



FLOOD RISK MANAGEMENT REPORT

Northern Beaches Council (Pittwater)

Proposed Seniors Living Development

at

27-29 North Avalon Road, AVALON BEACH

Job No. 190247 – Issue B

Prepared for: Armada Avalon Pty Ltd

Prepared by: Cameron Haack



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FLOOD RISK MANAGEMENT REPORT

DATE	4 th October, 2019
SITE	27-29 North Avalon Road, AVALON BEACH
ENGINEER	Cameron Haack
CLIENT	Armada Avalon Pty Ltd
JOB No	190247 – Issue B

INTRODUCTION:

NB Consulting Engineers assessed the plans prepared by *Environa Studio* – dated 25/09/2019 for the proposed Seniors Living Development at the above site address in reference to potential flooding issues. The proposed development generally meets the requirements of *Pittwater Council 21 DCP* subject to the recommendations outlined in this flood risk assessment.

The architectural plans, survey information and Council supplied flood information was used to determine flooding extents and impacts and to assess associated risks. The premises has been assessed in accordance with the requirements of Pittwater Council 21 DCP, Councils supplied flood information, *The Avalon to Palm Beach Floodplain Risk Management Study and Plan (2017)*, Pittwater Council's Flood Risk Management Reports – “*considerations when preparing a report*” sheet and the *NSW Government Floodplain Management Manual (2005)*.

The site is located on North Avalon Road in Avalon Beach. This report is in reference to a Development Application for a proposed Seniors Living development. The development site is located beyond the vicinity of the flow extents for the 1% AEP flood event and within the vicinity of the flow extents for the PMF event, as predicted in the *Avalon to Palm Beach Floodplain Risk Management Study (2017)*.

Below is a summary of flood information in reference to Northern Beaches Council (Pittwater) Flood Assessment report requirements and the *NSW Government Floodplain Management Manual*.

FLOOD RISK REPORT:

- Development Type Seniors Living
 - Land Use Group Vulnerable Development
 - Flood Risk Precinct N/A (1% AEP)
Low (PMF)
 - Hydraulic Category N/A (1% AEP)
Flood Fringe (PMF)
 - 1% AEP Flood Level N/A
 - Extreme Flood Level (PMF) 16.09m AHD
 - Flood Planning Level (FPL) 16.09m AHD
 - Proposed Dwelling Floor Level 16.10m AHD
 - Impact on surrounding properties None envisaged
 - Flood storage No anticipated net reduction
- The building footprint area contributing to potential flood blockages is proposed to increase as a result of the development. To ensure the development flood volume does not decrease as a result of the development, we recommend:
- a. That the subfloor area (including perimeter walls) of the units 1 and 2 is to be partially open for at least the PMF flood extent, to allow floodwaters to flow through unimpeded (refer Appendix D).
 - b. The garden areas and landscaping areas within the PMF extent (refer Appendix D) are retained at the existing natural surface levels.

- c. All fences within the PMF extent (refer Appendix D) are to provide openings to allow floodwater to flow through unimpeded.

These areas are to be designed by a structural engineer to ensure floodwaters are able to flow unimpeded below the structure. The flood storage calculations (incorporating these recommendations) are summarized below (refer Appendix C for further calculation details):

Existing Flood Blockage Volume = 47.40m³

Proposed Flood Blockage Volume = 43.90m³

Net Flood Blockage Reduction = 3.50m³

- Flood levels No anticipated increase
- Recommendations for structural design
The first-floor refuge is to be designed to withstand impacts from flooding up to the PMF flood event.
- Types of materials to be used
Any new structures are to be constructed of standard building materials of concrete, steel, timber and/or brickwork above the PMF level.
- Floor Level requirements
The proposed ground floor level is located at RL 16.10m AHD, which is above the PMF flood level.

As the proposed ground floor level is located at RL 16.10m AHD, which is above the PMF flood level (16.09m AHD), it is suitable for onsite shelter in place. The above demonstrates compliance with E1, E2, F1, F2, F3, F6 and F8 of part B3.11 of the Pittwater 21 DCP.
- Onsite Stormwater Management
The development proposes to relocate a trunk drainage line that runs through the subject site (No.27 and No.29). Provided the stormwater plans prepared by 'NB Consulting Engineers' Job No.190247 are complied with,



there will be no adverse flood effects as a result of the works, thus demonstrating compliance with B1 of part B3.11 of the Pittwater 21 DCP.

