FLOOD RISK MANAGEMENT REPORT

8 Bate Ave, Allambie Heights

Abstract

As instructed by Mari Elliot, Horizon Engineers prepared flood risk management report for above property.

24 June, 2021

Report No
034 -F21 Issue C

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About This Release:

Document Title:	Flood Risk Management Report
Intended Recipient:	Northern Beaches Council
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1.0 Site Description

The subject situated in the Allambie Heights area within the Northern Beaches Council. It is approximately 4.8 km from the Fire and rescue NSW Dee Why Fire station.

Subject Site Location

Figure 1: The site location
(Image taken from google Earth)

The site is currently developed with a single dwelling. From the survey plan, it can be identified that the property falls to the middle of the site, where the existing stormwater easement is located.

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2.0 Proposed Development

The proposed development will be an alteration/addition to the existing single dwelling with a pool and spa. The minimum habitable and non-habitable floor level of the proposed alteration/addition will be at or above the Flood planning level, which is the 1% AEP flood level plus freeboard.

3.0 Flood Classification and Characteristics

Refer to council local floodplain risk management policy and information of Flood Map.

Three flood classifications have been defined as follows:

- The **Medium Flood Risk** Precinct is equivalent to the Flood Planning Area (FPA), and covers flood prone land affected by the Flood Planning Level (FPL). The FPL is the 1% Annual Exceedance Probability (AEP) flood level (equivalent to the 1 in 100 year flood level) with a freeboard added.
- The **High Flood Risk** Precinct lies within the Medium Flood Risk Precinct, and covers flood prone land which is subject to a high hydraulic hazard.
- The **Low Flood Risk** Precinct covers flood prone land affected by the Probable Maximum Flood (PMF) but which is outside the Medium Flood Risk Precinct. The PMF is equivalent to the largest ever conceivable flood.

4.0 Classification of the Land

The subject site is classified as being within a Medium Flood Risk Precinct as a result of Mainstream **flooding** as shown in the Council Flood Letter - refer to **Appendix A.**

The proposed development will fall under the residential development category because it consists of Alteration/Addition to the existing dwelling.

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Flood	Flood Level (m AHD)
PMF maximum	24.74
1% AEP maximum	25.88

Table 1: Flood levels on the subject site (Taken from Council flood letter).

The flood levels within the site varies as shown in the Council flood letter – Refer to Appendix A.

The Adopted flood level for the subject site is as follow:

Size of Flood	Flood Level (m AHD)	Information provided by
1% AEP maximum	RL 23.29 (Point 12) RL 22.99 (Point 13)	Northern Beaches council
PMF	RL 23.94 (Point 12) RL 23.61 (Point 13) RL 24.48 (Point 14)	Northern Beaches council
Flood Planning Level	RL 23.48 (Point 13) RL 23.68 (Point 12) RL 24.40 (Point 14) RL 23.90 (Point 6)	Northern Beaches council
Min. Habitable Ground Floor Level	RL 25.15	Architect
Min. Habitable First Floor Level	RL 28.25	Architect
Min. Garage level	RL 24.48	Architect
Min. Deck Level	RL 23.875	Architect
Pool level	RL 23.80	Architect/Pool designer

Table 2: Adopted flood levels for subject site

Refer to Figure 2 below for ground floor plan overlay with Flood level points to determine area affected by the flooding.

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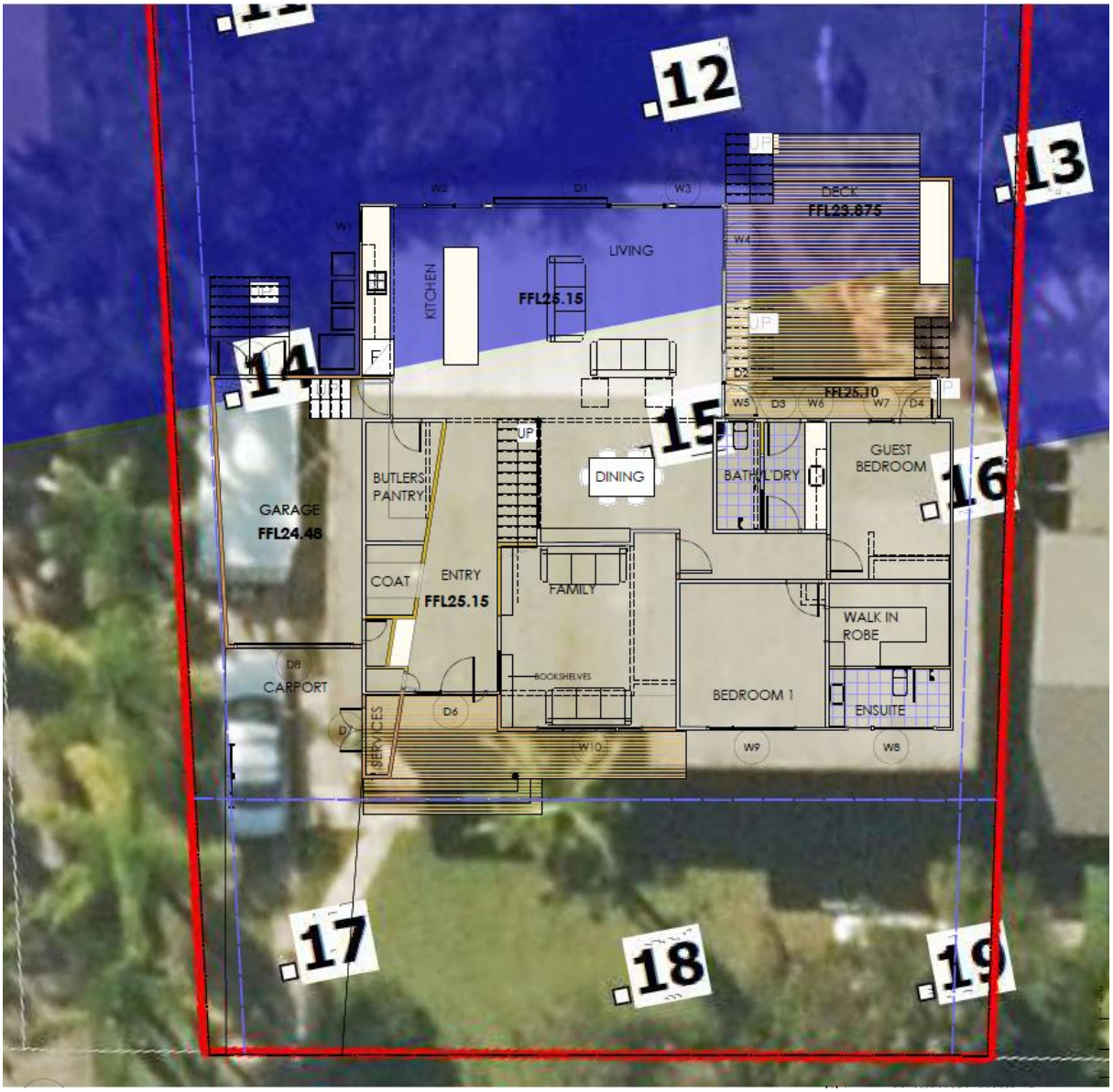

Figure 2: Ground floor plan overlay with Flood level points obtained from Council Flood Letter

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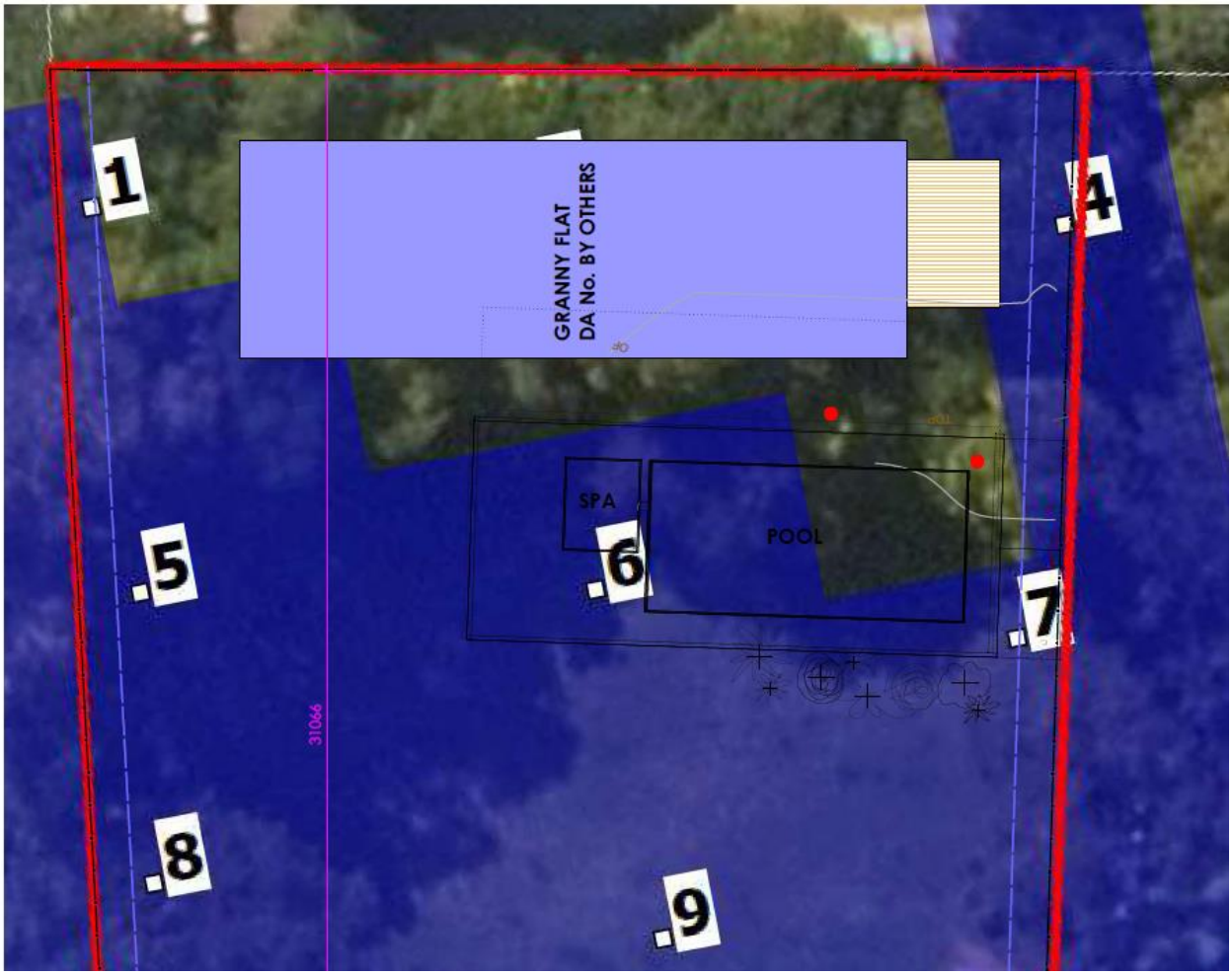

Figure 3: Pool and Spa plan overlay with Flood level points obtained from Council Flood Letter

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5.0 Summary of Flood Risk Management Strategies

The following table provides an outline of the flood risk management strategies for the proposed alteration/addition at 8 Bate Ave, Allambie Heights. These strategies represent an approach that will mitigate the present, future and existing flood.

Planning controls key points		Planning control measures
A. Flood effects caused by development	A1.Development shall not be approved unless it can be demonstrated in a Flood Management Report that it has been designed and can be constructed so that in all events up to the 1% AEP event: a.There are no adverse impacts on flood levels or velocities caused by alterations to the flood conveyance; and b. There are no adverse impacts on surrounding properties; and c. It is sited to minimise exposure to flood hazard. Major developments and developments likely to have a significant impact on the PMF flood regime will need to demonstrate that there are no adverse impacts in the Probable Maximum Flood.	Flood management report is enclosed. It has demonstrated that the proposed development complies with the flood prone land design guidelines
	A2. Development shall not be approved unless it can be demonstrated in a Flood Management Report that in all events up to the 1% AEP event there is no net loss of flood storage.	As per Figure 2, part of the new development that is affected by the 1% AEP flood zone are the timber deck, stairs, pool and the

	Consideration may be given for exempting the volume of standard piers from flood storage calculations. If Compensatory Works are proposed to balance the loss of flood storage from the development, the Flood Management Report shall include detailed calculations to demonstrate how this is achieved.	spa. Timber deck is set at the Flood planning level and suspended which allows flood water to flow below the deck. The flood storage taken by the portion of the pool will be compensated as shown in the appendix to ensure no loss of flood storage as a result of this development.
B.Building components and Structural Soundness	B1.All buildings shall be designed and constructed with flood compatible materials in accordance with "Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas", Hawkesbury-Nepean Floodplain Management Steering Committee (2006). B2. All new development must be designed and constructed to ensure structural integrity up to the Flood Planning Level, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the Probable Maximum Flood level. Structural certification shall be provided confirming the above. B3. 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 Flood Planning Level. All existing electrical	All structures below the PMF flood level will be constructed with flood compatible building components as per council guidelines. All structures up to the PMF level, which is RL 24.48 will be constructed to ensure its structural integrity. Structural plans and certification will need to be provided by structural engineer. All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed and/or

	equipment and power points located below the Flood Planning Level within the subject structure must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected.	located above RL 24.40.
C. Structural Soundness	C1. New floor levels within the development shall be at or above the Flood Planning Level. C3.All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event. For suspended pier/pile footings: (a)The underfloor area of the dwelling below the 1% AEP flood level is to be designed and constructed to allow clear passage of floodwaters, taking into account the potential for small openings to block; and (b) At least 50% of the perimeter of the underfloor area is of an open design from the natural ground level up to the 1% AEP flood level; and	All new floor levels within the development is higher than the flood planning level. Refer to Table 2 and Appendix 2 for architectural plan by others. The new development is not impeding the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event. The portion of the new development which is touching the area affected by flood are the living area and the deck. The footprint of the living area is the same as the existing rumpus area. The proposed deck is suspended above the NGL, which allows passage of water under the deck. Refer to appendix for the proposed compensatory works to compensate for the loss of flood storage by the pool.

