

# No. 14 Gladstone Street, Newport

## FLOOD RISK MANAGEMENT REPORT

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**Date: 5<sup>th</sup> November 2019**

**Our Reference: E299793**

**ISSUE B – DA SUBMISSION**

## INTRODUCTION

As per the architectural changes, Donovan Associates has prepared a revised Flood Risk Management Report to accompany the Development Application submitted to Pittwater Council for the Proposed Dual Occupancy at No. 14 Gladstone Street, Newport. In this study, the impacts on flooding behaviour due to the proposed development have been assessed. The flood study report covers the followings analysis and assessments;

- Catchment hydrology analysis for the 1% AEP storm events using DRAINS software;
- Analysis of stormwater overland flow for the development site for the 1% AEP storm events using XP-Storm software;
- Analysis of overland flow for the pre and post development scenarios;
- Assess the flooding impact due to the proposed development at the property and vicinity;
- Determine flood water depths and elevation levels for 1% AEP storm event;
- Analysis of hydraulic hazard for 1% AEP storm event and carry out risk assessment;
- Preparation of flood extent map for pre and post development conditions;
- Recommendation of finished floor level for the habitable rooms;
- Make the relevant recommendations to minimize flooding impacts at the property and surrounding areas

## SITE SPECIFIC INFORMATION

Pittwater Council has provided Flood Information including figures specific for the subject site relating to the 1% Annual Exceedance Probability (AEP) storm event and the Probable Maximum storm event (PMF). The information provided in the report includes figures providing information on the flooding behaviour within the site and the surrounding area.

The proposed site is at No. 14 Gladstone Street, Newport. The site falls toward the rear from the corner Bishop street and Gladstone street. The general property surrounding the subject site is primarily residential and is within close proximity of the subject site a sports oval (downstream of the site)

Figure 1 below shows the location of the subject site and an indication of the nature of the area surrounding the site.



Figure 1: Subject site at No. 14 Gladstone street, Newport

## FLOOD INFORMATION BACKGROUND

The Flood Information provided by Council identifies information that is relevant to the subject site. The report identifies the typical nature of the flooding within the Overland Flow Mapping and Flood Study, Cardno 2013 as **High/Medium Risk Flood Planning Precinct**.

## CATCHMENT ANALYSIS

Donovan Associates have investigated the catchment draining towards the subject site. One upstream catchment area has been identified using GRASS GIS as shown in figure 2 below. The catchment areas have been defined as basin and the basin sizes 27.214ha. The upstream catchment is predominantly residential with a fraction impervious value of 75%.



