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Our Reference: PDS19042021:38 GONDOLA RD:NARR

Jarrold Frowde
38 Gondola Road,
North Narrabeen, 2101
20/04/2022

Re: Flood Management Report for 38 Gondola Road, North Narrabeen

Dear Jarrod,

1.0 INTRODUCTION

I refer to your Development Application (DA) at 38 Gondola Road, North Narrabeen (Lot 264 DP 16719) as discussed with Premier Pools. The proposed pool is detailed in Figures 3,4 and 5. Northern Beaches Council (NBC) has identified the property as Medium to Low Hazard Category and land risk to life categories H3 to H4. Therefore, a Flood Management Report (FMP) of the design, flooding and evacuation process as detailed in Development Control Plan 2010 (DCP Section B3.11) is required.

The following investigation was undertaken and submitted for both your and NBC consideration as part of the DA process. Note that 38 Gondola Road, North Narrabeen will be referred to as the *site*.

2.0 GENERAL DESCRIPTION

The *site* is located in the Nareen Creek Catchment as shown in Figure 1. There are several features of the topography of the *site* and its location (proximity to Narrabeen Lagoon and Nareen Creek drainage system) that are important to the potential mainstream flooding processes and a flood evacuation plan.

These are:

1. The *site* is located on the western floodplain of Narrabeen Lagoon and is in the Nareen Creek Catchment as shown in Figure 1.
2. The Nareen Creek floodplain is generally at an elevation of between 1.5 to 2.5 metres AHD, and is exposed to major to extreme flooding from Narrabeen Lagoon and minor to moderate flooding from the Nareen Creek Catchments. The Lagoon experiences both floods and ocean surges.
3. The *site* varies in level from 3.7 metres to 3.8 metres (Figures 1 and 2).
4. The general area surrounding the *site* is a floodplain with no relief. Evacuation from the *site* may be difficult and requires a flood evacuation plan.

5. The *site* is within the fringe of the floodplain of Narrabeen Lagoon and would ***not*** be exposed to high flood or tidal velocities. Flood flows from the Nareen Creek will be concentrated along the existing concrete lined and natural channels, north of the *site*.

The *site* is exposed to major flooding from Narrabeen Lagoon during high rainfall events and elevated ocean levels. Narrabeen Lagoon water level can also be influenced by high ocean water levels when the Lagoon entrance is open. Narrabeen Lagoon, under normal astronomical tidal tides, experiences a tidal range of 0.1 metres near the channels of the *site*.

3.0 REVIEW OF EXISTING DATA

The *site* was surveyed by ENG Surveyors Pty Ltd Ref 211216DIGN, Dated 16th December 2021. (Figure 2).

The topography for this investigation used the NSW Government Land and Property Lidar 2014 Data Hawkesbury South 3406270. Contours were generated by Pittwater Data Services Pty Ltd at 0.25 metre intervals (Figure 1).

The Narrabeen Lagoon and Nareen Creek flooding processes have been extensively studied by a number of investigations commissioned by the then Pittwater and Warringah Councils. The more recent studies are :

1. Narrabeen Lagoon Flood Study, BMT WBM, September 2013 (Ref 1).
2. Nareen Creek Flood Study, Cardno Lawson and Treloar, September 2005 (Ref 2).

The recorded flood level data published in these studies is extensive going back to the early 1940's. However, many developments such as bridges, drainage channels etc. have been constructed over this period, affecting the flooding processes. The data of interest for the *site* is shown in Table 3.1.

Table 3.1: Recorded Peak Flood Levels

Date	Location	Flood Level m AHD	Comments
1942	22 RicKard Road	2.7	Published MHL (Ref 2)
	32 Lido Avenue	2.7	Published MHL (Ref 2)
	25 Narroy Road	2.5	Published MHL (Ref 2)
May 1974	72 Gondola Rd	2.4	Published PWD (Ref 2)
	78 Gondola Rd	2.4	Published PWD (Ref 2)
August 1986	13, 23,25 and 32 Lido Ave	2.3,2.3,2.1and 2.5	Published MHL (Ref 2)
1987	24 Lido Ave	2.1	Published MHL (Ref 2)
5 th June2016	Pittwater Road Bridge	2.2	MHL Recorder
9 th February 2020	Pittwater Road Bridge	2.1	MHL Recorder

Generally, the major flood peak levels in the vicinity of the *site* over the last 70 years have reached a level of approximately 2.1 to 2.7 metres AHD. These flood levels would not have inundated the *site*. The rate of rise of flood waters is a process that is significant in planning for major flood events, such as the 1%AEP flood. The history of flooding provides insight to the design events such as the 1%AEP flood.

4.0 RESULTS OF INVESTIGATION

The flood study which is relevant to this report is the GMT WBM 2013 study (Ref 1) and the Nareen Creek Flood Study (Ref 2). Appendix C flood data was issued by NBC based on Ref 1. The key findings for the 1%AEP flood simulations that relate to the Nareen Creek floodplain and the *site* specifically are:

1. The critical rainfall duration at Pittwater Road Bridge (PRB) is between 9 and 24 hours which equates (based IFD Bureau of Metrology curves) to between 230 to 340 mm of accumulated rainfall over the respective periods. This range of times and rainfall volumes will generate the highest peak water level of approximately 3m AHD near the *site*.

2. The 1%AEP ocean storm surge and associated setup is 1.9m AHD as observed at Pittwater Road Bridge during the May 1974 storm (Ref 2). This level will not inundate the *site*.
3. The rate of rise of the flood level between 2 metres (The *site* being flooded would trigger a high level of awareness) and 3 metres AHD (peak 1%AEP level) is approximately 3 hours.
4. The combination of extreme catchment rainfall and ocean levels will result in the same predicted 1%AEP peak levels as the extreme catchment flooding alone. This indicates the significant impact the Narrabeen Lagoon catchment runoff could have on the *site*. The peak flood level is independent to the ocean tide and to a lesser degree Nareen Creek flows at the *site*.
5. The entire floodplain and associated road network would become inundated, however they are not located in the high flood velocity zone as shown Figure 1. The velocities in the vicinity of the *site* are predicted to be low as the predicted flood gradient along Rickard and main drains is low. (Ref 2).
6. At a peak flood level (3metres AHD for the 1%AEP) velocities are low at the *site*. The flood definition of the *site* is considered to be Flood Fringe.
7. All access routes east of the *site* will flood at the same rate: complete inundation in 2 to 3 hours once floodwaters enter the Nareen floodplain.

5 PROPOSED DEVELOPMENT

The development as detailed in Figures 3,4 and 5 is as follows:

1. Construction of new swimming pool and associated landscaping.

As shown in Figure 2 the existing Dwelling floor level (FL) is 4.37m AHD and is above the Flood Planning Level (FPL) of 3.53m AHD. The garage floor level (GFL) is 3.62m AHD also above the FPL. However extreme floods above the 1%AEP to the PMF of 4.9m AHD may inundate the FL and GFL. These are extremely rare flood events, particularly the PMF.

