



CIVIL

Flood Management Report

for

202-204 Condamine Street, Balgowlah

for King Furniture Australia Pty Ltd

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Acronyms

2D	Two-Dimensional
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARR	Australian Rainfall & Runoff
DCP	Development Control Plan
DTM	Digital Terrain Model
FERP	Flood Emergency Response Plan
FFL	Finished Floor Level
FPL	Flood Planning Level
HPC	Heavy Parallelised Computation
GPU	Graphics Processing Unit
LGA	Local Government Area
LiDAR	Light Detection and Ranging
m	Measure of length / height / distance (metres)
mm	Measure of length / height / distance (millimetres)
m/s	Measure of velocity (metres per second)
m ²	Measure of area (square meters)
m ³ /s	Measure of flow rate (cubic metres per second)
m AHD	Metres above Australian High Datum
PMF	Probable Maximum Flood
TUFLOW	2D hydraulic modelling software

Introduction

Northrop Consulting Engineers Pty Ltd have been engaged by King Furniture Australia Pty Ltd, care of Centric Architects, to prepare a Flood Management Report for the proposed development located at 200-204 Condamine Street, Balgowlah.

King Furniture Australia Pty Ltd are seeking development consent for the proposed two-storey retail facility located at 200-204 Condamine Street, Balgowlah.

The purpose of this report is to outline the expected flood behaviour for the site, recognise the potential flood impact created by the proposed development and review the development response with respect to the development controls outlined by Northern Beaches Council (Council) policies.

Included herein is a:

- Summary of the methodology used for our assessment.
- Description of the subject site and the proposed development.
- Outline of Hydrologic and Hydraulic Model Parameters used in the investigation
- Overview of the existing and developed flood behaviour.
- Discussion of flood impact and compliance with Council's Policy.

Methodology

Northern Beaches Council have provided a copy of the Manly Lagoon Flood Study (BMT WBM, 2013) for specific use on this project. The Manly Lagoon FS (BMT WBM, 2013) was prepared by BMT WBM in 2013 and is, herein referred to as the "Manly Lagoon FS (BMT WBM, 2013)",

Using the Manly Lagoon FS (BMT WBM, 2013), the following approach has been adopted for our assessment:

- Desktop review of available information including detailed survey, design plans, aerial imagery, and LiDAR elevation data
- Site visit to review site constraints and ground truth modelling assumptions.
- Setup a detailed site specific and truncated version of the Manly Lagoon FS (BMT WBM, 2013) provided by Council.
- Run the 20%, 1% AEP and PMF existing case events and reviews results.
- Amend the TUFLOW model to represent the proposed development and run and compare the results with the existing case.
- Assess the proposed development with respect to Council's flood related planning requirements.

This report is to be read in conjunction with the following guidelines, reports and documents:

- Flood Information Reports for 200-204 Condamine Street prepared by Council and included in Appendix B.
- Updated Concept Civil design plans presented in Appendix C.
- Architectural plans prepared by Centric Architects
- Manly Lagoon Flood Study (BMT WBM, 2013)
- Manly Development Control Plan (2013), in particular Section 5.4.3.
- Manly Local Environment Plan (LEP) (2013).
- The NSW Floodplain Development Manual 2005.
- Australian Rainfall and Runoff 2019 Guidelines.

Subject Site and Proposed Development

Subject Site

The subject site is located within the Manly portion of the Northern Beaches Council Local Government Area. It includes the parcels of land at numbers 200, 202 and 204 Condamine Street. The site has an area of approximately 2132m² and is bordered by commercial properties to the north, east and south, and Condamine Street to the west. The existing site falls to the rear and currently hosts three independent one and two storey commercial buildings. The site locality is presented in **Figure 1**.

Council's Flood Reports indicate the site is subject to flooding from Burnt Bridge Creek which is located adjacent to the north-western boundary of the site. Similarly, Council's Flood Reports suggest the site is largely located within a Medium to High Flood Risk Precinct and is therefore subject to Council's flood planning controls.

The existing site frontage is presented in **Photo 1** and **Photo 2** below.



Photo 1 - Looking North Towards 200-204 Condamine Street (Google Maps, 2021)



Photo 2 - Looking South Towards 204-200 Condamine Street (Google Maps, 2021)



Legend

- Subject Site
- TUFLOW Model Extent
- Downstream Boundary
- Creeks
- Suburbs
- NPWS Reserves

0 300 600 Metres
1:20,000

Figure 1
Subject Site Locality

200-204 Condamine Street
Balgowlah



Proposed Development

The development proposes to construct a two-storey retail facility comprised of the following:

- Two-storey facility including retail and showrooms space with an active landscaped frontage along Condamine Street.
- Ground level carparking is also proposed with vehicular access via the south-west corner of the site.
- Undercroft area to provide flood storage

The building is proposed to be suspended above the 1% AEP flood level with the under-croft area designed to provide flood storage during flood events. Flood water is proposed to enter the under-croft area through the openings located along the building frontage and at the creek side in the north-western corner.

A markup of the concept civil drawings demonstrating additional proposed flood management measures is provided in Appendix C.

Further information is presented in the Architectural drawings prepared by Centric Architects.

Model Parameters

The original TUFLOW model prepared as part of the Manly Lagoon FS (BMT WBM, 2013) has been used as the basis for the hydraulic modelling presented herein. The Manly Lagoon FS (BMT WBM, 2013) was provided by Council for the purposes of this investigation.

For the analysis, the Manly Lagoon FS (BMT WBM, 2013) TUFLOW model extent was reduced (truncated) to reduce model run-time and enable preparation of a more detailed site-specific model. The updated model extent is shown in Figure 2 and extends to Garigal National Park to the west, Manly Golf Club to the east, approximately Sydney Road to the south and Alambie Heights / Manly Vale to the north.

Presented below is a summary of the modifications made to the original hydrological and hydraulic models for the purposes of this investigation.

Hydrological Model Updates

The original hydrology contained within the Manly Lagoon FS (BMT WBM, 2013) TUFLOW model was used for the existing and developed case modelling. The 20%, 1% and PMF design storm events have been considered for the analysis.

A 2-hour critical duration has been used for the 20% AEP, while a critical duration of 1 hour was used for the 1% AEP and PMF. These durations are consistent with the findings for the critical duration presented in the Manly Lagoon FS (BMT WBM, 2013).

Hydraulic Model Updates

The original Manly Lagoon FS (BMT WBM, 2013) TUFLOW hydraulic model elements were also updated based on detailed survey, review of aerial imagery and Google Street View as well as observations made during site investigations.

Modelled inflows, within the extent of the truncated model remain unchanged when compared to those adopted by the Manly Lagoon FS (BMT WBM, 2013). Inflow polygons are presented in Figure 2 below. Similarly, an outlet head boundary was entered into the model approximately 400m downstream of the subject site. A fixed outlet head boundary level of 1.4m AHD was adopted which is generally consistent with the results presented in the Manly Lagoon FS (BMT WBM, 2013).

The modelled land use and surface roughness is presented in the following Figure 3. During the existing and developed case scenarios, buildings around the subject site were blocked out following observations made on-site and review of detailed survey. In comparison, these were modelled with a high roughness in the Manly Lagoon FS (BMT WBM, 2013) however, were updated herein as the majority were observed to be of robust construction, especially the carpark at the rear of the subject site. This is considered a conservative assumption as the flow path through the site is removed, raising expected flood levels on-site.

During the developed case, the proposed building was modelled with a layered flow constriction, suspended above the under-croft area. Modelled block outs, representing the existing buildings on-site were removed with the proposed structural elements contributing blockage within the under-croft area (i.e. columns, shear walls and the lift shaft) fully blocked out of the model.

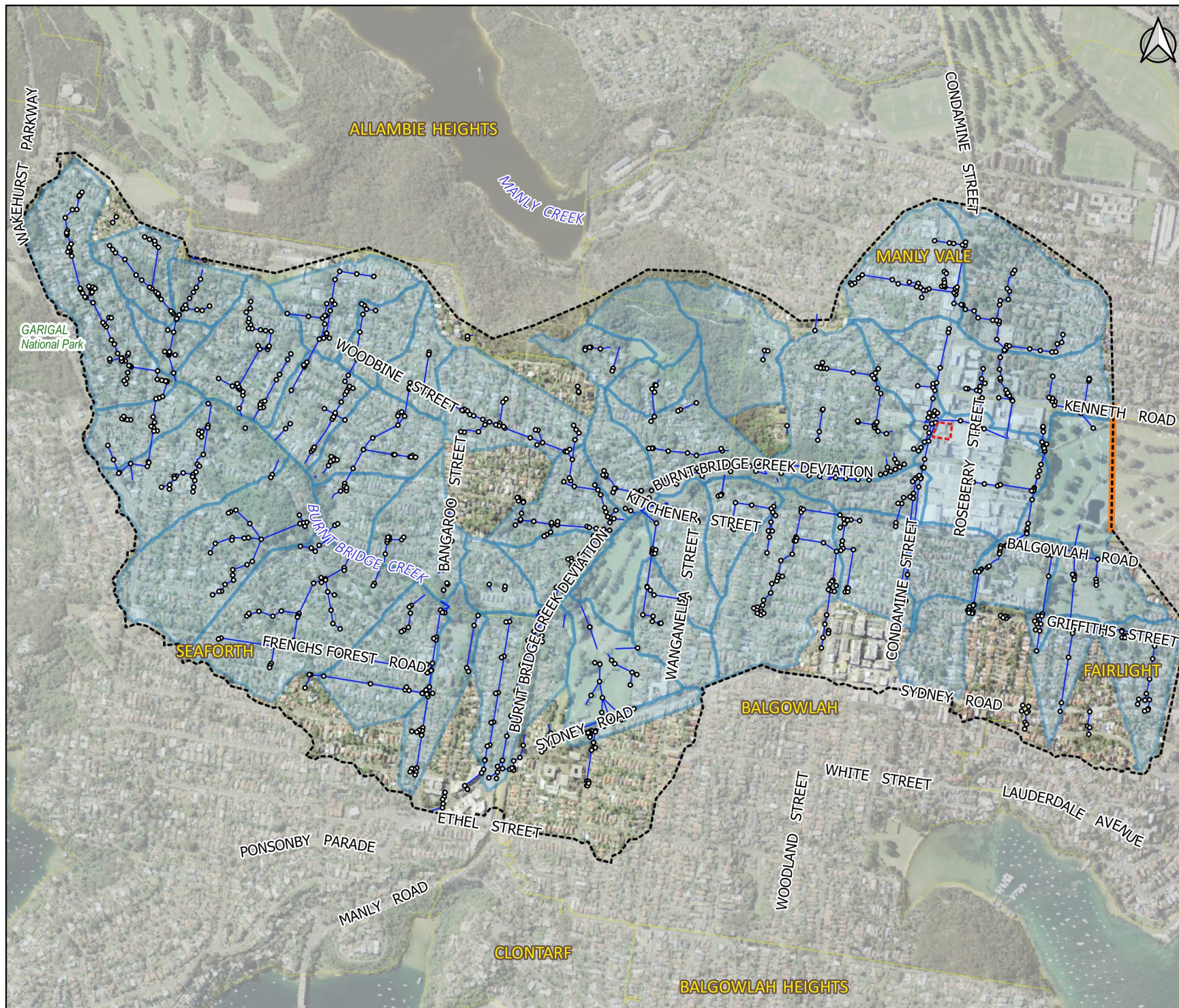
Similarly, areas at the front of the property that were expected to prevent flood water from passing beneath the soffit of the proposed building were also blocked out (i.e. at the front entrance and driveway). A ground floor thickness of 500mm was assumed for the building with full (100%) blockage modelled above the soffit level (i.e. 100% blockage at 11.3m AHD and above).

The original model terrain was updated to include the latest detailed survey as shown in Figure 4. Existing landscaped walls located along the front of the property were entered into the model manually.

During the developed case, a civil design surface was prepared for the under-croft area as shown in Figure 5. The extent of the suspended building, and structural elements are also presented in Figure 5.

The below ground network contained in the original Manly Lagoon FS (BMT WBM, 2013) remained unchanged for the purposes of the investigation. The stormwater network on the subject site was not included in the model due to their size (up to 150mm in diameter in the under-croft area). The intent of this network is to manage nuisance wetting within the under-croft area and is not designed to convey the magnitude of flows analysed herein.

The TUFLOW model was run using the latest TUFLOW version 2020-01-AA with HPC GPU module to improve model stability and reduce run time. A one-meter grid size was used to more accurately simulate flows around buildings and through the proposed under croft area.



Legend

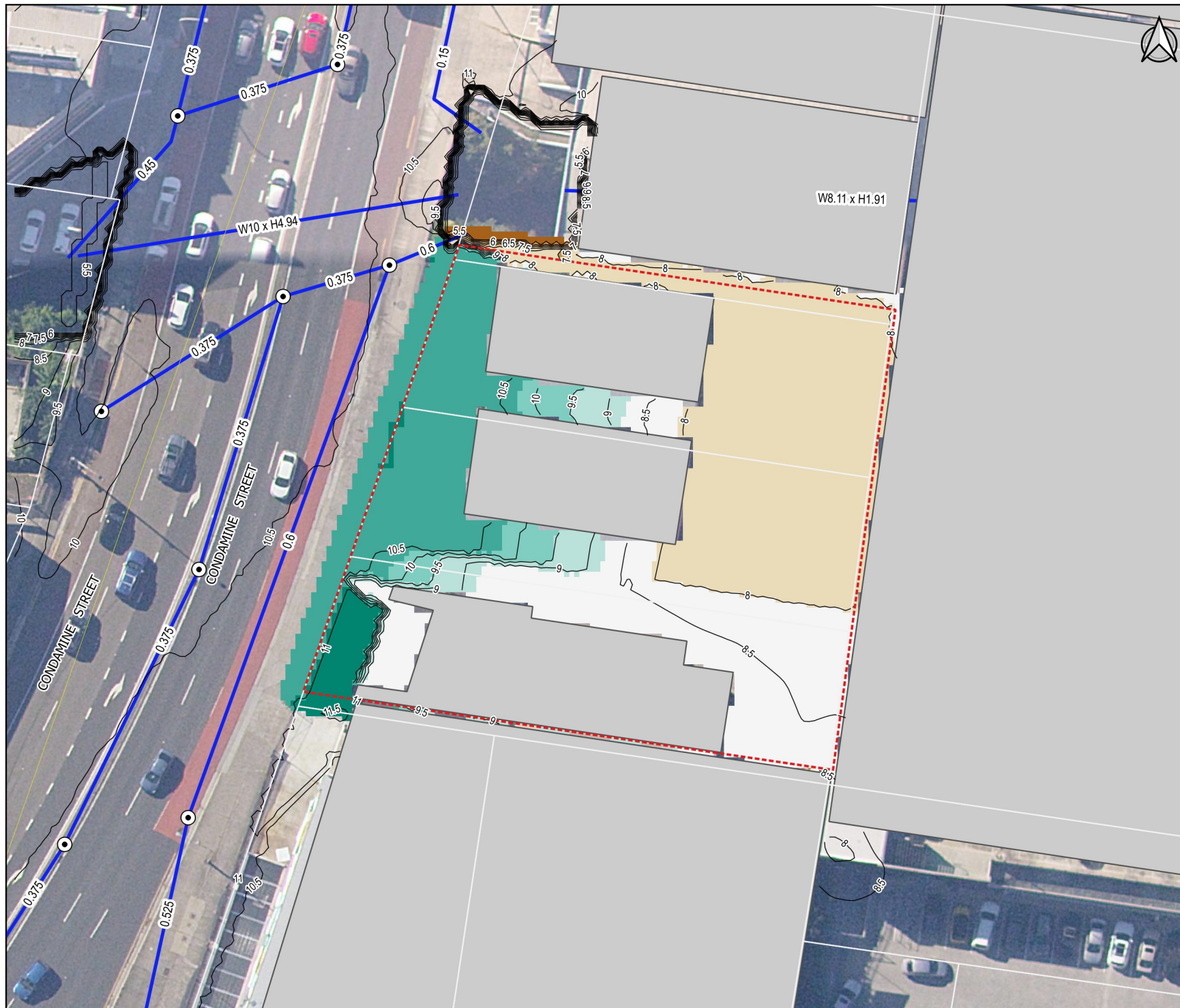
- Subject Site
- TUFLOW Model Extent
- Downstream Boundary
- 1D Pipes
- 1D Pits
- Inflow Polygons

