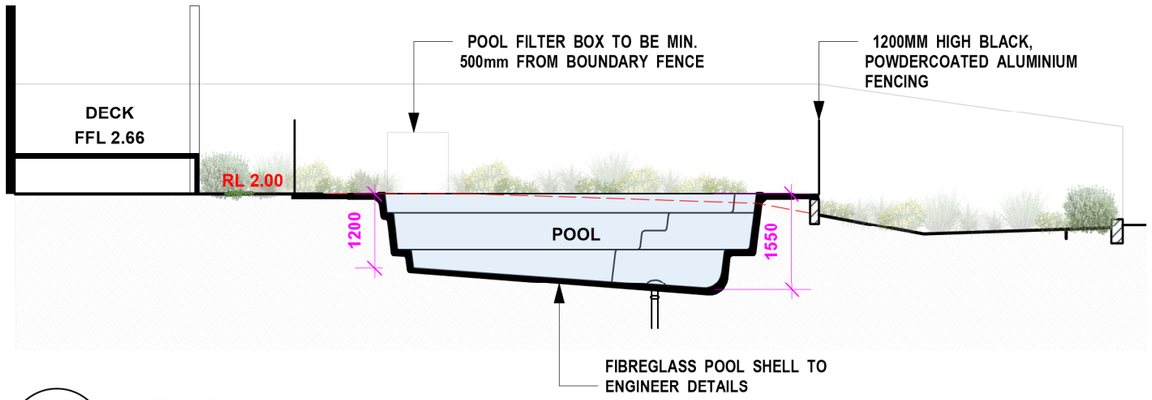

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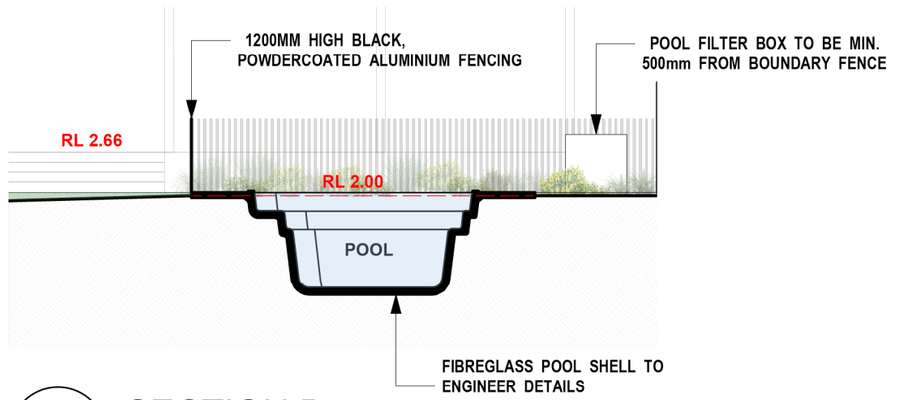

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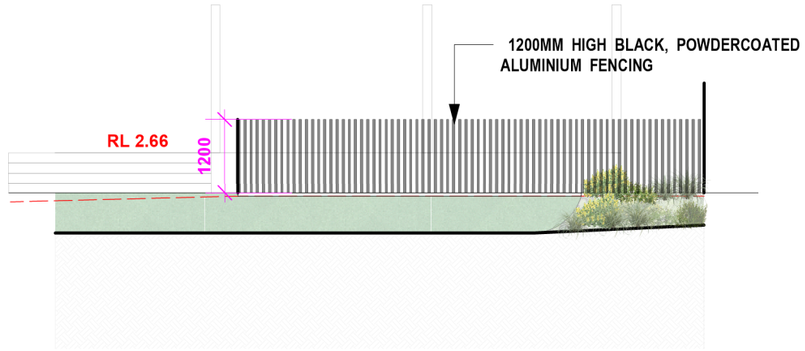