6.0 FLOOD MANAGEMENT PLAN

The access to a flood free haven away from the *site* in an extreme flood event is considered as viable . Access is available through western section of Gondola Avenue.

During the lead up to this event there are a number of flood prediction services available which should be used to ensure sufficient planning and action. The sequence of information available are:

1. This report provides information on the flooding processes of the *site*. The residents of the *site* should aware of this information and the Action Plan should be posted in a visible

location: BoM warning process, inundation process of the *site* and an action plan. The Action plan is in Appendix B.

2. Severe flood warnings for the Northern Beaches predicted by the Bureau of Meteorology (BoM), should prepare for a potential flooding at the *site*. This information is broadcasted on ABC radio and TV and is available on BoM website. Typically, rainfall intensities in an excess of 10mm/hr over a period over several hours will generate flooding near the *site*. The SES have a facebook page on flooding situations.
3. Flood levels exceeding 3.7 metres AHD will inundate the *site* and should be a trigger to prepare. When rain is predicted to continue a major event may occur, particularly if flood warnings continue to be issued by BoM.
4. As discussed in Section 4, the 1%AEP flood will rise above 2 m to its peak value in 2 to 3 hours. During that time the final preparations should be concluded to secure items on the *site* and ensure the safety of all persons

In conclusion, considering the flooding processes at the *site* the design of the swimming pool as detailed in Figures 3,4 and 5, it is my opinion the design and this flood Action Plan will satisfy NBC DCP Section B 3.11 requirements as detailed in Appendix A.

Yours Faithfully,



Stephen Wyllie Bsc (Eng) FMA Member

Directo

20/4/2022

7.0 REFERENCES

1. Narrabeen Lagoon Flood Study, BMT WBM, Sept 2013
2. Nareen Creek Flood Study, Cardno Lawson and Treloar, Sept 2005
3. Narrabeen Floodplain Risk Management Study and Plan, Cardno, July 2015

Appendix A: Development Matrix for Medium Risk Residential Development

Flood Impacts	Design Standard	Description	Comment
A: Flood Effects caused by Development	A1 A2	Complies with Flood Standard Loss of flood storage compensated	Yes Not Applicable
B: Building Components and Structural	B1 B2 B3	Constructed of flood compatible materials Structural stability under flood loads Services flood proofed or above FPL	Yes Not Applicable Not Applicable
C: Floor Levels	C1 C3 C4 C6	New Floor levels above FPL No Impedance of flood water One off Additions below FPL Retaining floor levels below FPL	Not Applicable
D: Car Parking	D1 D2 D3 D4 D5 D6	Open carpark shall not be located within a floodway The lowest floor level of open carpark no lower than natural ground level carpark open design at least two side. Vehicle Barriers if depth>300m for 1%AEP. Enclosed Garages Floor level at or above 1%AEP Enclosed garages protected to FPL	Not Applicable
E: Emergency Response	E1	Complies with NBC Planning Shelter in Place requirement and above PMF	Not Applicable Appendix B
F: Fencing	F1	Open Fencing not to impede flood flows	Not Applicable
G: Storage of Goods	G1	Stored at of hazardous above FPL	Complies Section 5
H: Pools	H1	Coping flush pumps and electrical proofed above FPL	complies

FLOODING WARNING

AWARENESS

- Heavy rain and Ocean storms predicted by the Bureau of Metrology (BoM) : flood warning /flash flooding for the Northern Beaches.
- Monitor media reports for flood warnings in the Sydney Metropolitan Area.
- Observe local rainfall and flood levels in Gondola Road .
- Check Predicted Fort Denison Tides.
- Gondola Road overtopped triggers Action Plan.

ACTION **BoM WARNINGS ISSUED**

- Account for all residents and visitors. Inform all residents and visitors of the potential flood situation and this Action Plan.
- Any items transportable by flood waters move to the FL.
- Secure the vehicles in Carport . Move essential items to FL.
- Observe inundation Gondola Road and state of tide.
- Continue to monitor BoM reports and tide.
- If rainfall is intense and warnings continue remain at FFL.

POST FLOOD

- Account for all residents and visitors.
- Inspect vehicles and *site* generally for safety particularly electrical issues.
- Monitor BoM reports to ensure no further flood warnings and check on tide predictions. Continue observing flood levels.
- Note that several peaks are possible depending on the rainfall patterns

Note : the floods conditions and orders can be viewed through SES facebook page.



FLOOD INFORMATION REPORT - BASIC

Property: 38 Gondola Road NORTH NARRABEEN NSW 2101

Lot DP: Lot 264 DP 16719

Issue Date: 13/04/2022

Flood Study Reference:

Flood Information for lot ¹:

Flood Risk Precinct – See Map A

Flood Planning Area – See Map A

Maximum Flood Planning Level (FPL) ^{2, 3, 4}: 3.53 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: N/A m AHD

1% AEP Maximum Depth from natural ground level³: N/A m

1% AEP Maximum Velocity: N/A m/s

1% AEP Hydraulic Categorisation: N/A See Flood Map D

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level ⁴: 4.90 m AHD

PMF Maximum Depth from natural ground level: 1.57 m

PMF Maximum Velocity: 0.34 m/s

Flood Life Hazard Category – See Map E

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. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