Site Stormwater management and discharge is to be constructed in accordance with the plans prepared by 'NB Consulting Engineers' Job No.190247.

- Flood warning No signage is recommended
- Evacuation strategy and onsite response plan Shelter in Place

Should floodwaters begin to enter the property boundary, the residents are recommended to stay indoors and shelter in place.

A copy of this report is to be kept on the premises at all times. This should be executed, on individual assessment, during high intensity rainfalls within the first 5–10 minutes of a storm and monitored accordingly. Refer to the local Northern Beaches flood warning website for updates:

<http://new.mhl.nsw.gov.au/users/NBFloodWarning/>

RECOMMENDATIONS / CONCLUSION:

- The proposed development is not envisaged to have an adverse effect on surrounding properties. The flood levels provided from council flood information have been adopted for this assessment. The proposed development generally meets the requirements of *Northern Beaches Council (Pittwater) DCP* provided the recommendations within this report are implemented. A development application is recommended.

- Authors qualifications / experience

Rick Wray

Director NB Consulting Engineers
BE(Civil) MIEAust CPEng NER RPEQ
Over 30 years professional
experience

We trust that this certificate meets with your requirements. Please contact the author if further clarification is required.

NORTHERN BEACHES CONSULTING ENGINEERS P/L

Reviewed By:



Rick Wray

Director
BE(Civil) MIEAust CPEng NER RPEQ

Report By:



Cameron Haack

Design Engineer
BE(Civil) MIEAust

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DIRECTORS

Stewart McGeady Rick Wray Brad Seghers

APPENDIX A – FLOOD INFORMATION **(PITTWATER COUNCIL)**



FLOOD INFORMATION REQUEST – MULTI-PURPOSE

Property: 27 North Avalon Road, Avalon Beach

Issue Date: 18/02/2019

Flood Study Reference: Avalon to Palm Beach Floodplain Risk Management Study and Plan 2017, NSW Public Works - MHL

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level³: N/A m AHD

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

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

1% AEP Provisional Flood Hazard: N/A See Flood Map E

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

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL)^{1,2, 3 & 4}: N/A m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level²: 15.90 m AHD

PMF Maximum Depth from natural ground level: 0.26 m

PMF Maximum Velocity: 0.88 m/s

PMF Flood Hazard: Low See Flood Map G

PMF Hydraulic Categorisation: Flood fringe See Flood Map H

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Figure 1.0 – Northern Beaches Council ‘Flood Information’

Flood Risk Precinct – See Map K

Flooding with Climate Change (See Flood Map I)

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

1% AEP Maximum Water Level with Climate change^{1&3}: 15.15 m AHD

1% AEP Maximum Depth with Climate Change³: 0.17 m

1% AEP Maximum Velocity with Climate Change³: N/A m/s

PMF Maximum Water Level from natural ground level with SLR³: N/A m

PMF Maximum Depth from natural ground level with SLR³: N/A m

¹The flood information does not take into account any local overland flow issues nor private stormwater drainage systems.

²Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site.

³Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels than those indicated on this flood advice.