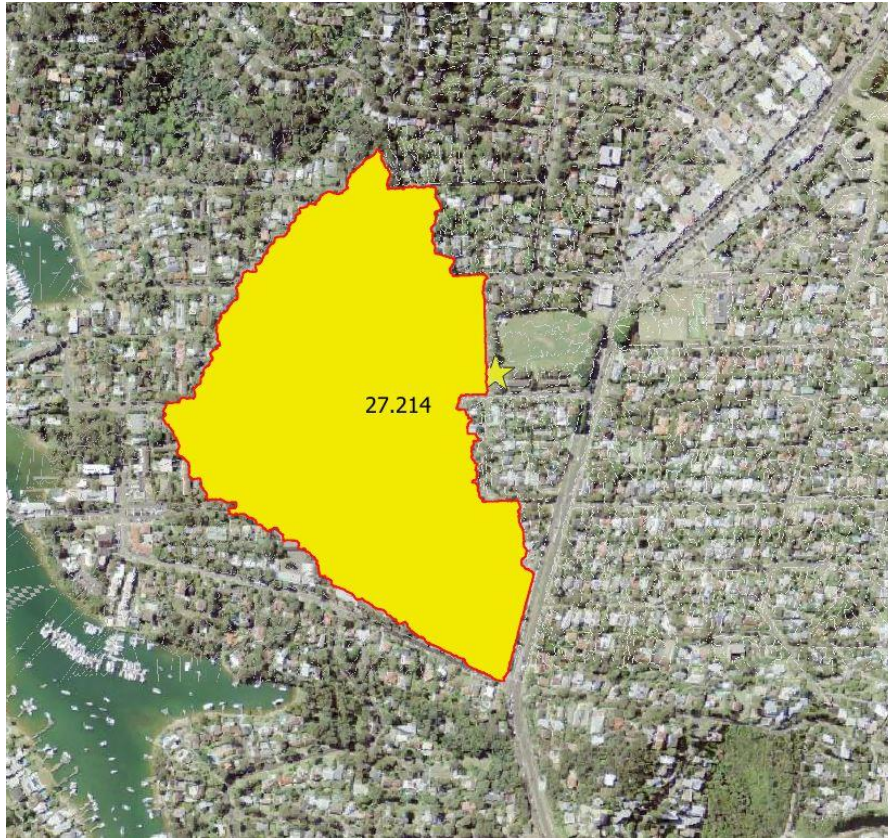


Figure 2 Delineated Catchment area from QGIS

Catchment runoff flows for a 1% AEP storm event were determined using Drains modelling and the upstream catchment delineated. Catchment parameters for the catchment inserted into the Drains model can be seen in Figure 3.

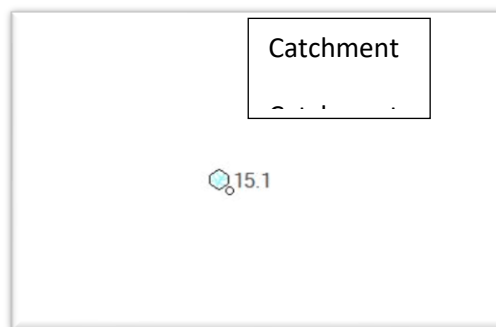


Figure 3 Drains result-Maximum flow

## SITE SPECIFIC FLOOD INFORMATION

The flood information provided for the subject site is presented in the Flood Information Letter provided by Pittwater Council.

Figure 4 below represents the 1% AEP flood event water depths specific for the subject site. The Flood Information specific for the site is outlined below:

**Property:** 14 Gladstone Street, Newport  
**Lot DP:** 11//10548  
**Issue Date:** 16/02/2018  
**Flood Study Reference:** Overland Flow Mapping and Flood Study, Cardno, 2013

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**Flood Information for lot:**

**Flood Life Hazard Category** – See Map A

Flood Emergency Response Strategy: H5

**1% AEP** – See Flood Map B

1% AEP Maximum Water Level<sup>3</sup>: 5.18 mAHD

1% AEP Maximum Peak Depth from natural ground level<sup>3</sup>: 0.76 m

**Probable Maximum Flood (PMF)** – See Flood Map D

PMF Maximum Water Level<sup>2</sup>: 6.04 m AHD

PMF Maximum Depth from natural ground level: 1.64 m

Figure 4: Flood Information data provided by Pittwater Council

From Figure 4 above, the 1% AEP flood level through the site is 5.18m AHD, hence the 1% AEP flood planning level is 5.56m AHD (see pre-da meeting minutes) and PMF flood level is 6.04m.

To support the above data, council have provided flood mapping to represent the extent of flooding and 'Hazard' areas specific for the subject site for the 1% AEP storm and the PMF storm.