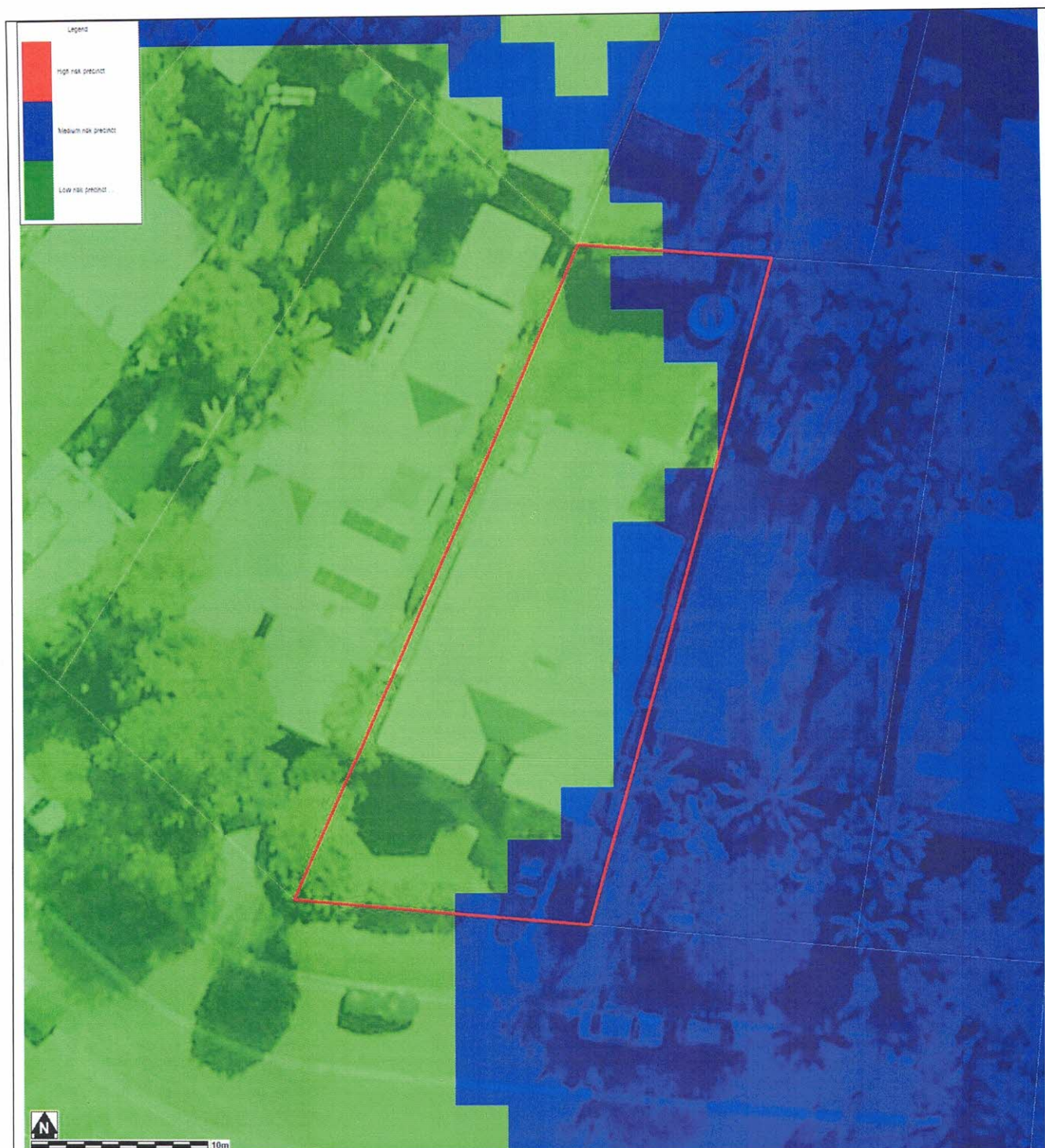
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

⁴ Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or FPL.

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.

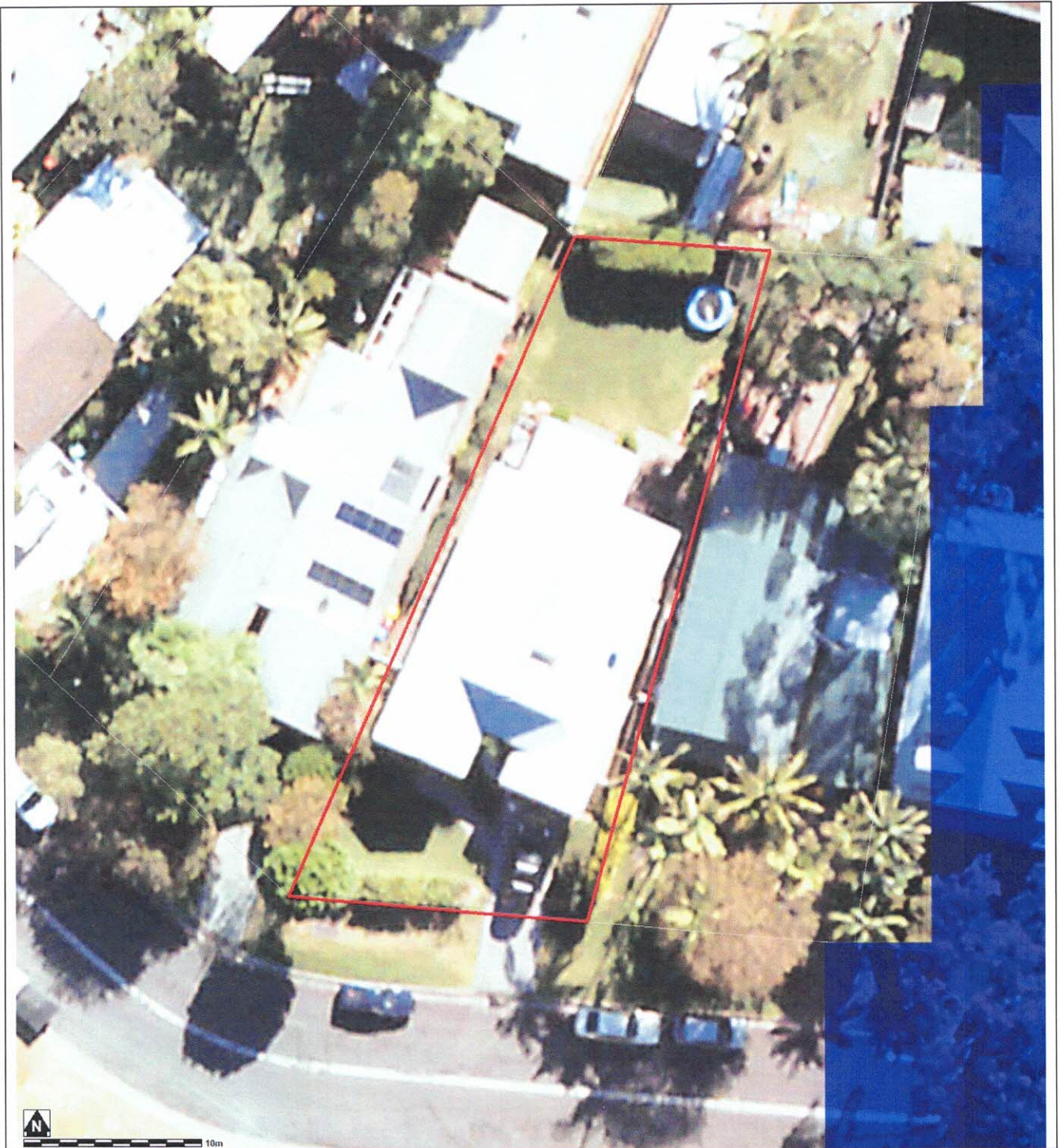
FLOOD MAP A: FLOOD RISK PRECINCT MAP



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 or H6 Life Hazard Classification)
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