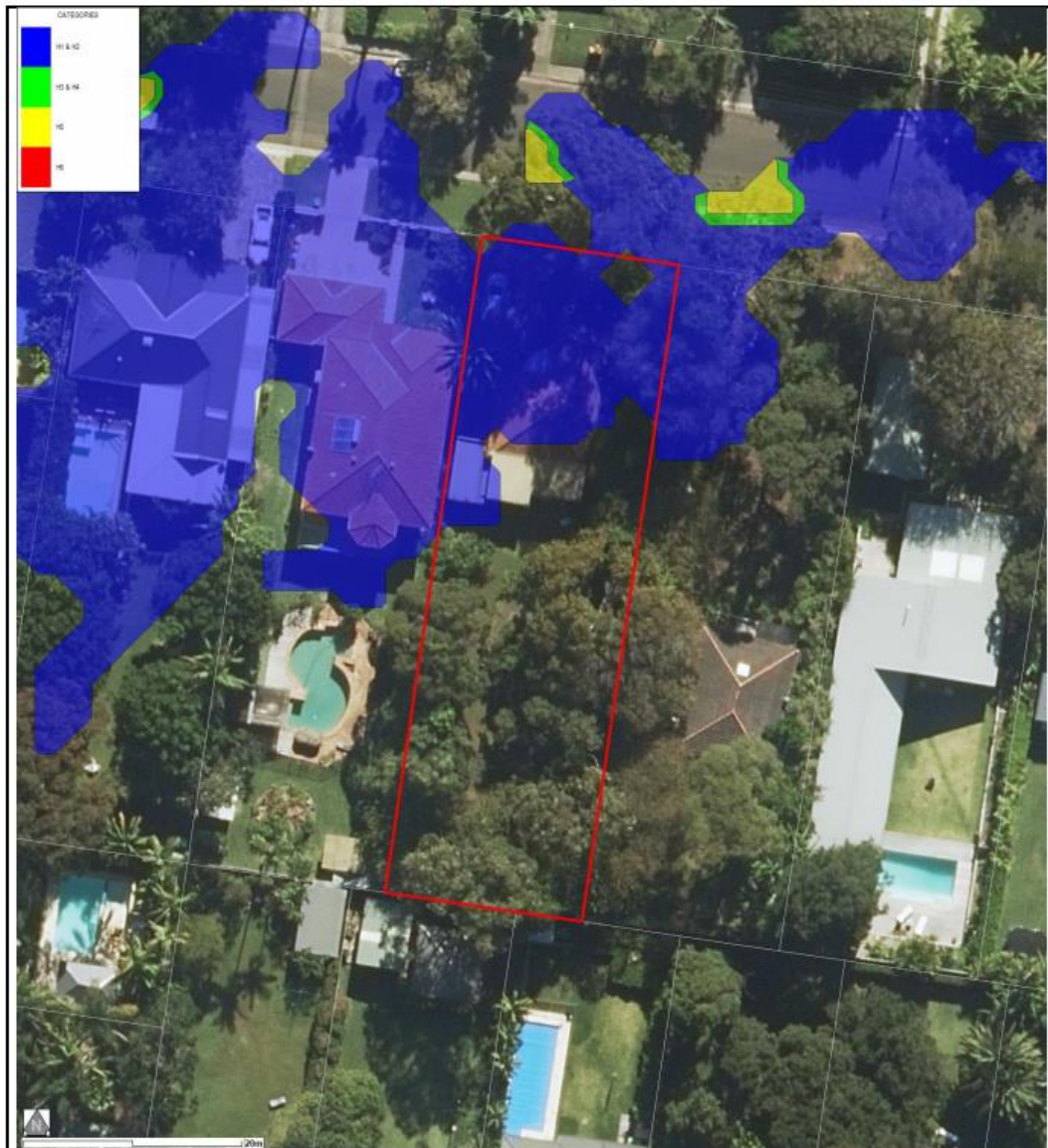
⁴Vulnerable/critical developments require higher minimum floor levels using the higher of the PMF or Flood Planning Level

General Notes:

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

Figure 1.1 – Northern Beaches Council 'Flood Information'

FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY



Notes:

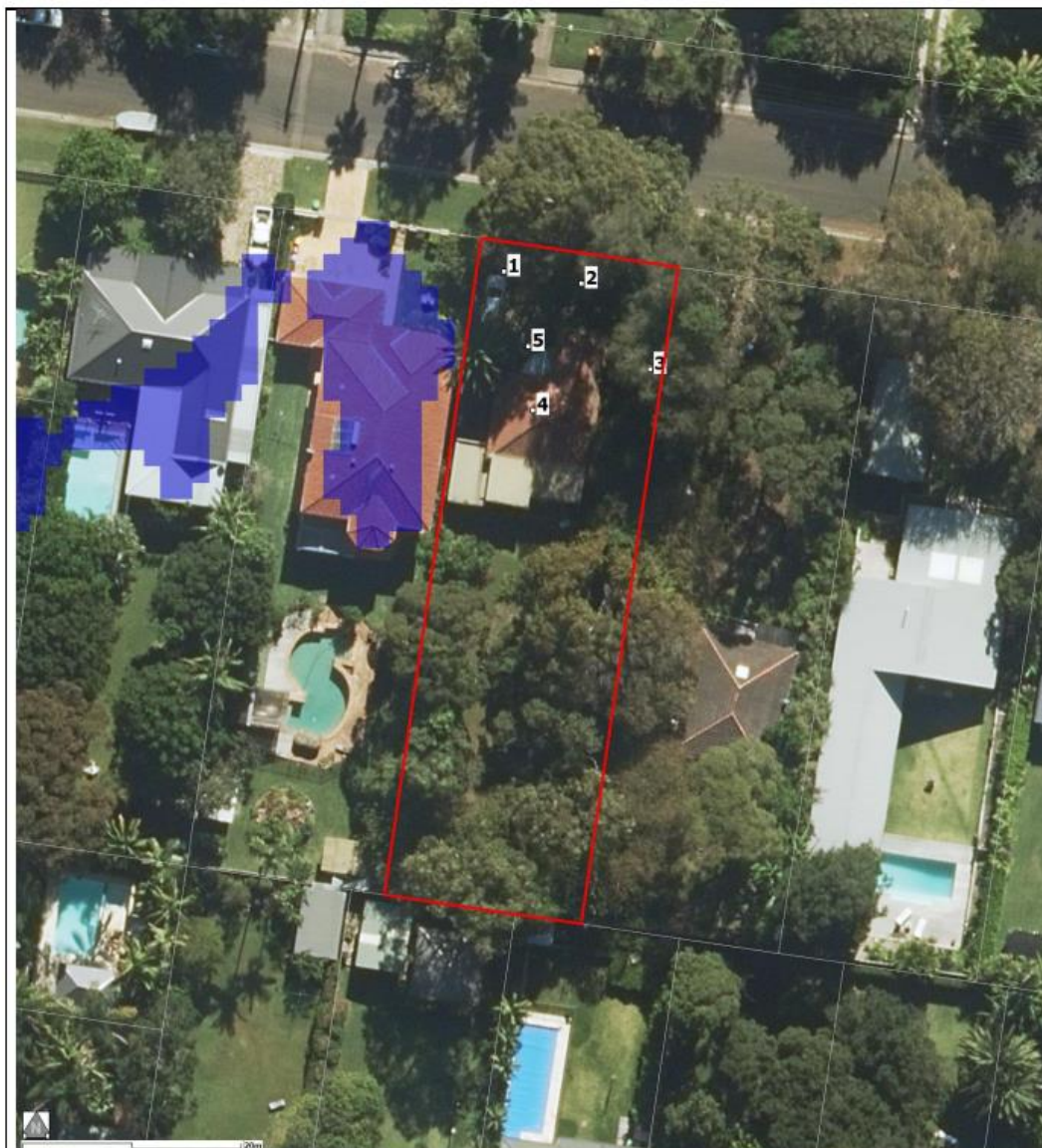
- Refer to 'Flood Emergency Response Planning for Development in Pittwater Policy for additional information on the Flood Life Hazard Categories and Pittwater 21 DCP Control B3.25.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source Near Map 2014) are indicative only.

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Figure 1.2 – Northern Beaches Council 'Flood Information'.

FLOOD LEVEL POINTS



Note: Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only.

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Figure 1.3 – Northern Beaches Council ‘Flood Information’.

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	15.18	0.21	0.48
2	N/A	N/A	N/A	N/A	N/A	N/A	15.45	0.17	0.55
3	N/A	N/A	N/A	N/A	N/A	N/A	15.70	0.17	0.48
4	N/A	N/A	N/A	N/A	N/A	N/A	15.16	0.17	0.43
5	N/A	N/A	N/A	N/A	N/A	N/A	15.17	0.24	0.50

WL – Water Level

PMF – Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event

Figure 1.4 – Northern Beaches Council ‘Flood Information’.

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	15.08	0.16

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

WL – Water Level

PMF – Probable Maximum Flood

N/A = no peak water level/depth/velocity available in flood event.

Figure 1.5 – Northern Beaches Council ‘Flood Information’.

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: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source Near Map 2014) are indicative only.

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Figure 1.6 – Northern Beaches Council ‘Flood Information’.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source Near Map 2014) are indicative only.

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Figure 1.7 – Northern Beaches Council ‘Flood Information’.

FLOOD MAP D - PMF EXTENT MAP



Notes:

- extent represents the Probable Maximum Flood (PMF) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.8 – Northern Beaches Council ‘Flood Information’.

FLOOD MAP E – 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.9 – Northern Beaches Council 'Flood Information'.

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



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.11 – Northern Beaches Council ‘Flood Information’.

FLOOD MAP G – PMF FLOOD HAZARD EXTENT MAP



Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.12 – Northern Beaches Council ‘Flood Information’.

