

Flood Risk Management Report

84 Lagoon Street, Narrabeen, NSW, 2101

14th January 2025

Ref: D24119



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Revision	Date	Prepared By	Approved By
A	14/01/2025	JD	DM

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Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARI	Average Recurrence Interval
PMF	Probable Maximum Flood
SES	State Emergency Service
BoM	Bureau of Meteorology
LGA	Local Government Area

1. Introduction

Danmor Consulting Engineers has been engaged by the client to prepare a Flood Risk Management Report for the development at 84 Lagoon Street, Narrabeen, NSW, 2101 (See **Figure 1.1**).

The purpose of this report is to:

- Investigate the site and local flood conditions.
- Describe the design criteria of the new dwelling to be constructed at the site.
- Investigate the impact on the flow of flood waters.
- Analyse the flood behaviour and risk related to the proposed development.
- Develop a flood evacuation management plan to ensure safety of residents in the event of a flood.



Figure 1.1: Site Map (From SIX Maps)

2. Site Description

The subject site is approximately 784 m² and naturally slopes away from Lagoon Street to Narrabeen Lake. The existing site consists of a single storey dwelling house with a granny flat, and the proposal is the demolition of the existing main dwelling and the construction of a two-storey dwelling with a basement. The proposed level of the basement is RL 4.130, the ground floor being internally located at RL 7.130, and the first floor being internally located at RL 13.130.

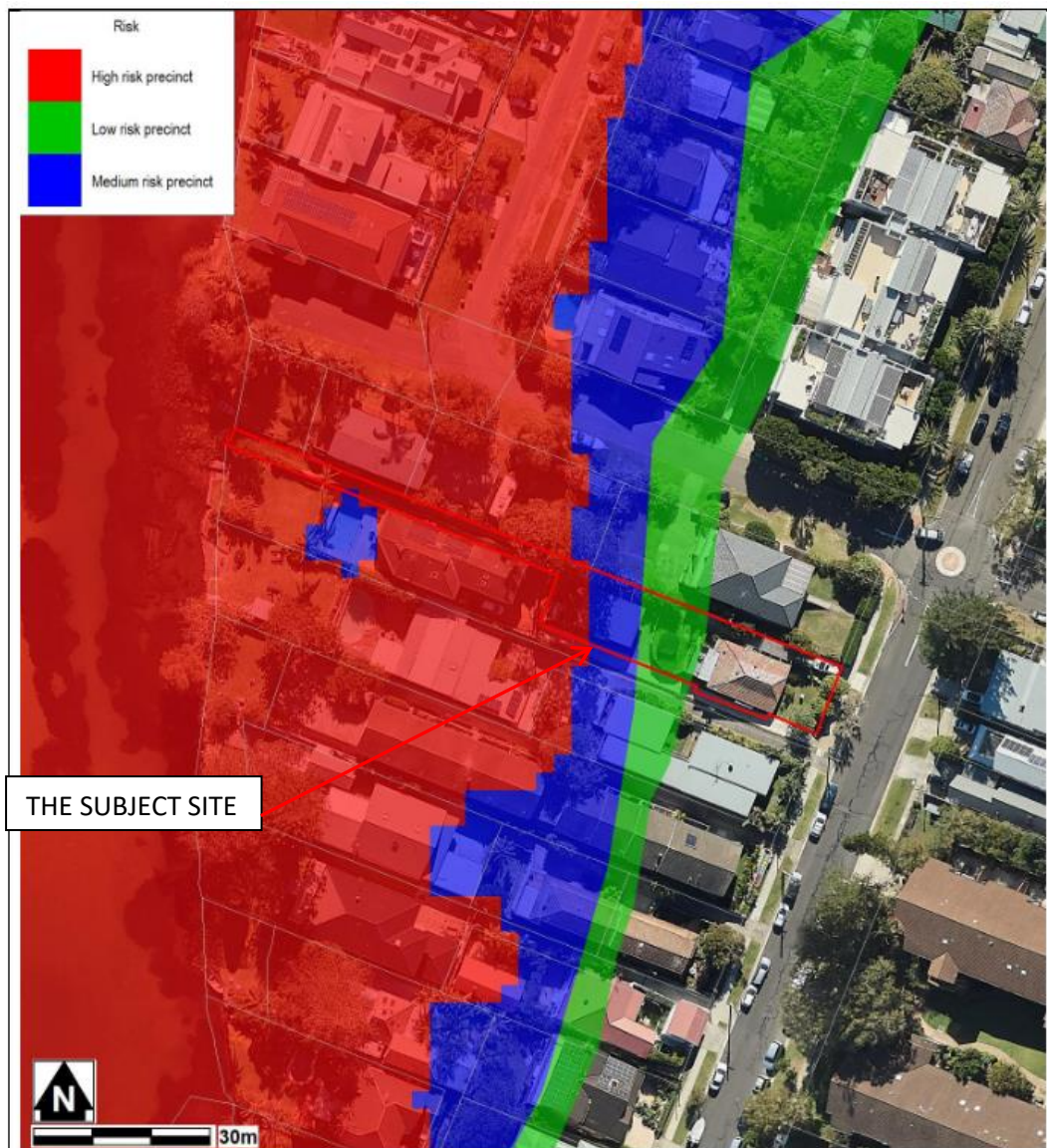
The architectural plans are attached in Appendix A and the Existing survey of this site is attached in Appendix B.

3. Flood levels and Design Requirement

3.1 Nature and Risk of flood

The subject property 84 Lagoon Street, Narrabeen is identified as flood affected by the 1% Annual Exceedance Probability (AEP) according to the “Comprehensive Flood Information Report” (dated 21/11/2024) prepared by Northern Beaches Council. The proposed development within the site, however, is located within the “Low Risk Precinct”.

As per the Flood Risk Precinct Mapping from the flood study, the subject site is identified to be located within a High Flood Risk precinct (see Figure 3.1.1 within the next page).



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.
- 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.

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Figure 3.1.1: Flood Risk Precincts

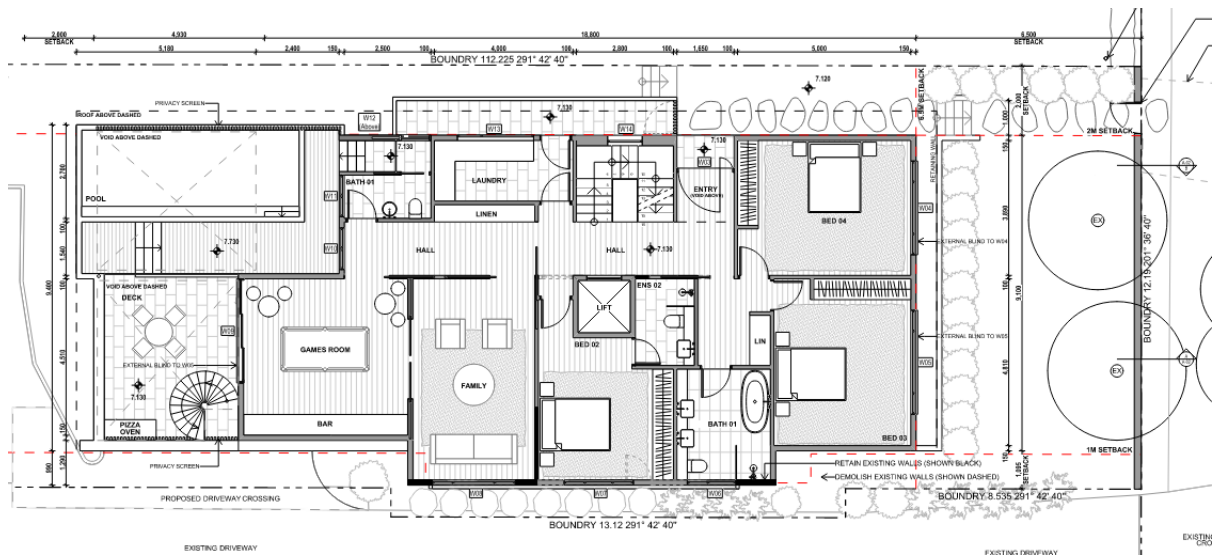


Figure 4.1.2: Proposed Ground Floor layout.



Figure 4.1.3: 1% AEP Flood Extent Map

Above is the 1% AEP Flood Extent Map where the blue shade indicates the areas affected by the 1% AEP flood event and the 0.9 m sea Level Rise climate scenario. The nodes, indicated by the small squares and respectively numbered, are points of interest in the Council's report. Note that Nodes 5 through 1 are not located within the 1% AEP Flood Extent.



Figure 4.1.4: PMF Flood Extent Map

Above is the 1% AEP Flood Extent Map where the blue shade indicates the areas affected by the 1% AEP flood event and the 0.9 m sea Level Rise climate scenario. Note that this site may be subject to events exceeding the 1% AEP.

The development site may be subject to inundation during a 100 year and PMF event. As per requirement of council DCP that the minimum habitable floor level shall be 500 mm above 100-year ARI flood event level for minor overland flows.