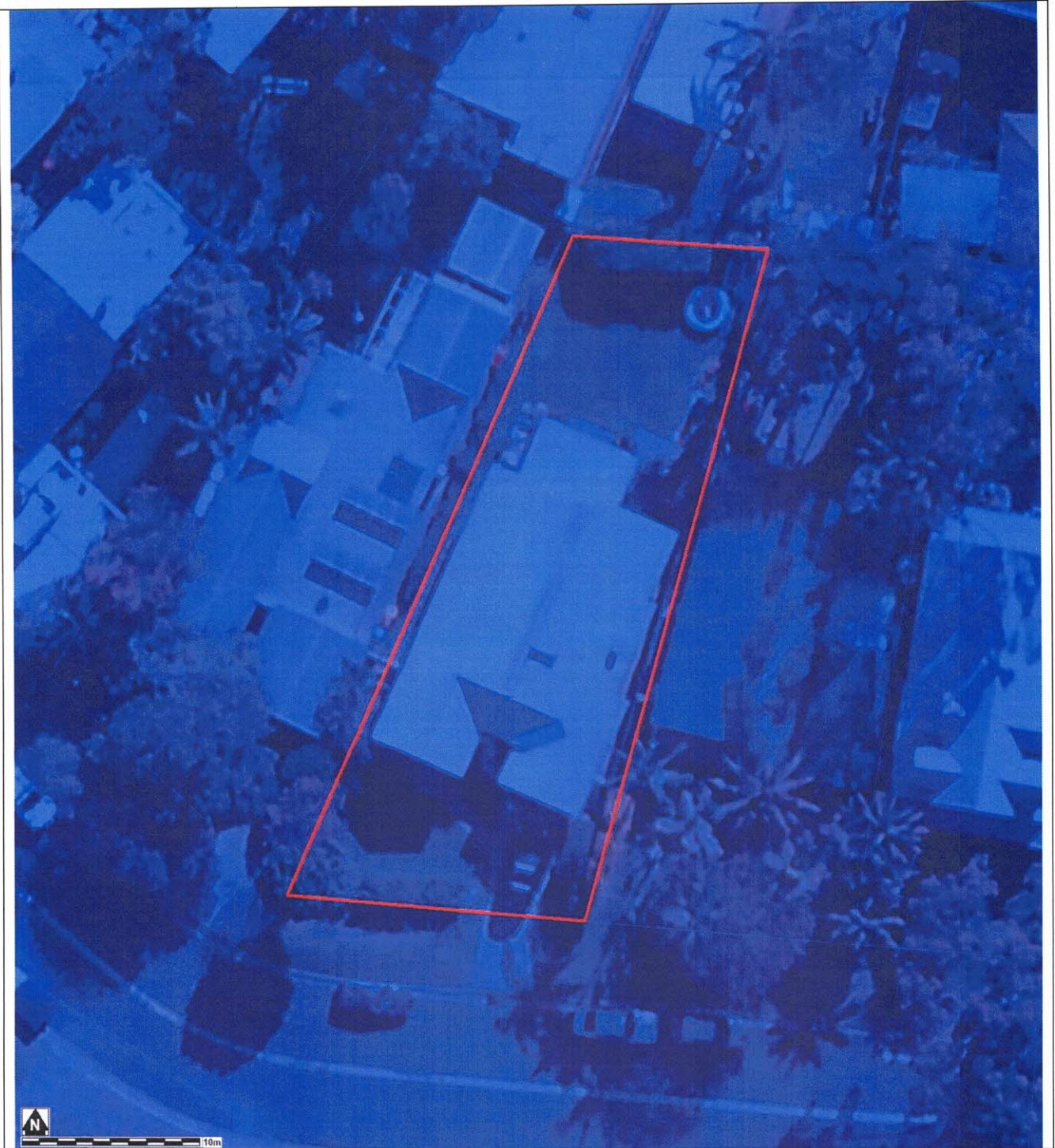
FLOOD MAP B: FLOODING - 1% AEP EXTENT



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:) and aerial photography (Source: NearMap 2014) are indicative only.

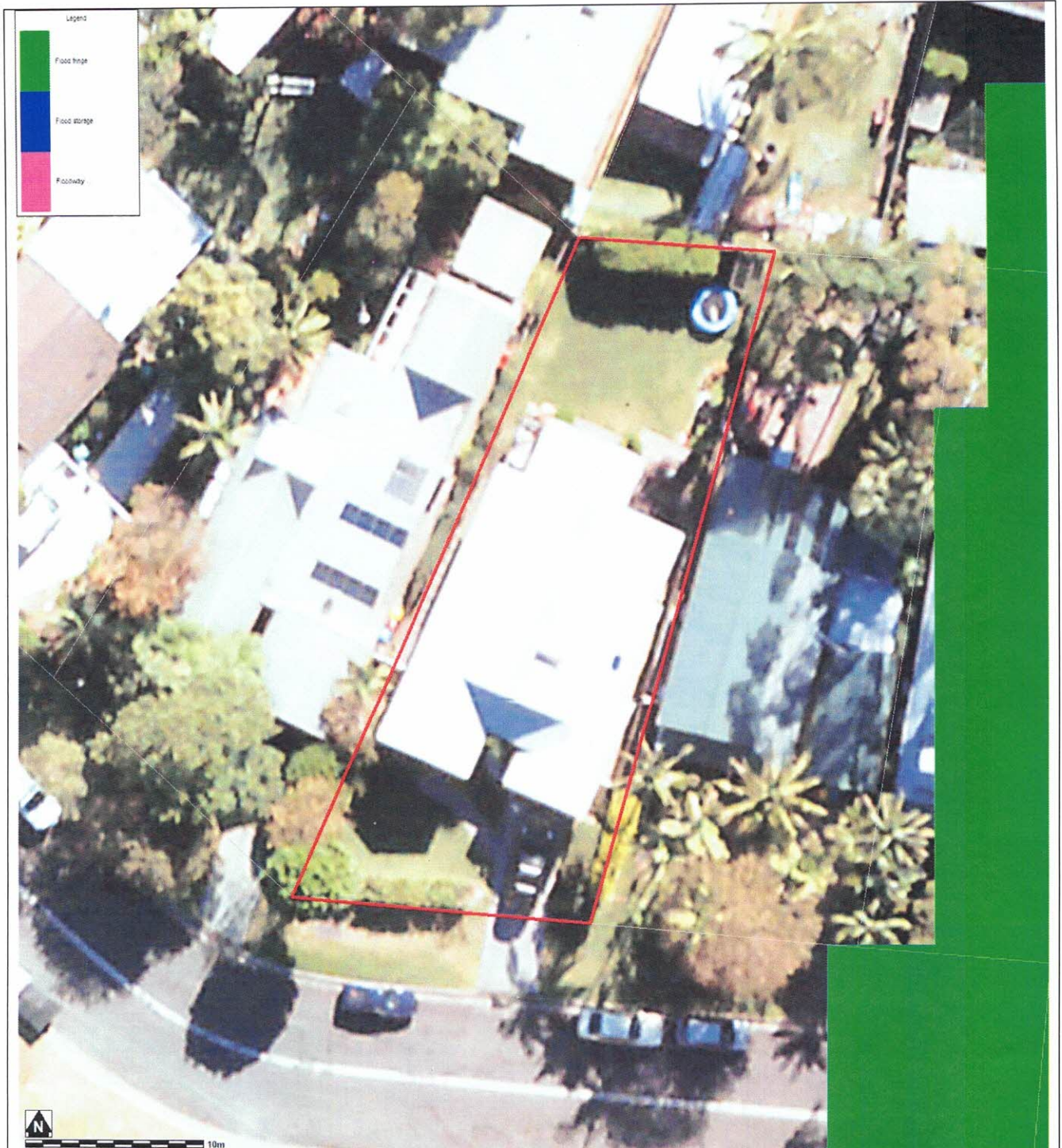
FLOOD MAP C: PROBABLE MAXIMUM FLOOD EXTENT



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:) and aerial photography (Source: NearMap 2014) are indicative only.