FLOOD MAP H – PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- extent represents the Probable Maximum Flood (PMF) event
- extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.13 – Northern Beaches Council ‘Flood Information’.

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



Note Notes:

- extent represents the 1% annual Exceedance Probability (AEP) flood event
- includes 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: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

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Figure 1.14 – Northern Beaches Council ‘Flood Information’.

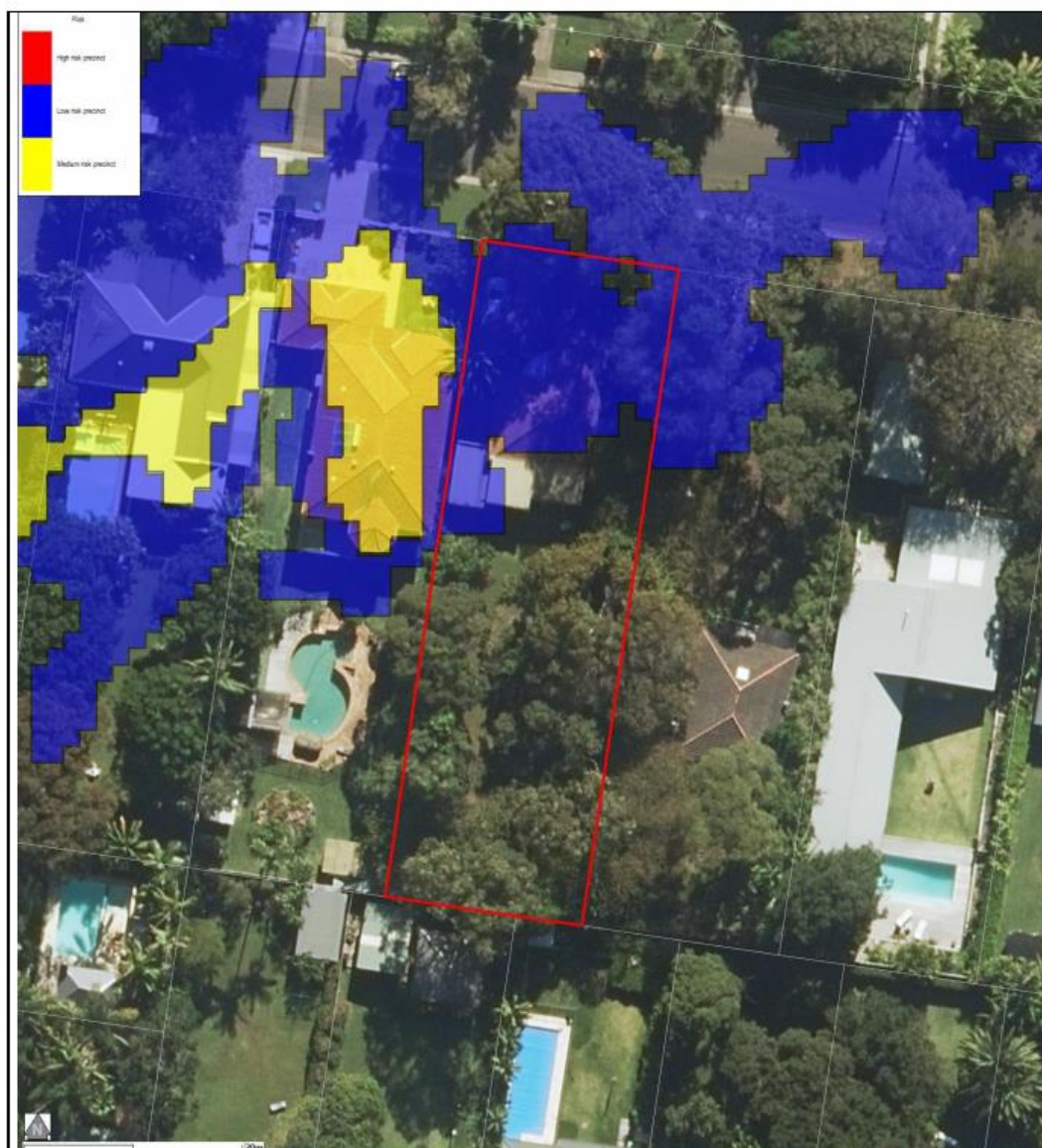
FLOOD MAP J: FLOODING – PMF EXTENT PLUS SEA LEVEL RISE

****No data available for this property.**

Note Notes:

- extent represents the PMF flood event
- includes 0.9m Sea Level Rise climate change scenario
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Avalon to Palm Beach Floodplain Risk Management Study and Plan) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP K – FLOOD RISK PRECINCT MAP



Notes:

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

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Figure 1.16 – Northern Beaches Council ‘Flood Information’.