	(c) No solid areas of the perimeter of the underfloor area would be permitted in a floodway	
	C4. A one-off addition or alteration below the Flood Planning Level of less than 30 square metres (in total, including walls) may be considered only where: (a)it is an extension to an existing room; and (b) the Flood Planning Level is incompatible with the floor levels of the existing room; and (c) out of the 30 square metres, not more than 10 square metres is below the 1% AEP flood level.	The addition/alteration is designed to be above the flood planning level. This item is not applicable.
	C6. Consideration may be given to the retention of an existing floor level below the Flood Planning Level when undertaking a first floor addition provided that: (a)it is not located within a floodway; and (b)The original foundations are sufficient to support the proposed final structure above them. The Flood Management Report must include photos and the structural certification required as per Control B2 must consider whether the existing foundations are adequate or should be replaced; and	The existing lower ground level is not located within floodway. Structural certifications will be provided by structural engineer to confirm that the original foundations are sufficient to support the proposed structure. The ground floor area below the flood planning level will be flood-proofed.

	(c) none of the structural supports/framing of existing external walls of are to be removed unless the building is to be extended in that location; and (d)The ground floor is flood-proofed.	
D. Car Parking	D1. Open carpark areas and carports shall not be located within a floodway. D2.The lowest floor level of open carparks and carports shall be constructed no lower than the natural ground levels, unless it can be shown that the carpark or carport is free draining with a grade greater than 1% and that flood depths are not increased. D3. Carports must be of open design, with at least 2 sides completely open such that flow is not obstructed up to the 1% AEP flood level. Otherwise it will be considered to be enclosed. When undertaking a like-for-like replacement and the existing garage/carport is located on the street boundary and ramping is infeasible, consideration may be given for dry floodproofing up to the 1% AEP flood level. D4. Where there is more than 300mm depth of flooding in a car park or carport during a 1% AEP flood event, vehicle barriers or	The carport is not affected by flooding. Refer to Council flood letter in Appendix A. The proposed carport is not located within a floodway.

	restraints are to be provided to prevent floating vehicles leaving the site. Protection must be provided for all events up to the 1% AEP flood event D5. Enclosed Garages must be located at or above the 1% AEP level D6. All enclosed car parks (including basement carparks) must be protected from inundation up to the Flood Planning Level. All access, ventilation, driveway crests and any other potential water entry points to any enclosed car parking shall be above the Flood Planning Level. Where a driveway is required to be raised it must be demonstrated that there is no net loss to available flood storage in any event up to the 1% AEP flood event and no impact on flood conveyance through the site. Council will not accept any options that rely on electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark	The enclosed garage is located at RL 24.48 which is above the 1% AEP level The enclosed carpark must be protected from inundation up to the flood planning level, which is RL 24.40 to comply with this flood control.
E. Emergency Response	E1. If the property is affected by a Flood Life Hazard Category of H3 or higher, then Control E1 applies and a Flood Emergency Assessment must be included in the Flood Management Report. If the property is affected by a Flood Life Hazard Category of H6, then development is not permitted unless it can be	Some portion of the development is within flood life hazard category of H3, H4 and H5. In the event of flooding, it is recommended that tenants take refuge on the first floor of the development. The floor level of the first floor is at RL 28.250, which is higher

	demonstrated to the satisfaction of the consent authority that the risk level on the property is or can be reduced to a level below H6 or its equivalent. If the property is flood affected but the Flood Life Hazard Category has not been mapped by Council, then calculations for its determination must be shown in the Flood Management Report, in accordance with the "Technical Flood Risk Management Guideline: Flood Hazard", Australian Institute for Disaster Resilience (2012). Where flood-free evacuation above the Probable Maximum Flood level is not possible, new development must provide a shelter-in-place refuge where: (a)The floor level is at or above the Probable Maximum Flood level; and (b) The floor space provides at least 2m2 per person where the flood duration is long (6 or more hours) in the Probable Maximum Flood event, or 1m2 per person for less than 6 hours; (c)It is intrinsically accessible to all people on the site, plainly evident, and self-directing, with sufficient capacity of access routes for all occupants without reliance on an elevator; and (d) It must contain as a minimum: sufficient clean water for all	than the PMF level. It can be accessed through the internal stair within the unit. The area of first floor space is 81 m2, therefore allowing at least 2 m2 per person where the flood duration is long. Sufficient clean water, portable radio and torch with spare batteries, and a first aid kit are to be kept on first floor in the case of emergencies. It is recommended that adequate warning signs be placed in areas which are visible to ensure occupants are educated with regards to evacuation locations and procedures. All residential tenancies within the subject site are also to be made aware and educated about flood evacuation requirements and procedures.

	occupants; portable radio with spare batteries; torch with spare batteries; and a first aid kit Class 10 classified buildings and structures (as defined in the Building Codes of Australia) are excluded from this control. In the case of change of use or internal alterations to an existing building, a variation to this control may be considered if justified appropriately by a suitably qualified professional. Note that in the event of a flood, occupants would be required to evacuate if ordered by Emergency Services personnel regardless of the availability of a shelter-in-place refuge	
F. Fencing	F1.Fencing, (including pool fencing, boundary fencing, balcony balustrades and accessway balustrades) shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. At least 50% of the fence must be of an open design from the natural ground level up to the 1% AEP flood level. Less than 50% of the perimeter fence would be permitted to be solid. Openings should be a minimum of 75 mm x 75mm.	50% of the pool fence(designed by others) are shown to have an open design from the NGL to the 1% AEP flood level, which is RL 23.65. There is a 100 mm gap in between of the bars which complies with this flood controls. Refer to appendix for pool fence details.

G. Storage of Goods	G1.Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.	Any hazardous or polluting materials shall not be stored below RL 24.40 unless adequately protected from floodwaters in accordance with industry standards.
H. Pools	H1.Pools located within the 1% AEP flood extent are to be in-ground, with coping flush with natural ground level. Where it is not possible to have pool coping flush with natural ground level, it must be demonstrated that the development will result in no net loss of flood storage and no impact on flood conveyance on or from the site.	Pool and spa are both located within the 1% AEP flood extent. Refer to Figure 3 of this document. Both of the portion of pool and spa are in-ground with coping flush with natural ground level. A small portion of the pool and spa are slightly above the NGL. A flood storage compensatory works has been proposed in appendix to indicate the measures to be taken to compensate the loss of flood storage. Refer to Appendices for pool design by others.
	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 Electrical equipment associated with the pool(including pool pumps) is to be waterproofed and/or located or above the flood planning level, which is RL 23.90.
	All chemicals associated with the pool are to be stored at or above the Flood Planning Level.	All chemicals associated with the pool are to be stored at or above the flood planning level, which is RL 23.90.

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6.0 Contact

NSW State Emergency Services (SES)	Phone: (02) 9555 7606 or 132 500
Northern Beaches Council	Phone: 1300 434 434
Dee Why Police Station St David Ave & Fisher Road, 1 St David Ave, Dee Why NSW 2099	Phone: (02)9971 3399or 000
Dee Why Fire Station 38 Fisher Rd, Dee Why NSW 2099	Phone: (02) 9982 3229 or 000
Closest Emergency Meeting Location- Entrance to Site (refer to Evacuation Plan)	To be advised on the day
Energy Australia	Phone: (02) 131 535
Telstra	Phone: (02) 1800 687 829
Jemena Gas	Phone: (02) 131 909
Local Radio Stations 1. Freq: 702 ABC Sydney	Phone: (02) 1300 222 702

These phone numbers are correct at the time of issuing this report.

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7.0 Conclusion and Recommendation

This report complies with the Flood Risk Management requirements of council. The proposed alteration/addition to existing building with pool and spa will be built partly on a Medium Flood Risk Area of the site. The minimum level of the habitable and non-habitable of the proposed development is to be as per Table 2 of this report.

The proposed development will not result in loss of flood storage and effect in flood flow and conveyance to and from the site. The loss of the flood storage due to the portion of proposed pool above NGL and retaining wall is compensated through landscaping works. Refer to Appendix D for more details.

Structural engineer must provide that the certification that structural integrity of the building up to the PMF level is maintained. Refer to Section 5, item C of this report for details.

The pool fence must be an open-style fencing to ensure no affectation to flood flow and conveyance. The opening to be min. Refer to Section 5, item F of this report for details.

The evacuation strategy would consist of taking refuge to the first floor of the dwelling, as the level is higher than the PMF. Please refer to Section 5, Item E of this report for the emergency response procedure.

All electrical equipment, chemicals and storage shall be located at or above the flood planning level as detailed in Section 5 of this report

In addition, it is important that a Flood Risk Management Plan be reviewed as a minimum every 5 years or immediately after a major flood event.

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Appendix A – Council Flood Map/ Flood Letter

northern beaches council

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 8 Bate Avenue ALLAMBIE HEIGHTS NSW 2100
Lot DP: Lot E DP 399909
Issue Date: 18/09/2020
Flood Study Reference: Manly Lagoon Flood Study 2013, BMT WBM

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]: 24.77 m AHD

Note: The FPL is based on the mainstream peak flood level (not overland flow peak levels). As such, in this case the FPL is lower than the 1% AEP catchment peak flood level.

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level [2, 3]: 25.88 mAHD

1% AEP Maximum Peak Depth from natural ground level[3]: 0.85 m

1% AEP Maximum Velocity: 2.74 m/s

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

1% AEP Hydraulic Categorisation: Floodway **See Flood Map E**

Probable Maximum Flood (PMF) – See Flood Map C

PMF Maximum Water Level [4]: 24.74 m AHD

PMF Maximum Depth from natural ground level: 1.53 m

PMF Maximum Velocity: 3.12 m/s

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

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

Flooding with Climate Change (See Flood Map H)

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

1% AEP Maximum Water Level with Climate change [3]: 23.96 m AHD

1% AEP Maximum Depth with Climate Change[3]: 0.39 m

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

Flood Life Hazard Category – See Map I

Indicative Ground Surface Spot Heights – See Map J

[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.

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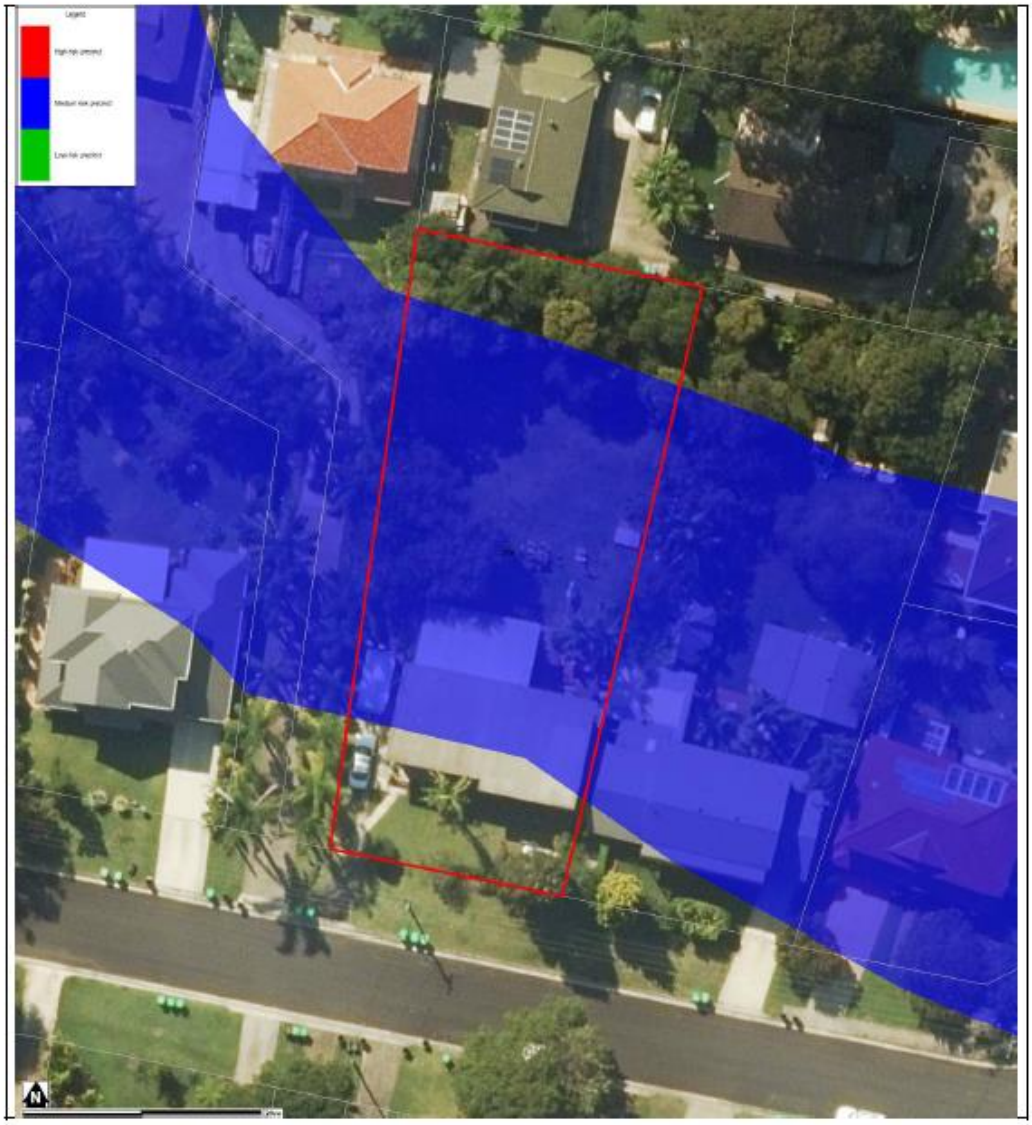
FLOOD MAP A: FLOOD RISK PRECINCT MAP



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.