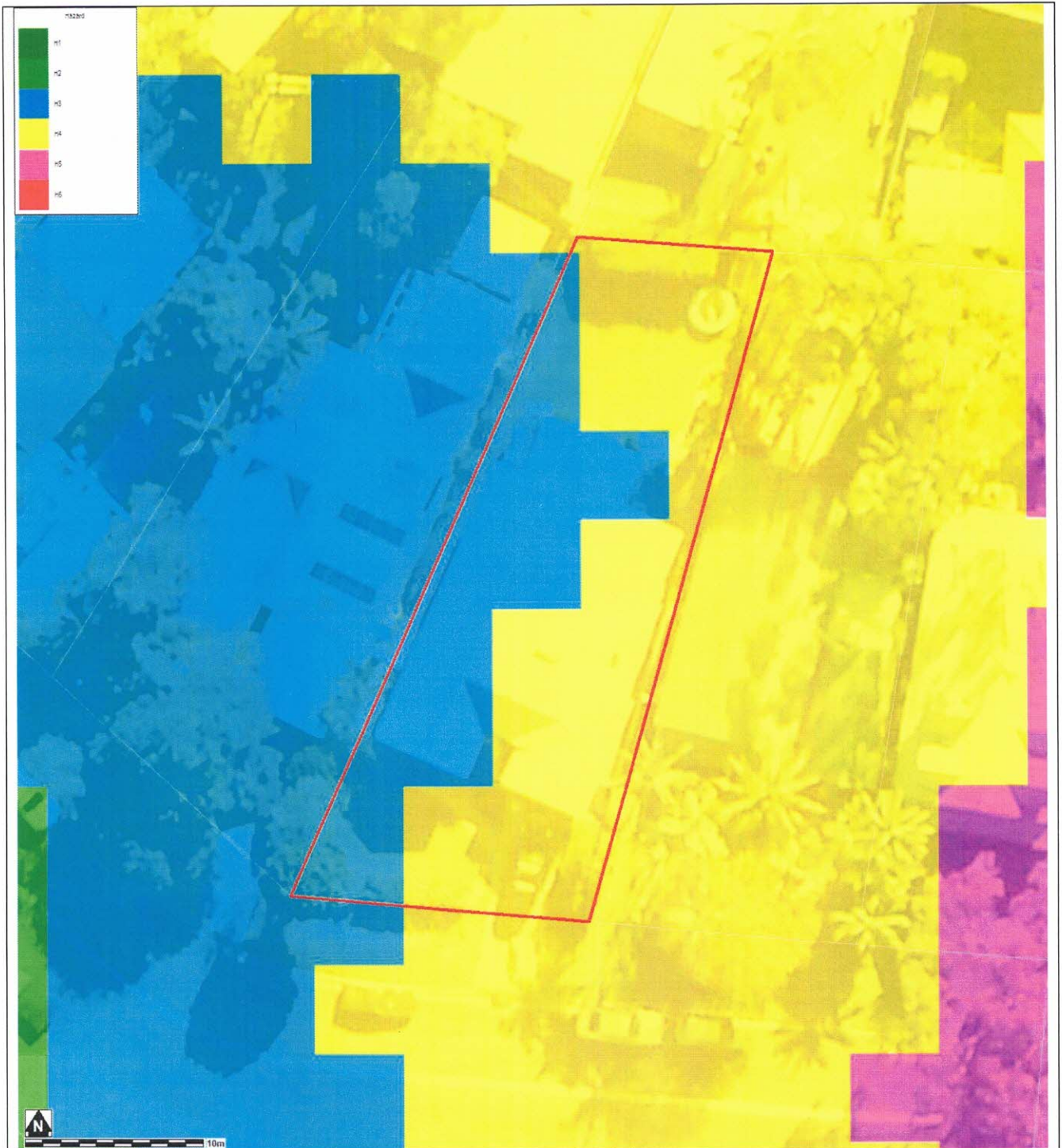
FLOOD MAP D: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

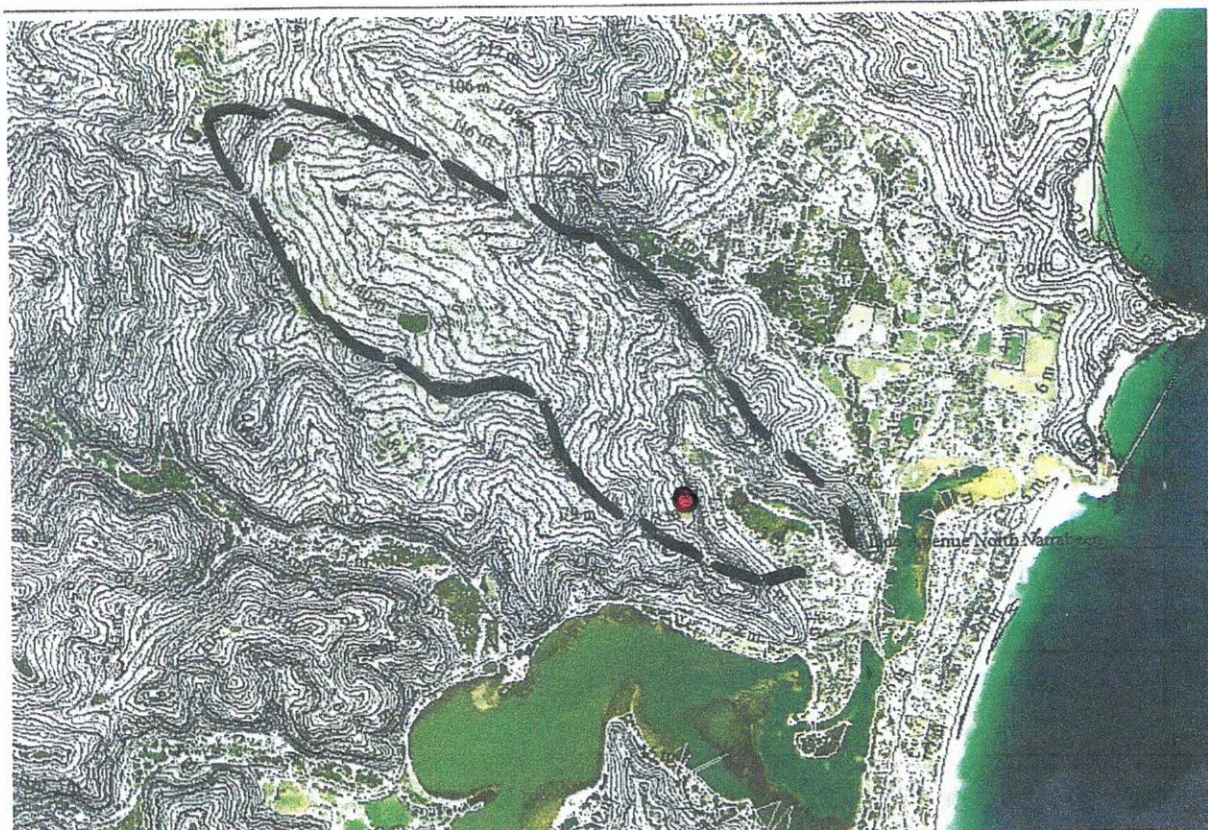
- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source:) and aerial photography (Source: NearMap 2014) are indicative only.