## FLOOD MAP B: FLOODING - 1% AEP EXTENT



Figure 5: Approximate 1% AEP flood within the subject site and surroundings

## FLOOD MAP D: PROBABLE MAXIMUM FLOOD EXTENT



Figure 6 Approximate PMF flood within the subject site and surroundings



## FLOOD MAP G – FLOOD RISK PRECINCT MAP

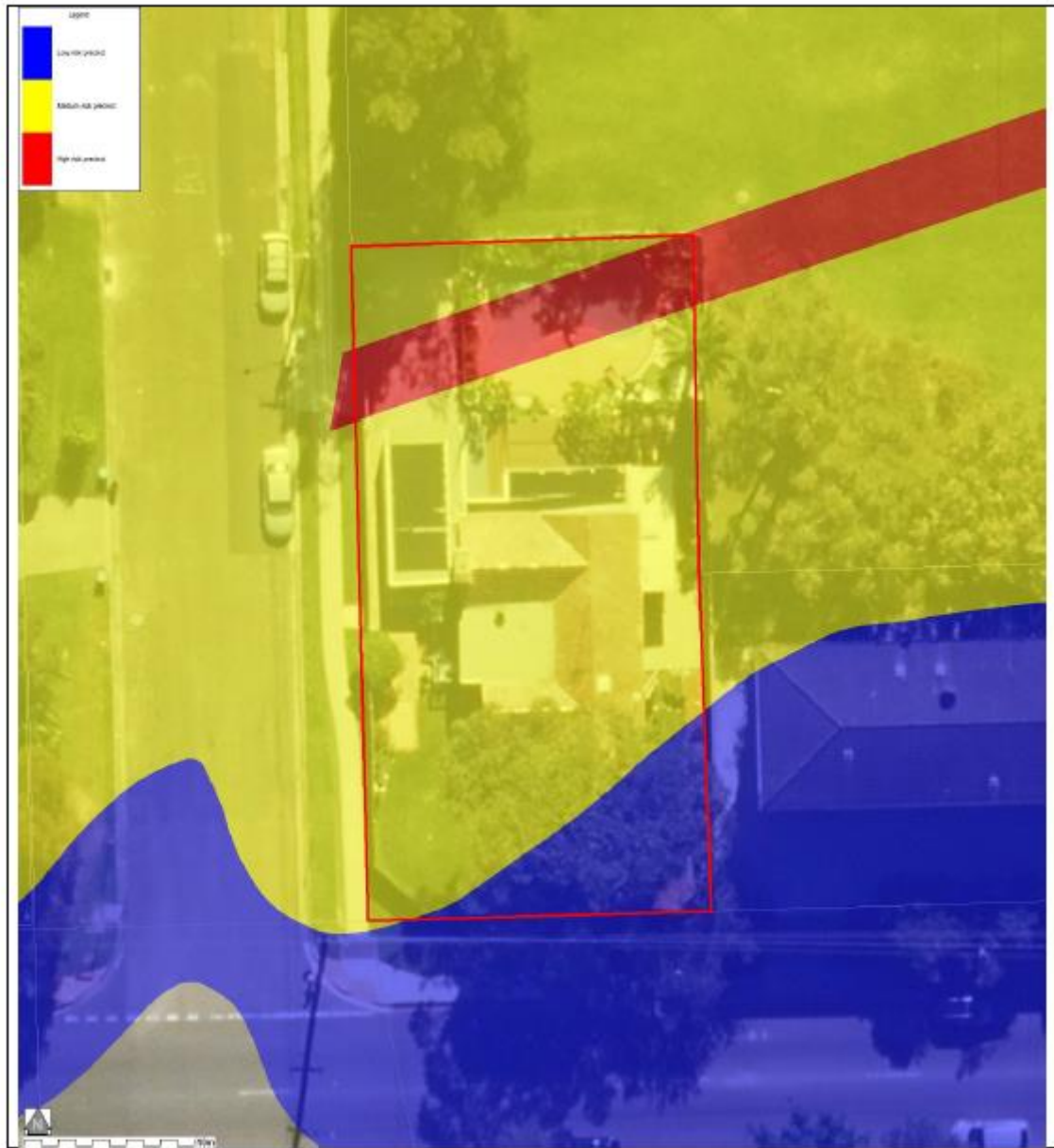


Figure 7 1% AEP Provisional Flood Hazard

Figure 7 above reveals that the majority of the site is within a “Medium Hazard” area, with the easement for drainage portion of the site experiencing “High Hazard”. It is important that in major rainfall events, that the ‘Flood Risk Management Report’ as depicted hereafter in this report is followed.



## **FLOOD RISK REQUIREMENTS**

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Pittwater Council has a number of 'Flooding Requirements' specified in their Development Control Plan, these include:

- **Flood Emergency Response**
- **Flood Impacts on Surrounds**
- **Flood Compatible Development**
- **Report Recommendations**

## **PROPOSED DEVELOPMENT – No. 14 Gladstone Street, Newport**

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The proposal for this site is for a dual occupancy development. A Stormwater Management Plan has been prepared by Donovan Associates having regard to this Flood Risk Management Report.

It should be noted that the minimum Flood planning level for the proposed development is RL 5.56m AHD based on the advice in the pre-da meeting minutes. In addition to the flood planning level, the following advice was advised in the pre-da meeting minutes.

- *The area of the subfloor must be at least 50% open to not impede the flow of flood water*
- *A suitable shelter in place refuge above the Probable Maximum Flood level must be provided.*

## **IMPACT OF PROPOSED DEVELOPMENT ON FLOODPLAIN BEHAVIOUR**

To assess the impact of the proposed development on flood levels throughout the surrounding area, a 2D flood model has been prepared utilising XPStorm. The purpose of the analysis was to determine any potential impact on the adjoining properties with a 50% open subfloor and the depth of flooding through the site to determine the height of the openings to be provided below the finished floor level.

The below images represent the results of the pre-development and post-development modelling.