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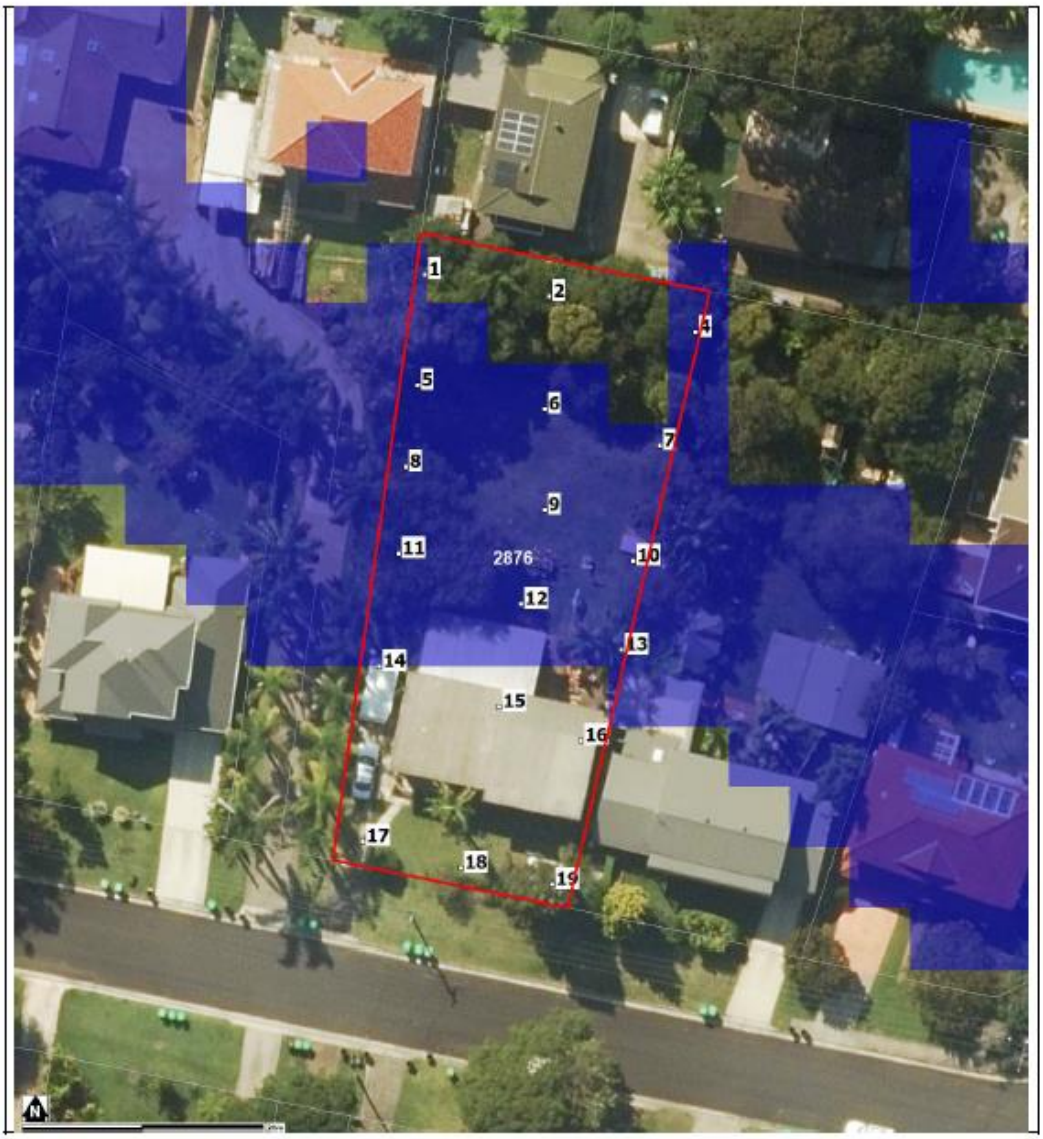
FLOOD LEVEL POINTS



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

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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	N/A	N/A	25.06	0.07	0.74	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	25.42	0.02	25.40	0.02	0.16	N/A	N/A	N/A	N/A
4	25.42	0.02	25.40	0.02	0.16	N/A	N/A	N/A	N/A
5	24.07	0.29	24.14	0.36	1.21	24.46	24.53	0.75	2.29
6	23.59	0.32	23.65	0.38	1.67	23.90	24.09	0.82	1.93
7	23.35	0.29	23.40	0.34	1.34	23.79	23.87	0.81	1.75
8	23.74	0.45	23.85	0.55	2.09	24.19	24.37	1.07	3.09
9	23.26	0.58	23.39	0.71	1.74	23.82	24.02	1.34	2.58
10	22.93	0.67	23.09	0.82	1.84	23.60	23.76	1.50	2.69
11	23.65	0.49	23.76	0.60	1.79	24.17	24.36	1.20	2.75
12	23.16	0.47	23.29	0.60	2.12	23.68	23.94	1.25	2.78
13	22.87	0.36	22.99	0.49	1.81	23.48	23.61	1.11	2.56
14	N/A	N/A	N/A	N/A	N/A	24.40	24.48	0.49	1.89
15	N/A	N/A	N/A	N/A	N/A	23.83	23.96	0.48	1.73
16	N/A	N/A	N/A	N/A	N/A	23.38	23.58	0.37	1.80
17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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)

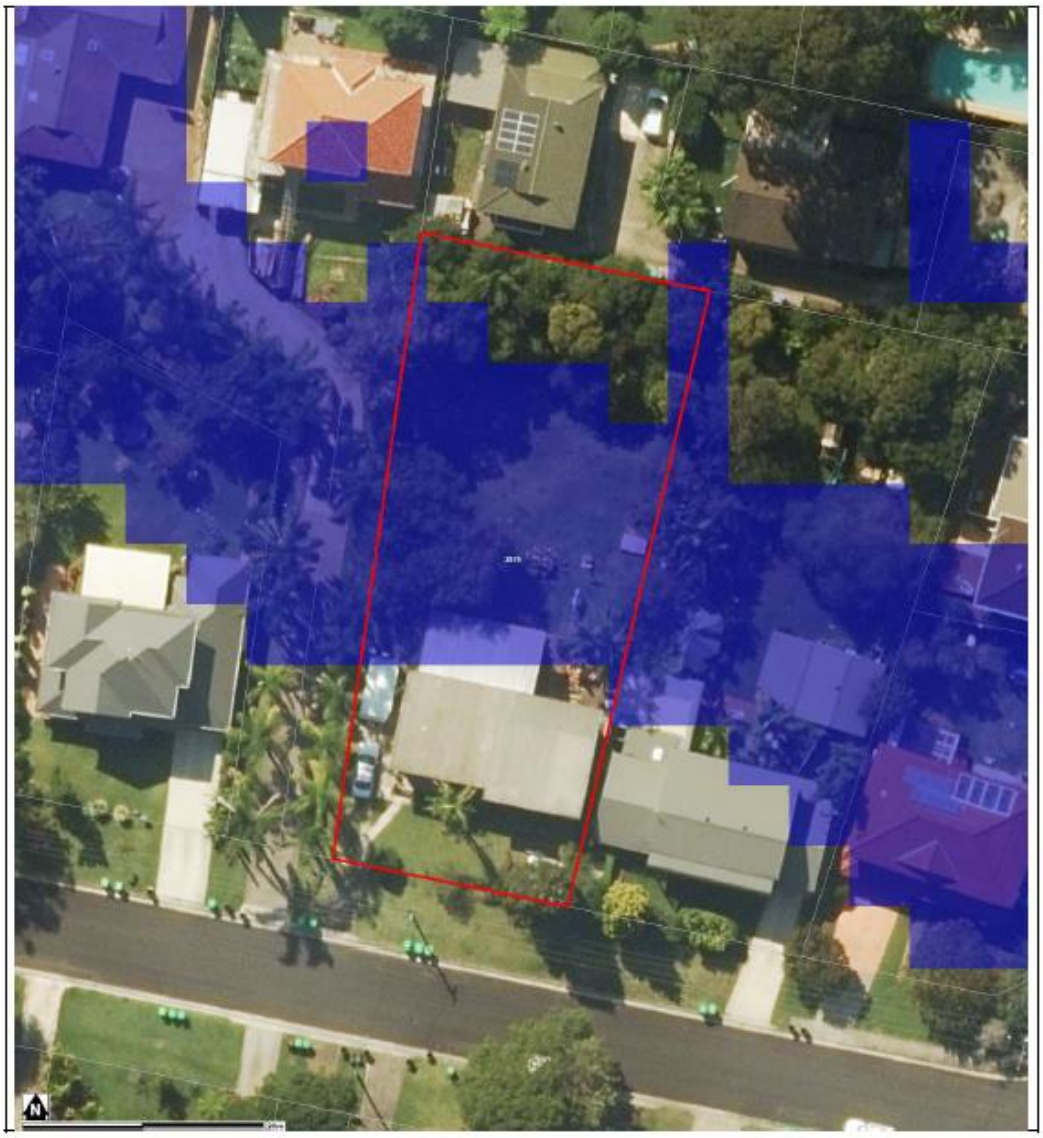
ID	CC 1% AEP Max WL (m AHD)	CC1 % AEP Max Depth (m)
1	N/A	N/A
2	N/A	N/A
3	N/A	N/A
4	N/A	N/A
5	23.96	0.18
6	N/A	N/A
7	23.26	0.20
8	23.54	0.25
9	23.01	0.33
10	22.65	0.39
11	23.43	0.27
12	22.95	0.26
13	22.70	0.20
14	N/A	N/A
15	N/A	N/A
16	N/A	N/A
17	N/A	N/A
18	N/A	N/A
19	N/A	N/A

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).

If the CC 1% AEP level is less than the 1% AEP level, this is probably because the 1% AEP level used for planning includes a 5% AEP ocean surge. In this case, the 1% AEP value should be used.