FLOOD MAP E: FLOOD LIFE HAZARD CATEGORY



Notes:

- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source:) and aerial photography (Source: NearMap 2014) are indicative only.



LEGEND
● SITE
--- CATCHMENT BOUNDARY
NARBEN CREEK
■ INUNDATION 1% AEP.

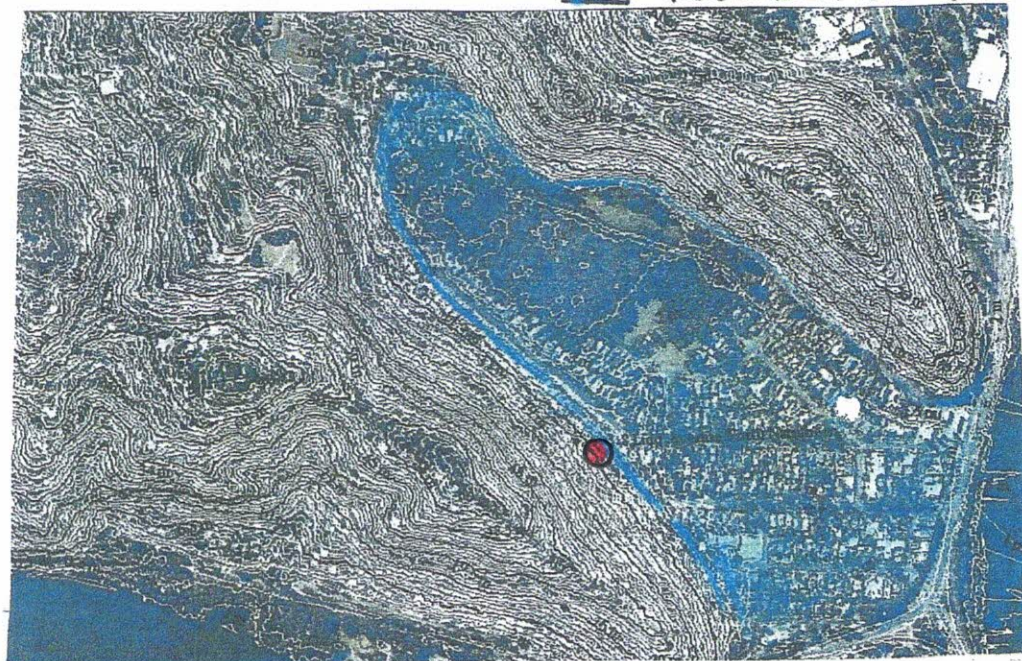
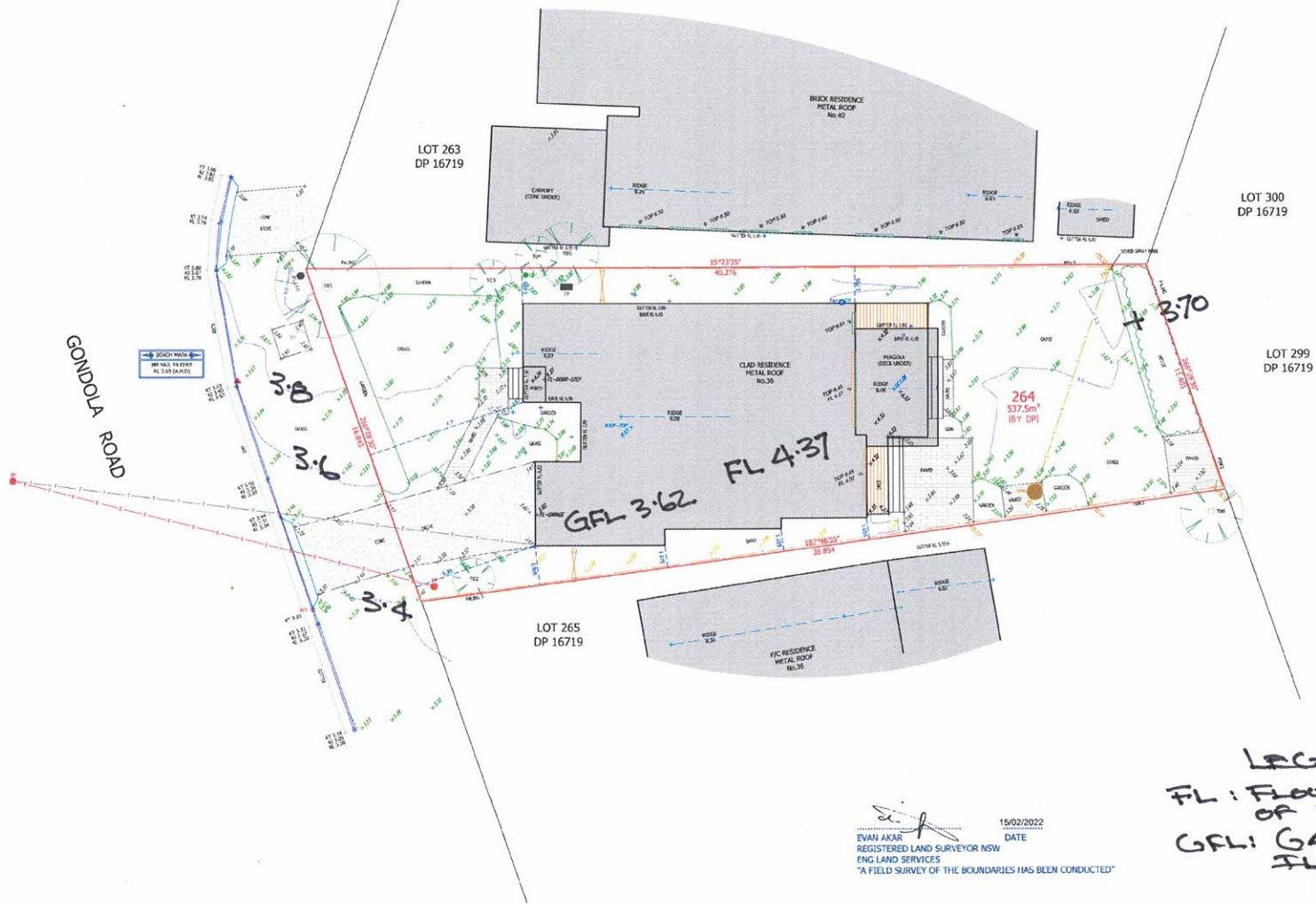