3 ELEVATION C
Scale: 1:100

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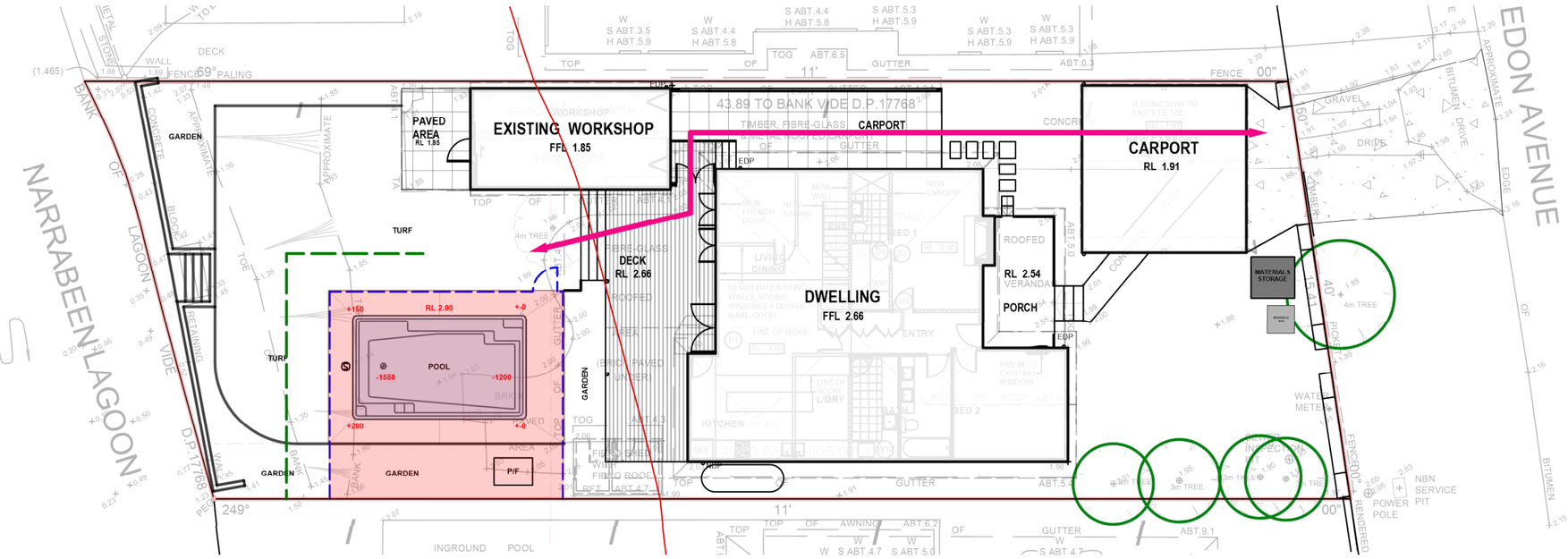
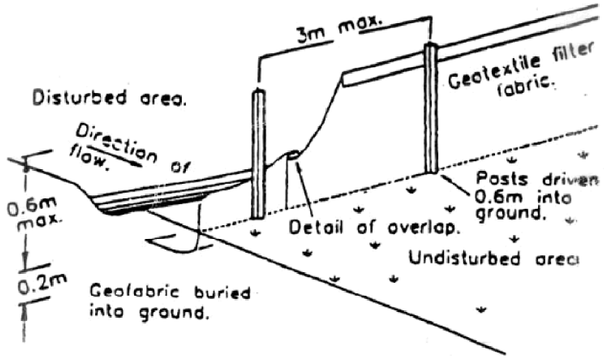


AREA OF WORKS

POOL EXCAVATED MATERIAL STORAGE AREA

GOOD ACCESS PRIOR TO HOUSE APPROVAL AND CONSTRUCTION

SEDIMENT FENCE



Sediment Fence

CONSTRUCTION MANAGEMENT NOTES

1. NO VEGETATION OR GRASS COVER IS TO BE REMOVED EXCEPT WITHIN AREAS OF NEW CONSTRUCTION.
2. INSTALL HAY BALES OR SEDIMENT CONTROL FENCING AS NECESSARY TO ENSURE THAT SILT FROM ANY DISTURBED AREAS IS TRAPPED ON-SITE.
3. PROVIDE BARRIERS AROUND ALL CONSTRUCTION WORK ON THE FOOTPATH AREA TO PROVIDE SAFE ALTERNATIVE ACCESS FOR PEDESTRIANS.
4. ALL WASTE MATERIALS ARE TO BE REMOVED FROM SITE OR STOCKPILED WITHIN THE SITE PRIOR TO REMOVAL.
5. ALL CONSTRUCTION MATERIALS & SITE SHEDS ARE TO BE KEPT WITHIN THE SITE AT ALL TIMES.