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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

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FLOOD MAP C: 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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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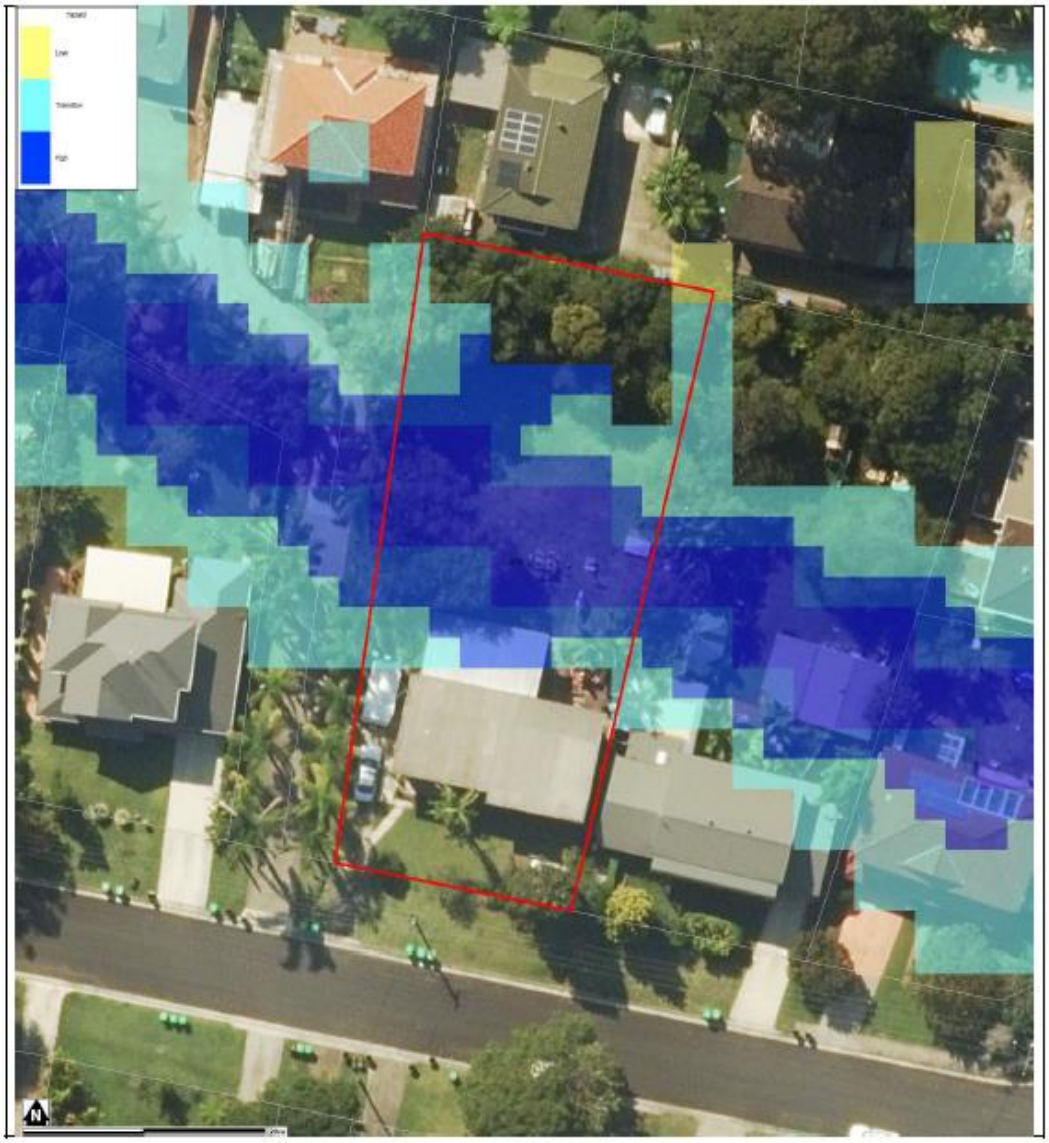
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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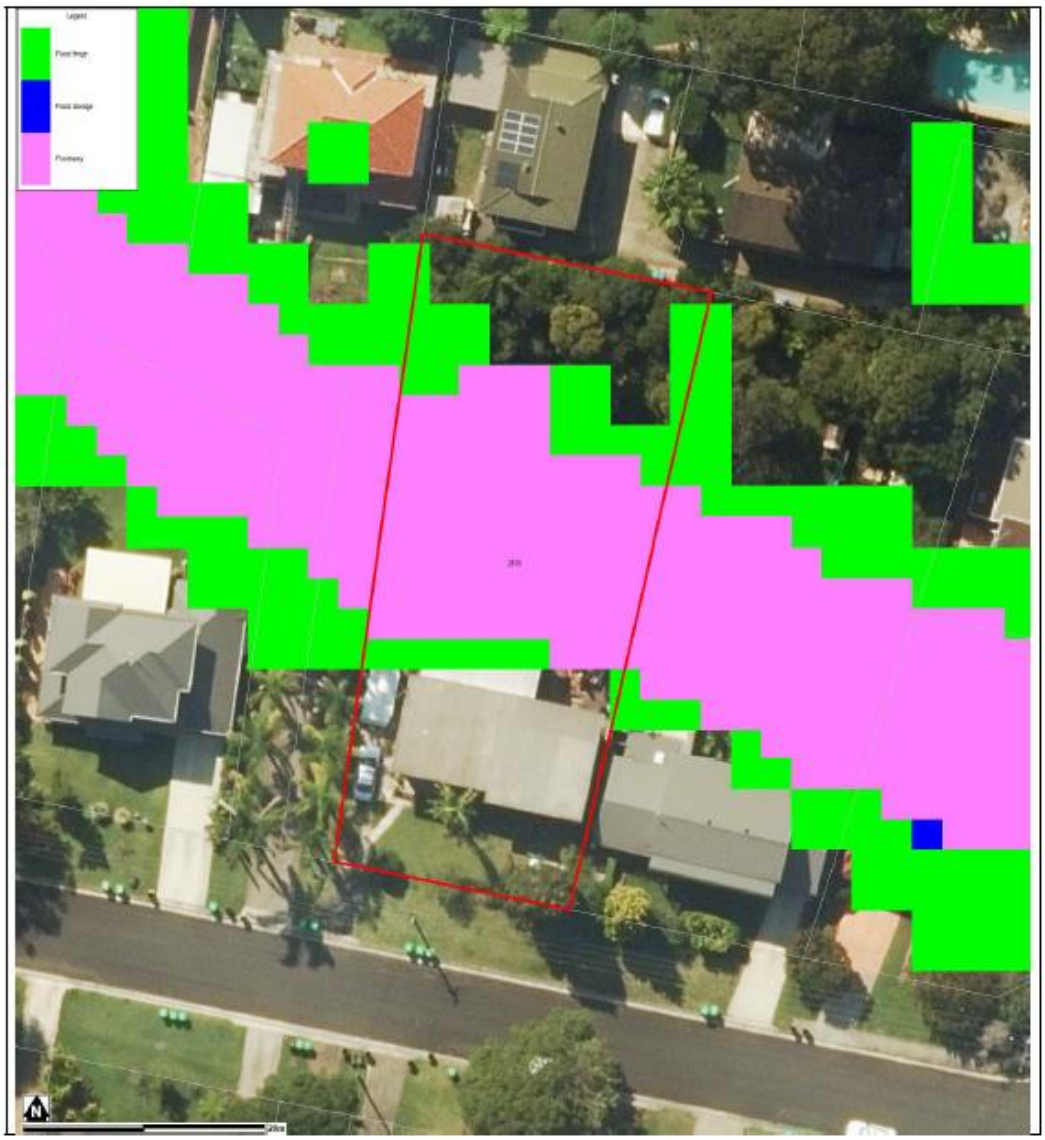
FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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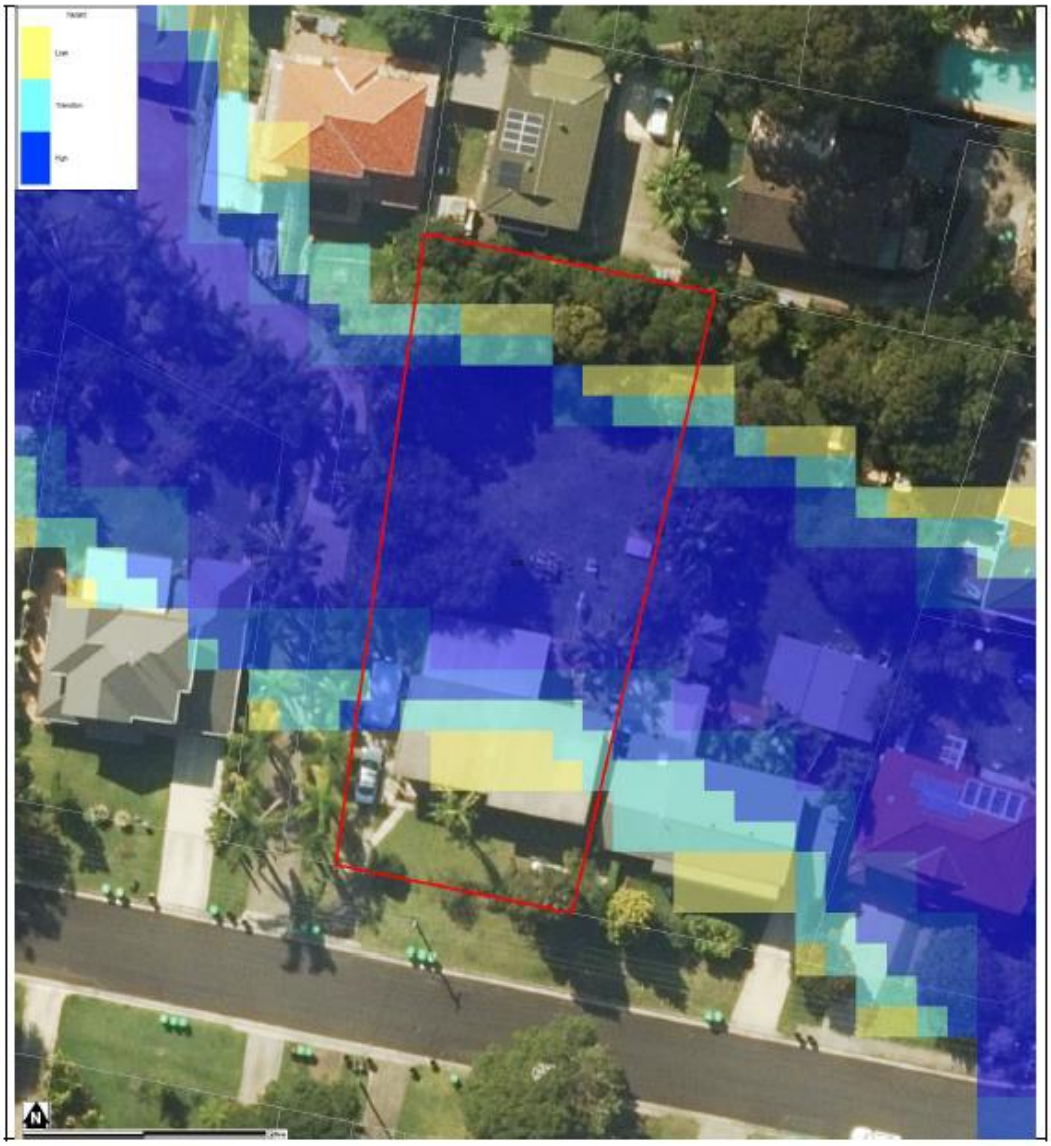
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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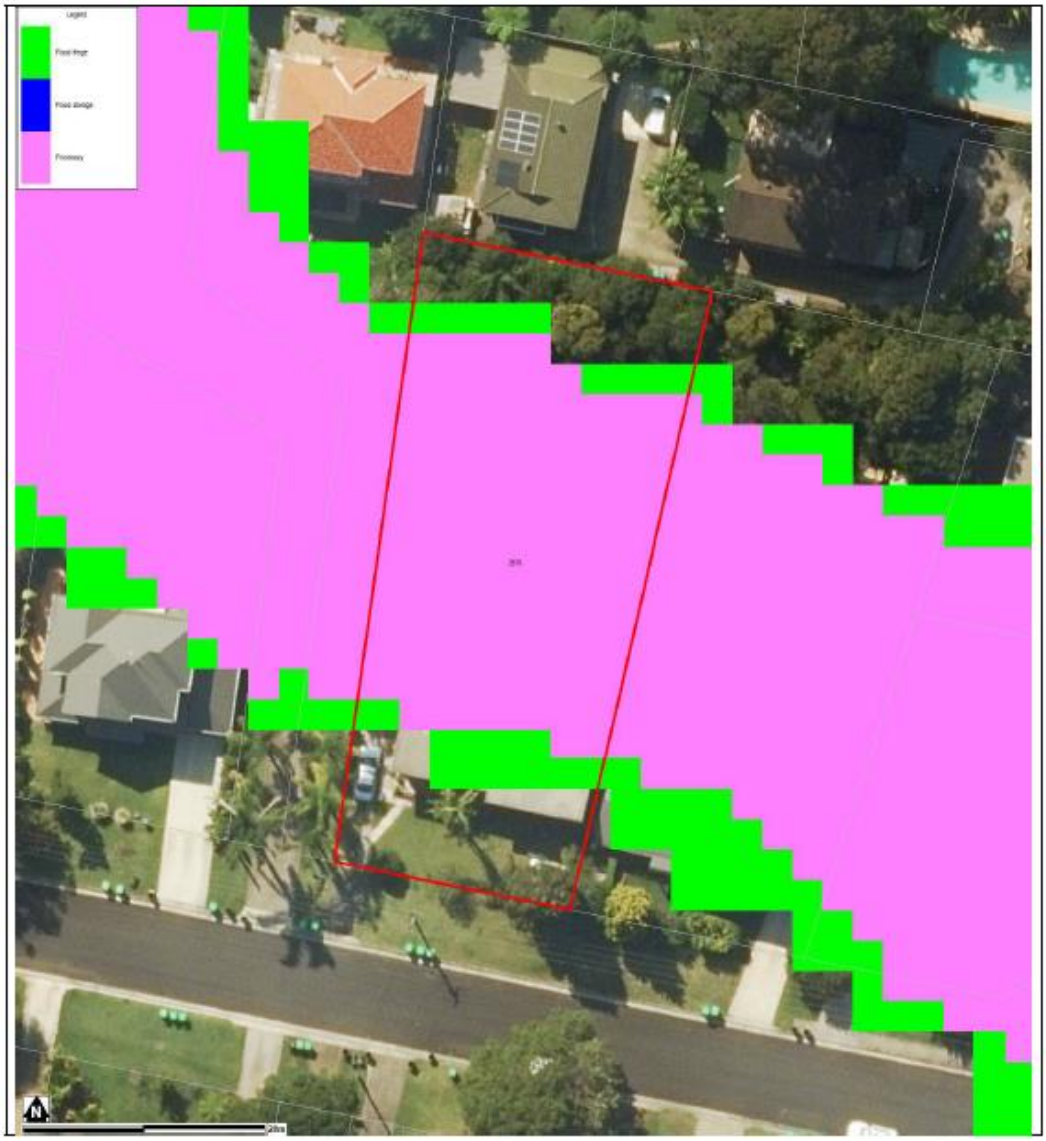
FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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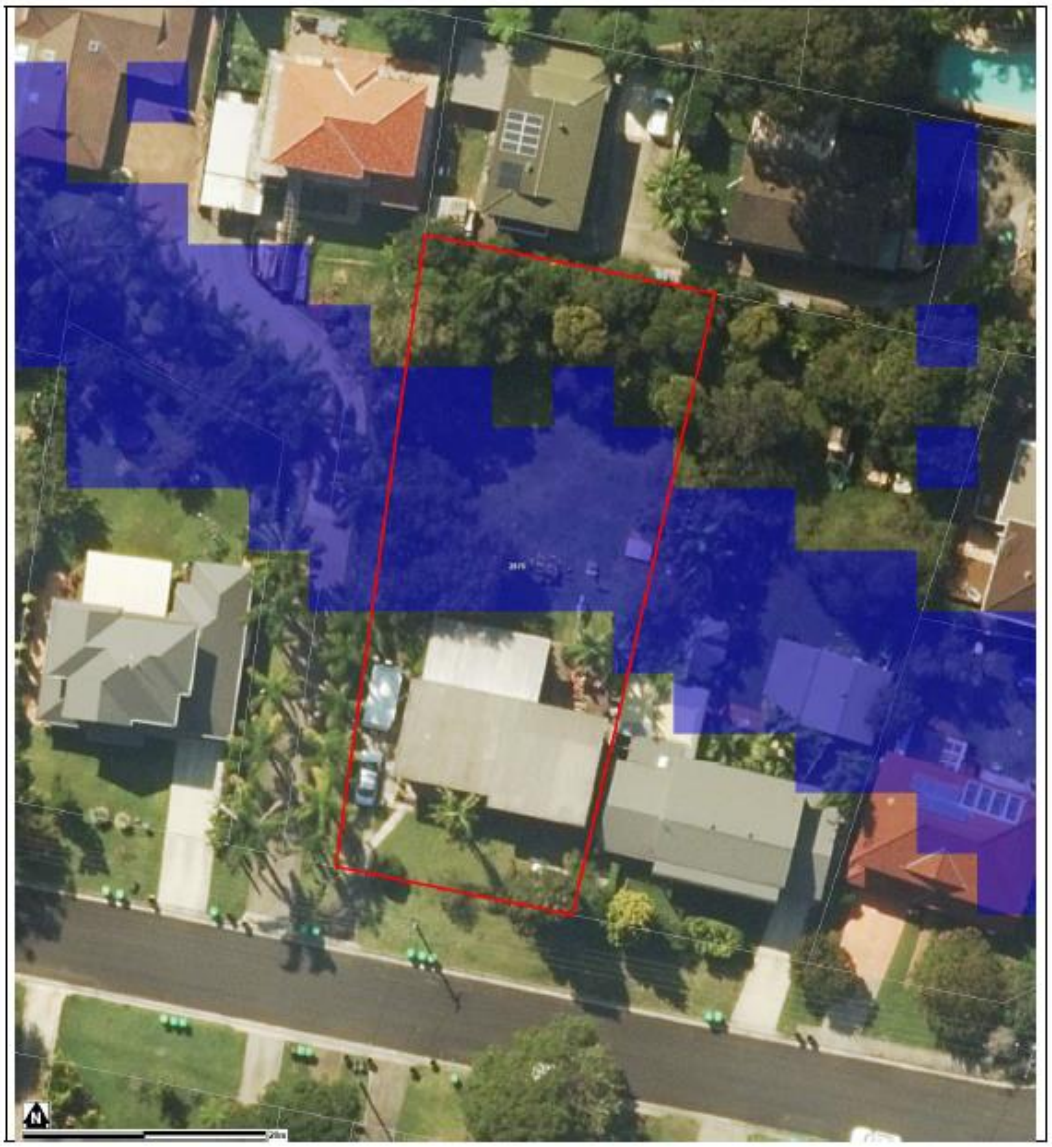
FLOOD MAP H: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