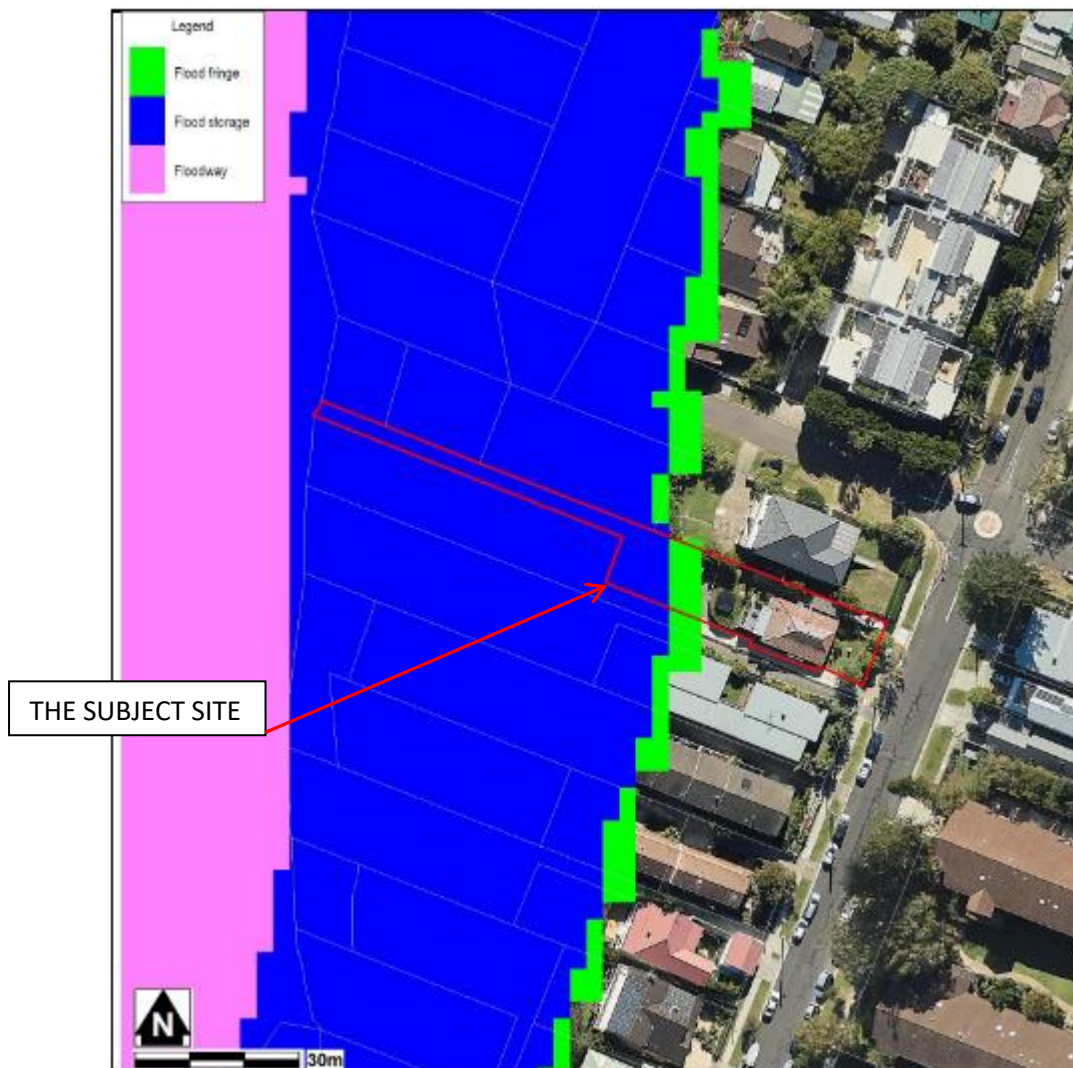


Figure 4.1.5: 1% AEP Flood Hydraulic Category Extent Map

	Lagoon Street
1% AEP	3.03 m AHD
PMF	4.89 m AHD
Flood Planning Level (FPL)	3.53 m AHD
Flooding with Climate Change	3.90 m AHD

Table 4.1.3: Summary of flood Levels at Lagoon Street

4.2 Structure soundness

A Structure Engineer's certificate shall be provided to certify that the structures can withstand the force of floodwater debris and buoyancy up to and including a PMF event. Structural engineering certification should be submitted with the C.C. application.

4.3 Flood Compatible Fencing

Flow-through open form fencing (louvres or pool fencing) are required on the Lagoon Street frontage up to the 1% AEP Flood Level to allow flood water to flow through. The fence shall be flood compatible with vertical elements that are no wider than 50mm and separated by no less than 90mm to allow floodwater to flow through unimpeded.

4.4 Building materials/Components

The proposed building shall be physically protected to the minimum 1% AEP Flood planning levels. All electrical connections, air conditioning units, or external power points are to be set above the Flood planning levels as stated in Table 4.1.3 above. Any portion of buildings classified as being flood liable shall be constructed from flood compatible materials as per the below table.

Building component	Flood compatible material
Flooring and sub-floor	<ul style="list-style-type: none"> concrete slab-on-ground monolith suspended reinforced concrete slab
Floor covering	<ul style="list-style-type: none"> clay tiles concrete, precast or in situ concrete tiles epoxy, formed-in-place mastic flooring, formed-in-place rubber sheets or tiles with chemicals-set-adhesive silicone floors formed-in-place vinyl sheets or tiles with chemical-set adhesive ceramic tiles, fixed with mortar or chemical-set adhesive asphalt tiles, fixed with water resistant adhesive
Wall structure	<ul style="list-style-type: none"> solid brickwork, blockwork, reinforced, concrete or mass concrete
Roofing structure (for situations where the relevant flood level is above the ceiling)	<ul style="list-style-type: none"> reinforced concrete construction galvanised metal construction
Doors	<ul style="list-style-type: none"> solid panel with water proof adhesives flush door with marine ply filled with closed cell foam painted metal construction aluminium or galvanised steel frame
Wall and ceiling linings	<ul style="list-style-type: none"> fibro-cement board brick, face or glazed clay tile glazed in waterproof mortar concrete concrete block steel with waterproof applications stone, natural solid or veneer, waterproof grout

	<ul style="list-style-type: none"> • glass blocks • glass • plastic sheeting or wall with waterproof adhesive
Insulation windows	<ul style="list-style-type: none"> • foam (closed cell types) • aluminium frame with stainless steel rollers or similar corrosion and water-resistant material
Nails, bolts, hinges and fittings	<ul style="list-style-type: none"> • brass, nylon or stainless steel • removable pin hinges • hot dipped galvanised steel wire nails or similar
<p>Electrical and mechanical equipment For development constructed on land to which this section of the DCP applies, the electrical and mechanical materials, equipment and installation must conform to the following requirements:</p> <p>Main power supply Subject to the approval of the relevant authority the incoming main commercial power service equipment, including all metering equipment, must be located above the relevant flood level. Means must be available to easily disconnect the dwelling from the main power supply.</p> <p>Wiring All wiring, power outlets, switches, must be, to the maximum extent possible, located above the maximum flood level. All electrical wiring installed below this level must be suitable for continuous underwater immersion and must contain no fibrous components. Each leakage circuit-breaker (core balance relays) must be installed. Only submersible type splices must be used below maximum flood level. All conduits located below the relevant designated flood level must be so installed that they will be self-draining if subjected to flooding.</p> <p>Equipment All equipment installed below or partially below the relevant flood level must be capable of disconnection by a single plug and socket assembly.</p> <p>Reconnection Should any electrical device and/or part of the wiring be flooded it must be thoroughly cleaned or replaced and checked by an approved electrical contractor before reconnection</p>	<p>Heating and air conditioning systems Where viable, heating and air conditioning systems should be installed in areas and spaces of the development above maximum flood level. When this is not feasible, every precaution must be taken to minimise the damage caused by submersion according to the following guidelines:</p> <p>Fuel Heating systems using gas or oil as fuel must have a manually operated valve located in the fuel supply line to enable fuel cut-off.</p> <p>Installation Heating equipment and fuel storage tanks must be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. All storage tanks must be vented to an elevation of 600mm above the relevant flood level.</p> <p>Ducting All ductwork located below the relevant flood level must be provided with openings for drainage and cleaning. Self-draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or floor below the relevant flood level, a closure assemble operated from above relevant flood level must protect the ductwork.</p>

Table 4.1.4.1 Flood Compatible Materials (Refer to Structural Engineer for details)

5. Flood Evacuation Plan

5.1 Before the flood

For those who live in areas subject to flooding, the effects of being unprepared can result significant loss of their property. Unfortunately, some people lost their lives in floods. If you are living in an area which is subject to flooding, it is significantly important for you to learn how to protect yourself, your family, pets and property before a flood.

5.1.1 Flood Awareness

The flood awareness of the community is a key factor in reducing the potential flood damages. A community with high flood awareness will suffer less damage during and after a flood because they know how to response to flood in an efficient and safe manner. Therefore, a flood awareness campaign/program is strongly recommended to raise flood awareness of the community, including how to remain safe in a flood and what to do to reduce loss and damages.

The most suitable measure to raise flood awareness needs to be developed by council, which should take into account the views of the local community, funding consideration and other awareness program within LGA. The details of the exact method need to be developed in consultation with affected communities.

In addition, an appropriate flood warning sign shall be placed at the front of the building in a prominent location to make residents and the visitors aware of the potential risk during heavy rains.

5.2 During the flood

5.2.1 Flood Evacuation plan for proposed development

The proposed development is generally not affected by the 100-year ARI flood event. Therefore, residents are recommended to stay inside their property during a flood unless an evacuation warning is issued by the SES for this area, which will be broadcast over the radio station. When residents observe plenty of water approaching the ground floor level, they shall move to First Floor of the building, which is higher than the PMF levels.

The following summarizes the key things for the proposed development during a flood:

- Stay at home as it is dangerous to enter flood water as it will rise and move quickly due to the nature of flood.
- Keep an emergency kit handy
- People who come to visit shall stay with their friends or relatives until it is safe to leave
- Never drive, ride or work through floodwater
- Keep listening to the radio for information and updates
- Keep in contact with your neighbour

5.3 After the flood

Severe weather and flood can result in loss and damages to property and many potential safety issues. The following are things you can do after a flood

- Ensure the structural stability of your property after a flood.
- Check for damage to your property.
- Carry out inspection before turning electricity and gas on.
- If electricity equipment or appliance which has been exposed to floodwater or water damaged, they must be inspected by a qualified electrician before use.
- Wear suitable protective equipment, such as boots and gloves.

6. Conclusions and recommendations

1. All habitable and non-habitable area floor levels are in accordance with Council's flood control requirement.
2. A qualified structural engineer shall be engaged to access all the existing and proposed structures to demonstrate the building can withstand the forces of floodwater, debris and buoyancy up to and including a probable maximum flood (PMF) event. Structural engineering certification should be submitted with the C.C. application.
3. All electrical connections, air conditioning units, or external power points are to be set above the Flood planning levels. Any portion of buildings classified as being flood liable shall be constructed from flood compatible materials.
4. Flow-through open form fencing (louvres or pool fencing) is required for front fencing and gates up to the 1% AEP Flood Level to allow flood water to flow through.