0 200 400 Metres
1:15,000

Figure 2
Model Setup

200-204 Condamine Street
Balgowlah





Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Buildings (Blocked Out)
- Stormwater - Pipes
- Stormwater - Pits
- 0.5m Ground
- Contours (mAHd)

Terrain(mAHd)

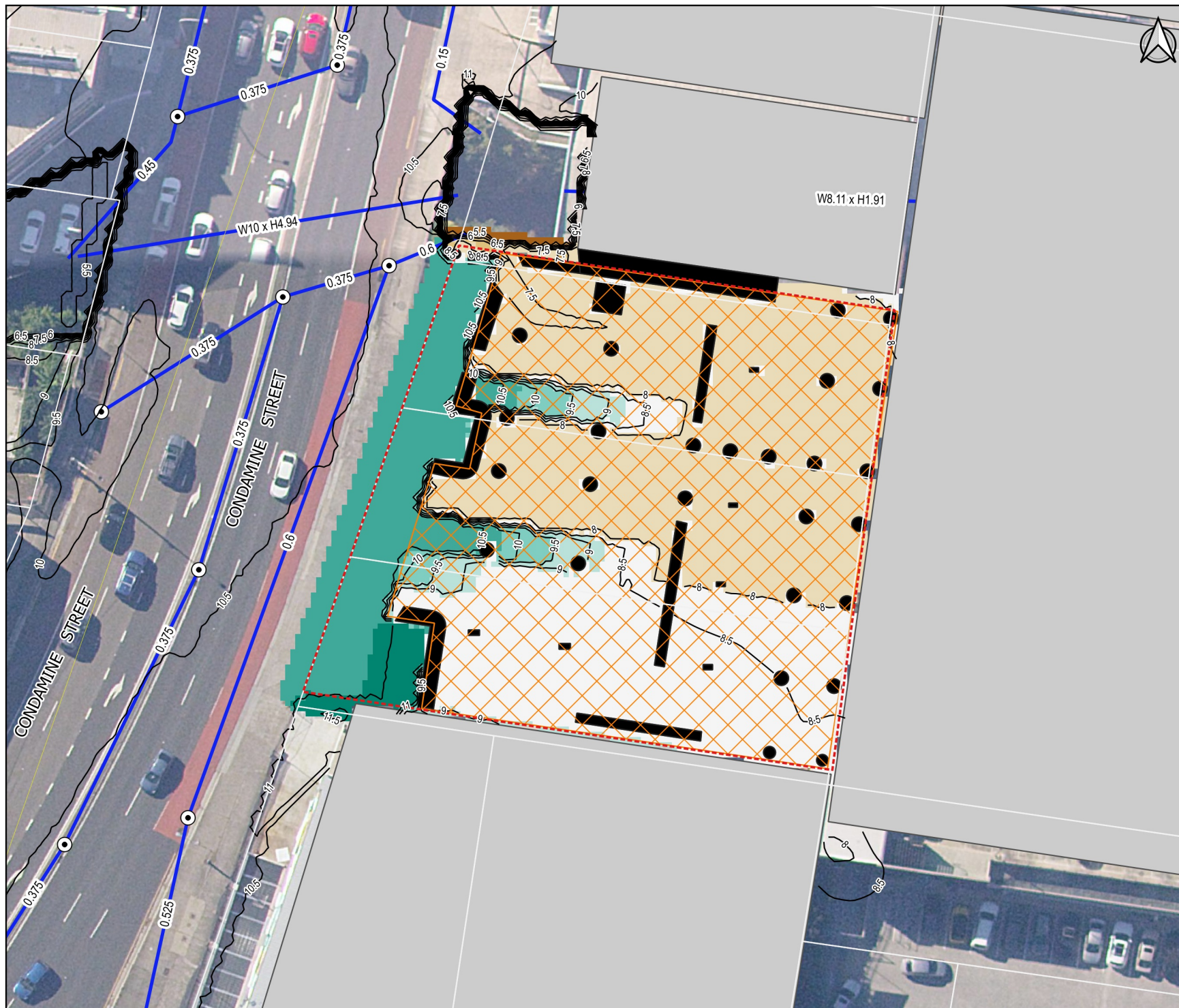
- <= 5.9
- 5.9 - 6.6
- 6.6 - 7.3
- 7.3 - 8.1
- 8.1 - 8.8
- 8.8 - 9.5
- 9.5 - 10.2
- 10.2 - 11.0
- > 11.0

0 8 16 Metres
1:500

Figure 4
Model Terrain and
Infrastructure
Existing Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Structural Elements (Blocked Out)
- Suspended Slab
- 0.5m Ground
- Contours (mAHd)
- Stormwater - Pipes
- Stormwater - Pits

Terrain(mAHd)

- <= 5.9
- 5.9 - 6.6
- 6.6 - 7.3
- 7.3 - 8.1
- 8.1 - 8.8
- 8.8 - 9.5
- 9.5 - 10.2
- 10.2 - 11.0
- > 11.0

0 8 16 Metres
1:500

Figure 5
Model Terrain and Infrastructure Developed Case

200-204 Condamine Street
Balgowlah



Flood Behaviour

Existing Case

The existing case flood depth and elevation contours for the 20%, 1% AEP and PMF design storm events are presented in Figures A1, A2 and A4 of Appendix A, respectively.

During the existing case, flows derived by the upstream Burnt Bridge Creek catchment approach the subject site from the west, continuing beneath and over Condamine Street before connecting into an open channel located on 206 Condamine Street. Excess flows that breach the capacity of the open channel spill down Hayes Street, to the south of the subject site, before continuing through the downstream road and stormwater network and passing through Manly Golf Course.

During the 20% AEP, flows are largely contained within Condamine Street, but connect to the site via the open channel in 206 Condamine Street. Flows run along the northern boundary of the site before filling up the carpark at the rear of the property which acts as a flood storage zone.

During the 1% AEP and PMF design storm events, the capacity of the Condamine Street carriageway is exceeded with flows observed to spill onto the subject site via the existing driveways and the open channel adjacent to the north-western corner of the site. Similar to the 20% AEP, the rear of the property is expected to act as a flood storage zone during the 1% AEP and PMF design storm events.

Flood hazard categories for the 1% AEP and PMF are presented in Figures A3 and A5 of Appendix A and have been based on the latest ARR 2019 categories presented in the below Figure 6. The results suggest flood hazard conditions of up to H5 and H6, are expected on the subject site during the 1% AEP and PMF design storm events, respectively.

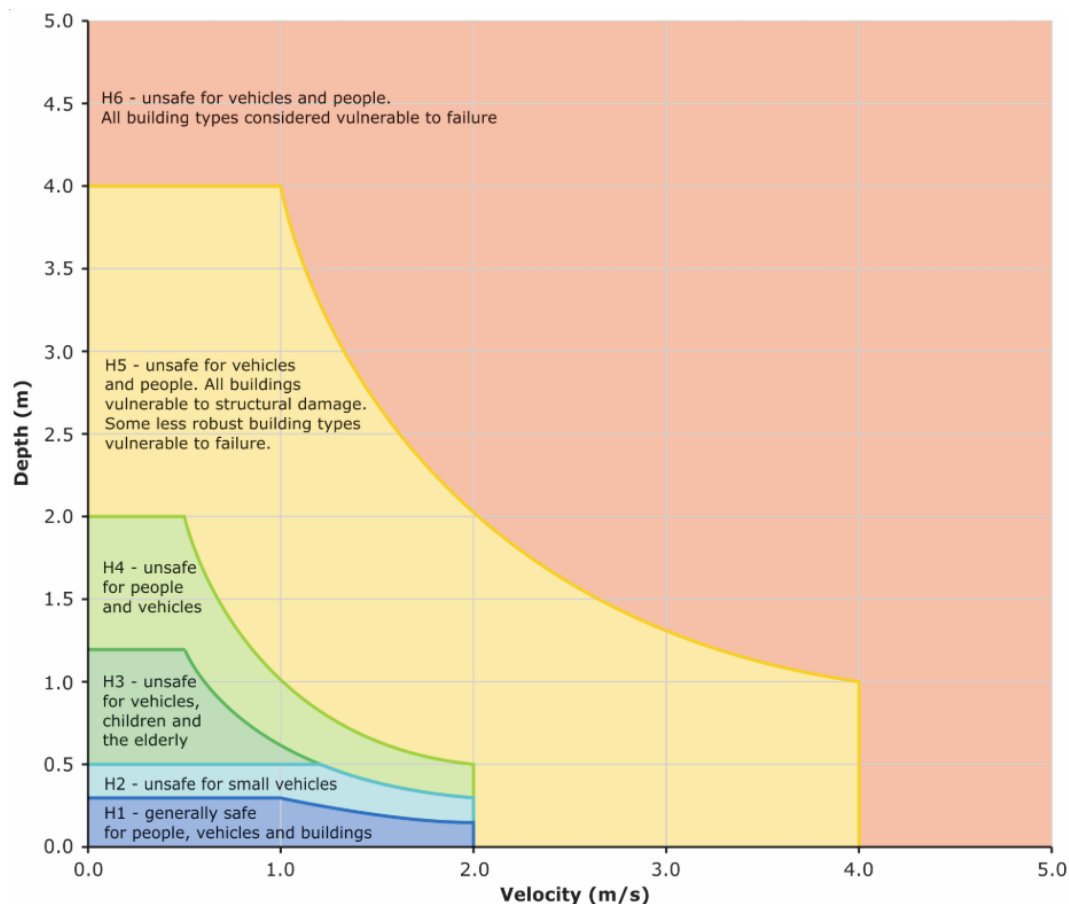


Figure 6 – Australian Rainfall and Runoff (2019) Hazard Categories

Developed Case

The developed case flood depth and elevation contours for the 20%, 1% AEP and PMF design storm events are presented in Figures B1, B2 and B5 of Appendix A, respectively.

Flow behaviour during the developed case is similar to that of the existing case. Flows enter the site from the open channel in 206 Condamine Street during the 20% AEP. Similarly, during the 1% AEP and PMF design storm events, flows enter the subject site via the street frontage, as well as the open channel in the north-western corner.

Flood elevations at the rear of the site are observed to be slightly higher during the developed case when compared to the existing case for both the 20% and 1% AEP design storm events. This is expected to be due to the additional inflow capacity created by the openings at the site frontage and the overland flow path in the under-croft along the north boundary of the site.

Figures B3 and B6 present the developed case flow velocities during the 1% AEP and PMF design storm events respectively. Flow velocities in the under-croft area during the 1% AEP and PMF are generally less than 0.5m/s. Flow velocities of up to approximately 1.0m/s and 2.0m/s are observed at the street frontage during the 1% AEP and PMF design storm events, respectively.

Flood hazard conditions are similar to those observed during the existing case with up to approximately H5 and H6 on the subject site during the 1% AEP and PMF design storm events respectively.

Flood Impacts

The flood impact of the proposed development during the 20%, 1% AEP and PMF flood events are shown in Figures C1[A] to C5[A] of Appendix A.

The results presented in Figures C1 and C3 of Appendix A show only minor changes in flood elevations during 20% AEP and PMF events. These changes are relatively small and are not expected to adversely impact nearby public or private properties.

Figure C1 of Appendix A shows a decrease in flood elevations across the Condamine Street and in the vicinity of the subject site under proposed conditions. This decrease is expected to be due to the increased flood storage capacity within the under-croft area of the proposed building. Flood storage capacities are discussed in a later section of this report.

A localised increase of approximately up to 20mm is observed in Condamine Street adjacent to the subject site frontage. This increase is expected to be due to the proposed modification of the site frontage and is not expected to adversely alter the existing flow behaviour.

Figures C4 and C5 of Appendix A show the change in flood velocities during 1% AEP and PMF design storm events. Generally, a decrease in flow velocities is observed around the subject site and vicinity. Minor spikes in velocities are observed however, these are not expected to create a significant adverse change to the flood hazard conditions.

Discussion

Comparison with Flood Report Levels

The modelled existing case maximum water elevations have been compared with the maximum flood levels presented in the Flood Reports provided by Council for the subject site (refer to Appendix B). The results for each property are listed in the below **Table 1**:

Table 1 – 1% AEP Flood Level Comparison (m AHD)

Property	Flood Reports (m AHD)	Updated Modelling (m AHD)	Difference (m)
200 Condamine St	11.06	11.07	+0.01
202 Condamine St	11.17	11.09	-0.08
204 Condamine St	11.19	11.24	+0.05

The above comparison indicates the existing case flood levels are generally consistent with the maximum flood levels provided in Council's Flood Reports. Some minor differences are observed which is expected to be due to the inclusion of the site-specific model elements and use of the latest TUFLOW solver.

It is noted that the flood levels at the rear of the property as presented in the Flood Reports are lower than those observed in the results presented in Appendix A. This is expected to be due to the inclusion of the block out to represent the concrete carpark adjacent to the eastern boundary. This carpark is expected to act to trap flood water on the subject site, blocking the overland flow path assumed to travel west to east across the subject site by the Manly Lagoon FS (BMT WBM, 2013). The inclusion of this block out is expected to be more realistic and is considered a conservative assumption as higher flood levels are observed at the rear of the property.