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Stewart McGeady Rick Wray Brad Seghers

APPENDIX B – PROPOSED DRAWINGS AND SITE SURVEY



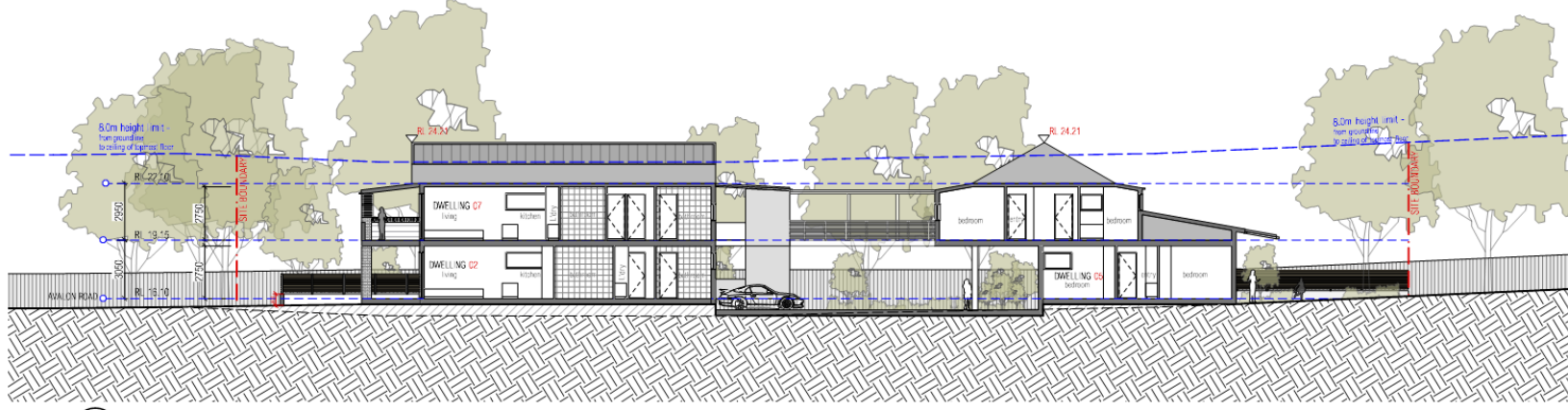
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Figure 2.0 – Level 1 Plan by ‘Environa Studio’.



Figure 2.1 — Level 2 Plan by 'Environa Studio'.



01 SECTION AA
1:200 @ A3



02 SECTION BB
1:200 @ A3

notes all work to be carried out in accordance with local, state codes and conditions of council requirements, in terms unless noted, use figured dimensions, do not scale drawings. take measure before starting work. refer all discrepancies to the architect.	rev date amendment A 20/01/18 issued for information A 20/02/18 issued to council for information B 20/03/18 issued for information C 20/04/18 issued for information D 20/04/18 issued for information E 20/06/18 issued to consultants F 20/06/18 issued to consultants G 20/06/18 issued to consultants	rev date amendment T 14/06/18 issued to consultants H 20/06/18 issued to consultants + client I 20/06/18 issued to consultants + client J 20/07/18 issued to consultants + client K 20/07/18 issued to client, for comment L 20/08/18 issued to client for comment M 20/08/18 issued to client for comment N 20/08/18 issued to client for information	environa studio 224 Riley St Sunny Hills 2010 t: 02 9211 0000 w: www.environastudio.com.au architects registration number 6239	project: SENIORS LIVING location: 27-29 NORTH AVALON ROAD at: AVALON BEACH	drawing: AA - BB SECTIONS	stage: DA checked: TW drawn: MB date: 25/09/19 revision: L	project no.: 991 drawing no.: 120