7. References

'Comprehensive Flood Information Report', Northern Beaches Council, November 2024



APPENDIX A (Architectural Plans)

84 LAGOON ST NARRABEEN 2101 NSW

DEVELOPMENT APPLICATION- NEW HOUSE

SITE DETAILS

Council: Northern Beaches Council
Address: 84 Lagoon St, Narrabeen, NSW
Lot/Section/Plan no: Lot A D.P. 162009

DRAWING LIST

A-00	COVER PAGE
A-01	SITE PLAN & ANALYSIS
A-02	LOWER GROUND FLOOR PLAN
A-03	GROUND FLOOR PLAN
A-04	LEVEL 1 FLOOR PLAN
A-05	EAST & WEST ELEVATION
A-06	NORTH AND SOUTH ELEVATION
A-07	SECTIONS
A-08	LANDSCAPE PLAN
A-09	SHADOW DIAGRAMS

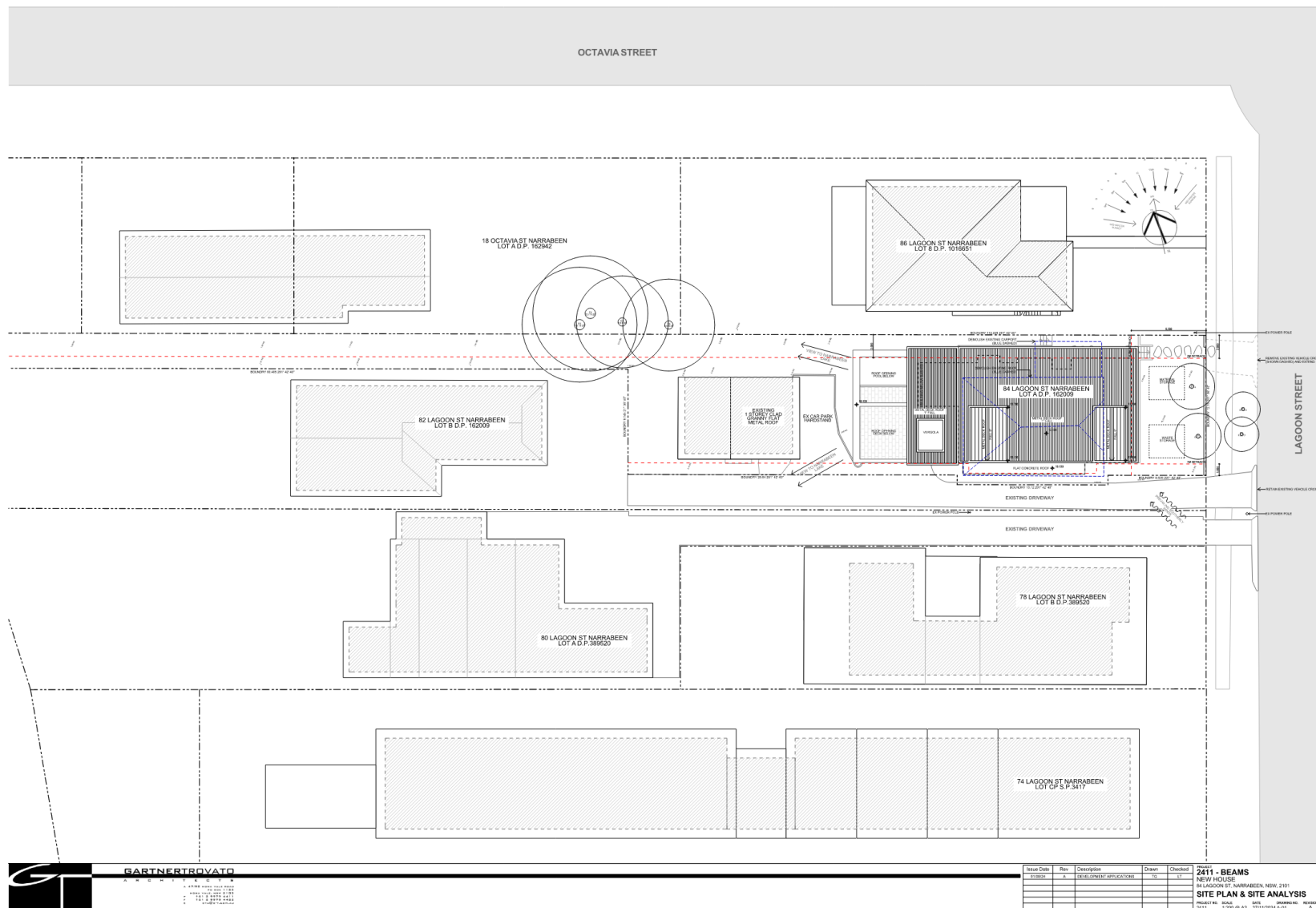
GLAZING SCHEDULE

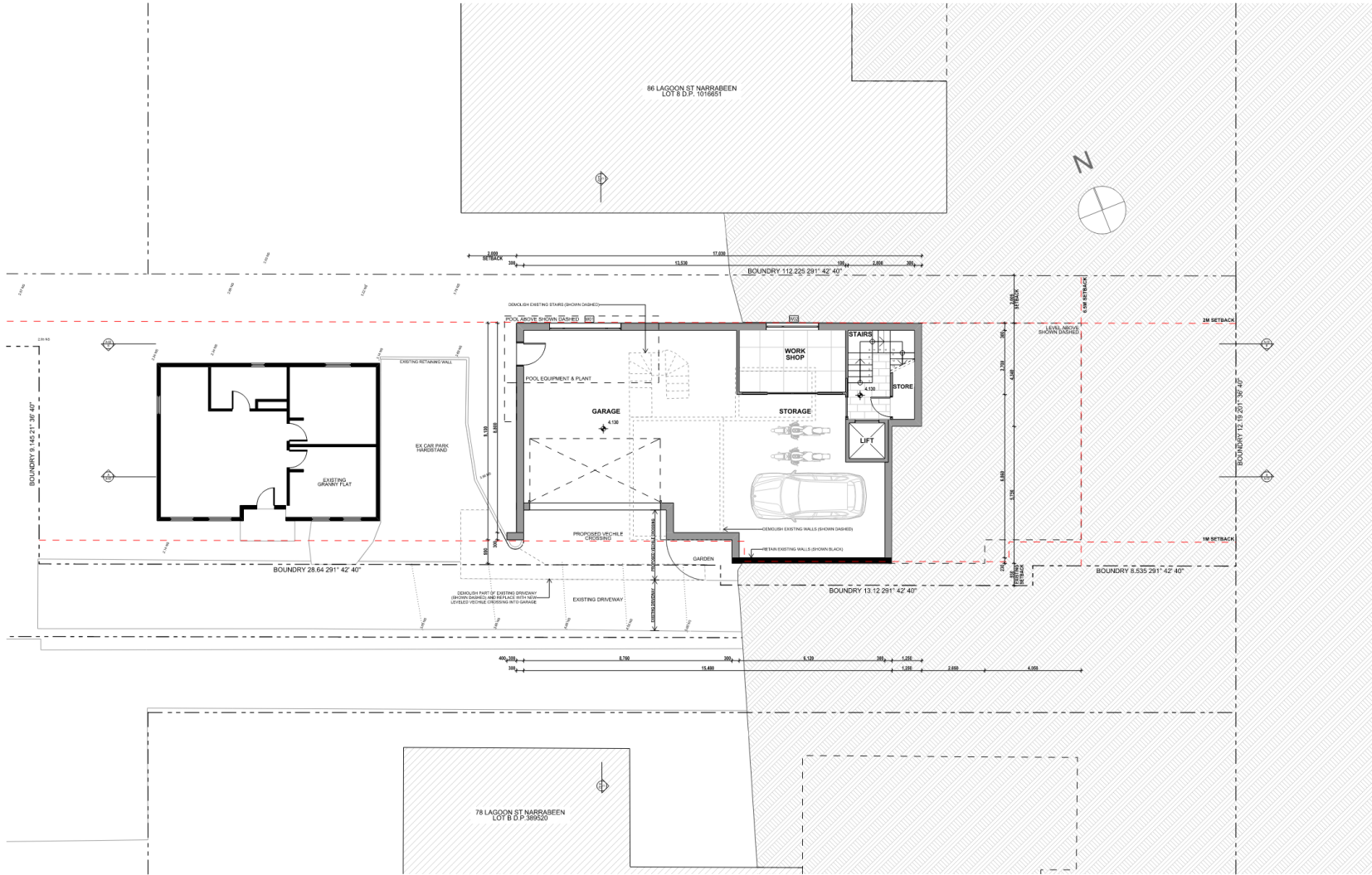
Window No.	Width	Height	Sill	Type	Area	External Blind
W01	3,000	700	1,400	Fixed & Sliding	2.10	No
W02	2,200	600	2,100	Fixed & Sliding	1.32	No
W03	1,650	2,700	0	Pivot Door	4.46	No
W04	2,700	1,200	1,500	Fixed & Sliding	3.24	YES
W05	3,000	1,200	1,500	Fixed & Sliding	3.60	YES
W06	1,400	1,000	900	Fixed & Sliding	1.40	No
W07	2,000	1,000	900	Fixed & Sliding	2.00	No
W08	2,400	1,000	900	Fixed & Sliding	2.40	No
W09	3,000	2,400	0	Sliding Stack	7.20	YES
W10	1,200	1,300	1,100	Sliding	1.56	No
W11	1,200	600	1,800	Sliding	0.72	No
W12	2,500	600	2,100	Fixed & Sliding	1.50	No
W13	2,200	600	900	Fixed & Sliding	1.32	No
W14	1,000	2,700	0	Fixed	2.70	No
W15	800	1,500	900	Sliding	1.20	No
W16	800	1,500	900	Sliding	1.20	No
W17	1,000	2,700	0	Fixed	2.70	No
W18	1,650	2,700	0	Fixed & Sliding	4.46	No
W20	2,400	2,700	0	Sliding Stack	6.48	No
W21	1,400	2,700	0	Sliding Stack	3.78	No
W22	3,000	1,700	1,000	Fixed & Sliding	5.10	YES
W23	1,200	700	900	Fixed & Sliding	0.84	No
W24	900	700	900	Sliding	0.63	No
W25	1,000	700	900	Sliding	0.70	No
W26	1,000	700	900	Sliding	0.70	No
W28	3,200	2,400	0	Sliding Stack	7.68	Yes
W29	2,400	2,400	16	Sliding Stack	5.76	No
W30	2,000	1,500	900	Fixed & Louver	3.00	YES
W31	2,000	1,500	900	Fixed & Sliding	3.00	No
W32	2,400	500	0	Fixed	1.20	No
W33	3,000	500	0	Fixed	1.50	No