Flood Storage

An assessment on the change in flood storage available on the subject site has been performed based on a maximum 1% AEP flood level of 11.24m AHD as presented in the above **Table 1**.

The assessment concludes that the proposed development is expected to increase the available flood storage on the site from approximately 3,200m³ under existing conditions to 6,000m³ during developed conditions. This is expected to be due to the removal of the existing buildings and the proposed cut along the northern portion of the site.

As a result, an increase in flood storage is expected on-site due to the proposed development.

Finished Floor Levels

A Finished Floor Level (FFL) of 11.80m AHD is proposed across the ground floor of the building. The proposed FFL is above the Flood Planning Level of 11.69m AHD outlined by Council's Flood Reports and is also higher than modelled existing case 1% AEP + 500mm level of 11.74m AHD.

The proposed carpark is also protected to a level above the FPL with a minimum driveway crest level of 11.75m AHD.

A small section at the front of the building is proposed below the Flood Planning Level to enable pedestrian access to the facility. This area is less than 30m² and generally complies with the requirements set out by item C7 of Councils Development Control Plan (Section 5.4.3).

It is recommended this area be constructed using flood compatible materials that maintain structural integrity when wet and are easily cleaned following a flood event. Similarly, electrical fittings in this area are recommended to be waterproofed or sited at or above the Flood Planning Level.

Building Components

The building is of robust construction and all structural components are expected to be flood compatible. Similarly, due to the type of building, it is expected flood forces, debris impact loading and buoyancy will not be limiting in the design. It is anticipated this will be confirmed by a structural engineer prior to construction certificate.

As mentioned below, it is recommended the building be designed to withstand flood forces for events up to and including the PMF to enable on-site refuge.

Safety and Evacuation

The regional road network will likely be compromised in the 1% AEP event and access via Condamine Street is unlikely during the peak of the event. It is strongly recommended access and egress to and from the facility is not attempted during a major or extreme flood event.

The second storey of the proposed facility is expected to provide sufficient refuge above the PMF level. This will facilitate vertical evacuation in the event of a very rare or extreme flood event.

The building is to be designed to withstand flood forces and debris impact in the PMF to facilitate this approach. This is to be confirmed by a structural engineer prior to construction certificate.

Given the managed nature of the development, an excellent opportunity exists to provide education of the existing flooding risks prior to a flood event occurring. Building management will also play a role in the response and control of this evacuation during flood events.

It is anticipated that a Flood Emergency Response Plan (FERP) will formalise this process and assist in reducing the risk to life by educating building occupants on the flood risk prior the onset of very rare to extreme rainfall and outlining response procedures and areas of refuge.

Council Requirements and Assessment

The proposed development has been assessed with respect to the flood related controls outlined by Council's Development Control Plan (DCP). Section 5.4.3 of the DCP outlines Council's flood related development controls which are summarised in the below Table 2.

Also presented in Table 2 is the development response to each control. For the purposes of the assessment, the proposed development is categorised as a "Business & Industrial" use with a worst-case High Flood Risk Precinct classification.

Table 2 – Council Requirements

Control	Relevant Requirement	Response
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	As presented above, the proposed development is not expected to create an adverse impact on flood levels or velocities in adjacent public or private properties during events ranging from the 20% AEP to the PMF.

Control	Relevant Requirement	Response
	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.	The proposed development is expected to minimise exposure of the flood hazard to occupants by placing the FFL above the FPL and by providing capacity for on-site refuge during both major and extreme events.
	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.	As discussed above, an increase in flood storage on site below the 1% AEP of approximately 2,800m³ is expected to be created by the development.
B. Building Components and Structural	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).	This is not expected to be limiting in design and will be considered during to Construction Certificate Phase.
	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.	Structural design for events up to and including the PMF is to be considered to enable on-site refuge. It is expected this will be reviewed during to Construction Certificate Phase.
	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	This is not expected to be limiting in design and will be reviewed during to Construction Certificate Phase.

Control	Relevant Requirement	Response
	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. C3. All development structures must be designed and constructed so as not to impede the floodway or flood conveyance on the site, as well as ensuring no loss of flood storage in a 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 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	Refer to the <i>Finished Floor Level</i> section of the report. The building has been designed to be suspended above the 1% AEP design storm event. The front of the building is designed to enable flows to pass beneath the soffit and into the under-croft area. It is anticipated louvres or equivalent will be installed across the opening to limit unauthorised access. The perimeter has been designed to ensure an appropriate quantity of flow enters the under-croft area in order to limit flood impacts off-site. As mentioned in the Finished Floor Section above, a small section of the proposed development is sited below the FPL however, generally complies with this requirement.
D. Car Parking	D6. All enclosed car parks (including basement car parks) must be protected from inundation up to the Flood Planning Level. All access, ventilation, driveway crests and any other	The proposed car park is protected to a level above the FPL.

Control	Relevant Requirement	Response
	potential water entry points to any enclosed car park 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	No loss in flood storage is expected to be created by the development as discussed above.
E. Flood Emergency Response	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: - The floor level is at or above the Probable Maximum Flood level; and - 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; - 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	Flood hazard conditions accordance with AIDR and ARR 2019 are presented herein. Refuge on site is recommended with the proposed building to be designed to withstand flood forces up to and including the PMF. Refer to the <i>Safety and Evacuation</i> section of the report for further details. It is anticipated a Flood Emergency Response Plan will be prepared prior to Occupation to ensure a flood emergency kit is maintained on site. The upper level of the facility is sited at an RL of 17.2m AHD – Approximately 4.7m above the modelled PMF flood level. This area is expected to provide sufficient space for staff and visitors to seek refuge following notification of a predicted major or extreme flood event.

Control	Relevant Requirement	Response
	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	
F. Fencing	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.	Proposed fences located within flooded areas will be designed to be of open style in accordance with this requirement, so as to not impede the flow of flood water.
D. Storage of Goods	D1. Hazardous or potentially polluting materials shall not be stored below the Flood Planning Level unless adequately protected from floodwaters in accordance with industry standards.	Hazardous or potentially polluting materials are to be stored above the Flood Planning Level.

Conclusions

A Flood Management Report has been prepared for the proposed development at 200-204 Condamine Street, Balgowlah NSW.

It was concluded that the proposed development is not expected to create a significant adverse impact to the existing flood behaviour on the subject site and on the properties surrounding the subject site.

Furthermore, the proposed development is expected to generally comply with Council's flood related development controls.

We commend our findings to Northern Beaches Council for their review.

Limitation statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by King Furniture Australia Pty Ltd. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

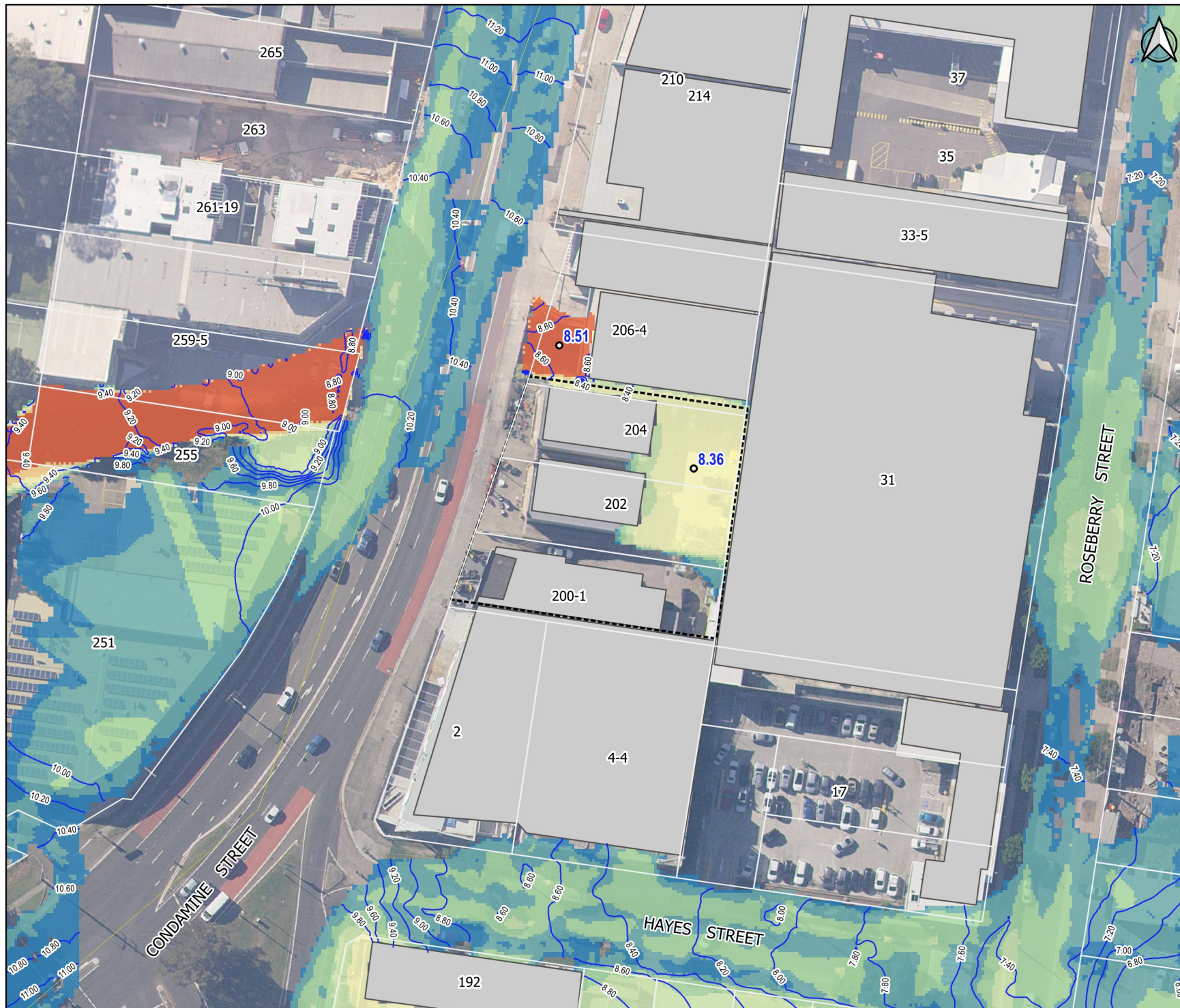
This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Document Register

Rev	Status	Prepared	Approved	Date
A	Approval	RB	LG	23 November 2022

Appendix A – Flood Figures



Legend

- Subject Site
- Buildings
- 0.2m Contours (mAHD)
- Spot Level (mAHD)

Depth(m)

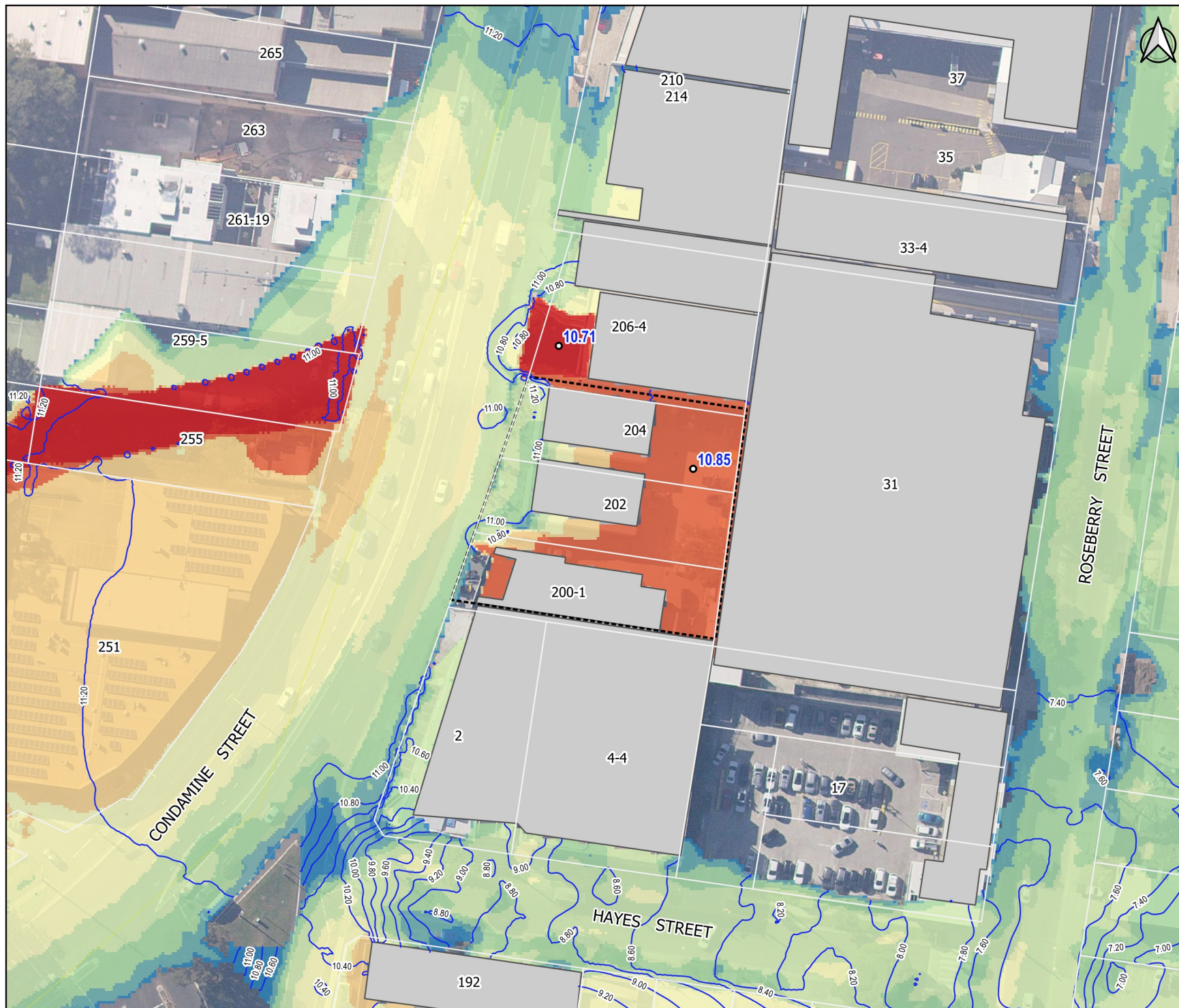
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- 0.10 - 0.25
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- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 >

0 10 20 Metres
1:1,000

Figure A1[A]
20% AEP Flood Depth and Elevation Existing Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- 0.2m Contours (mAHD)
- Spot Level (mAHD)

Depth(m)