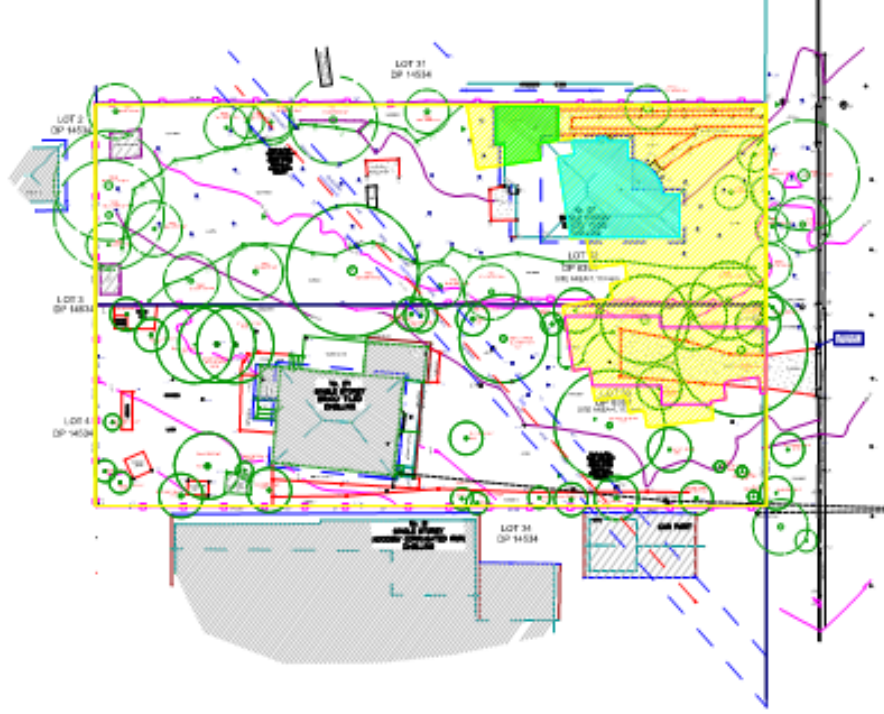
Figure 2.2 – Sections by ‘Environa Studio’.



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Stewart McGeady Rick Wray Brad Seghers

APPENDIX C - FLOOD STORAGE CALCULATIONS



EXISTING FLOOD BLOCKAGE AREAS

KEY:

- HATCH DENOTES FLOOD BLOCKAGE. 76m² x 0.46m DEPTH (NOTE: FLOOD LEVEL POINT MAX RL 15.70m AHD) BLOCKAGE = 34.90m³
- HATCH DENOTES FLOOD BLOCKAGE. 24m² x 0.52m DEPTH (NOTE: FLOOD LEVEL POINT MAX RL 15.18m AHD) BLOCKAGE = 12.50 m³
- HATCH DENOTES PMF EXTENT