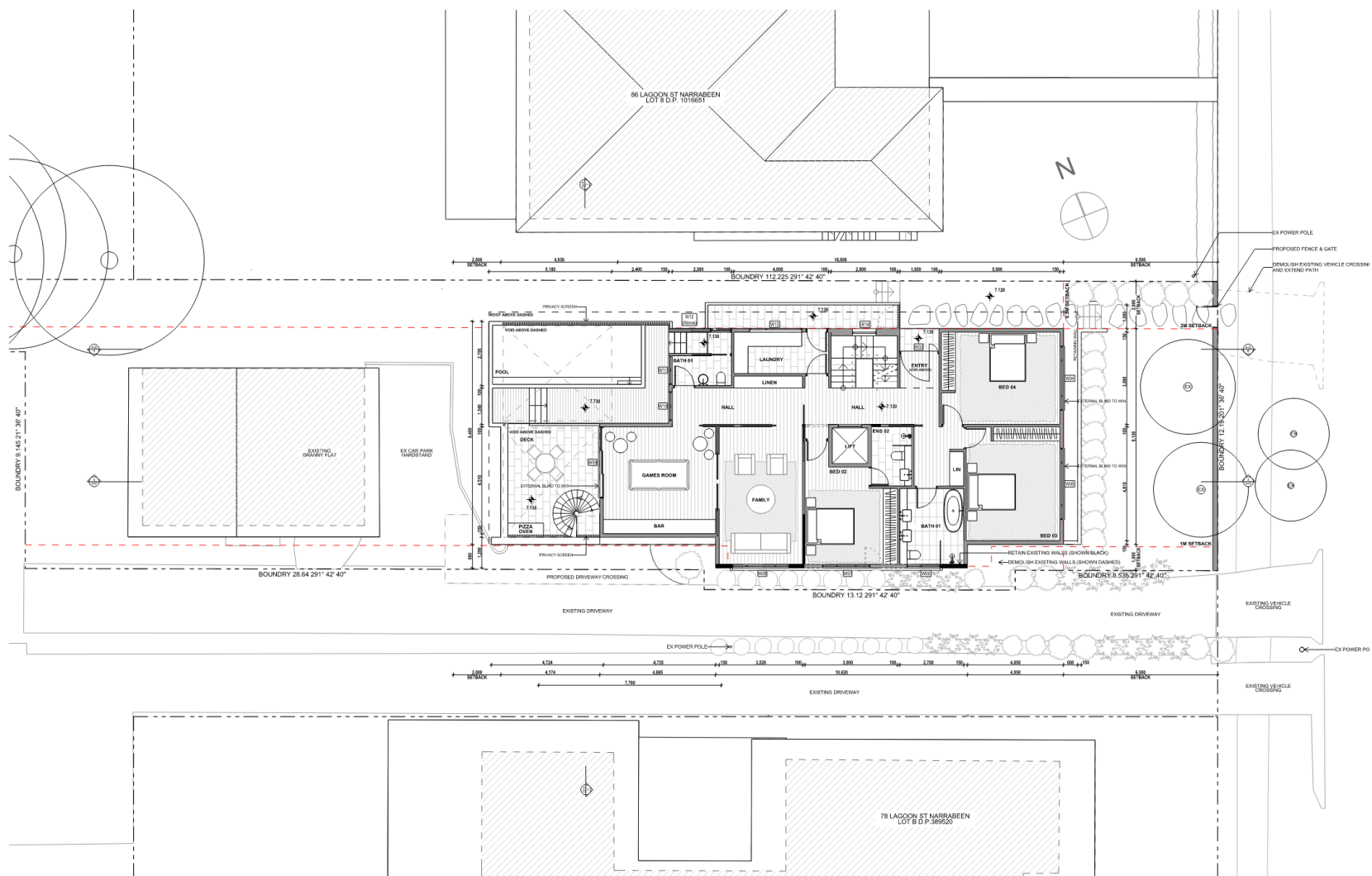


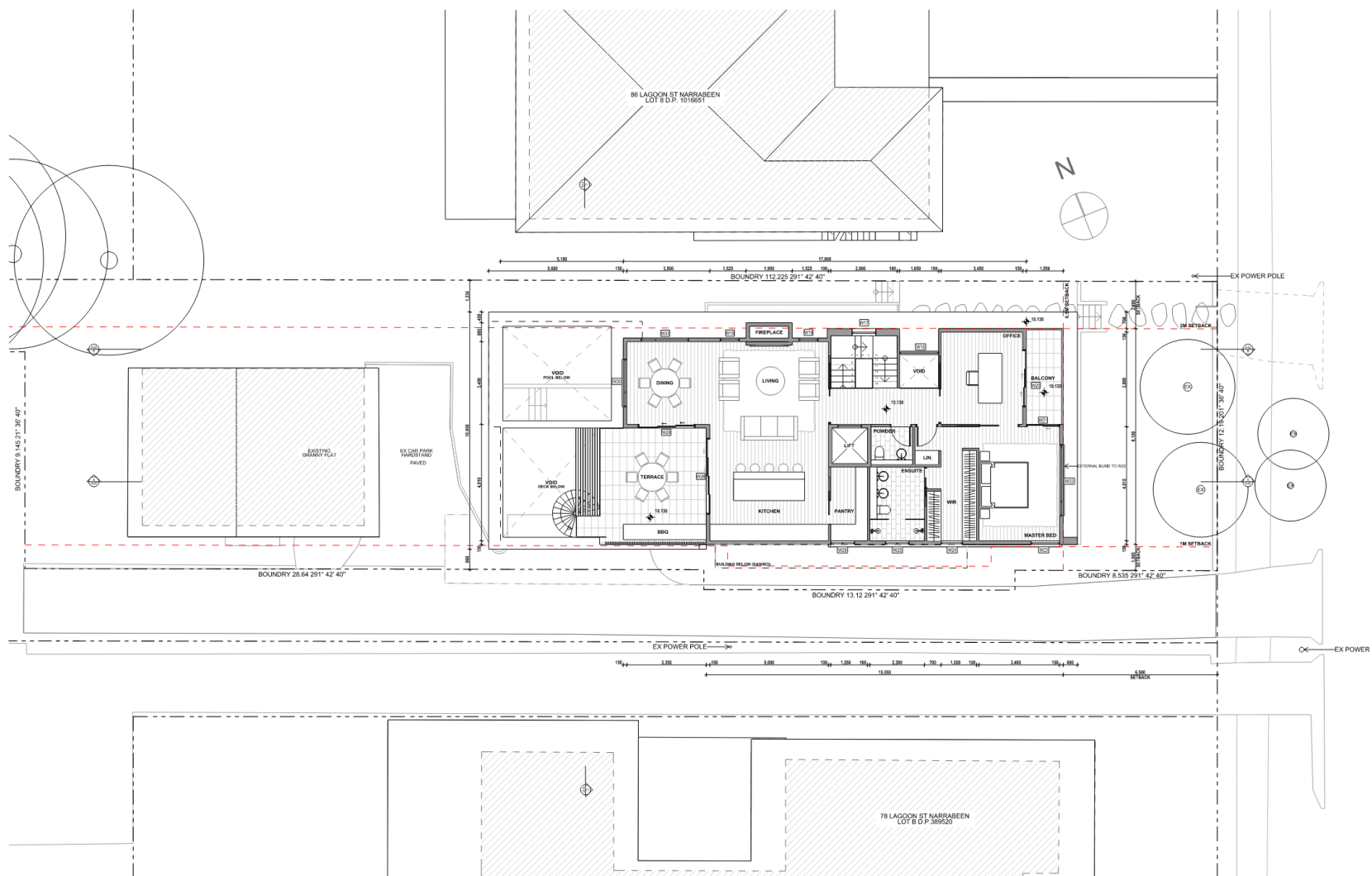
BASIX NOTES

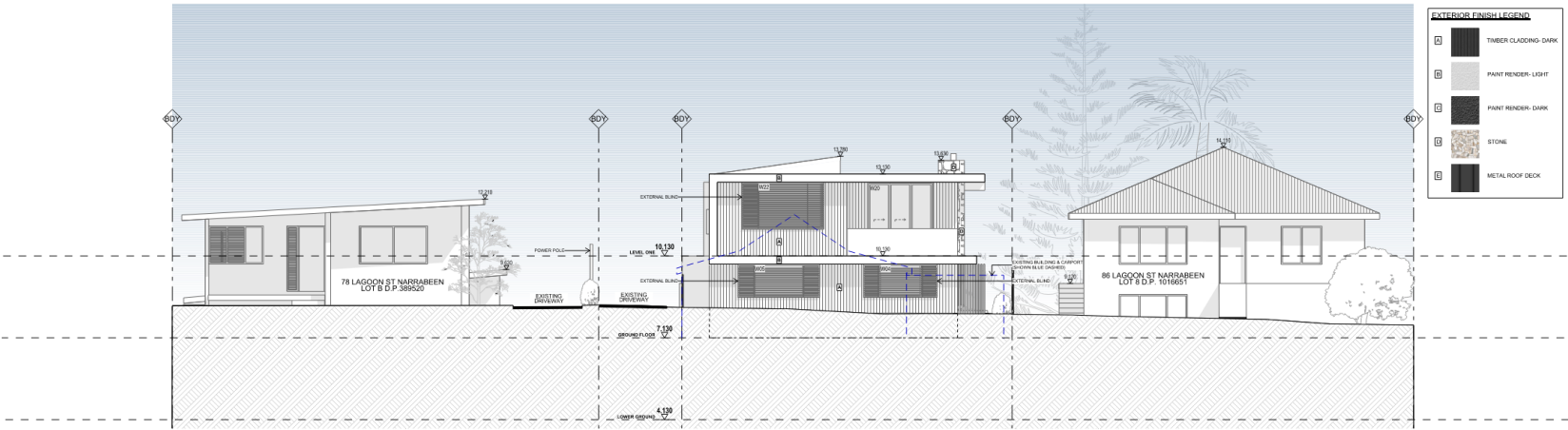
- metal roof (medium colour) with 70mm foil lined blanket
- R3.0 insulation to all ceilings adjacent to roof including terrace
- GF & FF external walls 50mm foam/reflective sarking + R3.0 insulation/plasterboard
- internal walls adjacent to bathrooms & laundry to include R2.5 insulation
- LGP & GP 200mm concrete slabs
- R2.5 insulation to slabs on ground (GF level)
- R4.0 insulation under floors adjacent to garage & outdoor air
- FF framed with timber flooring/plywood bracing uninsulated
- Louvre window breezeway U=4.3 SHGC=0.57 +/-5%
- All sliding doors custom aluminium thermally broken frames/DG/low e U=2.5 SHGC=0.45 +/-5%
- All fixed windows custom aluminium thermally broken frames/DG/low e U=2.2 SHGC=0.49 +/-5%
- All sliding/double hung windows aluminium thermally broken frames/DG/low e U=2.9 SHGC=0.51 +/-10%
- Entry door aluminium thermally broken frames/DG/low e U=2.9 SHGC=0.44 +/-10%
- All recessed downlights sealed and to allow for uninterrupted ceiling insulation
- All exhaust fans sealed
- Fireplace sealed
- Outdoor verandahs to W04, 05, 09, 22, 28 & 30
- Ceiling fans to living, office, family, games & all bedrooms (min 1200mm diameter)