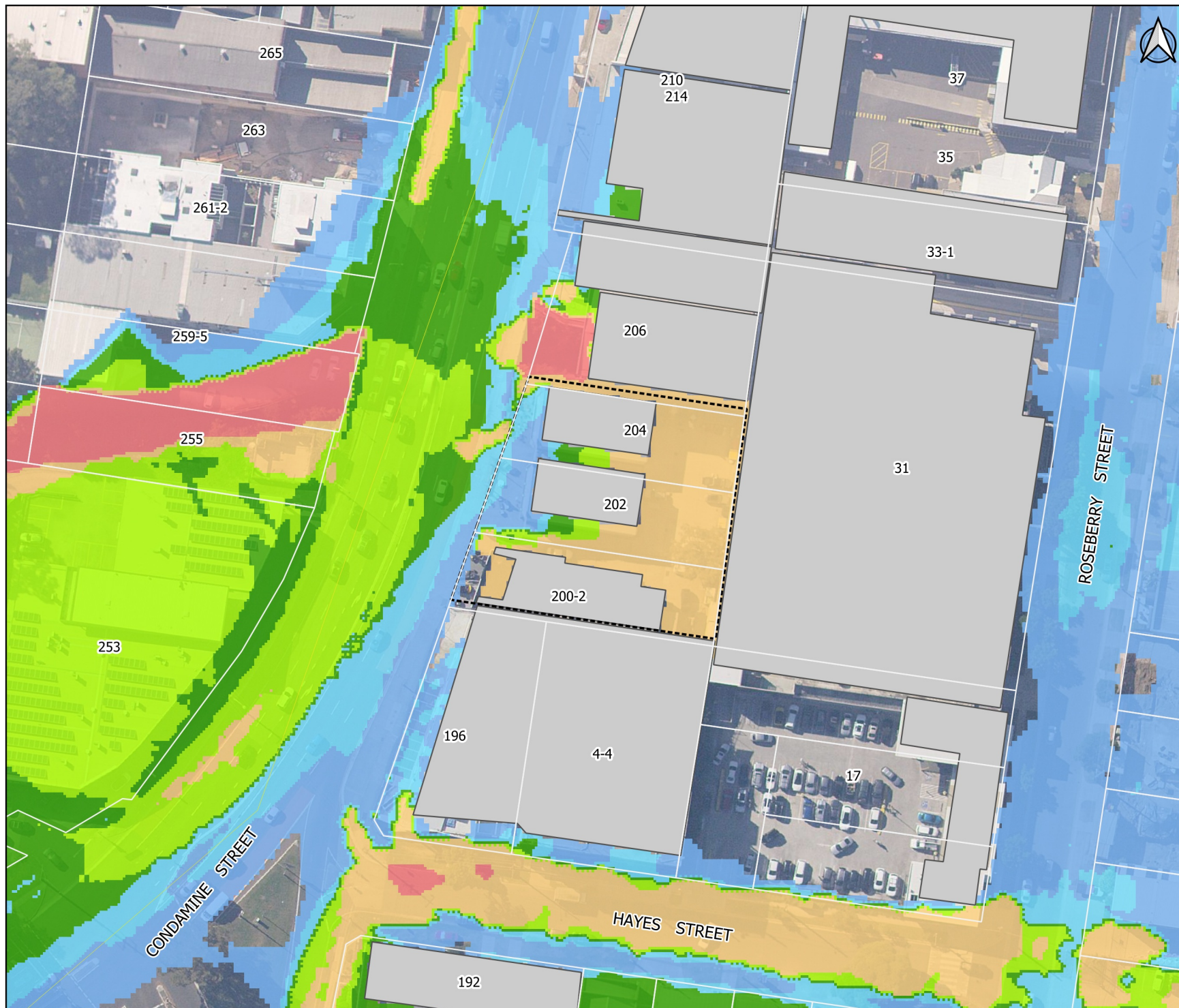
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- 0.50 - 1.00
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- 2.00 - 4.00
- 4.00 >

0 10 20 Metres
1:1,000

Figure A2[A]
**1% AEP Flood Depth and
Elevation
Existing Case**

200-204 Condamine Street
Balgowlah





Legend

Subject Site

Buildings

Hazard Category

H1

H2

H3

H4

H5

H6

0 10 20 Metres

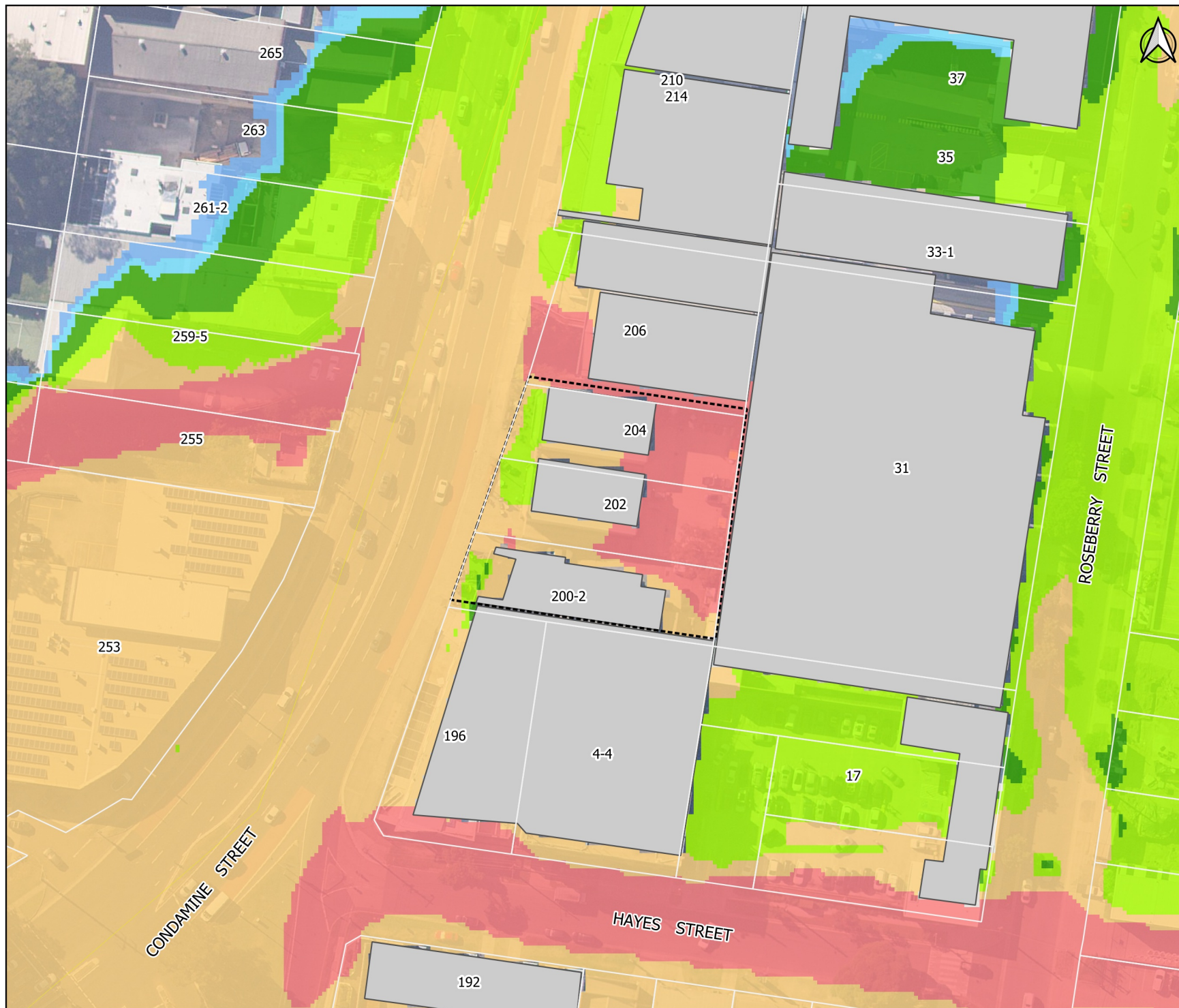
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Figure A3[A]

1% AEP Flood Hazard
Existing Case

200-204 Condamine Street
Balgowlah





Legend

Subject Site

Buildings

Hazard Category

H1

H2

H3

H4

H5

H6

0 10 20 Metres

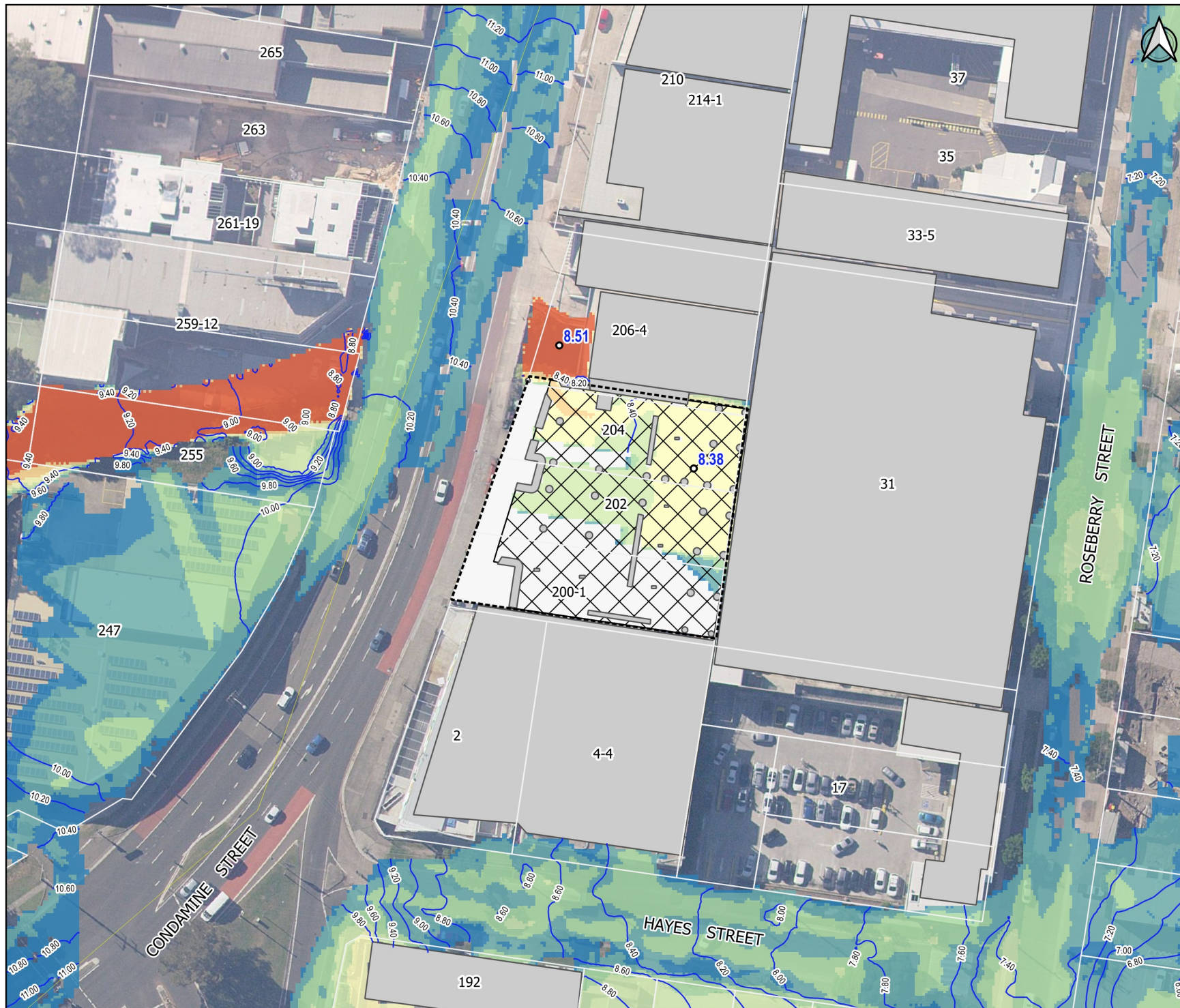
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Figure A5[A]

PMF Flood Hazard
Existing Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab
- 0.2m Contours (mAHD)
- Spot Level (mAHD)

Depth(m)

- <= 0.02
- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 >

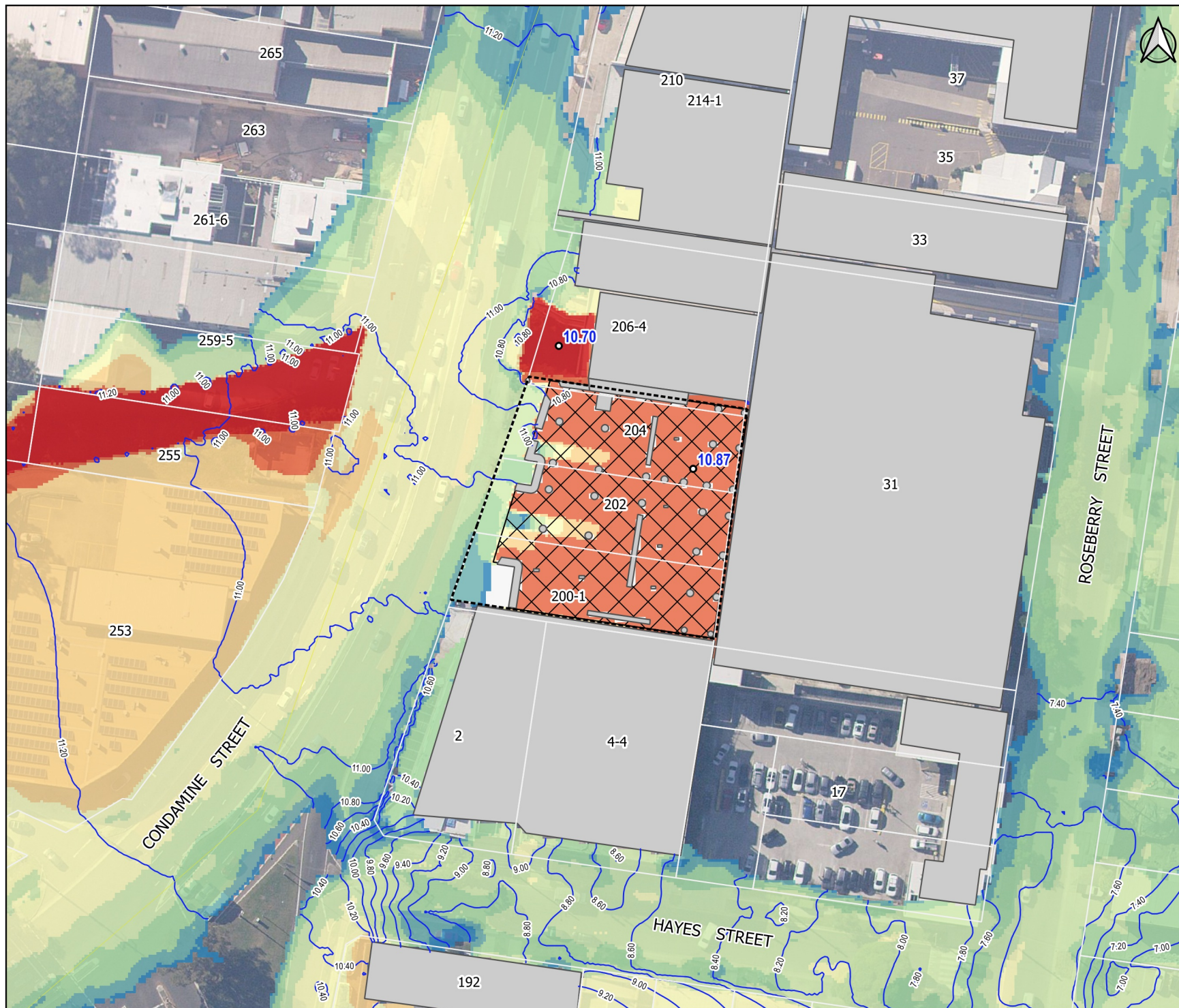
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Figure B1[A]