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: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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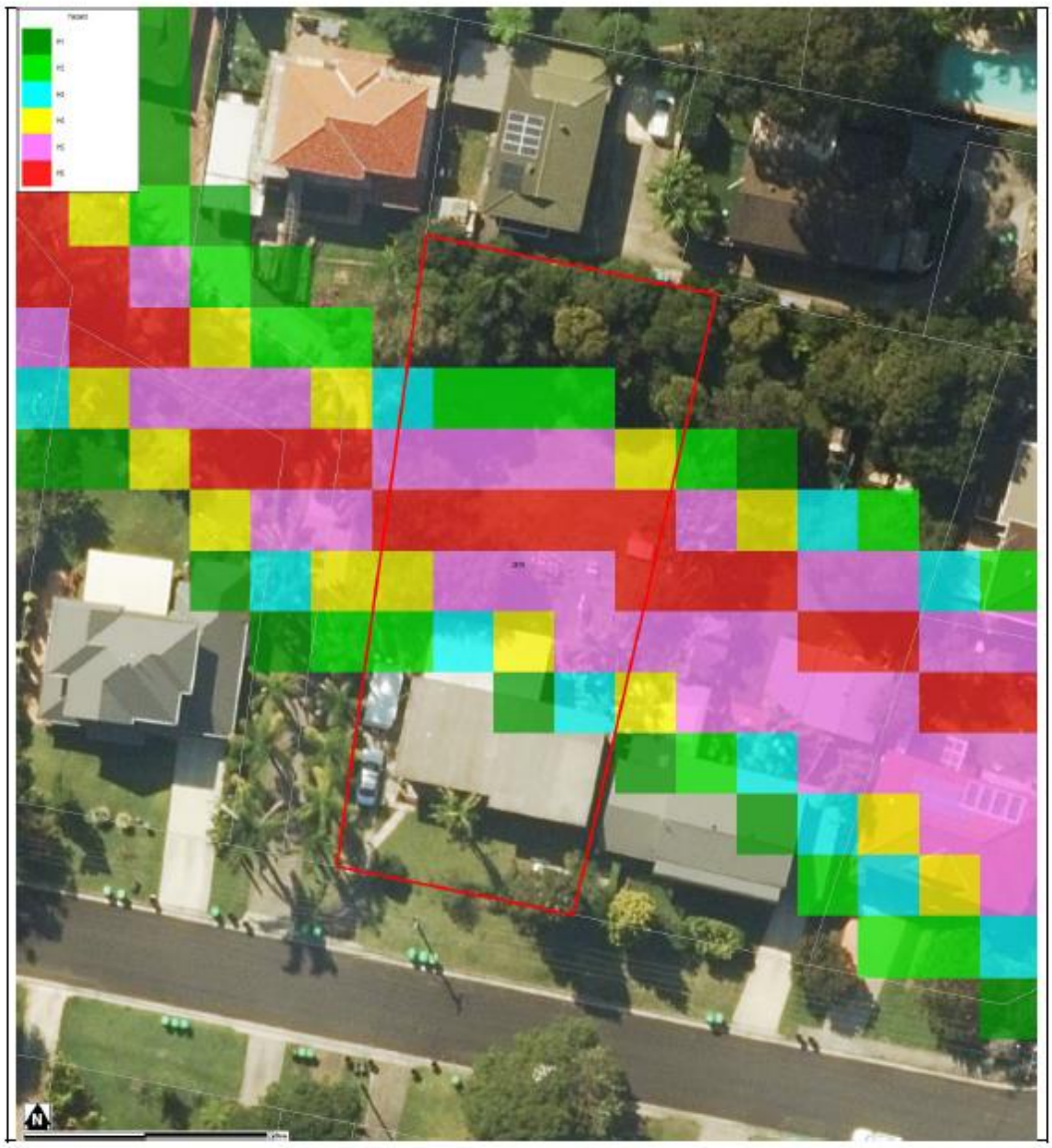
FLOOD MAP I: FLOOD LIFE HAZARD CATEGORY



Notes:

- For additional information on Flood Life Hazard Categories, refer to 'Flood Emergency Response Planning for Development in Pittwater Policy' and Pittwater 21 DCP Control B3.13.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

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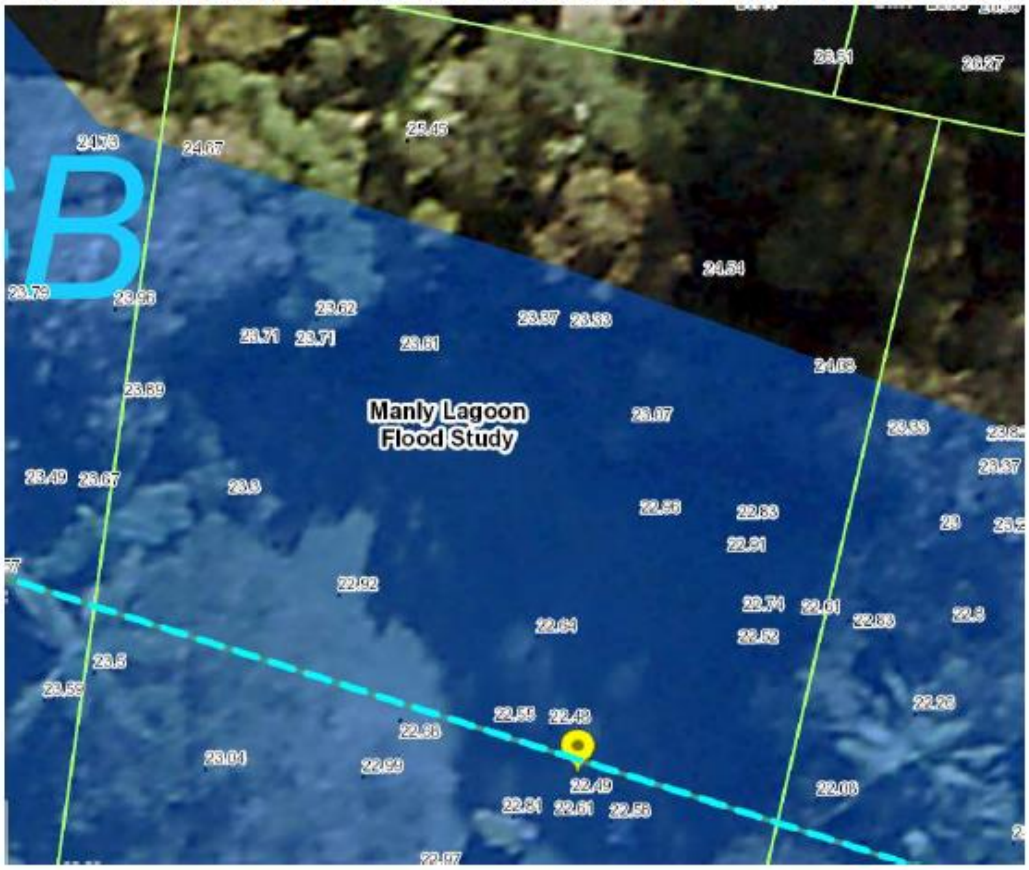
MAP J: INDICATIVE GROUND SURFACE SPOT HEIGHTS



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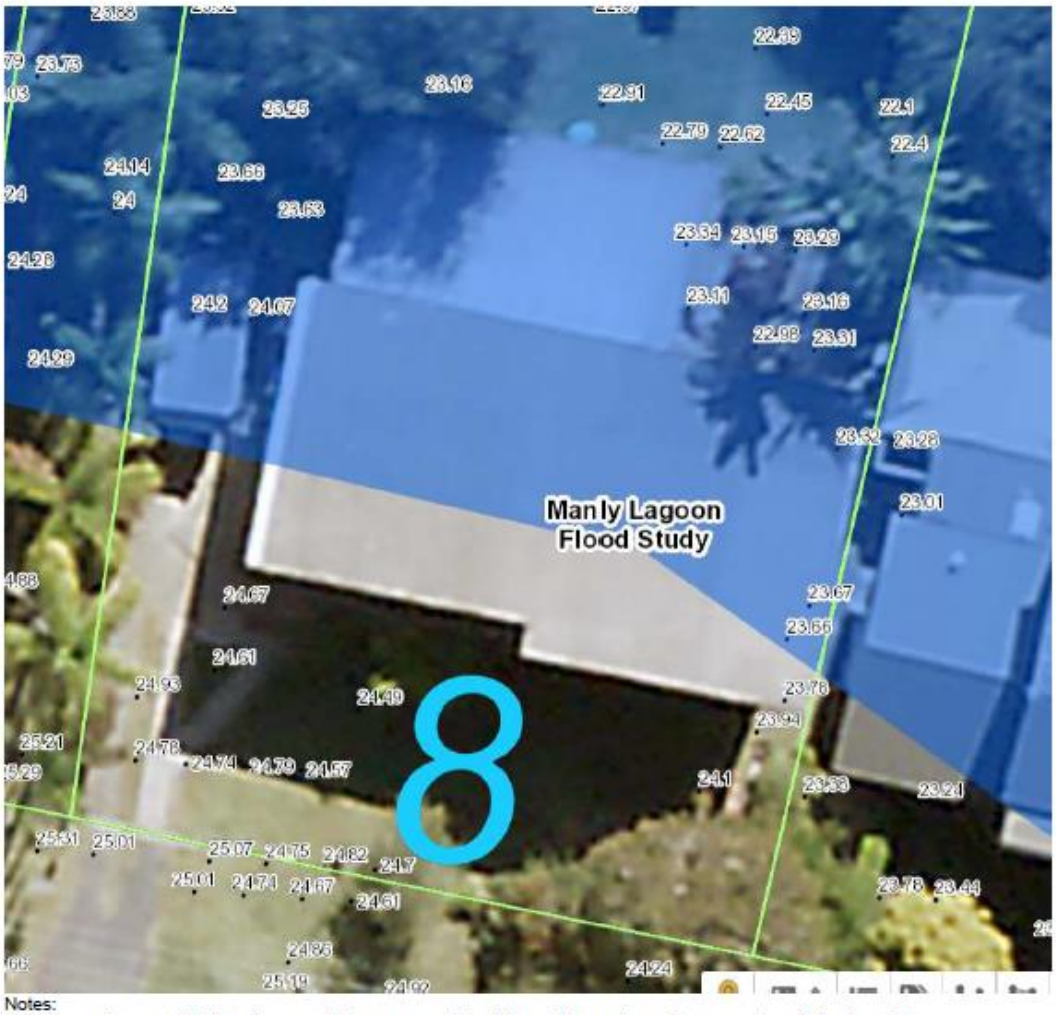

Notes:

- 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.