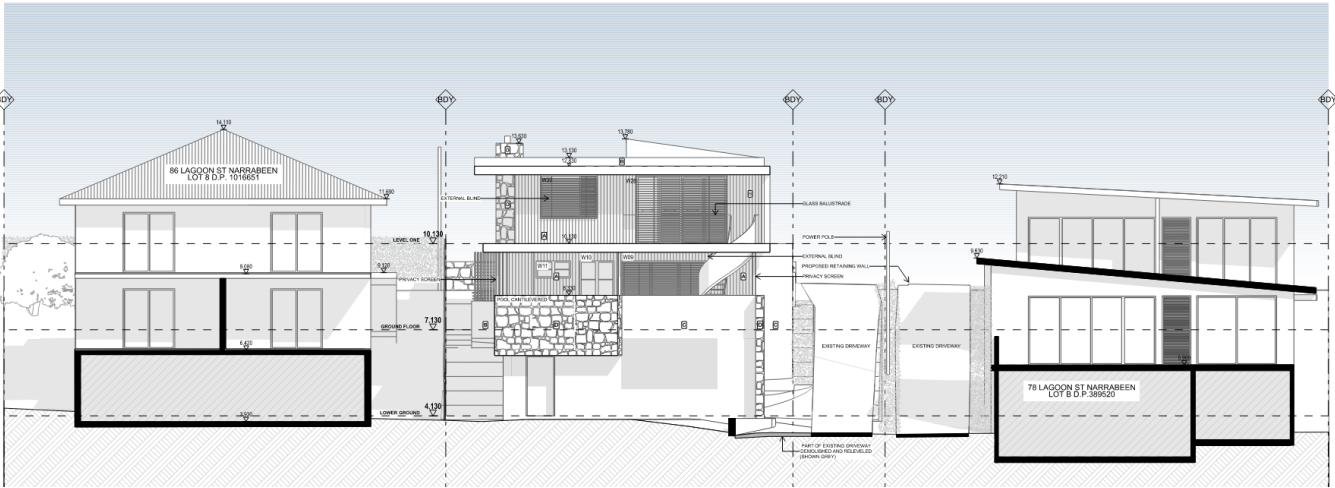






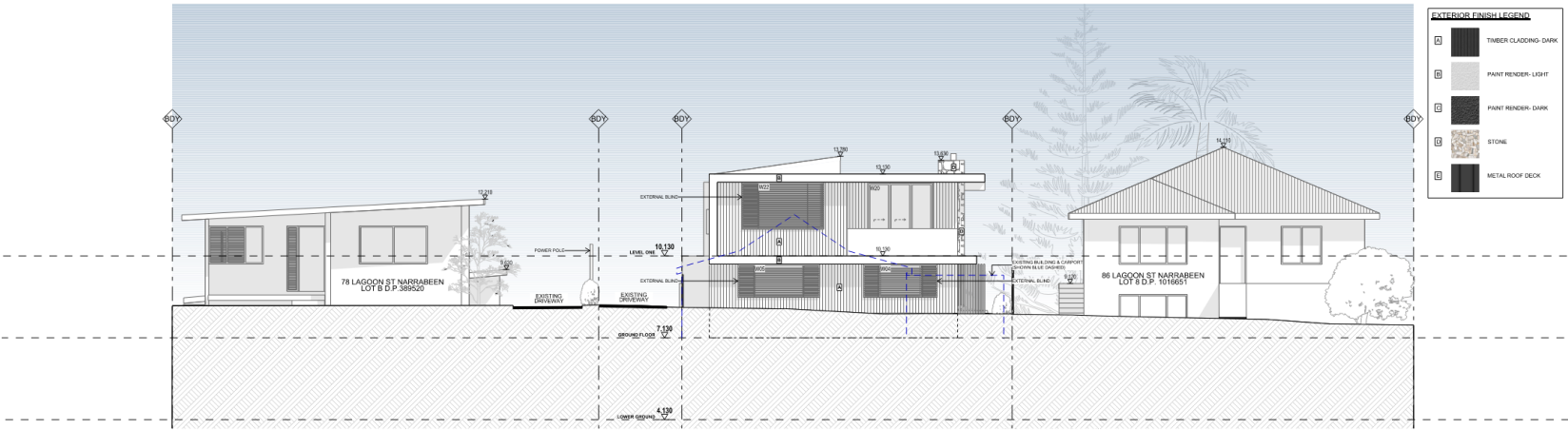
EAST ELEVATION

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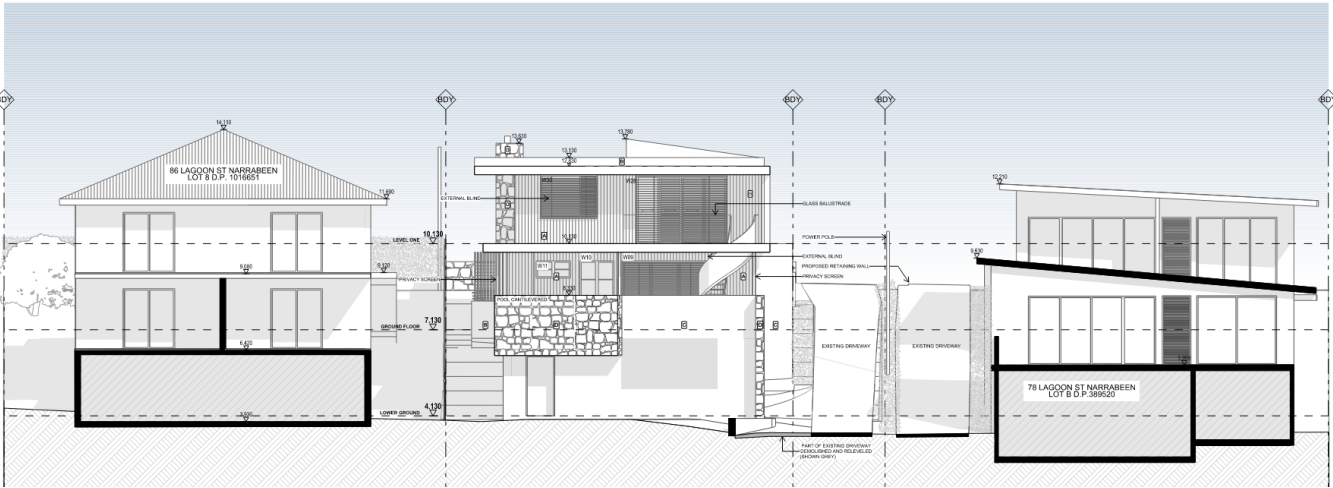
WEST ELEVATION

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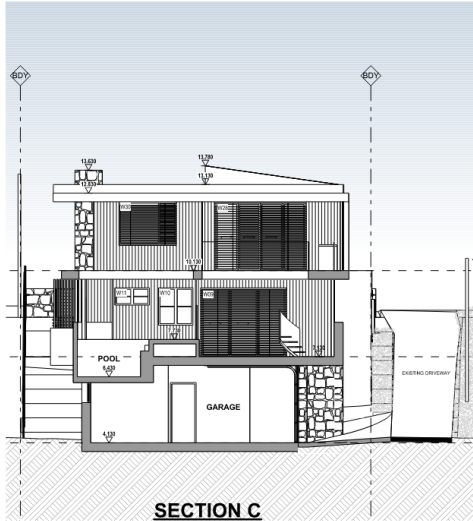
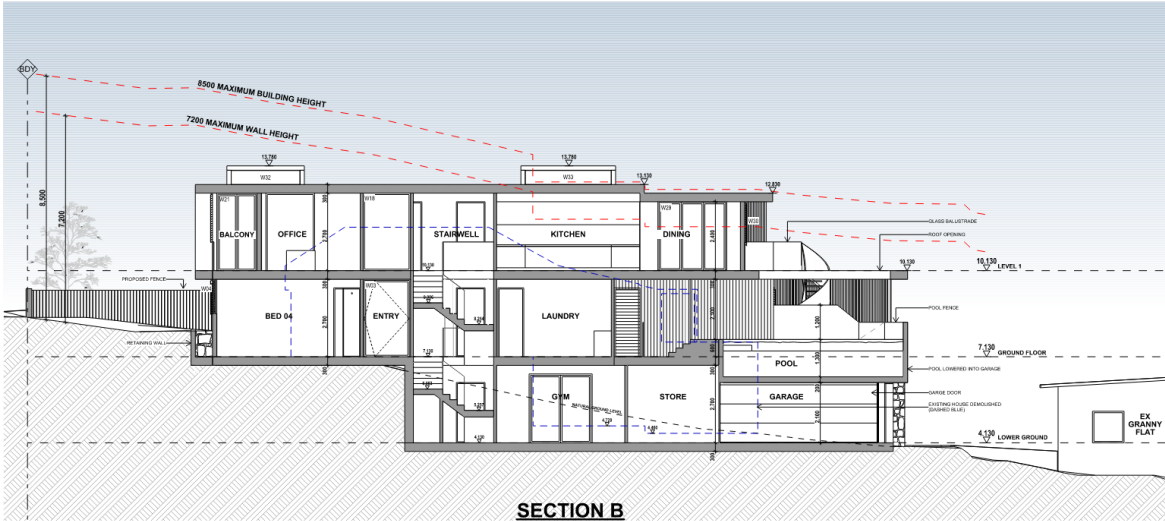
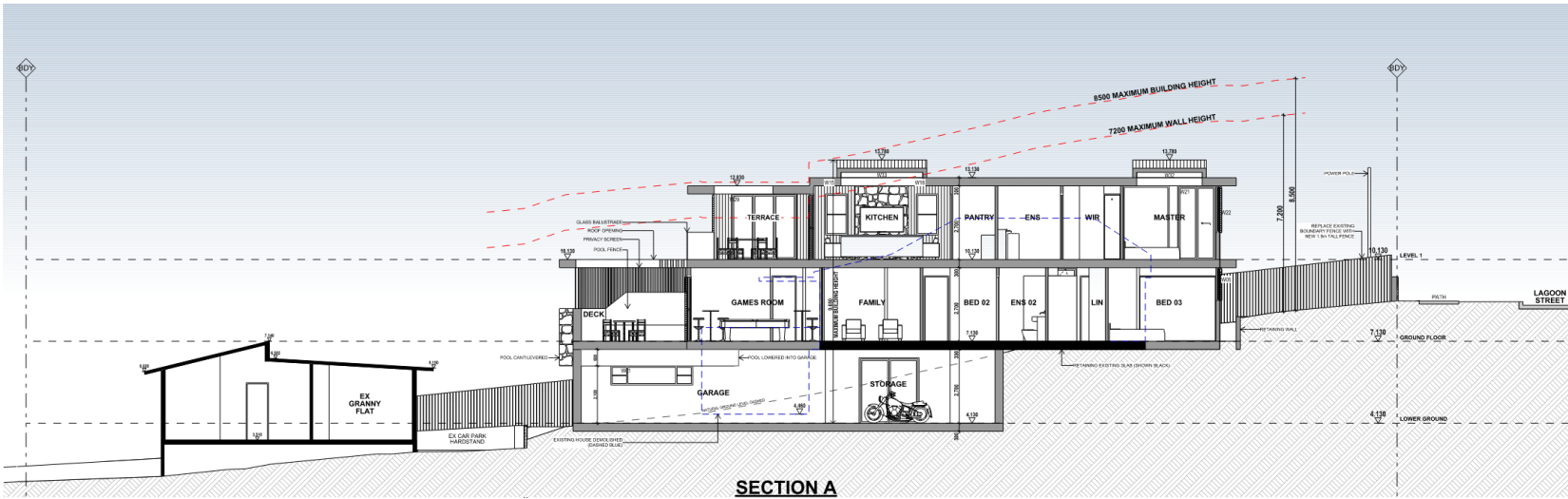
EAST ELEVATION