SOIL & WATER MANAGEMENT NOTES

1. WHEREVER POSSIBLE, EXISTING VEGETATION & GRASS COVER IS TO BE LEFT UNDISTURBED.
2. REMOVAL OR DISTURBANCE OF VEGETATION & TOP SOIL SHALL BE CONFINED TO WITHIN 3m OF THE APPROVED BUILDING AREA.
3. TEMPORARY SILT FENCE (AS SHOWN) TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY EARTHWORKS.
4. AND MAINTAINED THROUGHOUT THE CONSTRUCTION PERIOD, AND PARTICULAR AFTER STORM EVENTS.

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		Drawing No.	7017

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Appendix B – Council Flood Information

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FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 95 Wimbledon Avenue, Narrabeen
Lot DP: 7//17768
Issue Date: 26/11/2019
Flood Study Reference: Narrabeen Lagoon Flood Study 2013, BMT WBM

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level[3]: 3.05 m AHD

1% AEP Maximum Peak Depth from natural ground level[3]: 2.34 m

1% AEP Maximum Velocity: 0.54 m/s

1% AEP Provisional Flood Hazard: High **See Flood Map E**

1% AEP Hydraulic Categorisation: Flood storage **See Flood Map F**

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL) [1, 2, 3 & 4]: 3.6 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level[2]: 5.03 m AHD

PMF Maximum Depth from natural ground level: 4.31 m

PMF Maximum Velocity: 0.66 m/s

PMF Flood Hazard: High **See Flood Map G**

PMF Hydraulic Categorisation: Floodway **See Flood Map H**

Flooding with Climate Change (See Flood Map I)

The following is for the 30% Rainfall intensity increase and 0.9m Sea Level Rise Scenario:

1% AEP Maximum Water Level with Climate change[1&3]: 3.81 m AHD

1% AEP Maximum Depth with Climate Change[3]: 2.86 m

1% AEP Maximum Velocity with Climate Change[3]: N/A m/s

Flood Risk Precinct – See Map J

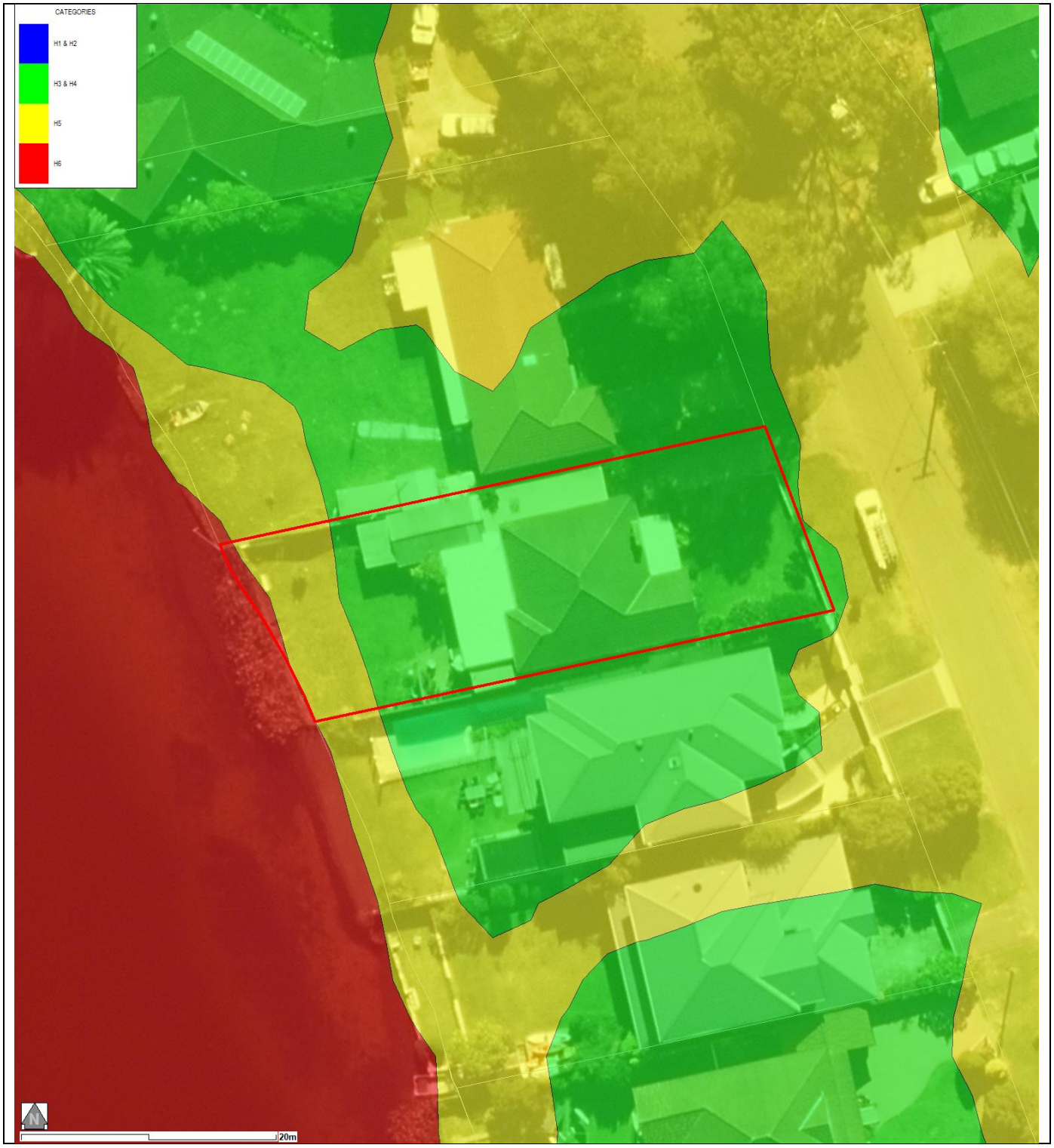
Indicative Ground Surface Spot Heights – See Map K