NET FLOOD BLOCKAGE

EXISTING FLOOD BLOCKAGE	47.40 m ³
PROPOSED FLOOD BLOCKAGE	43.90 m ³
NET FLOOD BLOCKAGE REDUCTION	3.50 m ³

Figure 4 – Existing Flood Storage Calculations

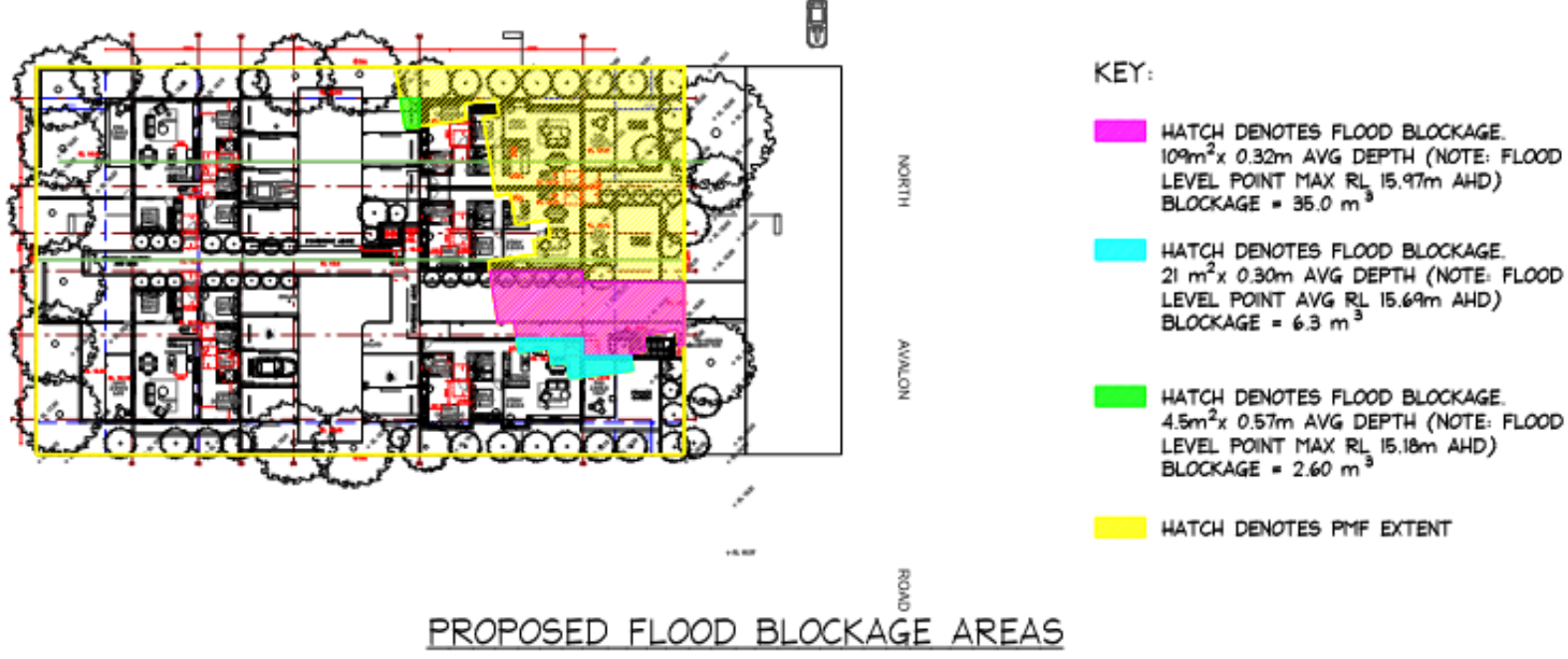


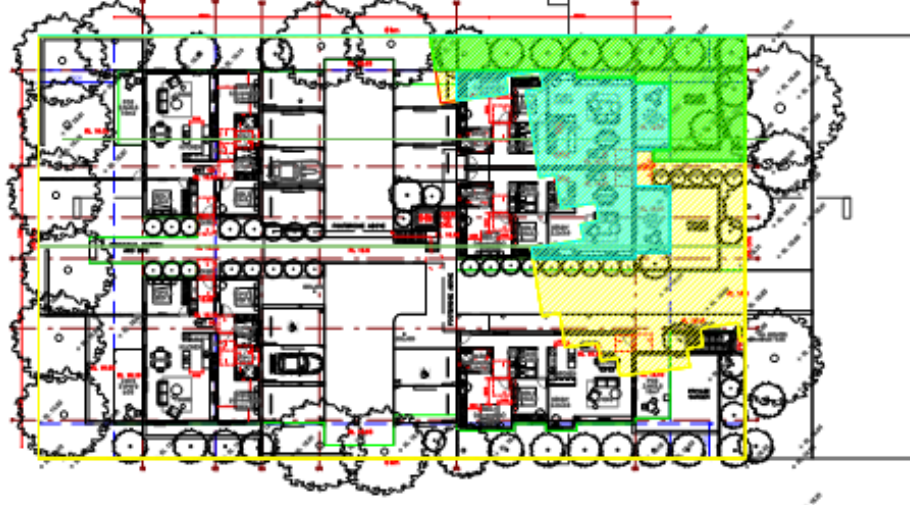
Figure 5 – Proposed Flood Storage Calculations



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Stewart McGeady Rick Wray Brad Seghers

**APPENDIX D – BUILDING AND
LANDSCAPING LEVEL REQUIREMENTS
WITHIN PMF EXTENT**



PROPOSED FIRST FLOOR PLAN

KEY:

- HATCH DENOTES AREA OF SUBFLOOR TO PROVIDE OPENINGS 3m LONG FROM NATURAL SURFACE TO UNDERSIDE OF PROPOSED FFL TO ALLOW FLOODWATERS TO FLOW THROUGH UNIMPEDED.
- HATCH DENOTES AREA TO BE RETAINED AT NATURAL SURFACE LEVEL. ANY WALLS OR FENCES IN THIS AREA ARE TO PROVIDE OPENINGS FOR FLOODWATERS TO FLOW THROUGH UNIMPEDED
- HATCH DENOTES PMF EXTENT

Figure 6 – Requirements for building and landscaped areas within PMF extent.