FIGURE 1

NORTH NOTE
 BEARING SHOWN ARE RELATED TO PRAGMATIC
 NORTH AND HAVE BEEN DETERMINED FROM
 THE LAND SURVEY SERVICE'S MAGNETIC
 TRUE NORTH IS APPROXIMATE ONLY &
 HITHERTO INDICATED WITH A D.E. SYMBOL
 TO DIFFERENTIATE ACTUALLY TRUE NORTH.



15/02/2022
 DATE
 EVAN AKAR
 REGISTERED LAND SURVEYOR NSW
 ENG LAND SERVICES
 "A FIELD SURVEY OF THE BOUNDARIES HAS BEEN CONDUCTED"

LEGEND
 FL: FLOOR LEVEL
 OF DWELLING
 GFL: GARAGE
 FLOOR LEVEL
 +3.70: GROUND
 LEVEL

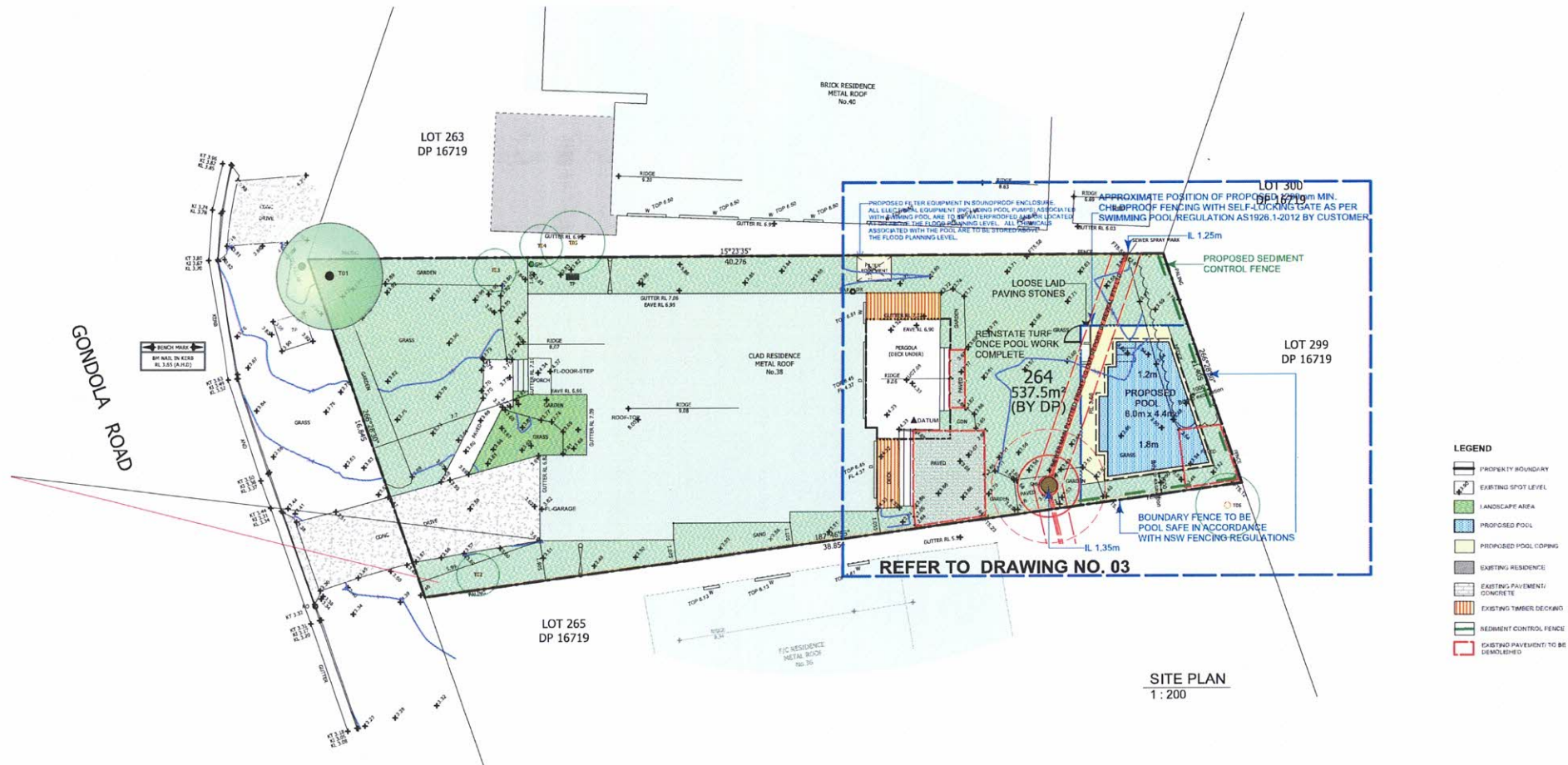
LEGEND
BENCH MARK ELECTRIC CABLE (UNDERGROUND) APPROX. POSITION
GRAVEL PIT
PHOTO POINT
SEWER MAIN (UNDERGROUND) APPROX. POSITION
VEGETATION

YOU ARE ADVISED TO CALL 1300 734 600 BEFORE YOU DIG
 BEFORE CARRYING OUT ANY BUILDING WORKS.
 COPYRIGHT ENG LAND SERVICES

DRAWING NOTES
 1. THIS DRAWING IS A PRELIMINARY DESIGN AND IS NOT TO BE USED FOR CONSTRUCTION.
 2. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
 3. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
 4. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
 5. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.