[1]The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.
[2]Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/ flood planning levels across the site.
[3]Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.
[4]Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

- All levels are based on Australian Height Datum (AHD) unless otherwise noted.
- This is currently the best available information on flooding; it may be subject to change in the future.
- Council recommends that you obtain a detailed survey of the above property and surrounds to AHD by a registered surveyor to determine any features that may influence the predicted extent or frequency of flooding. It is recommended you compare the flood level to the ground and floor levels to determine the level of risk the property may experience should flooding occur.
- Development approval is dependent on a range of issues, including compliance with all relevant provisions of Northern Beaches Council's Local Environmental Plans and Development Control Plans.
- Please note that the information contained within this letter is general advice only as a detail survey of the property as well as other information is not available. Council recommends that you engage a suitably experienced consultant to provide site specific flooding advice prior to making any decisions relating to the purchase or development of this property.
- The Flood Studies on which Council's flood information is based are available on Council's website.

FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



Notes:

- Refer to 'Flood Emergency Response Planning for Development in Pittwater Policy for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.12.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Ingleside, Elanora and Warriewood Overland Flow Flood Study (2019), WMAwater, Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD LEVEL POINTS

Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only.

Flood Levels

ID	5% AEP Max WL (m AHD)	5% AEP Max Depth (m)	1% AEP Max WL (m AHD)	1% AEP Max Depth (m)	1% AEP Max Velocity (m/s)	Flood Planning Level (m)	PMF Max WL (m AHD)	PMF Max Depth (m)	PMF Max Velocity (m/s)
1	2.71	0.81	3.05	1.15	0.04	3.6	5.02	3.07	0.05
2	2.71	0.72	3.05	1.06	0.04	3.6	4.98	3.01	0.09
3	2.71	0.81	3.05	1.15	0.03	3.6	4.98	3.07	0.19
4	2.71	1.17	3.05	1.51	0.04	3.6	5.02	3.06	0.03
5	2.71	0.61	3.05	1.00	0.40	3.6	4.99	2.88	0.27
6	2.71	0.75	3.05	1.08	0.03	3.6	4.98	3.01	0.18

WL – Water Level
PMF – Probable Maximum Flood
N/A = no peak water level/depth/velocity available in flood event

Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)

ID	CC 1% AEP Max WL (m AHD)	CC1 % AEP Max Depth (m)
1	3.81	2.86
2	3.81	2.86
3	3.81	2.86
4	3.81	2.86
5	3.81	2.86
6	3.81	2.86

A variable Flood Planning Level might apply - 0.5m above 1% AEP max water level (for Mainstream flooding) or 0.5m above the 1% AEP max water level flow path extent with depth greater than 0.3m and 0.3m above the 1% AEP max water level flow path with depth 0.3m and less (for overland flow)

WL – Water Level
PMF – Probable Maximum Flood
N/A = no peak water level/depth/velocity available in flood event.