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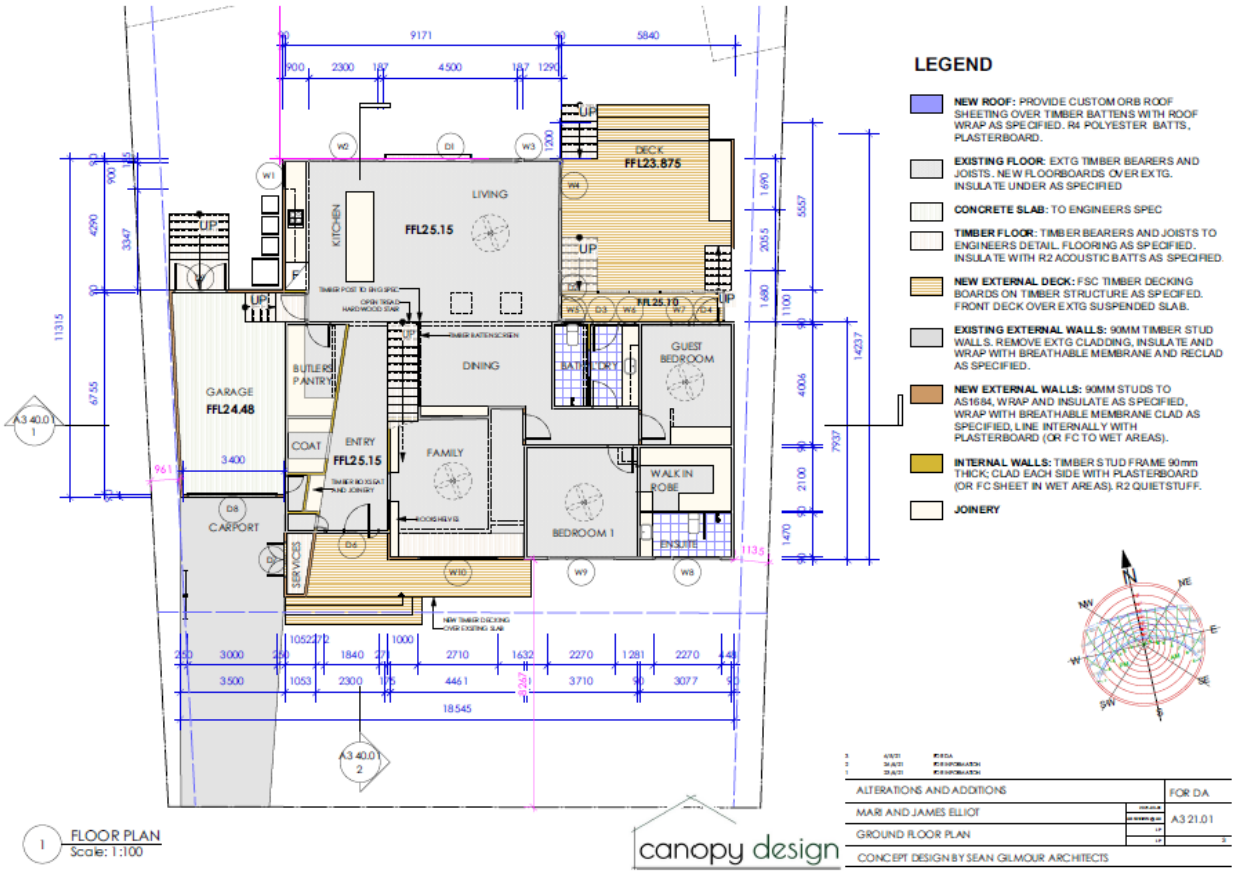
Appendix B –Architectural plan by others



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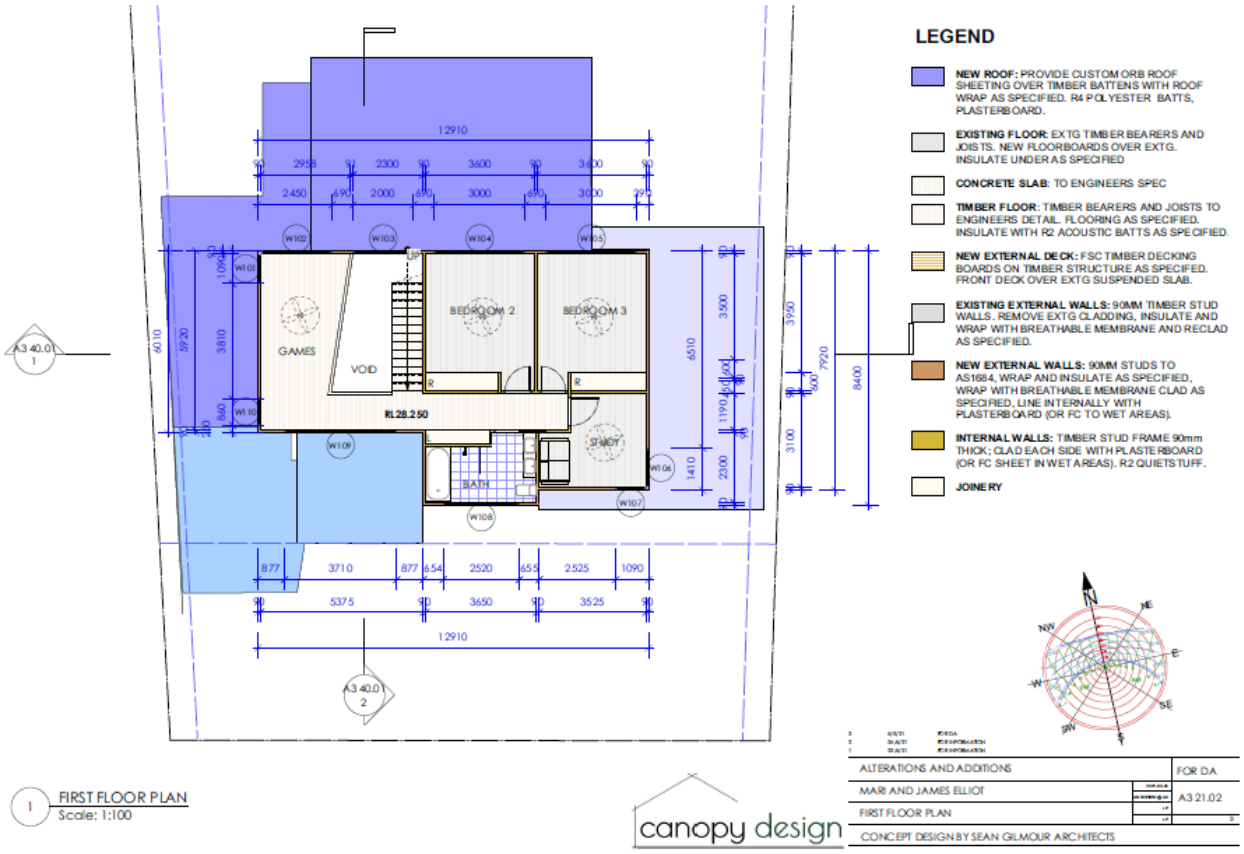

1 FIRST FLOOR PLAN
Scale: 1:100

canopy design

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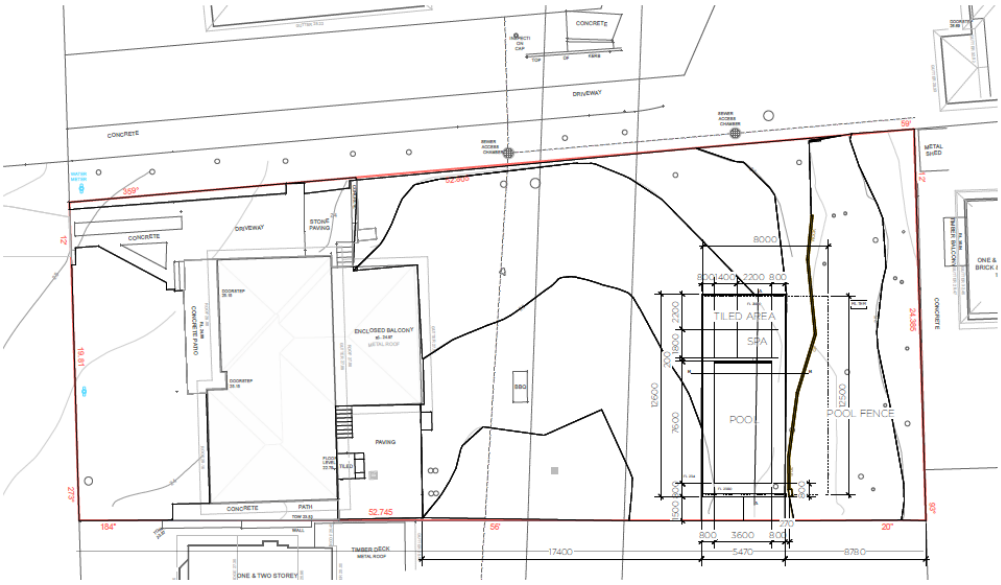

SITE LAYOUT PLAN
SURVEY BASE BY BEE & LETHBRIDGE REF NO. 21893

LAYOUT OF POOL AND SPA COMPLYING FLOOD CERTIFICATE 034-SWF21

POOL & SPA INFORMATION

POOL STYLE "CAMBRIDGE"
7.6m x 3.6m
Depth 1.0m to 1.96m
REFER MANUFACTURERS DRAWING

SPA STYLE "VAIL"
2.2m x 1.8m
Depth 1.0m
REFER MANUFACTURERS DRAWING

SCENIC POOLS

ROLLO

REVISION	DATE	NOTE
B	6/5/21	Final
A	21/4/21	Draft

PROJECT: Elliott Residence Pool — PROJECT #: 135
CLIENT: Mari-Jane Elliott — DATE #: 6/5/21
SCALE @ A3: NTS — DWG #: L001
DRAWN: BR — REVISION: B
DWG: Site Layout Plan — CHKD: DM — REVISION: A

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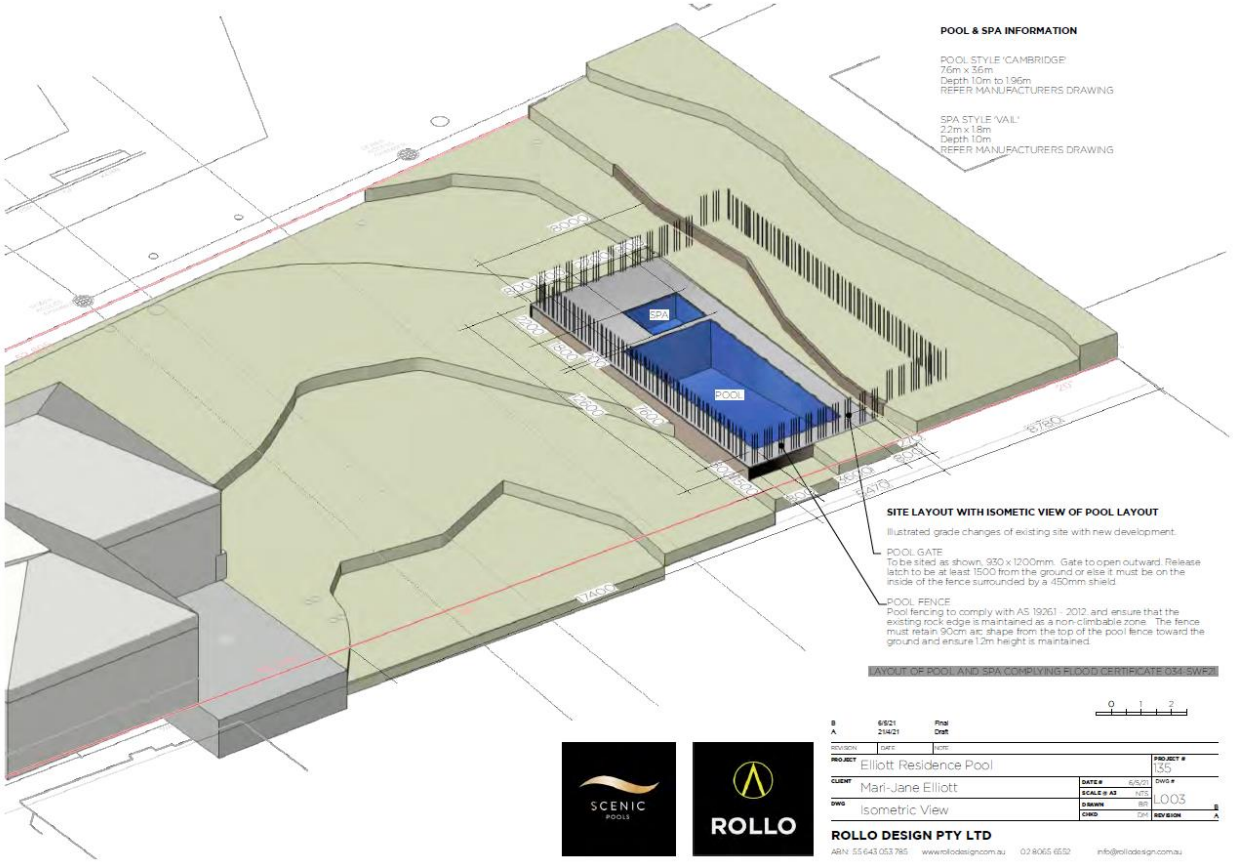