Figure 6 : Pre-development model creation





Figure 7 : Post-development model creation



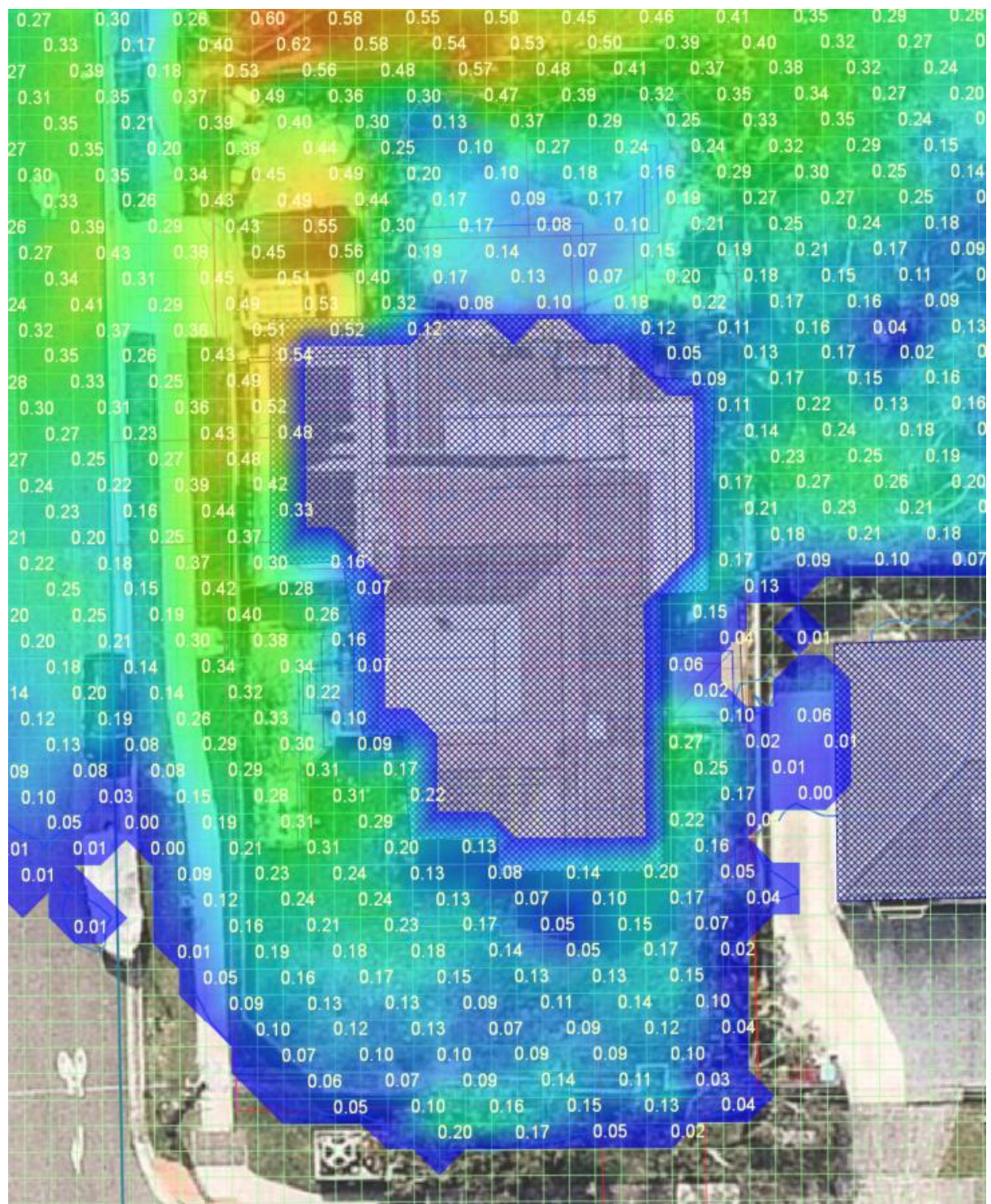


Figure 8: Pre-development flow depth 1% AEP





Figure 9: Pre-development Water Elevation – 1% AEP



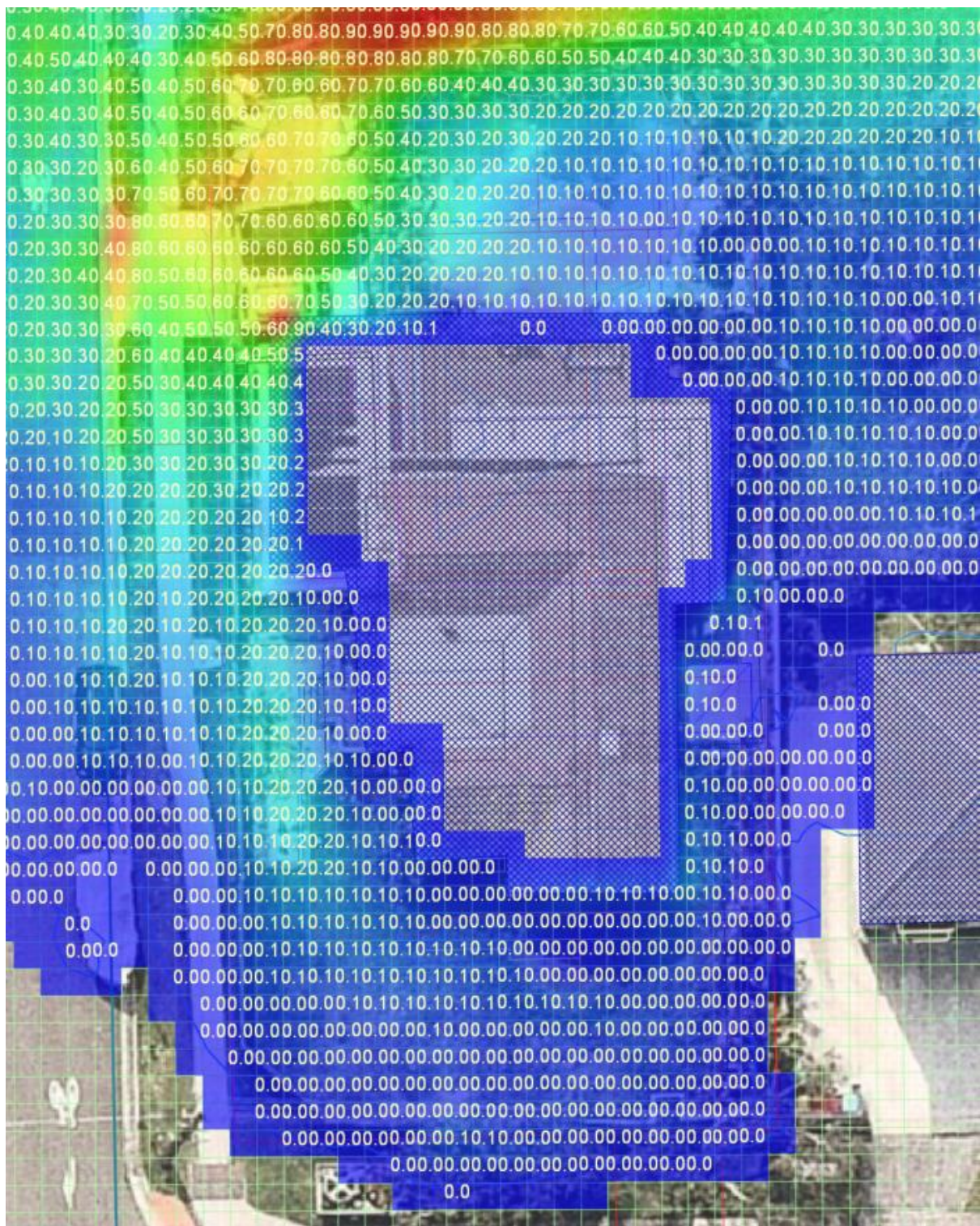


Figure 10: Pre-development Flow velocity x depth – 1% AEP



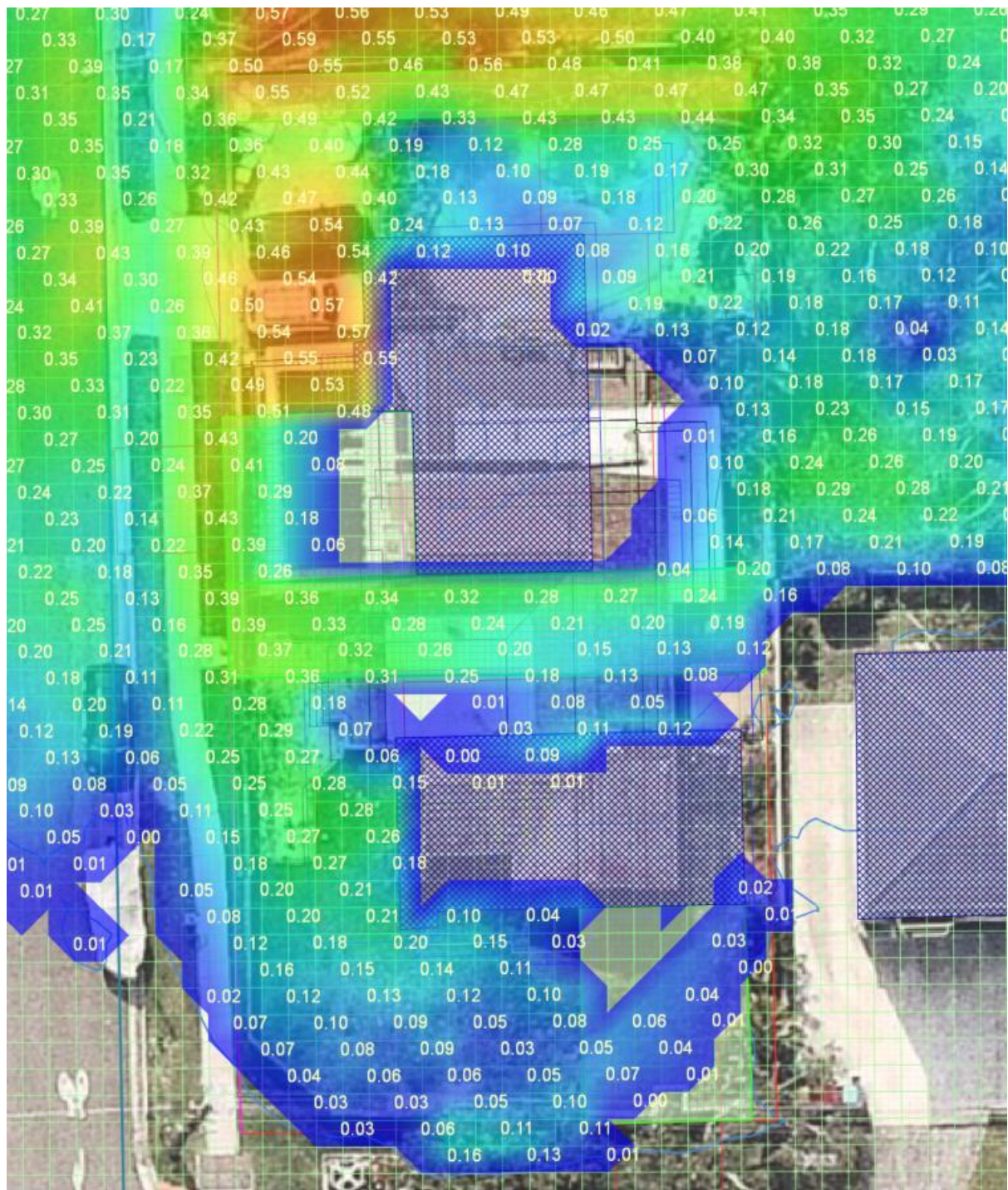


Figure 11: Post development Water depth – 1% AEP





Figure 12: Post- development Water Elevation – 1% AEP



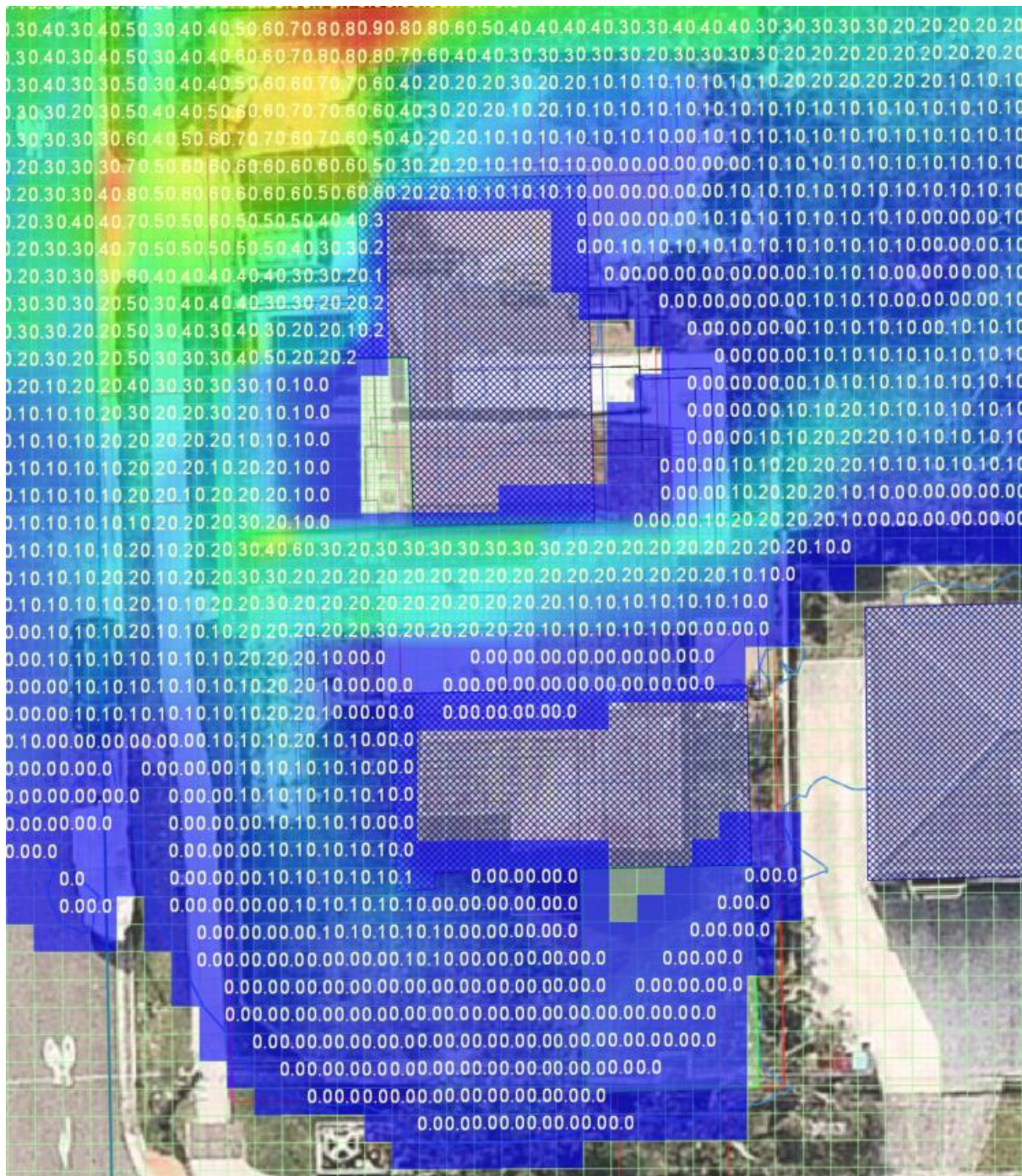


Figure 13: Post-development velocity x depth – 1% AEP

In assessing the results of the pre to post development the following statements can be made.