FLOOD MAP B: FLOODING - 1% AEP EXTENT

Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT

Notes:

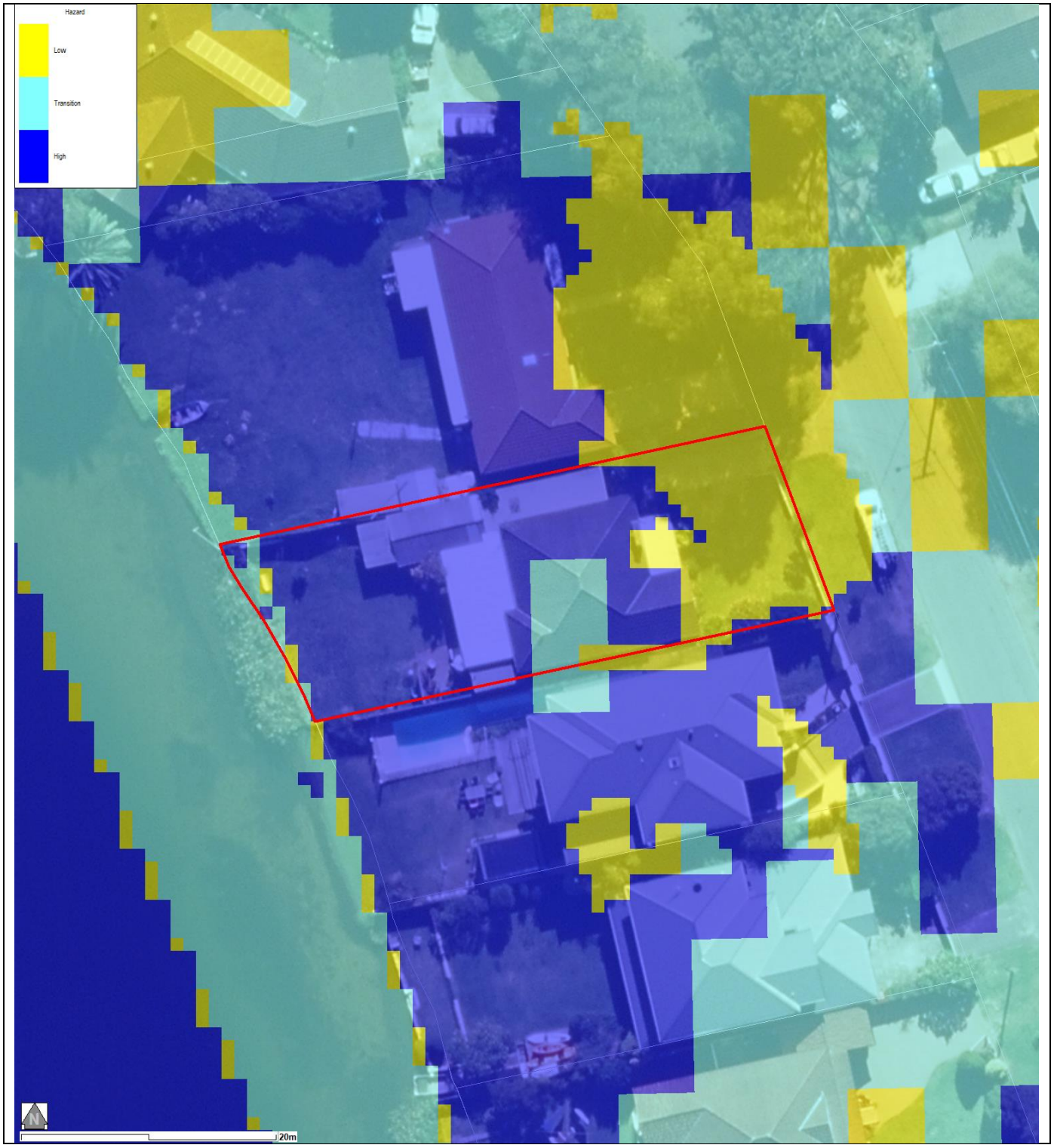
- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP D: PMF EXTENT MAP

Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

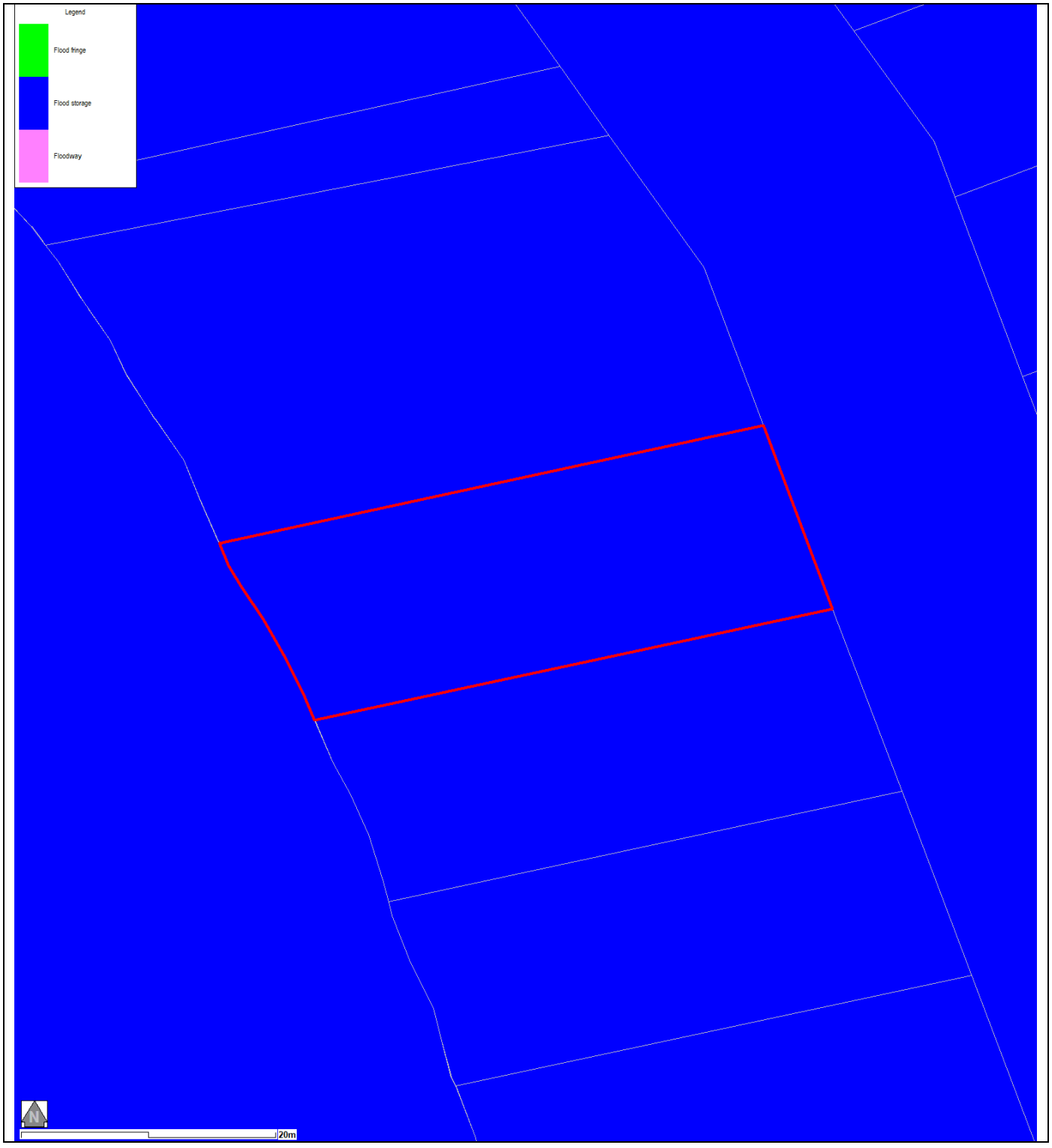
FLOOD MAP E: 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP F: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