LOCATION PLAN LAT: 33.972 LONG: 151.7913
PLAN BY ENG LAND SERVICES
CLIENT PREMIER POOLS
PROJECT LOCATION LOT 264 DP 16719 38 GONDOLA ROAD NORTH NARRABEEN
PLAN TYPE IDENTIFICATION SURVEY & CONTOUR PLAN
ABBREVIATIONS
NOTES ALL INFORMATION IS A PRELIMINARY DESIGN AND IS NOT TO BE USED FOR CONSTRUCTION. THE CLIENT IS RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS.
JOB REFERENCE 21121601GN
SOURCE OF LEVELS PM 5313 RL 4.199 (AHD)
SURVEY DATE 16.12.2021
SCALE / SHEET 1:1000/A1

FIGURE 2



SITE PLAN
1 : 200

▲ FIXED DATUM: TOP OF EXISTING DECK
FINISHED POOL COPING TO BE RL 3.66

POOL VOLUME = 33.1KL

SWIMMING POOL SAFETY FENCE TO COMPLY WITH:
AS 1926.1-2012
AS 1926.2-2007
SWIMMING POOLS ACT 1992
SWIMMING POOLS REGULATION 2008
BUILDING CODE OF AUSTRALIA
BUILDING CODE OF AUSTRALIA NSW AMENDMENT -PART 3.9.3

BUILDER IS TO ENSURE SEDIMENT CONTROL FENCING TO BE PROVIDED WHERE REQUIRED PRIOR TO SITE WORKS COMMENCING.
SEDIMENT CONTROL FENCING TO BE REMOVED UPON COMPLETION OF CONSTRUCTION

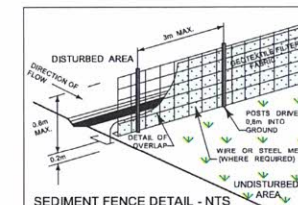
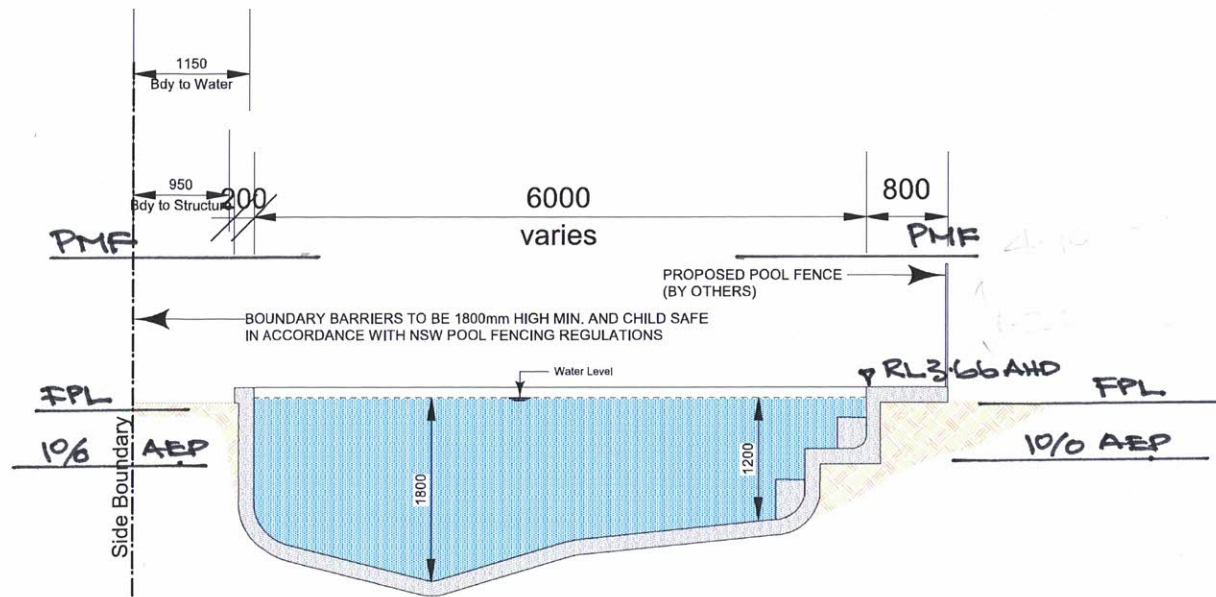


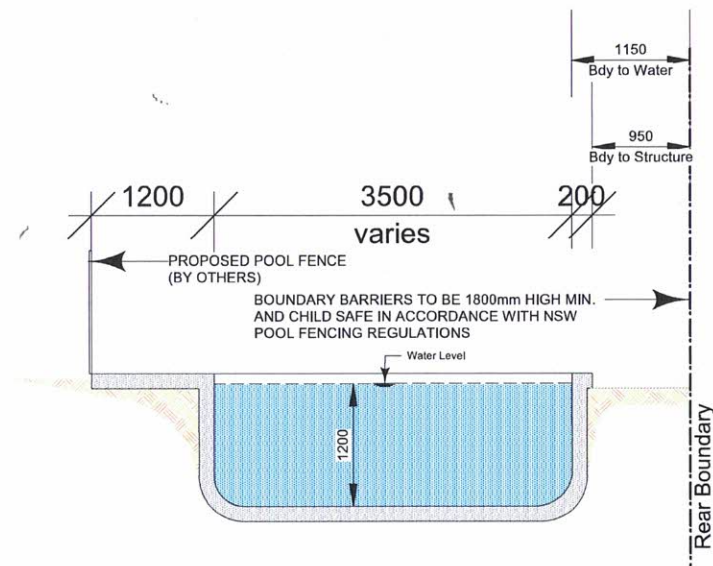
FIGURE 3

NOTE:

THIS PLAN IS TO BE READ IN CONJUNCTION WITH ENGINEERING PLANS RELATING TO THE PROPOSED DEVELOPMENT. NO LIABILITY SHALL BE CARRIED FORWARD BY THE AUTHOR SHOULD IT BE USED FOR ANY OTHER PURPOSE.
FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALING FROM PLAN.
ALL DIMENSIONS AND LEVELS TO BE VERIFIED BY THE CONTRACTOR ON SITE.



LONGITUDINAL SECTION
1 : 50



SECTION C-C
1 : 50

SWIMMING POOL SAFETY FENCE TO COMPLY WITH:
AS 1926.1-2012
AS 1926.2-2007
SWIMMING POOLS ACT 1992
SWIMMING POOLS REGULATION 2008
BUILDING CODE OF AUSTRALIA
BUILDING CODE OF AUSTRALIA NSW AMENDMENT -PART 3.9.3

NOTE:

THIS PLAN IS TO BE READ IN CONJUNCTION WITH ENGINEERING PLANS RELATING TO THE PROPOSED DEVELOPMENT. NO LIABILITY SHALL BE CARRIED FORWARD BY THE AUTHOR SHOULD IT BE USED FOR ANY OTHER PURPOSE.

FIGURED DIMENSIONS ARE TO BE TAKEN IN PREFERENCE TO SCALING FROM PLAN.

ALL DIMENSIONS AND LEVELS TO BE VERIFIED BY THE CONTRACTOR ON SITE.

PROJECT	PROPOSED SWIMMING POOL
CLIENT	FROWDE RESIDENCE
ADDRESS	38 Gondola Rd NTH NARRABEEN

TITLE SECTIONAL
ELEVATIONS

PROJECT
2111_003
REVISION

DATE	24.03.22	DWG 04
SCALE	AS SHOWN	
DRAWN	VP	
CHKD		