In the pre-development model, the maximum depth of flood waters experienced on site is approximately 560mm shown at the front of the existing dwelling. In the post development model, the depth of flooding at the same location shown in the pre-development has increase to 570mm. Open-under subfloor allowing the flood waters to traverse through the site relatively impeded and scrapping through the middle and northern end of the site have allow for a reduced flow depth through the post development. The results also indicate that the maximum depth of flooding at the location of the upstream face of Lot A is 550mm and Lot B is 260mm.

Therefore, as a summary the open subfloor area and scrapping as reflected in the modelling have maintained the depth of flooding through the site and from the pre-development to post-development to no more than 10mm. In addition to this, the impact on adjoining properties has been reduced from pre-development to post development.

Figure 14 below is a depiction of the area of the proposed development that has been modelled as a blockage and the area modelled as open subfloor.

It is proposed that all areas modelled as 'open subfloor' must maintain a **minimum 50% perimeter opening along the face of the proposed open subfloor** below the 1% AEP flood level (5.18m AHD). Only impediments allowed would be the piercing system which is considered negligible for overland flow assessments. This must be reflected on the final architectural plans submitted for the development application. Please note that for Lot A all opening to be minimum 550mm higher than the finished natural ground level and for Lot B opening to be minimum 260mm higher than finished natural ground level.

Flood storage volume has been calculated based on the difference on pre-development obstructions and post development proposed site works and obstructions. It has been shown the post development flood storage volumes have increase by 33.2m<sup>3</sup>.