20% AEP Flood Depth
and Elevation
Developed Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab
- 0.2m Contours (mAHD)
- Spot Level (mAHD)

Depth(m)

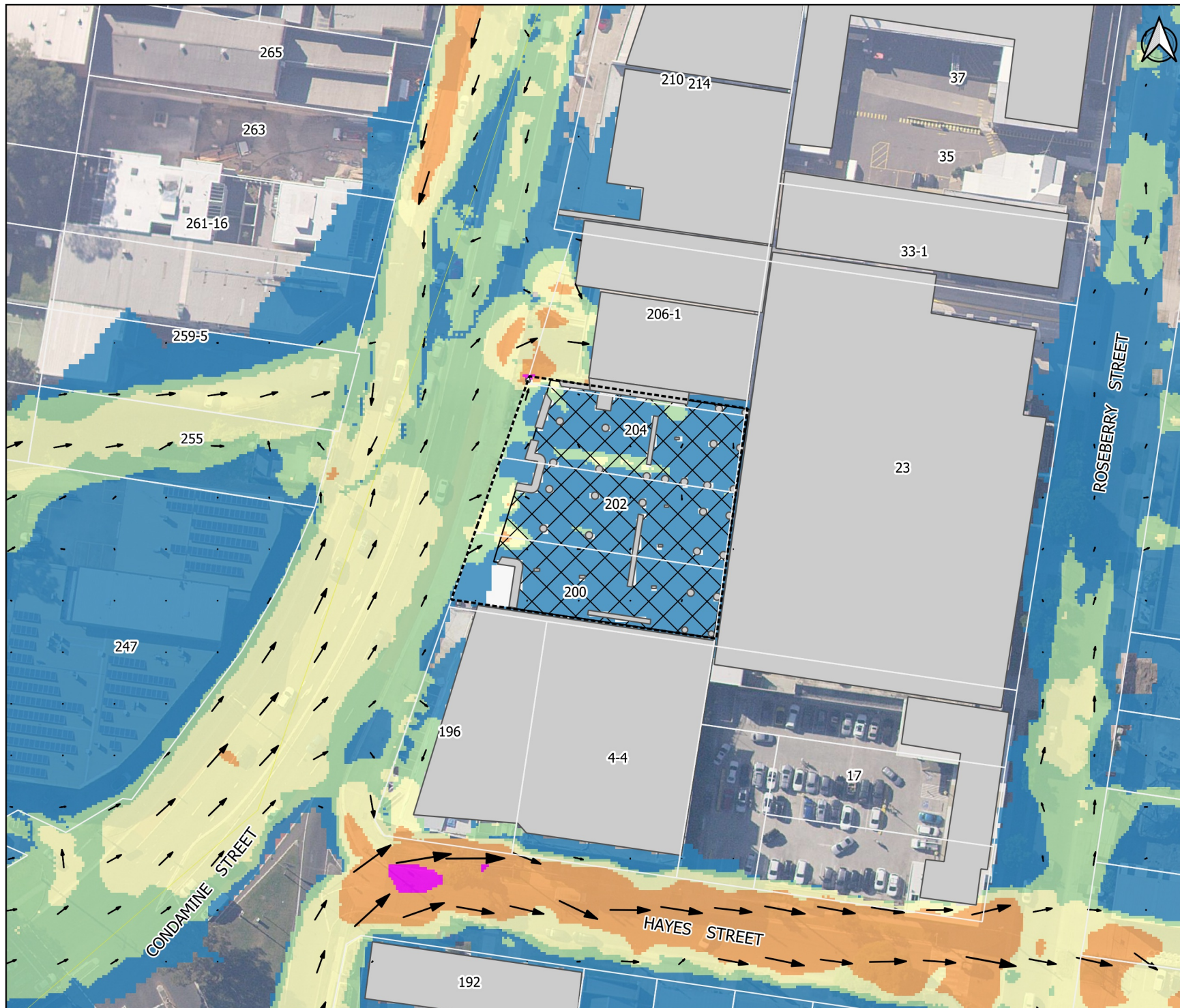
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- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 >

0 10 20 Metres
1:1,000

Figure B2[A]
**1% AEP Flood Depth
and Elevation
Developed Case**

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab
- Velocity Vector

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

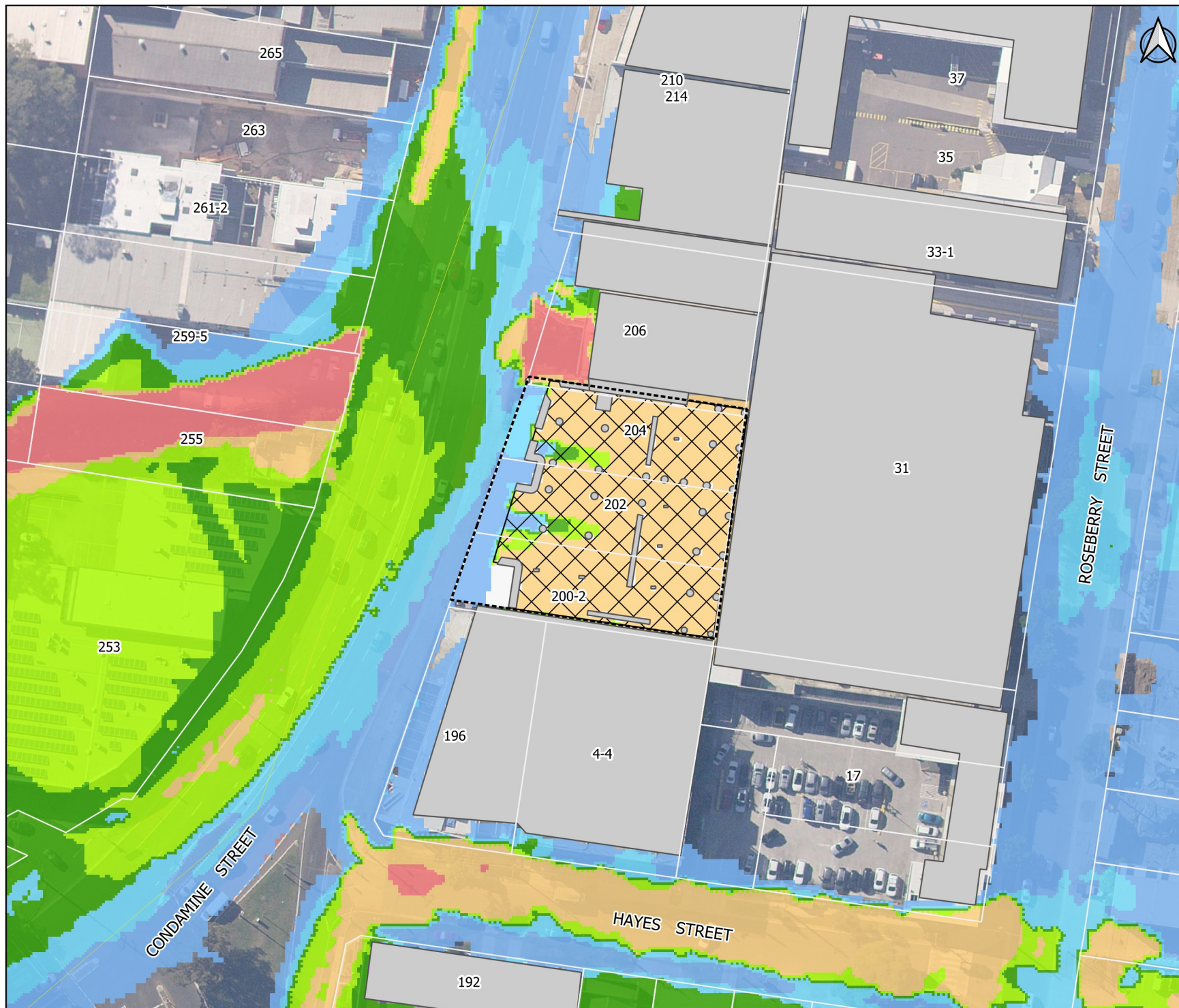
0 10 20 Metres

1:1,000

Figure B3[A]
1% AEP Flood Velocity
Developed Case

200-204 Condamine Street
 Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

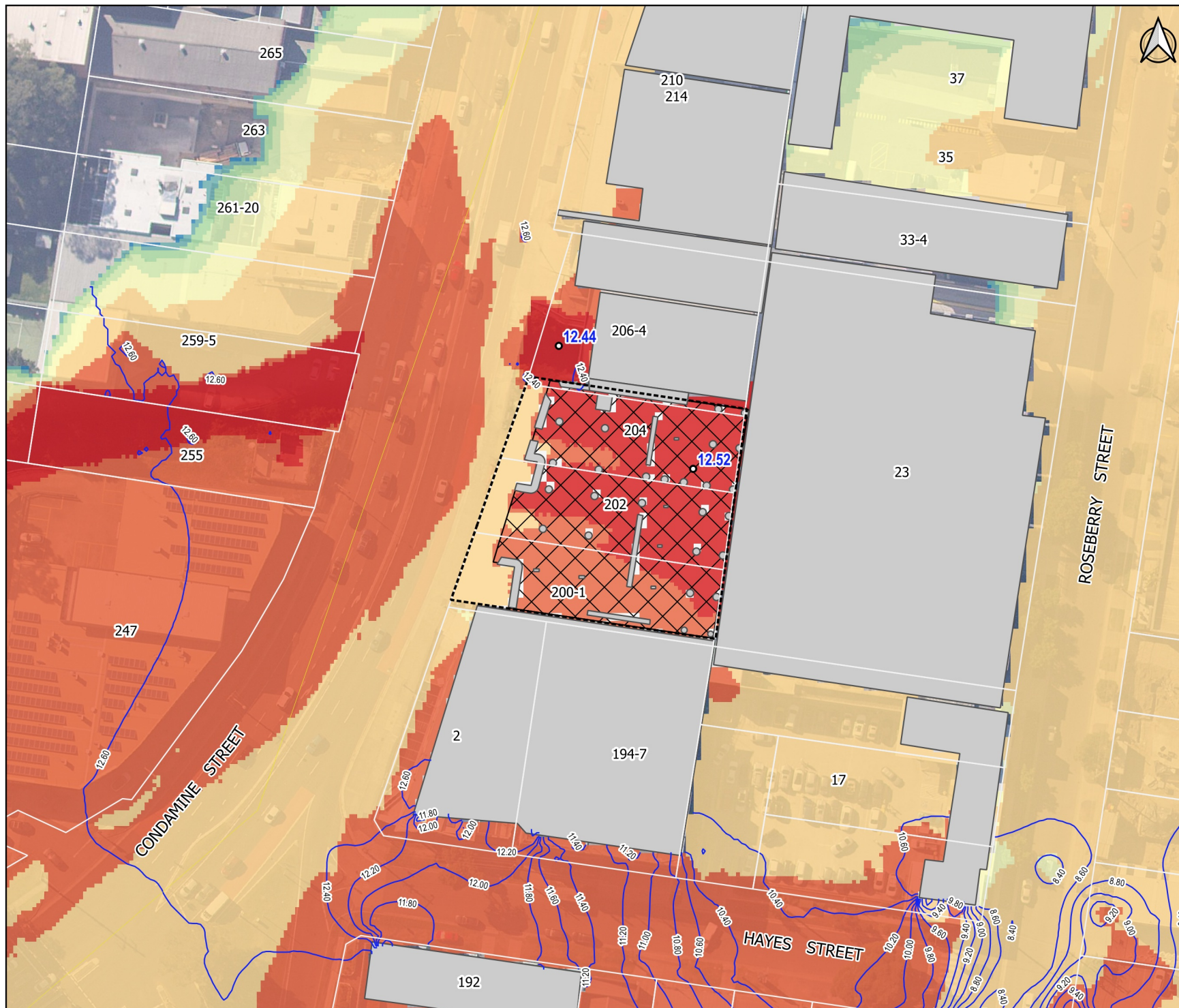
0 10 20 Metres
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Figure B4[A]

1% AEP Flood Hazard
Developed Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab
- 0.2m Contours (mAHD)
- Spot Level (mAHD)

Depth(m)