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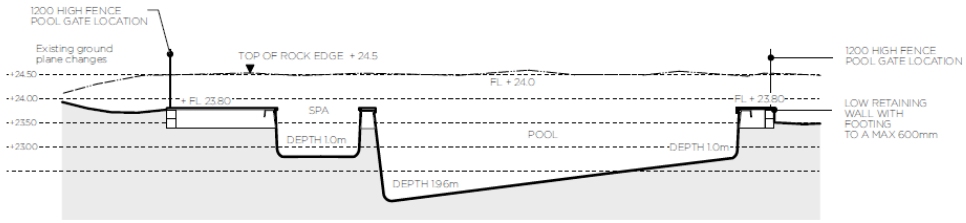
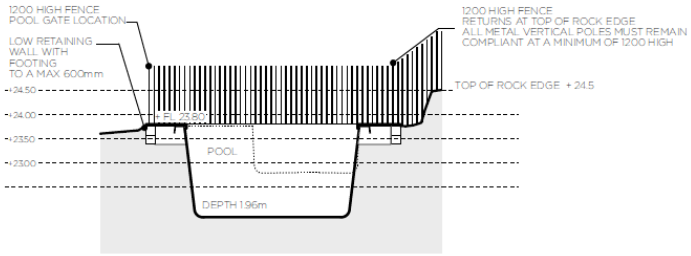


SECTION LINE A_A

SCALE 1:50



SECTION LINE B_B

SCALE 1:50

0 1 2 3

REVISION	DATE	NOTE
PROJECT	Elliott Residence Pool	PROJECT # 135
CLIENT	Mari-Jane Elliott	DATE # 23/4/21
		SCALE @ A3 SHOWN
DWG	Sections	DRAWN RR
		CHKD DM
		DWG # L005
		REVISION

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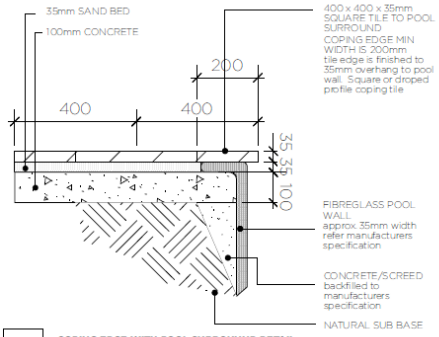
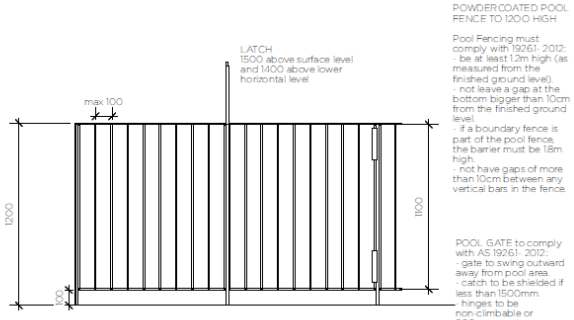
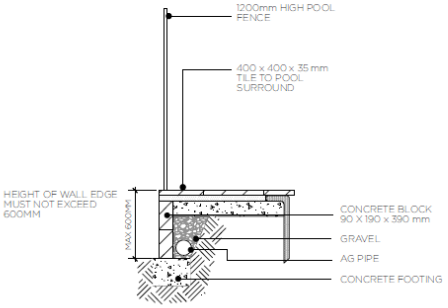


1 **COPING EDGE WITH POOL SURROUNND DETAIL**
SCALE 1:10



2 **TYPICAL POOL FENCE DETAIL**
SCALE 1:20



3 **RETAINING WALL DETAIL**
SCALE 1:20

LAYOUT OF POOL AND SPA COMPLYING FLOOD CERTIFICATE 034-SWF21.

REVISION	DATE	NOTE
A	6/5/21	Final

PROJECT	Elliott Residence Pool		PROJECT # 135
CLIENT	Mari-Jane Elliott	DATE # 6/5/21	DWG # L006
DWG	Details	SCALE @ A3 NTS	
		DRAWN BR	
		CHKD DH	REVISION A

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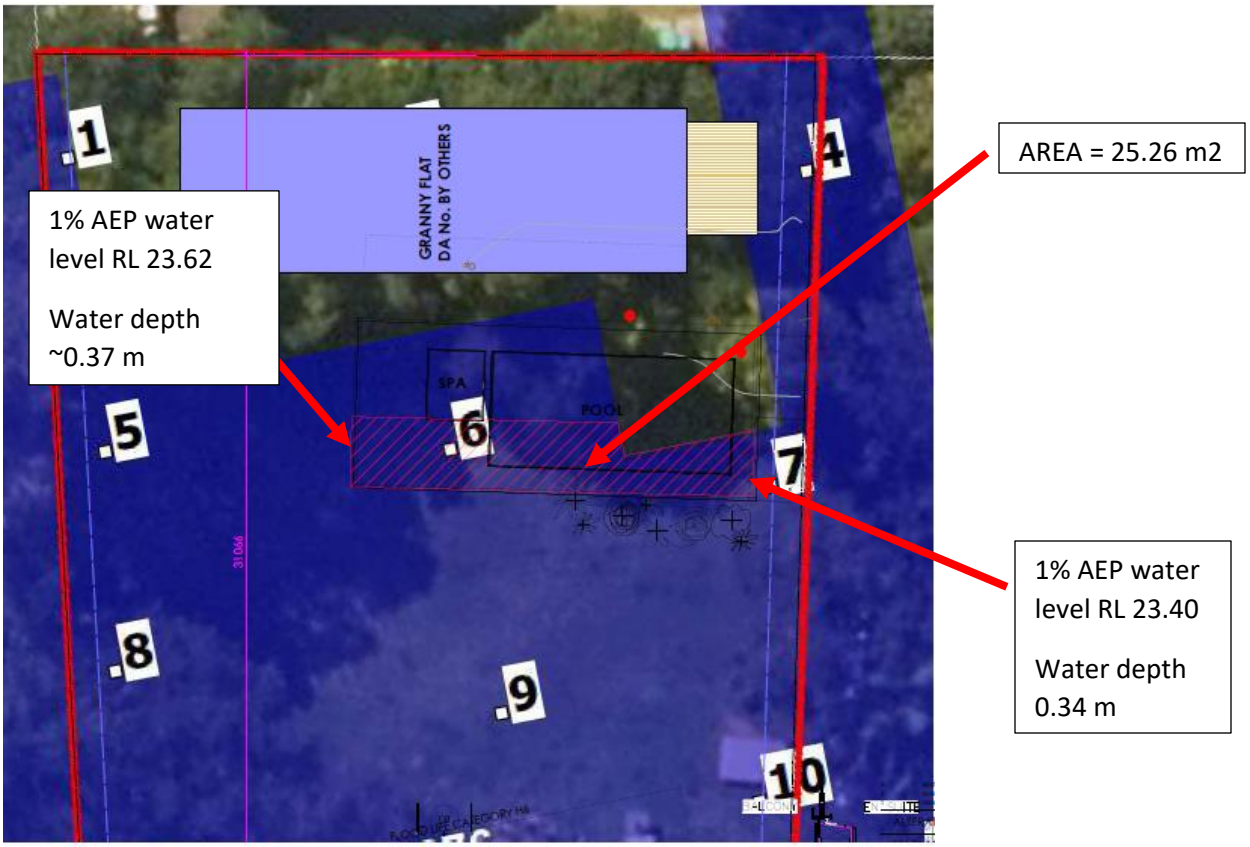
Appendix C – Flood Storage Compensatory Works

As per the pool design prepared by Rollo design (refer to Appendix B), some of the pool and spa portion are elevated above the NGL. The area loss due to this proposed works is approx. 25.26 m2.

The 1% AEP water level on the western and eastern side of the pool is approx. RL 23.895 and RL 23.40 respectively. Therefore, the average volume loss due to this proposed pool and spa is ~ 8.96 m3.

Refer to Figure below.



Refer to figure below, there is a minor portion of the garage is within the flood zone (point 14). Based on the flood levels table provided by Northern Beaches council dated 18.09.2020, point 14 is not affected by the 1% AEP flood, only PMF.

Therefore, the proposed garage is not affecting the any loss of flood storage in the 1% AEP event.

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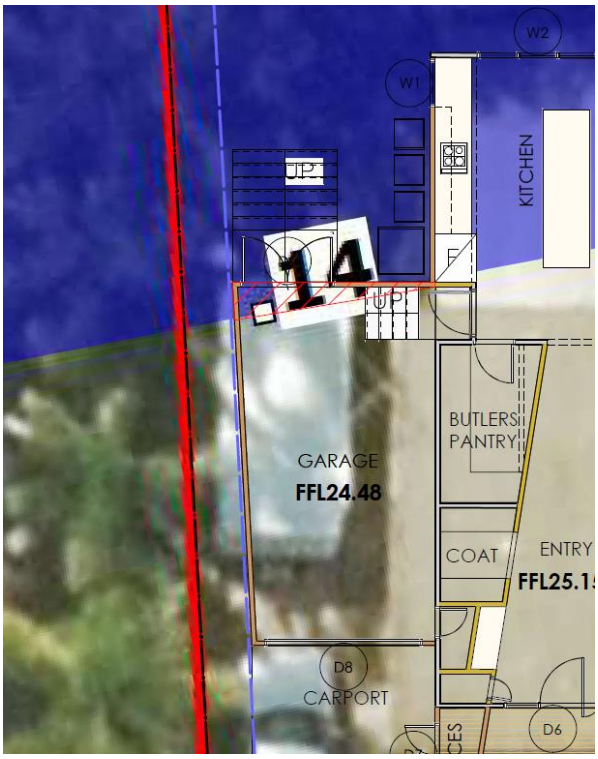

Flood Levels

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	N/A	N/A	25.06	0.07	0.74	N/A	N/A	N/A	N/A
2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
3	25.42	0.02	25.40	0.02	0.16	N/A	N/A	N/A	N/A
4	25.42	0.02	25.40	0.02	0.16	N/A	N/A	N/A	N/A
5	24.07	0.29	24.14	0.36	1.21	24.46	24.53	0.75	2.29
6	23.59	0.32	23.65	0.38	1.67	23.90	24.09	0.82	1.93
7	23.35	0.29	23.40	0.34	1.34	23.79	23.87	0.81	1.75
8	23.74	0.45	23.85	0.55	2.09	24.19	24.37	1.07	3.09
9	23.26	0.58	23.39	0.71	1.74	23.82	24.02	1.34	2.58
10	22.93	0.67	23.09	0.82	1.84	23.60	23.76	1.50	2.69
11	23.65	0.49	23.76	0.60	1.79	24.17	24.36	1.20	2.75
12	23.16	0.47	23.29	0.60	2.12	23.68	23.94	1.25	2.78
13	22.87	0.36	22.99	0.49	1.81	23.48	23.61	1.11	2.56
14	N/A	N/A	N/A	N/A	N/A	24.40	24.48	0.49	1.89
15	N/A	N/A	N/A	N/A	N/A	23.83	23.96	0.48	1.73
16	N/A	N/A	N/A	N/A	N/A	23.38	23.58	0.37	1.80
17	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
19	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