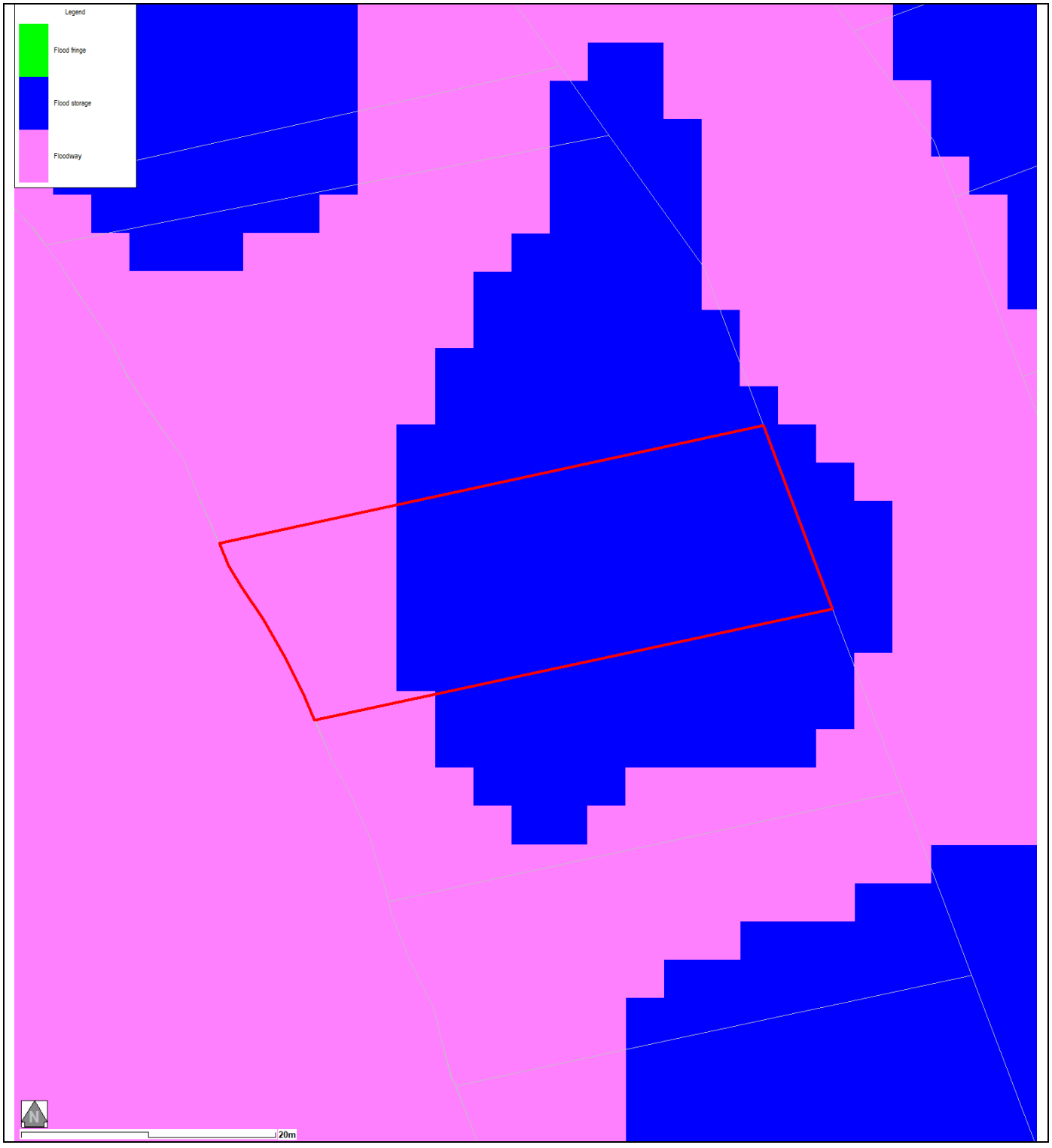
- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP G: PMF FLOOD HAZARD EXTENT MAP

Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP H: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