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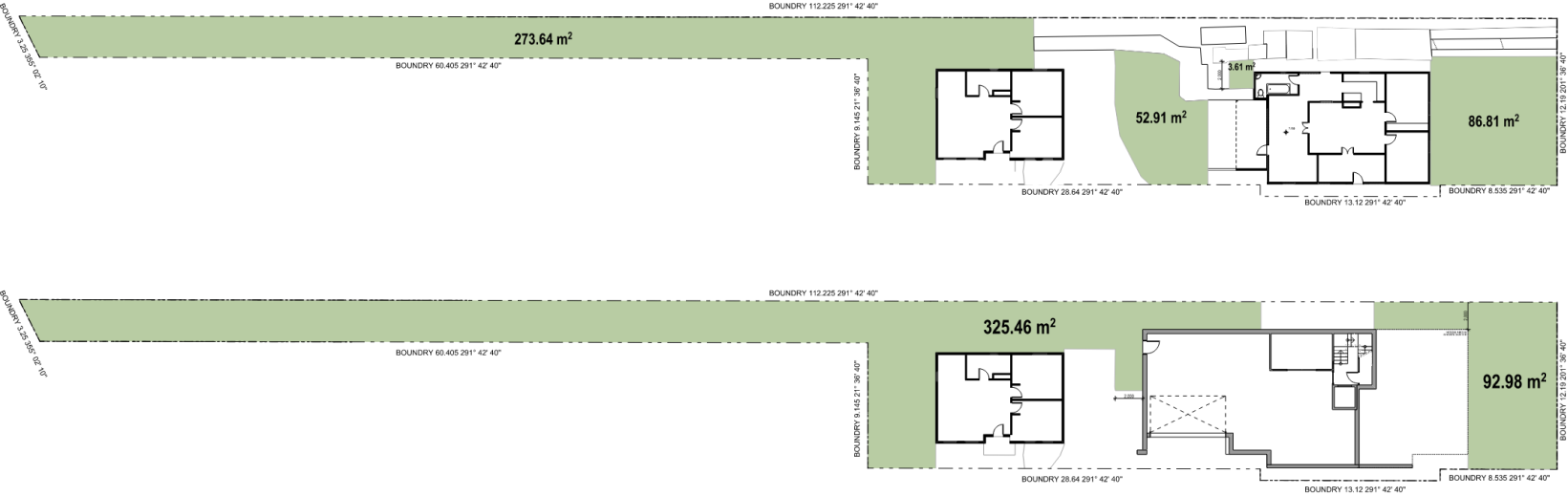


WEST ELEVATION

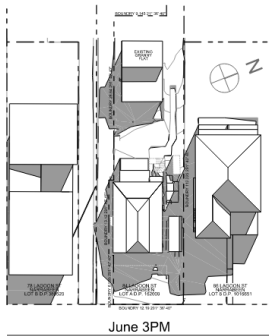
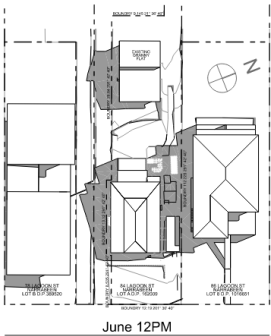
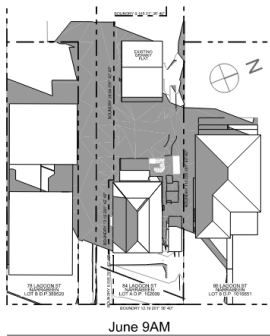
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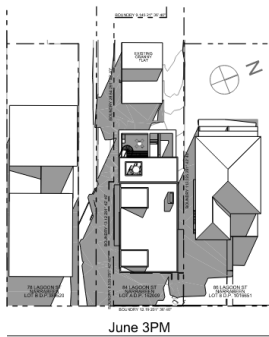
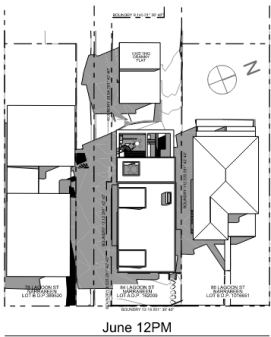
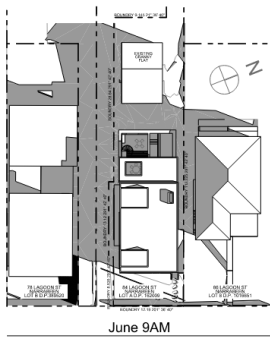
LANDSCAPE CALCULATIONS
NET SITE AREA: 784m ²
EXISTING LANDSCAPE AREA: 416.97m ² or 53.1%
PROPOSED LANDSCAPE AREA: 418.44 or 53.4%



EXISTING SHADOW DIAGRAMS



PROPOSED SHADOW DIAGRAMS





APPENDIX B (Survey Plan)



APPENDIX C (Flood Certificate & Council Flood Info.)



COMPREHENSIVE FLOOD INFORMATION REPORT

Property: 84 Lagoon Street NARRABEEN NSW 2101

Lot DP: Lot A DP 162009

Issue Date: 21/11/2024

Flood Study Reference: Narrabeen Lagoon Flood Study 2013, BMT WBM

Flood Information¹:

Map A - Flood Risk Precincts

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

Map B - 1% AEP Flood & Key Points

1% AEP Maximum Water Level ^{2,3}: 3.03 m AHD

1% AEP Maximum Depth from natural ground level³: 1.96 m

1% AEP Maximum Velocity: 0.33 m/s

Map C - 1% AEP Hydraulic Categorisation

1% AEP Hydraulic Categorisation: Flood storage / Flood fringe

Map D - Probable Maximum Flood

PMF Maximum Water Level (PMF) ⁴: 4.89 m AHD

PMF Maximum Depth from natural ground level: 3.82 m

PMF Maximum Velocity: 0.57 m/s

Map E - Flooding with Climate Change

1% AEP Maximum Water Level with Climate change ³: 3.90 m AHD

1% AEP Maximum Depth with Climate Change³: 2.83 m

Map F - Flood Life Hazard Category in PMF

H5 – H1

Map G - Indicative Ground Surface Spot Heights

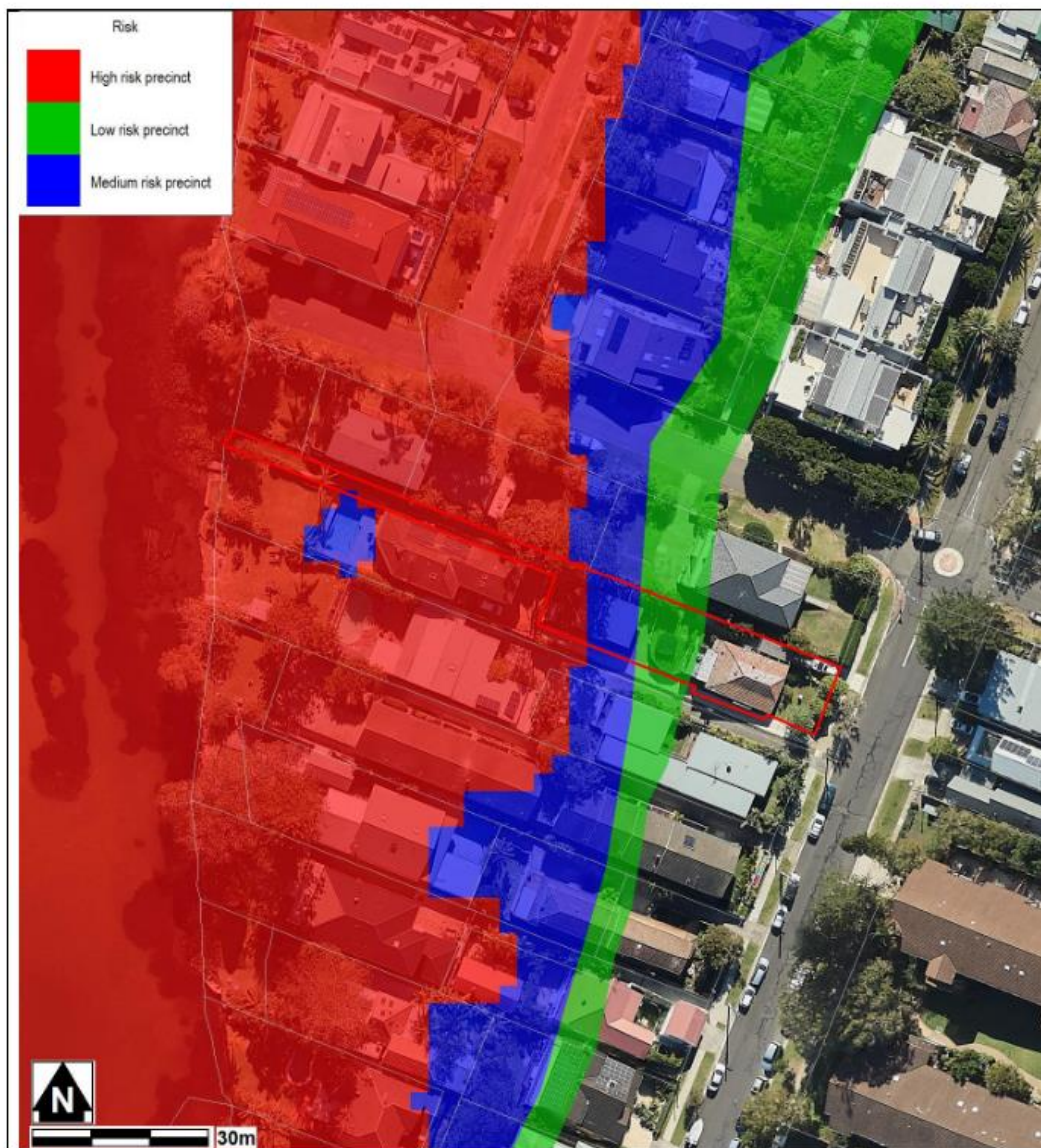
- ⁽¹⁾ The provided flood information does not account for any local overland flow issues nor private stormwater drainage systems.
- ⁽²⁾ Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/ flood planning levels across the site. The maximum Flood Planning 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