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

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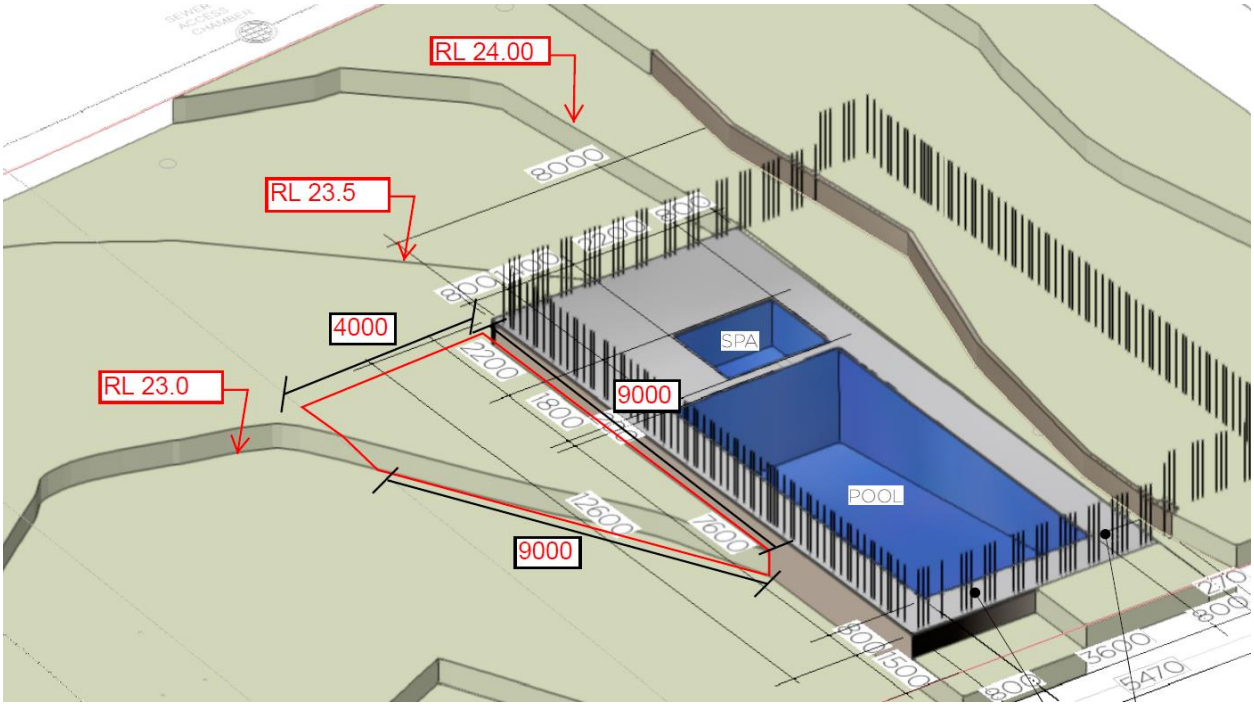
To compensate for the loss of flood storage, a landscaping works need to be done on the site. The existing soil with a surface area of 19 m2 on the southern side of the pool will be removed by approx. 500 mm to RL 23.00 (Area highlighted in red below). This will provide a 9.5 m3 of flood storage which is more than what is loss (8.96 m3) due to the proposed pool and spa.



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Appendix D – Warringah Flood prone Land Matrix

		Medium Flood Risk Precinct				
		Vulnerable & Critical Use	Residential Use	Business & Industrial Use	Recreational & Environmental Use	Subdivision & Civil Works
A	Flood effects caused by Development	A1 A2	A1 A2	A1 A2	A1 A2	A1 A2
B	Building Components & Structural	B1 B2 B3	B1 B2 B3	B1 B2 B3	B1 B2 B3	
C	Floor Levels	C2 C3	C1 C3 C4 C6	C1 C3 C4 C6 C7	C3	C5
D	Car Parking	D1 D2 D3 D4 D7	D1 D2 D3 D4 D5 D6	D1 D2 D3 D4 D5 D6	D1 D2 D3 D4 D5 D6	D1
E	Emergency Response	E1 E2	E1	E1	E1	E3
F	Fencing	F1	F1	F1	F1	F1
G	Storage of Goods	G1	G1	G1	G1	
H	Pools	H1	H1	H1	H1	H1

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A. FLOOD EFFECTS CAUSED BY DEVELOPMENT

A1	Development shall not be approved unless it can be demonstrated in a Flood Management Report that it has been designed and can be constructed so that in all events up to the 1% AEP event: (a) There are no adverse impacts on flood levels or velocities caused by alterations to the flood conveyance; and (b) There are no adverse impacts on surrounding properties; and (c) It is sited to minimise exposure to flood hazard. Major developments and developments likely to have a significant impact on the PMF flood regime will need to demonstrate that there are no adverse impacts in the Probable Maximum Flood.
A2	Development shall not be approved unless it can be demonstrated in a Flood Management Report that in all events up to the 1% AEP event there is no net loss of flood storage. Consideration may be given for exempting the volume of standard piers from flood storage calculations. If Compensatory Works are proposed to balance the loss of flood storage from the development, the Flood Management Report shall include detailed calculations to demonstrate how this is achieved.

B. BUILDING COMPONENTS AND STRUCTURAL SOUNDNESS

B1	All buildings shall be designed and constructed with flood compatible materials in accordance with "Reducing Vulnerability of Buildings to Flood Damage: Guidance on Building in Flood Prone Areas", Hawkesbury-Nepean Floodplain Management Steering Committee (2006).
B2	All new development must be designed and constructed to ensure structural integrity up to the Flood Planning Level, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Where shelter-in-place refuge is required, the structural integrity for the refuge is to be up to the Probable Maximum Flood level. Structural certification shall be provided confirming the above.
B3	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 Flood Planning Level. All existing electrical equipment and power points located below the Flood Planning Level within the subject structure must have residual current devices installed that turn off all electricity supply to the property when flood waters are detected.

C. FLOOR LEVELS

C1	New floor levels within the development shall be at or above the Flood Planning Level.
C2	All floor levels within the development shall be at or above the Probable Maximum Flood level or Flood Planning Level, whichever is higher.
C3	All new development must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no net loss of flood storage in all events up to the 1% AEP event. For suspended pier/pile footings: (a) The underfloor area of the dwelling below the 1% AEP flood level is to be designed and constructed to allow clear passage of floodwaters, taking into account the potential for small openings to block; and (b) At least 50% of the perimeter of the underfloor area is of an open design from the natural ground level up to the 1% AEP flood level; and (c) No solid areas of the perimeter of the underfloor area would be permitted in a floodway
C4	A one-off addition or alteration below the Flood Planning Level of less than 30 square metres (in total, including walls) may be considered only where: (a) it is an extension to an existing room; and (b) the Flood Planning Level is incompatible with the floor levels of the existing room; and (c) out of the 30 square metres, not more than 10 square metres is below the 1% AEP flood level. This control will not be permitted if this provision has previously been utilised since the making of this Plan. The structure must be floodproofed to the Flood Planning Level, and the Flood Management Report must demonstrate that there is no net loss of flood storage in all events up to the 1% AEP event.
C5	The applicant must demonstrate that future development following a subdivision proposal can be undertaken in accordance with this Development Control Plan.
C6	Consideration may be given to the retention of an existing floor level below the Flood Planning Level when undertaking a first floor addition provided that: (a) it is not located within a floodway; and (b) the original foundations are sufficient to support the proposed final structure above them. The Flood Management Report must include photos and the structural certification required as per Control B2 must consider whether the existing foundations are adequate or should be replaced; and (c) none of the structural supports/framing of existing external walls of are to be removed unless the building is to be extended in that location; and (d) the ground floor is floodproofed.
C7	Consideration may be given to a floor level below the Flood Planning Level within the first 5 metres from the street front in an existing business zone provided it can be demonstrated that: (a) The minimum floor level is no lower than the adjacent footpath level, and (b) The maximum internal distance from the front of the building is 5 metres, which can only apply to one side of an individual premises, and (c) The maximum area for the floor area to be below the Flood Planning Level for an individual premises is 30 square metres, and (d) There is direct internal access between areas above and below the Flood Planning Level for each individual premises

D. CAR PARKING

D1	Open carpark areas and carports shall not be located within a floodway.
D2	The lowest floor level of open carparks and carports shall be constructed no lower than the natural ground levels, unless it can be shown that the carpark or carport is free draining with a grade greater than 1% and that flood depths are not increased.
D3	Carports must be of open design, with at least 2 sides completely open such that flow is not obstructed up to the 1% AEP flood level. Otherwise it will be considered to be enclosed. When undertaking a like-for-like replacement and the existing garage/carport is located on the street boundary and ramping is infeasible, consideration may be given for dry floodproofing up to the 1% AEP flood level.
D4	Where there is more than 300mm depth of flooding in a car park or carport during a 1% AEP flood event, vehicle barriers or restraints are to be provided to prevent floating vehicles leaving the site. Protection must be provided for all events up to the 1% AEP flood event
D5	Enclosed Garages must be located at or above the 1% AEP level
D6	All enclosed car parks (including basement carparks) must be protected from inundation up to the Flood Planning Level. All access, ventilation, driveway crests and any other potential water entry points to any enclosed car parking shall be above the Flood Planning Level. Where a driveway is required to be raised it must be demonstrated that there is no net loss to available flood storage in any event up to the 1% AEP flood event and no impact on flood conveyance through the site. Council will not accept any options that rely on electrical, mechanical or manual exclusion of the floodwaters from entering the enclosed carpark
D7	All enclosed car parks must be protected from inundation up to the Probable Maximum Flood level or Flood Planning Level whichever is higher. For example, basement carpark driveways must be provided with a crest at or above the relevant Probable Maximum Flood level or Flood Planning Level whichever is higher. All access, ventilation and any other potential water entry points to any enclosed car parking shall be at or above the relevant Probable Maximum Flood level or Flood Planning Level whichever is higher.

E. EMERGENCY RESPONSE

E1	If the property is affected by a Flood Life Hazard Category of H3 or higher, then Control E1 applies and a Flood Emergency Assessment must be included in the Flood Management Report. If the property is affected by a Flood Life Hazard Category of H6, then development is not permitted unless it can be demonstrated to the satisfaction of the consent authority that the risk level on the property is or can be reduced to a level below H6 or its equivalent. If the property is flood affected but the Flood Life Hazard Category has not been mapped by Council, then calculations for its determination must be shown in the Flood Management Report, in accordance with the "Technical Flood Risk Management Guideline: Flood Hazard", Australian Institute for Disaster Resilience (2012). Where flood-free evacuation above the Probable Maximum Flood level is not possible, new development must provide a shelter-in-place refuge where: a) The floor level is at or above the Probable Maximum Flood level; and b) The floor space provides at least 2m² per person where the flood duration is long (6 or more hours) in the Probable Maximum Flood event, or 1m² per person for less than 6 hours; c) It is intrinsically accessible to all people on the site, plainly evident, and self-directing, with sufficient capacity of access routes for all occupants without reliance on an elevator; and d) It must contain as a minimum: sufficient clean water for all occupants; portable radio with spare batteries; torch with spare batteries; and a first aid kit Class 10 classified buildings and structures (as defined in the Building Codes of Australia) are excluded from this control. In the case of change of use or internal alterations to an existing building, a variation to this control may be considered if justified appropriately by a suitably qualified professional. Note that in the event of a flood, occupants would be required to evacuate if ordered by Emergency Services personnel regardless of the availability of a shelter-in-place refuge.
E2	If a shelter-in-place refuge is required, it must contain as a minimum: sufficient clean water for all occupants; portable radio with spare batteries; torch with spare batteries; a first aid kit; emergency power; and a practical means of medical evacuation.
E3	It must be demonstrated that evacuation or a shelter-in-place refuge in accordance with the requirements of this DCP will be available for any potential development arising from a Torrens title subdivision.

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F. FENCING

F1	Fencing, (including pool fencing, boundary fencing, balcony balustrades and accessway balustrades) shall be designed so as not to impede the flow of flood waters and not to increase flood affectation on surrounding land. At least 50% of the fence must be of an open design from the natural ground level up to the 1% AEP flood level. Less than 50% of the perimeter fence would be permitted to be solid. Openings should be a minimum of 75 mm x 75mm.

G. STORAGE OF GOODS

G1	Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.

H. POOLS

H1	Pools located within the 1% AEP flood extent are to be in-ground, with coping flush with natural ground level. Where it is not possible to have pool coping flush with natural ground level, it must be demonstrated that the development will result in no net loss of flood storage and no impact on flood conveyance on or from the site. 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.

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Appendix E – Form A/A1 Northern Beaches Council Standard Hydraulic Certification form

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Attachment A

NORTHERN BEACHES COUNCIL
STANDARD HYDRAULIC CERTIFICATION FORM
FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: 8 Bate Avenue, Allambie Heights

Declaration made by hydraulic engineer or professional consultant specialising in flooding/flood risk management as part of undertaking the Flood Management Report:

I, Hussein Naji (Insert Name) on behalf of Horizon Engineers (Trading or Business/ Company Name)

on this the 11/05/2021 (Date) certify that I am engineer or a professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least $2 million.

***Flood Management Report* Details:**

Report Title:

Flood Risk Management Report

Report Date: 11/05/2021

Author: Sanny Sanny

Author's Company/Organisation: Horizon Engineers

I: Hussein Naji
(Insert Name)

Please tick all that are applicable (more than one box can be ticked)

☑ have obtained and included flood information from Council (must be less than 12 months old) (**This is mandatory**)

☑ have followed Council's Guidelines for Preparing a Flood Management Report

☐ have requested a variation to one or more of the flood related development controls. Details are provided in the *Flood Management Report*.

Signature 

Name Hussein Naji