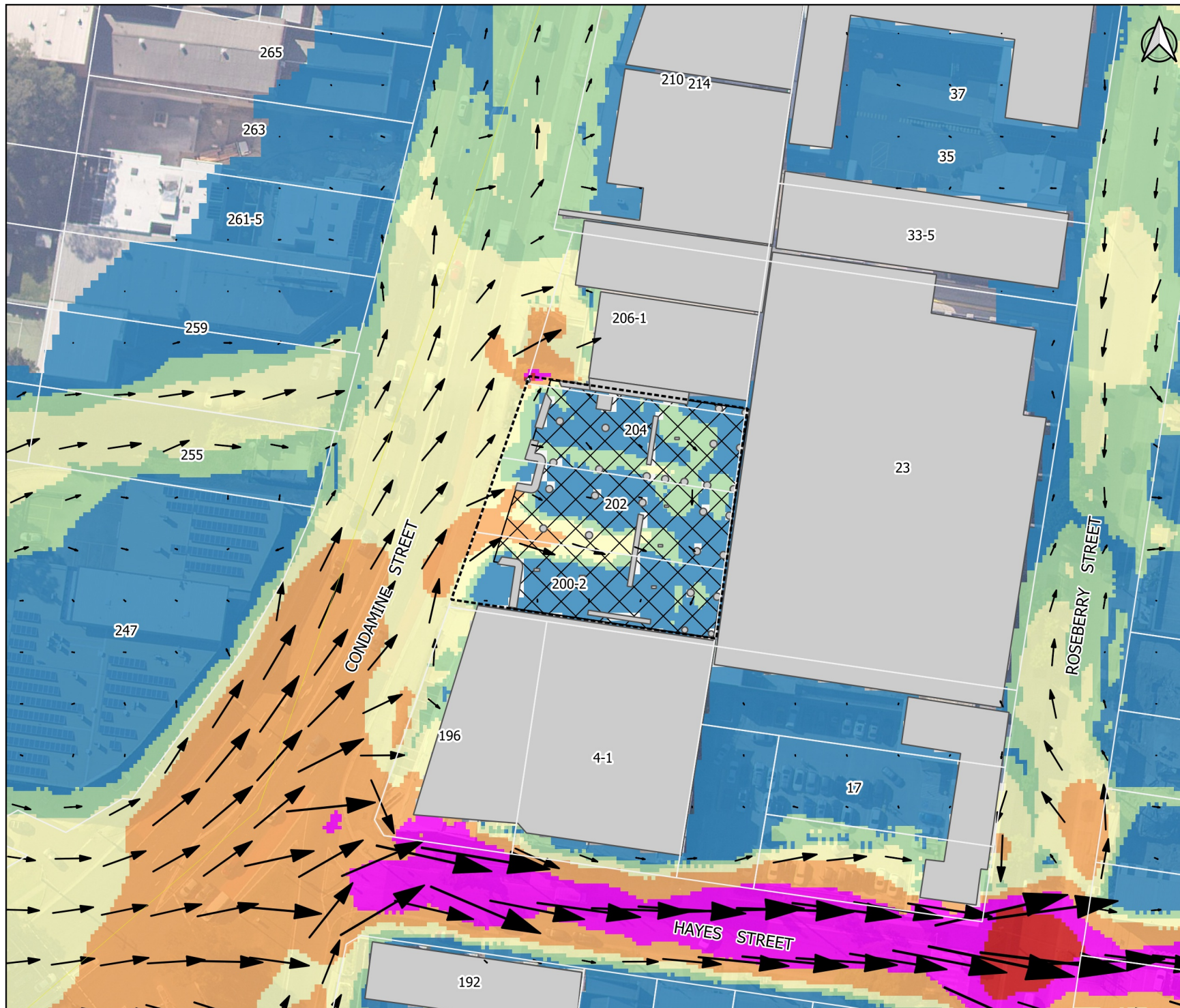
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- 0.02 - 0.10
- 0.10 - 0.25
- 0.25 - 0.50
- 0.50 - 1.00
- 1.00 - 2.00
- 2.00 - 4.00
- 4.00 >

0 10 20 Metres
1:1,000

Figure B5[A]
PMF Flood Depth
and Elevation
Developed Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab
- Velocity Vector

Velocity(m/s)

- < 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 4.0
- 4.0 - 6.0
- > 6.0

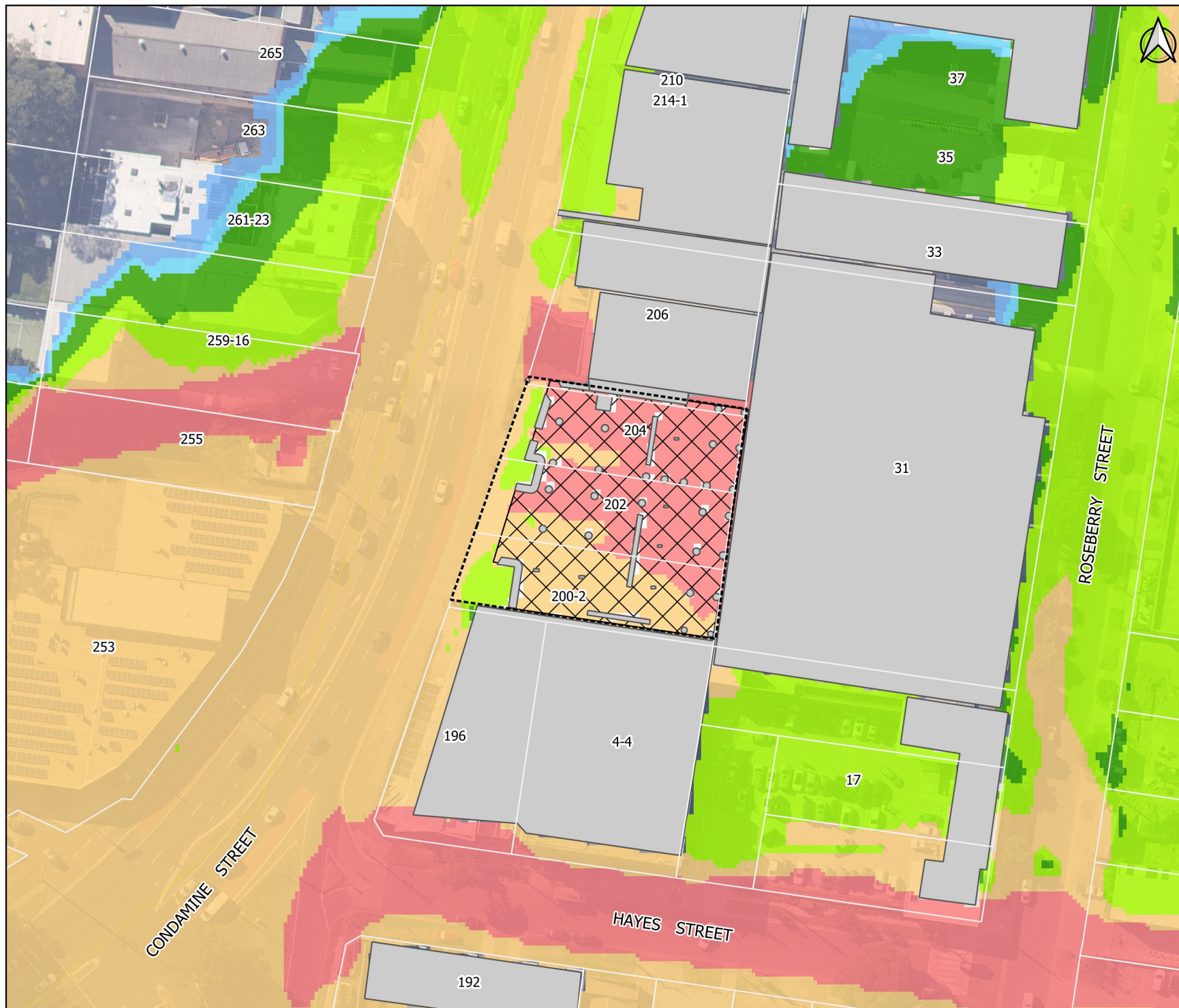
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1:1,000

Figure B6[A]
PMF Flood Velocity
Developed Case

200-204 Condamine Street
 Balgowlah





Legend

- Subject Site
- Buildings
- Suspended Slab

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 10 20 Metres
1:1,000

Figure B7[A]
PMF Flood Hazard
Developed Case

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Suspended Slab

Difference(m)

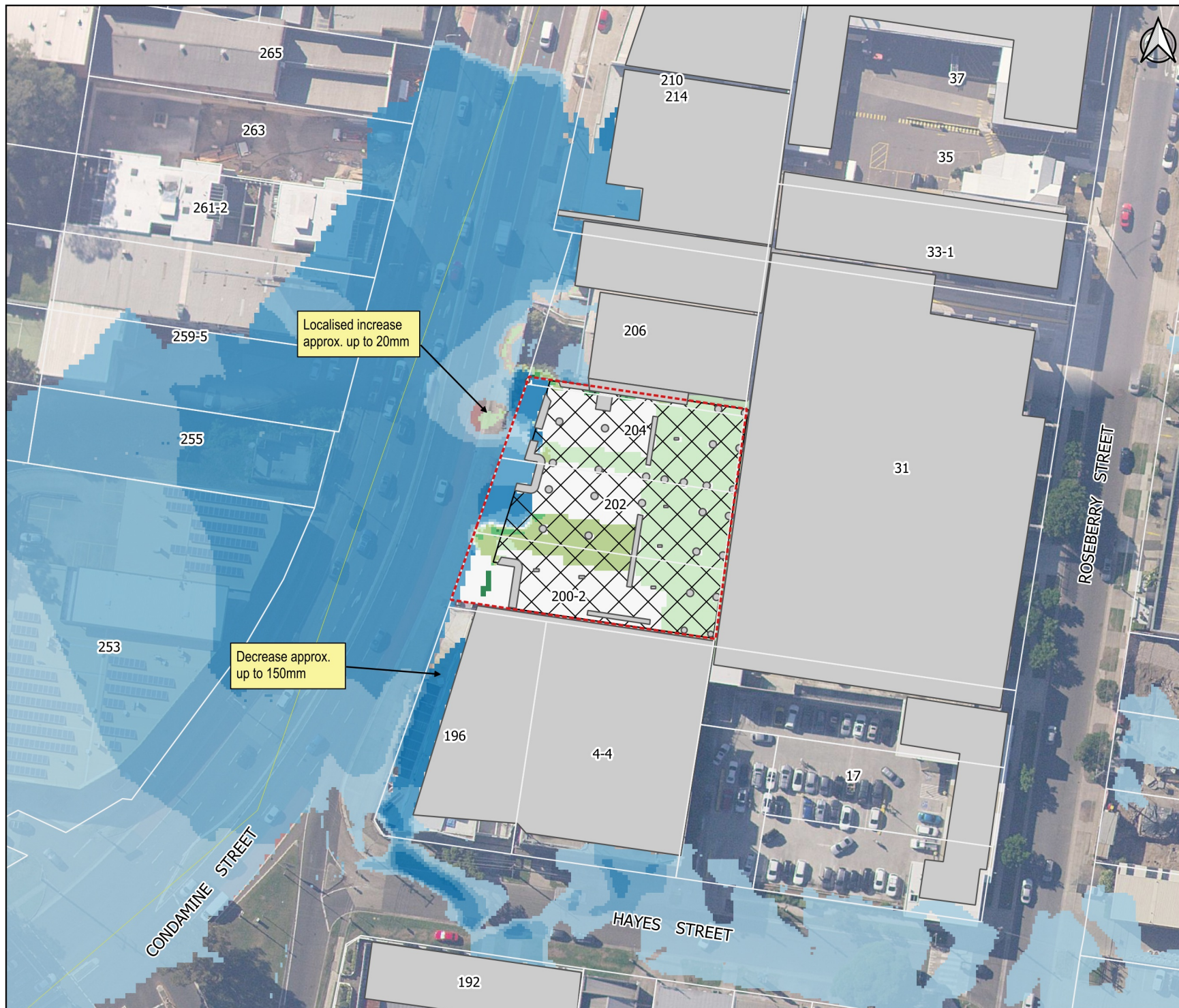
- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 10 20 Metres
1:1,000

Figure C1[A]
20% AEP Flood
Elevation Difference
Developed minus Existing

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Suspended Slab

Difference(m)

- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

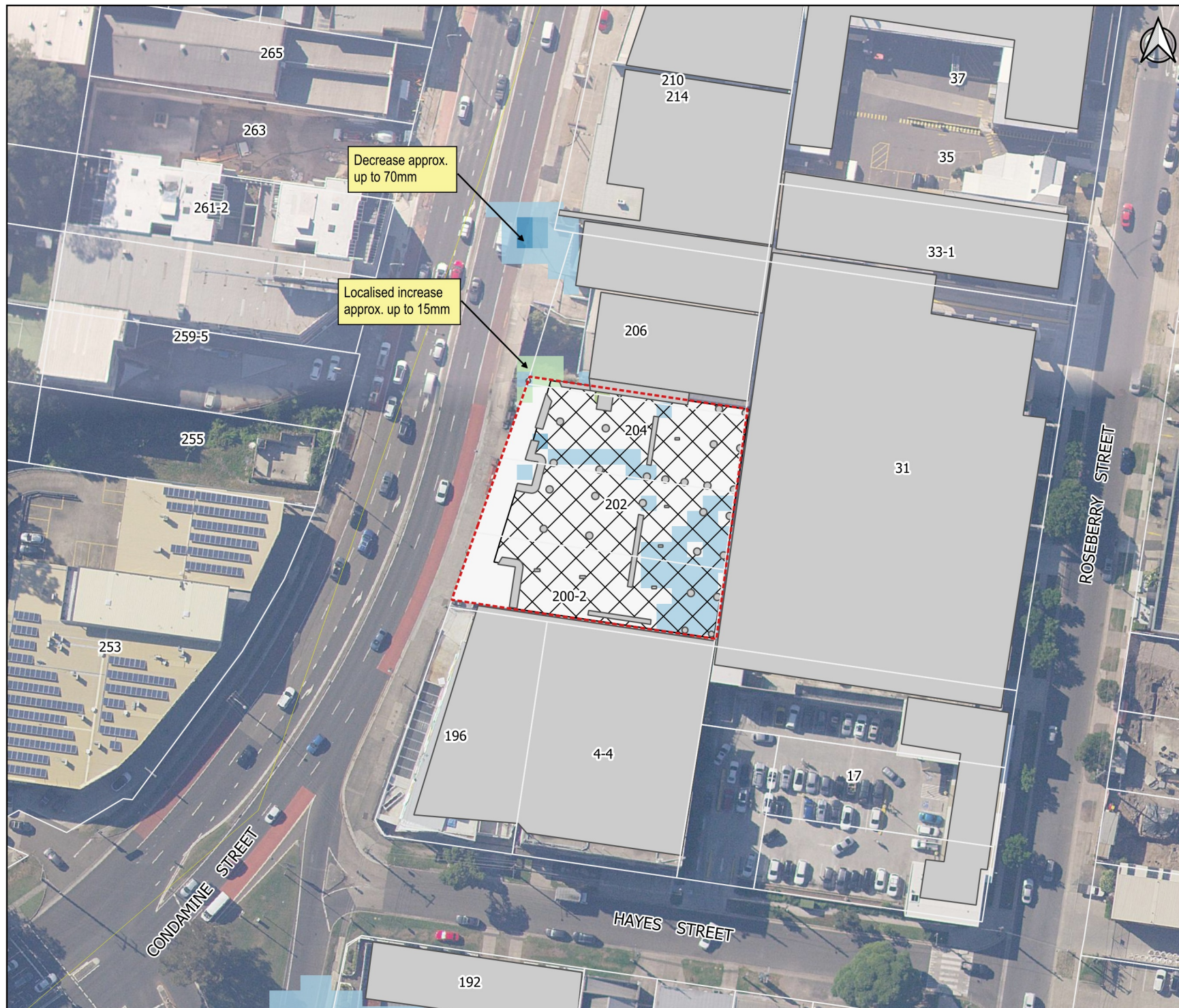
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Figure C2[A]
1% AEP Flood
Elevation Difference
Developed minus Existing

200-204 Condamine Street
 Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Suspended Slab

Difference(m)

- <-0.10
- 0.10 - -0.05
- 0.05 - -0.03
- 0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