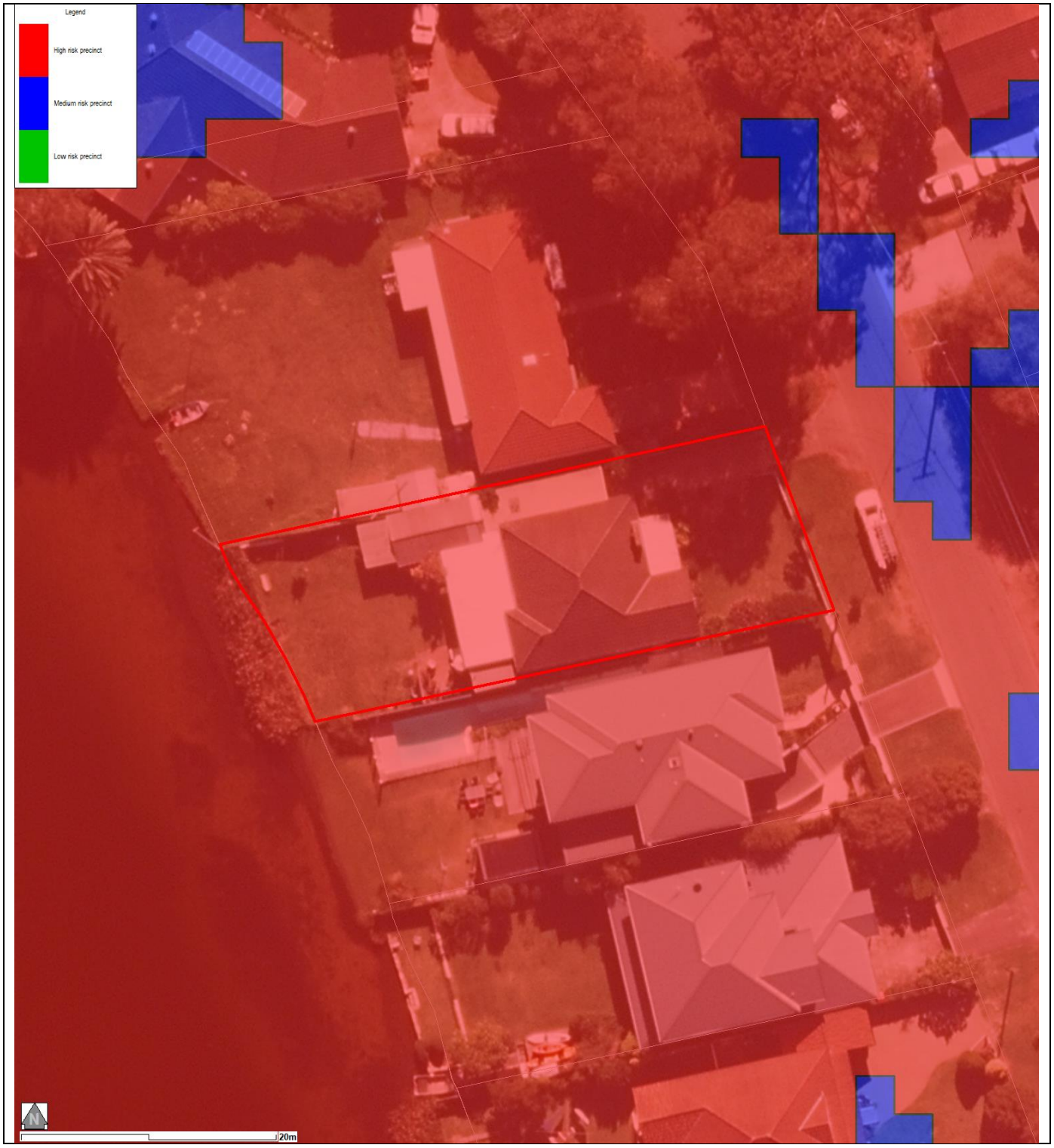
- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP I: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE

Note:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event including 30% rainfall intensity and 0.9m Sea Level Rise climate change scenario
- Flood events exceeding the 1% AEP can occur on this site.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Narrabeen Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP J: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 and or H6 Life Hazard Classification).
- Does not include climate change

MAP K: INDICATIVE GROUND SURFACE SPOT HEIGHTS

Notes:

- The surface spot heights shown on this map were derived from Airborne Laser Survey and are indicative only.
- Accuracy is generally within ± 0.2m vertically and ± 0.15m horizontally, and Northern Beaches Council does not warrant that the data does not contain errors.
- If accuracy is required, then survey should be undertaken by a registered surveyor.