## RECOMMENDATIONS AND CONCLUSIONS

- Based on the information available to Donovan Associates, the proposed dwellings for the site are to have habitable finished floor level **NO LOWER** than 5.56m AHD and non-habitable floor **NO LOWER** than 5.30m AHD.
- As it is demonstrated in this report, the proposed development has almost no impact on surrounding floodplain behaviour during 1% AEP flooding event
- Any proposed structures must be built on a pier/beam system and maintain a **minimum 50% perimeter opening along the face of the proposed open subfloor** to facilitate up to the 1% AEP storm event (5.18m AHD). Pier system underneath and around the perimeter of the dwelling should be designed by qualified structural engineer in order to withstand the mainstream flows and uplift actions as well provide the minimum opening as stated above. Refer to figure 14 for depiction of area to be open subfloor. Lot A and Lot B shall provide 50% openings around the perimeter of dwellings up to 5.18m AHD.
- Any proposed fencing must be paling fencing only and must have a clear 50mm gap between the vertical palings and no filling work is permitted in this site area
- All finished ground levels outside of 'blockage' building footprint are to be no higher than existing natural ground levels on site
- No retaining walls allowed to be built on the proposed development
- Any proposed screening of the open subfloor space is to be of 'open style' construction. Example of this may be timber slats with 50mm opening between palings, louvered metal screening



# FLOOD RISK MANAGEMENT PLAN

## *No.14 Gladstone Street, Newport*

### SITE INFORMATION

Council documentation at the time of this report being prepared has indicated that the subject site is subject to flooding during the 1% AEP storm event. Generally, flood evacuation is based on the Probable Maximum Flood (PMF) which is the highest flood level ever likely to occur, however it is extremely rare.

**The relevant levels through the subject property are:**

<b>1% AEP storm event flood level</b>	<b>=</b>	<b>RL 5.18m AHD</b>
<b>Probable Maximum Flood level</b>	<b>=</b>	<b>RL 6.04m AHD</b>

The levels noted above indicate how the various flood events will impact the subject property.

It is therefore important that the Flood Risk Management Plan mentioned hereafter is clearly understood and followed in the occasion of rainfall events regardless of severity.

### EMERGENCY RESPONSE:

The main consideration of risk to life of occupants for evacuation is whether there is sufficient time to evacuate before flooding, if occupants can evacuate before flooding occurs then the risk to life may be considered acceptable. Based on council advice the following advice is recommend to seek refuge from any flood event up to the Probable Maximum Flood.

### EMERGENCY RESPONSE (SHELTER-IN-PLACE):

The AFAC guideline states that evacuation is the most effective strategy, provided that evacuation can be safely implemented, however it may be worse than not evacuating at all. As an alternative emergency response the first floor of the proposed development can be used as a shelter during flooding events.

Based on the adopted requirements for shelter in place by council, the minimum floor level must be equal to the PMF flood level. The first floor level of the proposed development is 8.75m AHD which is higher than PMF level and could be used as a safe shelter during flood events when evacuation is not possible.

According to the Pittwater LGA adopted requirements for shelter in place, minimum floor space are 2 m<sup>2</sup> per person for all long duration flooding. The proposed first story of the development consisted of 4 bedrooms with total area approximately of 50 m<sup>2</sup> which is enough to shelter up to about 20 people.

In addition following requirements for shelter in place shall be implemented:

- Shelter-in-place refuge must be intrinsically accessible to all people on the site, plainly evident, and self directing, with sufficient capacity of access routes for all occupants.
- Structural stability of the refuge building is to be verified by a suitably qualified structural engineer considering lateral flood flow, buoyancy, suction effects, and debris load impact of 1% AEP design flood depths and velocities.
- Refuge must comply with Building Code of Australia requirements, with external components rated appropriately for storm, wind, and moisture.

In term of the long duration flooding, following serviceability requirements to be applied:

- Sufficient clean water; and
- First Aid Kit
- Portable radio with spare batteries; and
- Torch with spare batteries.

#### **AFTER A FLOOD EVENT**

- Stay tuned to ABC 702 on a battery powered radio for official advice and warnings
- Don't allow children to play in or near flood waters
- Avoid entering flood waters in all circumstances. If it is absolutely necessary to enter flood waters, check depth in front of you before every step using a stick/pole or similar
- Stay away from drains, culverts and water over knee deep
- Don't turn on your gas or electricity until it has been checked by a professional/licensed repairer
- Avoid using gas or electrical appliances which have been in flood water until checked for safety
- Do not consume food that has been in flood waters
- Boil tap water until supplies have been declared safe
- Watch for trapped animals
- Beware of fallen power lines
- Take as many photos as possible for all damages for insurance purposes
- Notify family and friends of your whereabouts