0 10 20 Metres
1:1,000

Figure C3[A]
PMF Flood
Elevation Difference
Developed minus Existing

200-204 Condamine Street
Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Suspended Slab

Difference(m)

- <-1.0
- 1.0 - -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- Less than +/-0.1m/s
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- >1.0

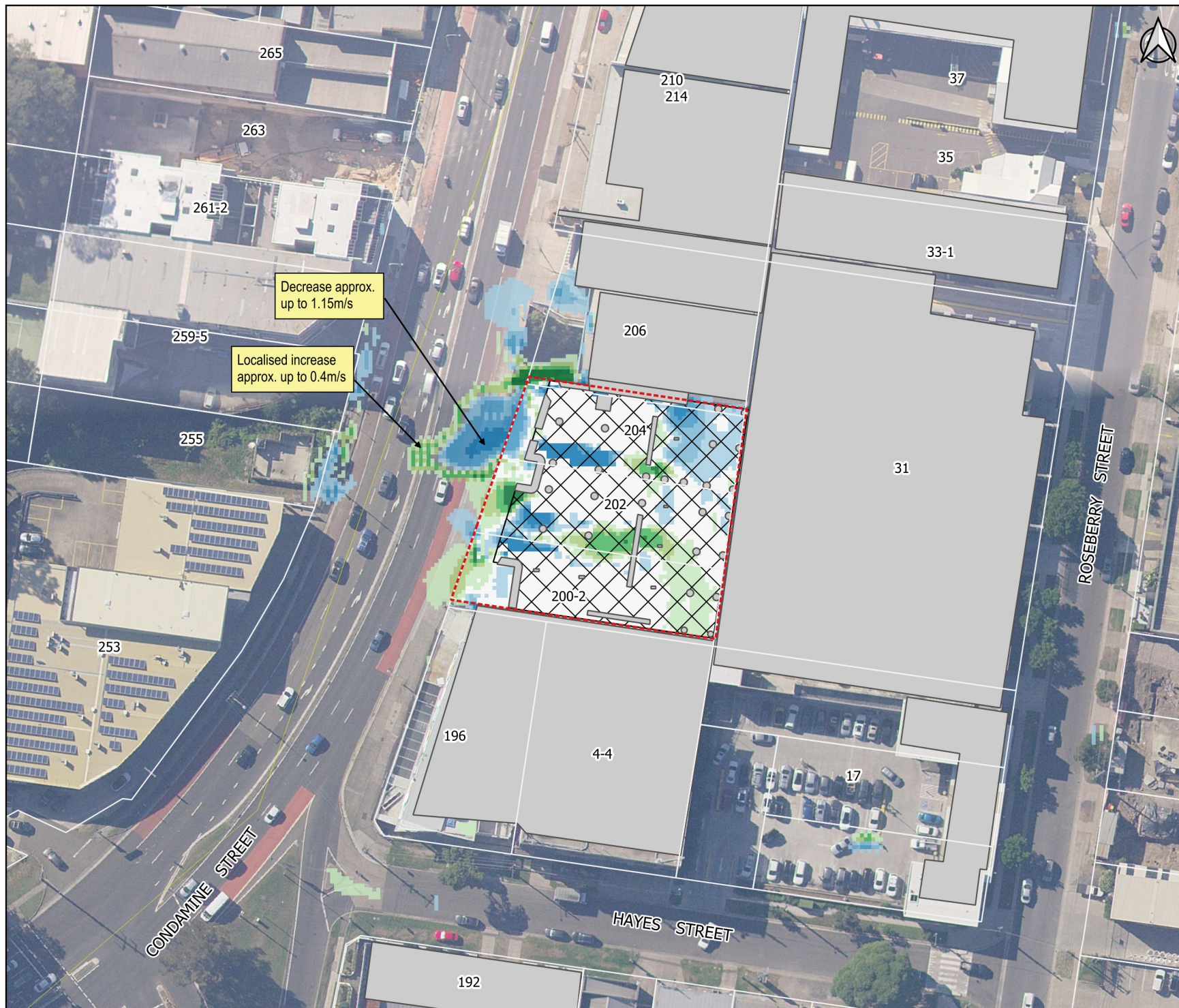
0 10 20 Metres

1:1,000

Figure C4[A]
1% AEP Flood
Velocity Difference
Developed minus Existing

200-204 Condamine Street
 Balgowlah





Legend

- Subject Site
- Buildings (Blocked Out)
- Suspended Slab

Difference(m)

- <-1.0
- 1.0 - -0.5
- 0.5 - -0.3
- 0.3 - -0.1
- Less than +/-0.1m/s
- 0.1 - 0.3
- 0.3 - 0.5
- 0.5 - 1.0
- >1.0

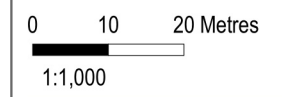


Figure C5[A]
PMF Flood
Velocity Difference
Developed minus Existing

200-204 Condamine Street
 Balgowlah



Appendix B – Council Flood Report Information

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 200 Condamine Street BALGOWLAH NSW 2093

Lot DP: Lot 91 DP 607382

Issue Date: 08/02/2021

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}: 11.56 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: 11.06 mAHD

1% AEP Maximum Depth from natural ground level³: 1.86 m

1% AEP Maximum Velocity: 3.19 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: 12.21 m AHD

PMF Maximum Depth from natural ground level: 3.84 m

PMF Maximum Velocity: 4.96 m/s

PMF Flood Hazard: High See Flood Map F

PMF Hydraulic Categorisation: Floodway See Flood Map G

Flooding with Climate Change – N/A

Flood Life Hazard Category – See Map H

Indicative Ground Surface Spot Heights – See Map I

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

² Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

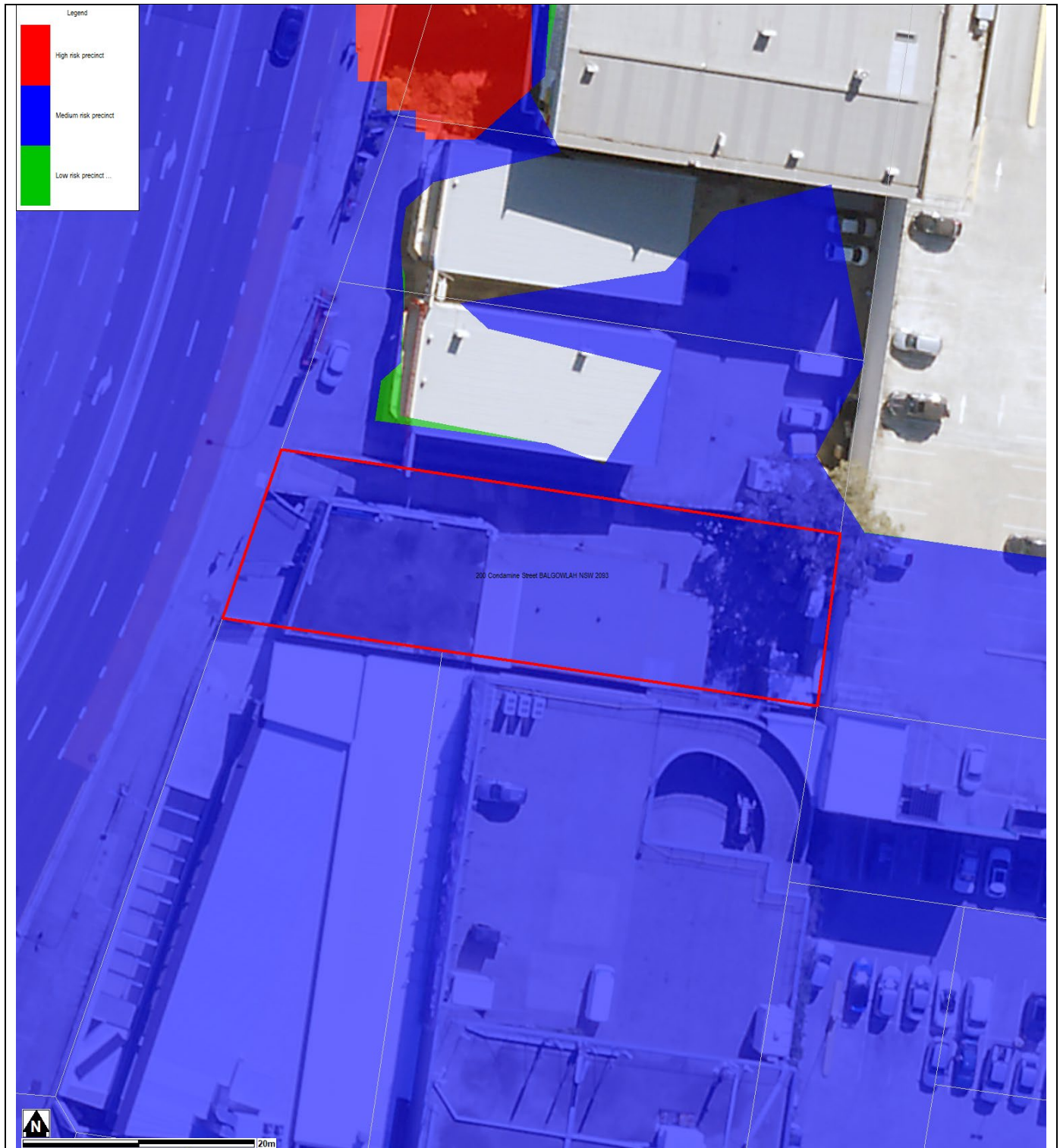
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

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

General Notes:

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

FLOOD MAP A: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 or H6 Life Hazard Classification).
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

FLOOD 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.

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	10.98	1.18	1.79	11.48	12.20	2.40	2.40
2	N/A	N/A	10.10	1.47	1.93	10.60	12.11	3.47	2.61
3	N/A	N/A	10.07	1.62	0.99	10.57	12.04	3.34	1.65
4	N/A	N/A	10.88	1.12	1.36	11.38	12.20	2.44	1.99
5	N/A	N/A	10.05	1.07	0.44	10.55	12.10	3.12	0.39
6	N/A	N/A	10.00	1.44	0.74	10.50	11.93	3.38	0.87

WL – Water Level

PMF – Probable Maximum Flood

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

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than $0.3\text{m}^2/\text{s}$, a freeboard of 0.3m may be able to be justified.

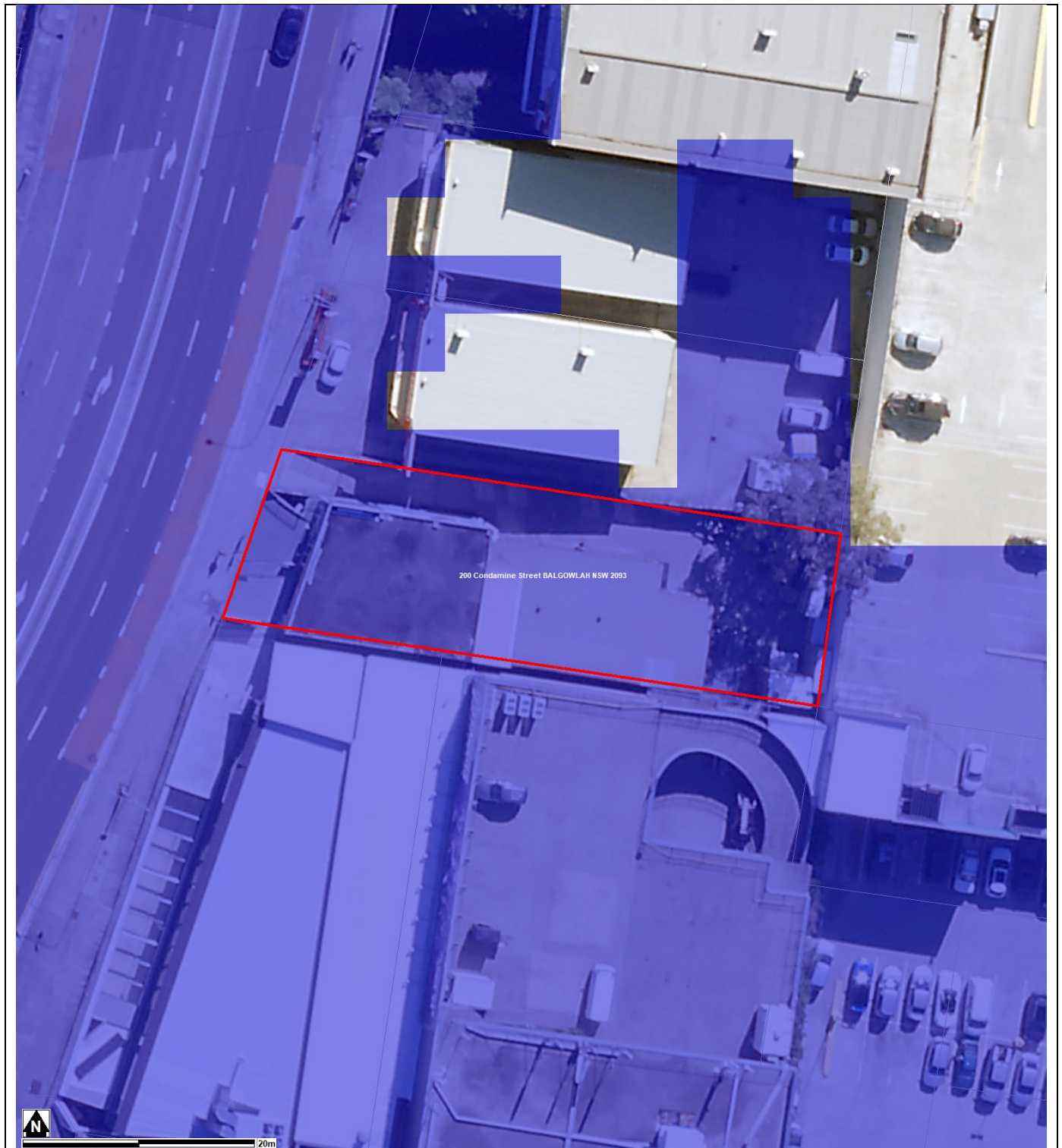
FLOOD MAP B: FLOODING - 1% AEP EXTENT



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.