Notes

General

- 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 online [Flood Study Reports](#) webpage.
- If the FPL is higher than the PMF level, then the FPL should still be used as the FPL, as it includes freeboard which the PMF does not.
- If the property is affected by an Estuarine Planning Level (EPL) which is higher than the FPL, then the EPL should be used as the FPL.
- Areas affected by an EPL in the former Pittwater LGA are mapped on Council's online [Estuarine Hazard Map](#). Note that areas in the former Manly LGA affected by an EPL have been identified and will be soon added to this map.
- Council's drainage infrastructure is mapped on Council's [Stormwater Map](#). Note that locations are indicative only and may not be exactly as shown.

MAP A: FLOOD RISK PRECINCTS



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).
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- None of these mapped extents 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.

MAP B: FLOODING - 1% AEP EXTENT & KEY POINTS



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 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	N/A	N/A	N/A	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	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
4	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
5	N/A	N/A	N/A	N/A	N/A	N/A	4.89	1.28	0.07
6	N/A	N/A	3.03	0.09	0.01	N/A	4.89	1.54	0.07
7	N/A	N/A	3.03	0.39	0.04	3.53	4.89	2.12	0.10
8	2.65	0.22	3.03	0.60	0.05	3.53	4.89	2.46	0.09
9	2.65	0.70	3.03	1.07	0.14	3.53	4.89	2.93	0.12
10	2.65	0.67	3.03	1.04	0.07	3.53	4.89	2.90	0.09
11	2.65	0.83	3.03	1.21	0.08	3.53	4.89	3.06	0.09
12	2.65	1.03	3.03	1.40	0.16	3.53	4.89	3.26	0.25
13	2.65	1.11	3.03	1.49	0.14	3.53	4.89	3.35	0.40

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	3.90	0.35
6	3.90	0.55
7	3.90	1.13
8	3.90	1.47
9	3.90	1.94
10	3.90	1.91
11	3.90	2.08
12	3.90	2.27
13	3.90	2.36

WL – Water Level

PMF – Probable Maximum Flood

N/A - No Peak Water Level/Depth/Velocity Available.

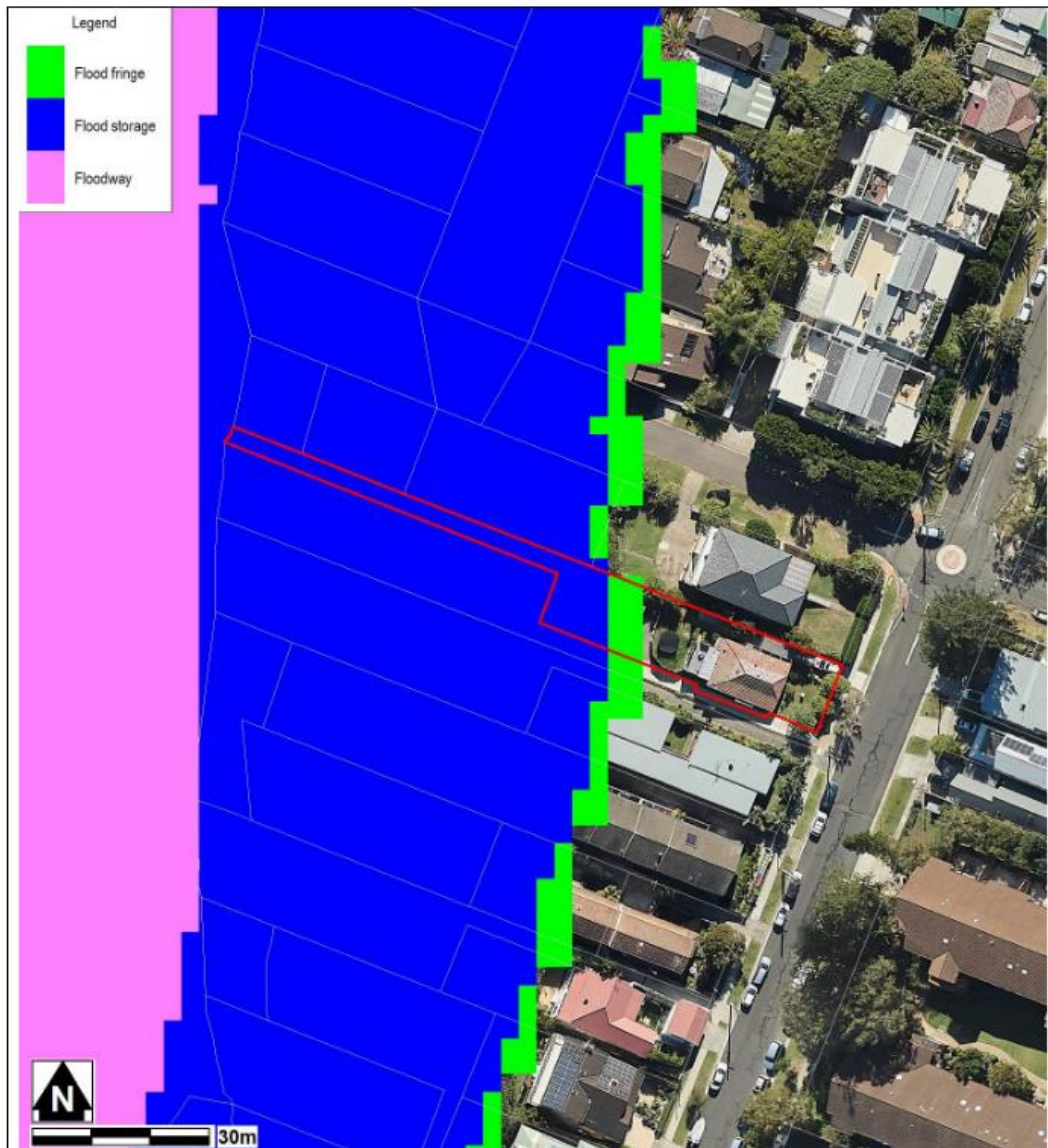
Notes:

- The flood planning levels above are calculated by adding a 0.5m freeboard to the 1% AEP water level. However, if the depth of flow is less than 0.3m and a Velocity X Depth product is less than 0.3m²/s, a freeboard of 0.3m may be able to be justified for development.

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MAP C: 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

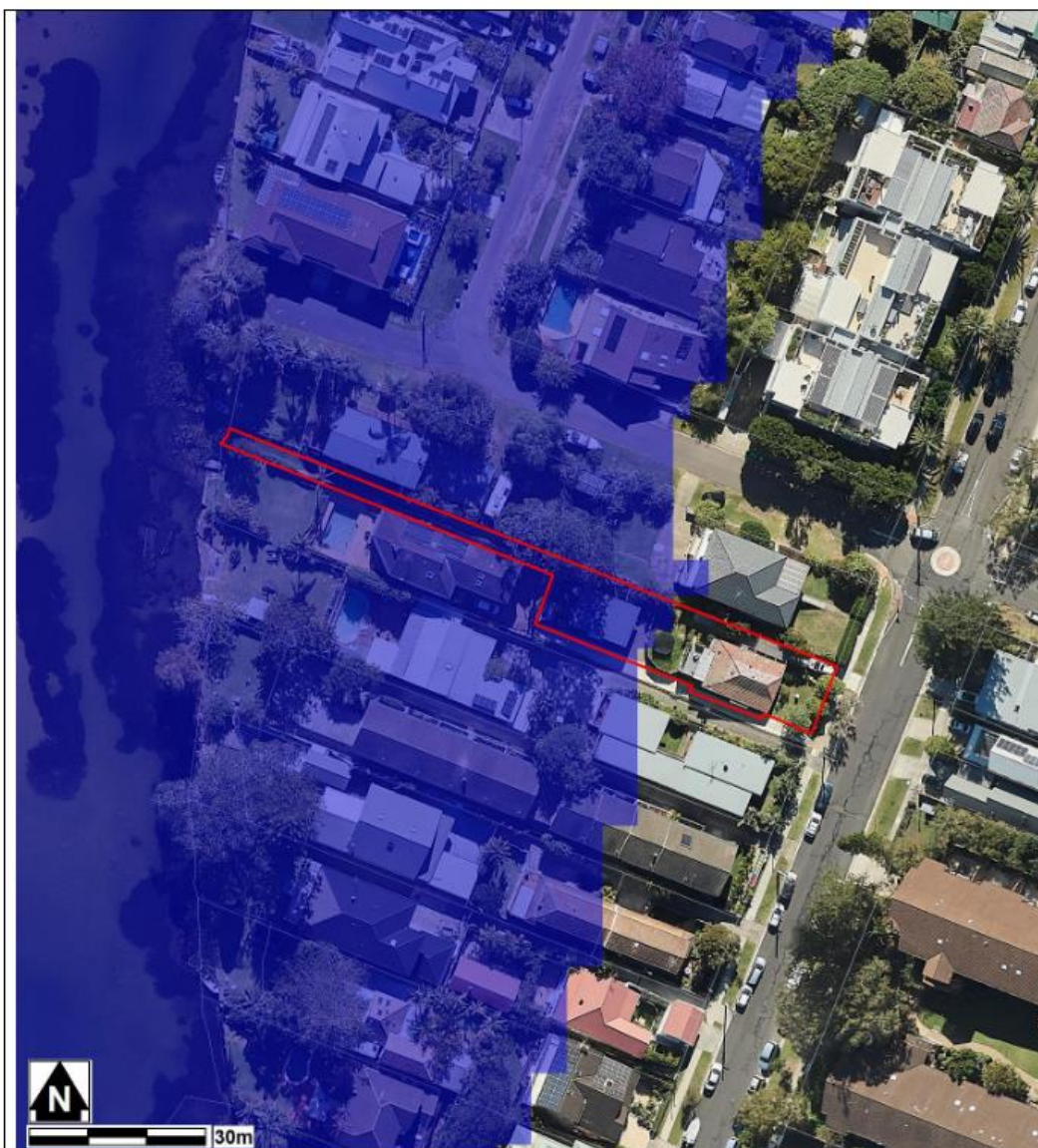
MAP D: PMF EXTENT MAP



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

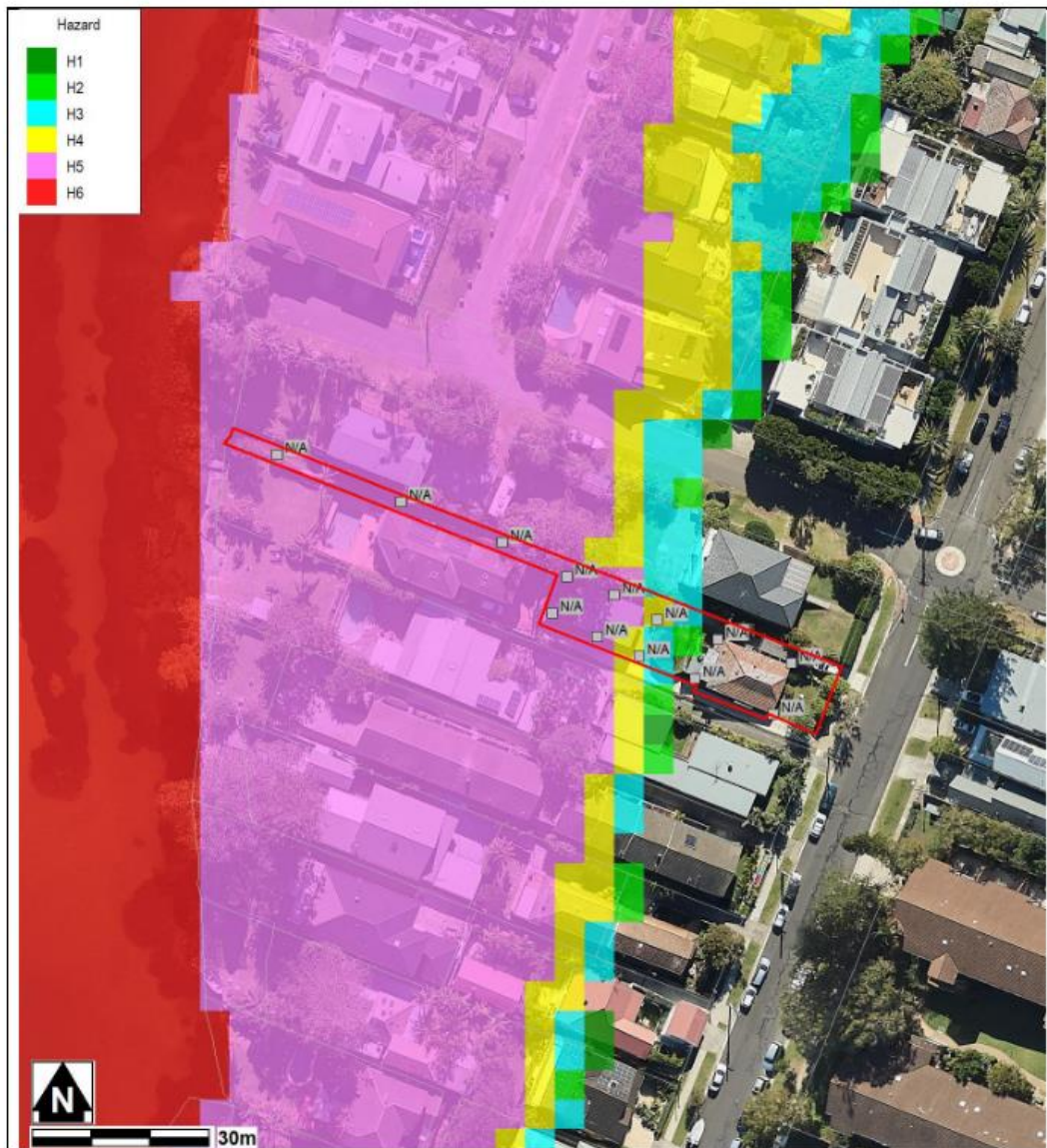
MAP E: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



Notes:

- 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

MAP F: FLOOD LIFE HAZARD CATEGORY IN PMF



Notes:

- 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.

MAP G: 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 $\pm 0.2\text{m}$ vertically and $\pm 0.15\text{m}$ 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.

Preparation of a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on how to determine what rules apply on flood prone land, and how to prepare a Flood Management Report. The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood related planning requirements.

Planning Requirements for Flood Prone Land

Development must comply with the requirements for developing flood prone land set out in the relevant Local Environment Plan (LEP) and Development Control Plan (DCP). There are separate LEPs and DCPs for each of the former Local Government Areas (LGAs), although preparation of a LGA-wide LEP and DCP is currently under way.

The clauses specific to flooding in the LEPs and DCPs are as follows:

LEP Clauses	DCP Clauses
Manly LEP (2013) – 5.21 Flood Planning Manly LEP (2013) – 5.22 Special Flood Considerations	Manly DCP (2013) – 5.4.3 Flood Prone Land
Warringah LEP (2011) – 5.21 Flood Planning Warringah LEP (2011) – 5.22 Special Flood Considerations Warringah LEP (2000) – 47 Flood Affected Land *	Warringah DCP (2011) – E11 Flood Prone Land
Pittwater LEP (2014) – 5.21 Flood Planning Pittwater LEP (2014) – 5.22 Special Flood Considerations	Pittwater 21 DCP (2014) – B3.11 Flood Prone Land Pittwater 21 DCP (2014) – B3.12 Climate Change

* The Warringah LEP (2000) is relevant only for the “deferred lands” which affects only a very small number of properties, mostly in the Oxford Falls area.

Development on flood prone land must also comply with Council's Water Management for Development Policy, and if it is in the Warriewood Release Area, with the Warriewood Valley Water Management Specification and Clause C6.1 of the Pittwater 21 DCP (2014). Guidelines for Flood Emergency Response Planning are available for addressing emergency response requirements in the DCP. These documents can be found on Council's website on the [Flooding page](#).

Note that if the property is affected by estuarine flooding or other coastal issues, these need to be addressed separately under the relevant DCP clauses.

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land (with exceptions noted below), for Council to consider the potential flood impacts and applicable controls. For Residential or Commercial development, it is required for development on land identified within the Medium or High Flood Risk Precinct. For Vulnerable or Critical development, it is required if it is within any Flood Risk Precinct.

There are some circumstances where a formal Flood Management Report undertaken by a professional engineer may not be required. However the relevant parts of the DCP and LEP would still need to be addressed, so as to demonstrate compliance. Examples where this may apply include:

- If all proposed works are located outside the relevant Flood Risk Precinct extent
- First floor addition only, where the existing ground floor level is above the FPL
- Internal works only, where habitable floor areas below the FPL are not being increased

Note that development on flood prone land will still be assessed for compliance with the relevant DCP and LEP, and may still be subject to flood related development controls.

What is the purpose of a Flood Management Report?

The purpose of a Flood Management Report is to demonstrate how a proposed development will comply with flood planning requirements, particularly the development controls outlined in the relevant LEP and DCP clauses. The report must detail the design, measures and controls needed to achieve compliance, following the steps outlined below.

A Flood Management Report should reflect the size, type and location of the development, proportionate to the scope of the works proposed, and considering its relationship to surrounding development. The report should also assess the flood risk to life and property.

Preparation of a Flood Management Report

The technical requirements for a Flood Management Report include (where relevant):

1. Description of development
 - Outline of the proposed development, with plans if necessary for clarity
 - Use of the building, hours of operation, proposed traffic usage or movement
 - Type of use, eg vulnerable, critical, residential, business, industrial, subdivision, etc
2. Flood analysis
 - 1% AEP flood level
 - Flood Planning Level (FPL)
 - Probable Maximum Flood (PMF) level
 - Flood Risk Precinct, ie High, Medium or Low
 - Flood Life Hazard Category
 - Mapping of relevant extents
 - Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the relevance to the proposed development

If the property is affected by an Estuarine Planning Level (EPL) which is higher than the FPL, then the EPL should be used as the FPL. If the FPL is higher than the PMF level, then the FPL should still be used as the FPL, as it includes freeboard which the PMF does not.

3. Assessment of impacts
 - Summary of compliance for each category of the DCP, as per the table below.

	Compliance		
	N/A	Yes	No
A) Flood effects caused by Development			
B) Building Components & Structural Soundness			
C) Floor Levels			
D) Car parking			
E) Emergency Response			
F) Fencing			
G) Storage of Goods			
H) Pools			

- Demonstration of how the development complies with any relevant flood planning requirements from the DCP, LEP, Water Management for Development Policy, and if it is in the Warriewood Valley Urban Land Release Area, with the Warriewood Valley Water Management Specification (2001)
- For any non-compliance, a justification for why the development should still be considered.
- Calculations of available flood storage if compensatory flood storage is proposed
- Plan of the proposed development site showing the predicted 1% AEP and PMF flood extents, as well as any high hazard or floodway affectation
- Development recommendations and construction methodologies
- Qualifications of author - Council requires that the Flood Management Report be prepared by a suitably qualified Engineer with experience in flood design / management who has, or is eligible for, membership to the Institution of Engineers Australia
- Any flood advice provided by Council
- Any other details which may be relevant

Further information and guidelines for development are available on Council's website at:

<https://www.northernbeaches.nsw.gov.au/planning-and-development/building-and-renovations/development-applications/guidelines-development-flood-prone-land>

Council's Flood Team may be contacted on 1300 434 434 or at floodplain@northernbeaches.nsw.gov.au .