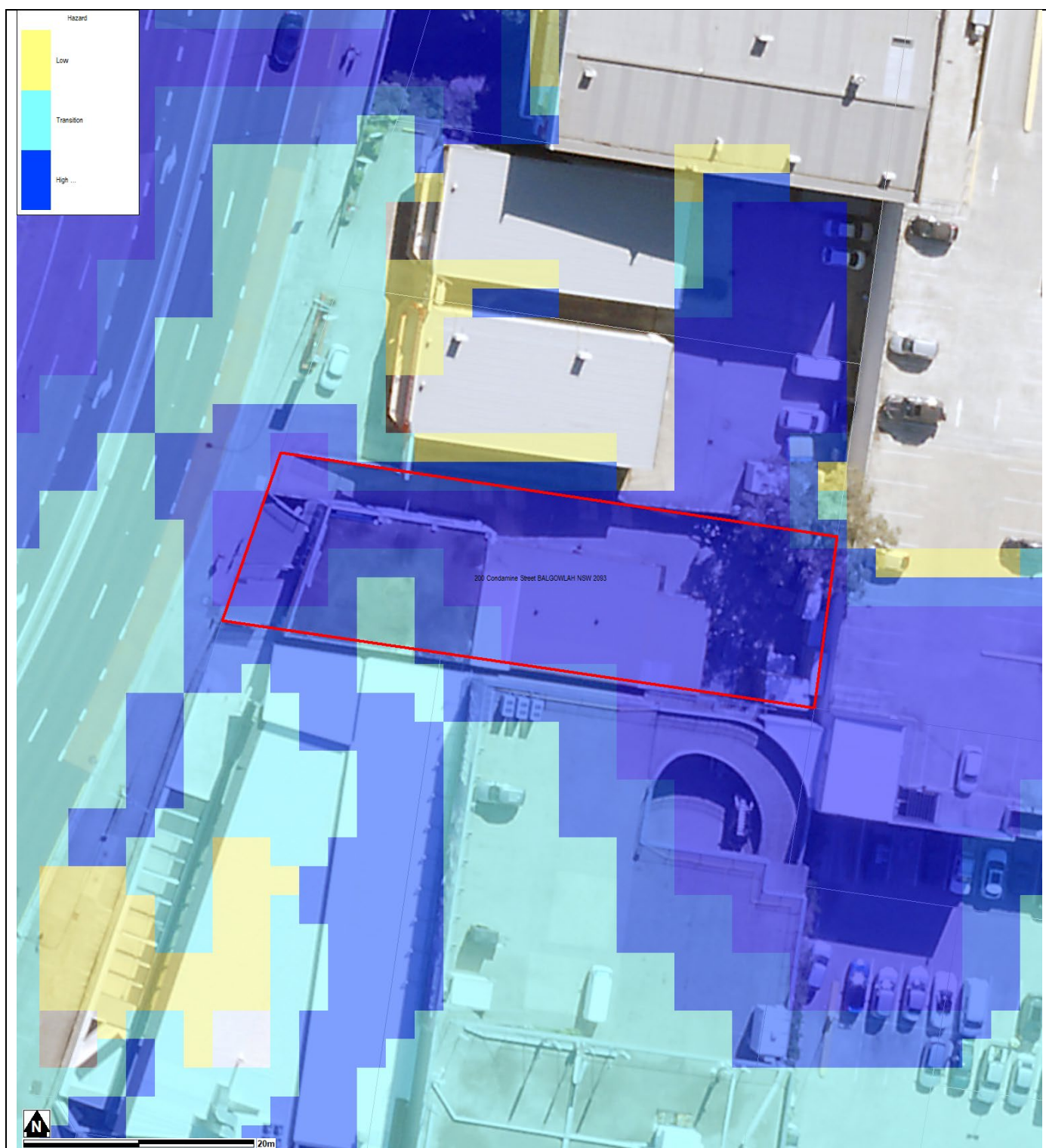
FLOOD MAP C: PMF EXTENT MAP



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

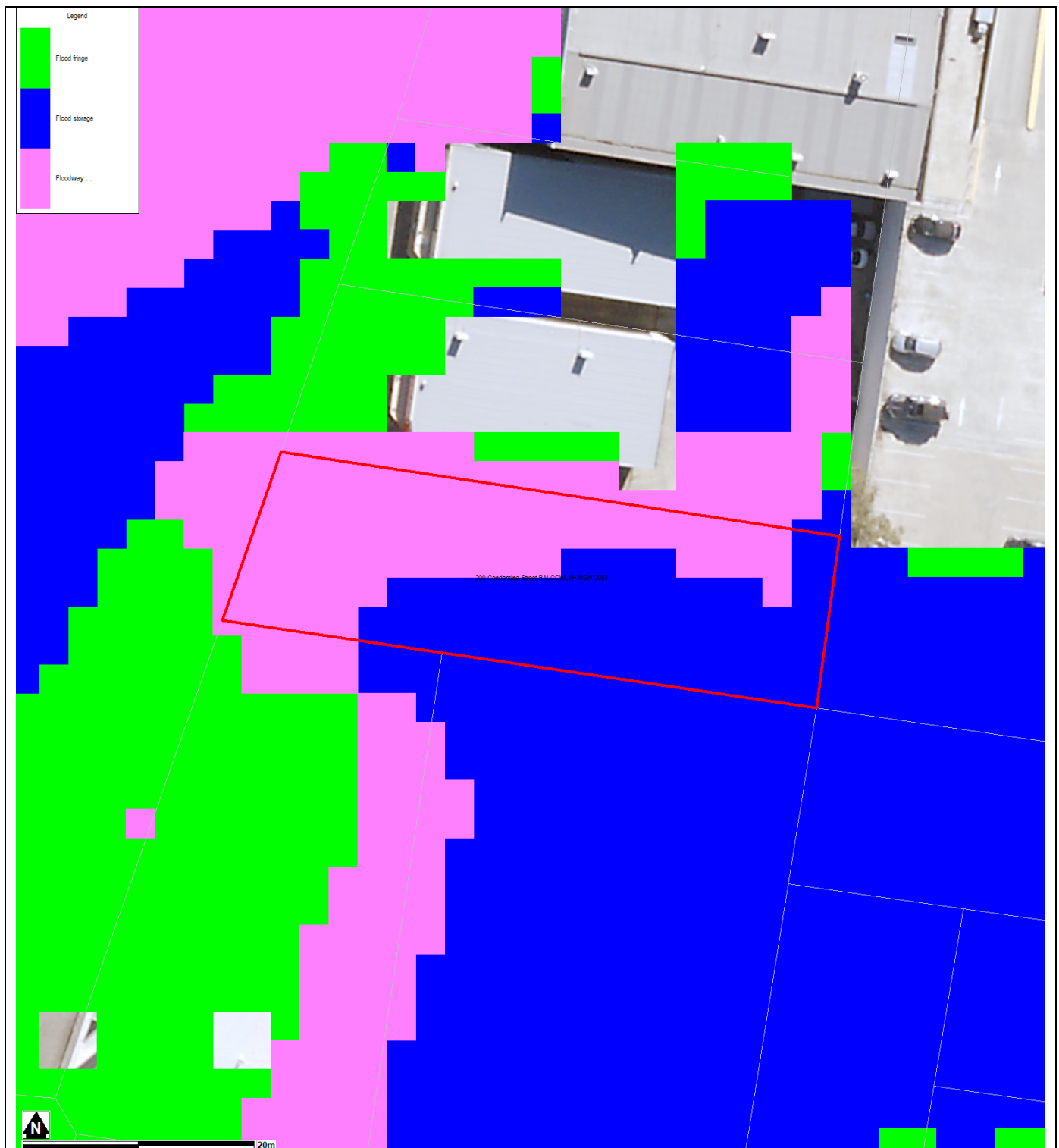
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



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

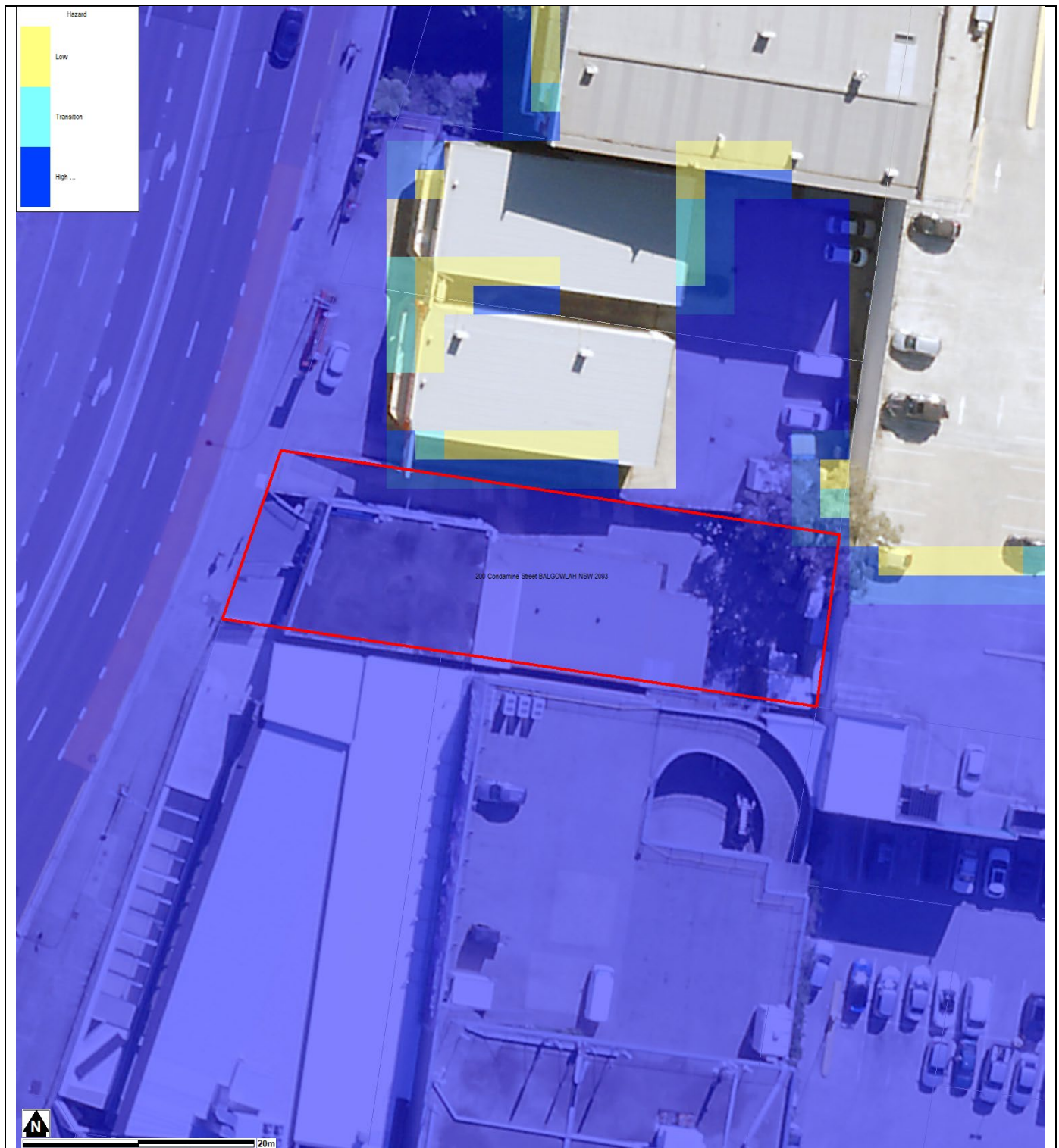
FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



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

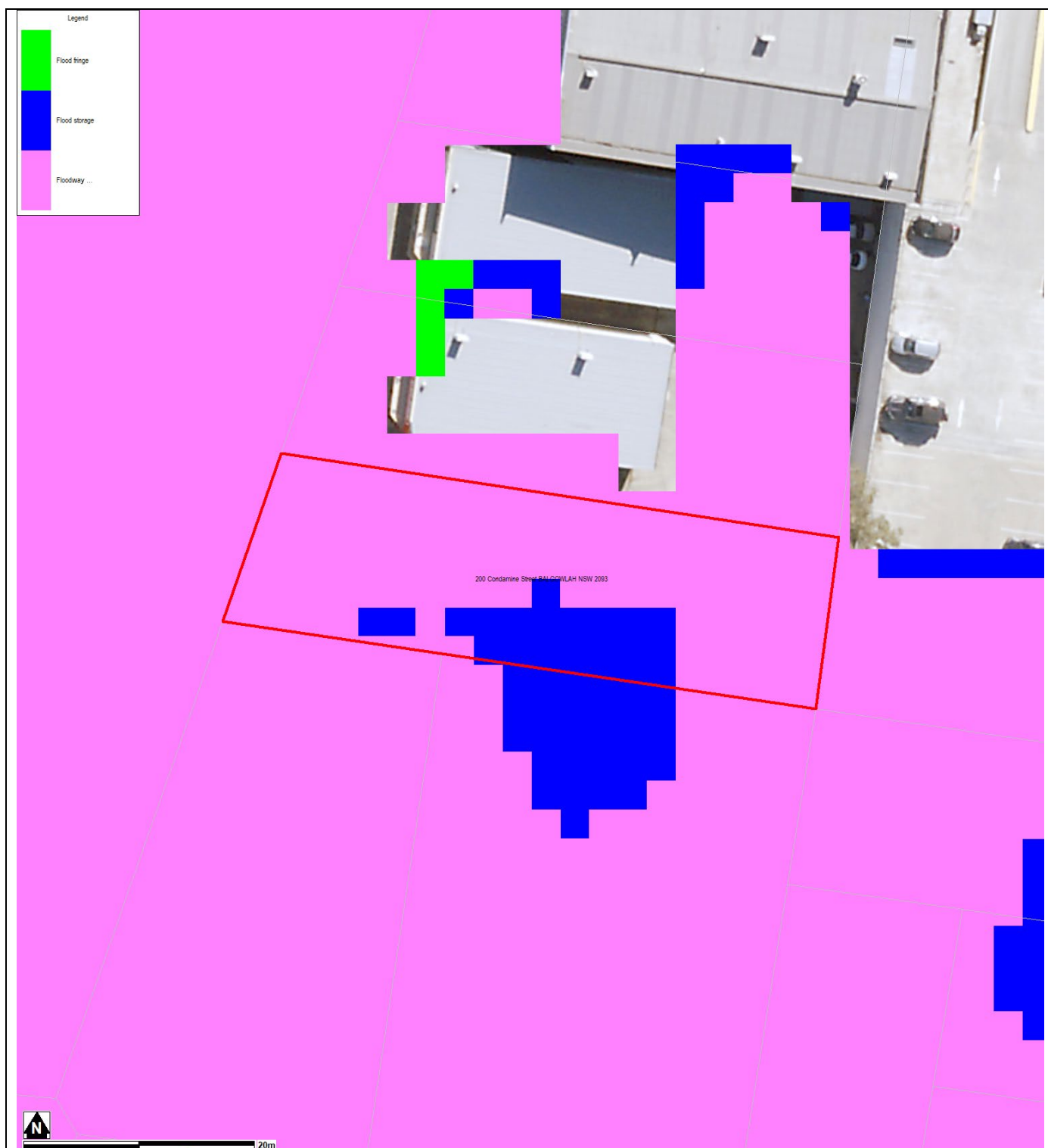
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



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

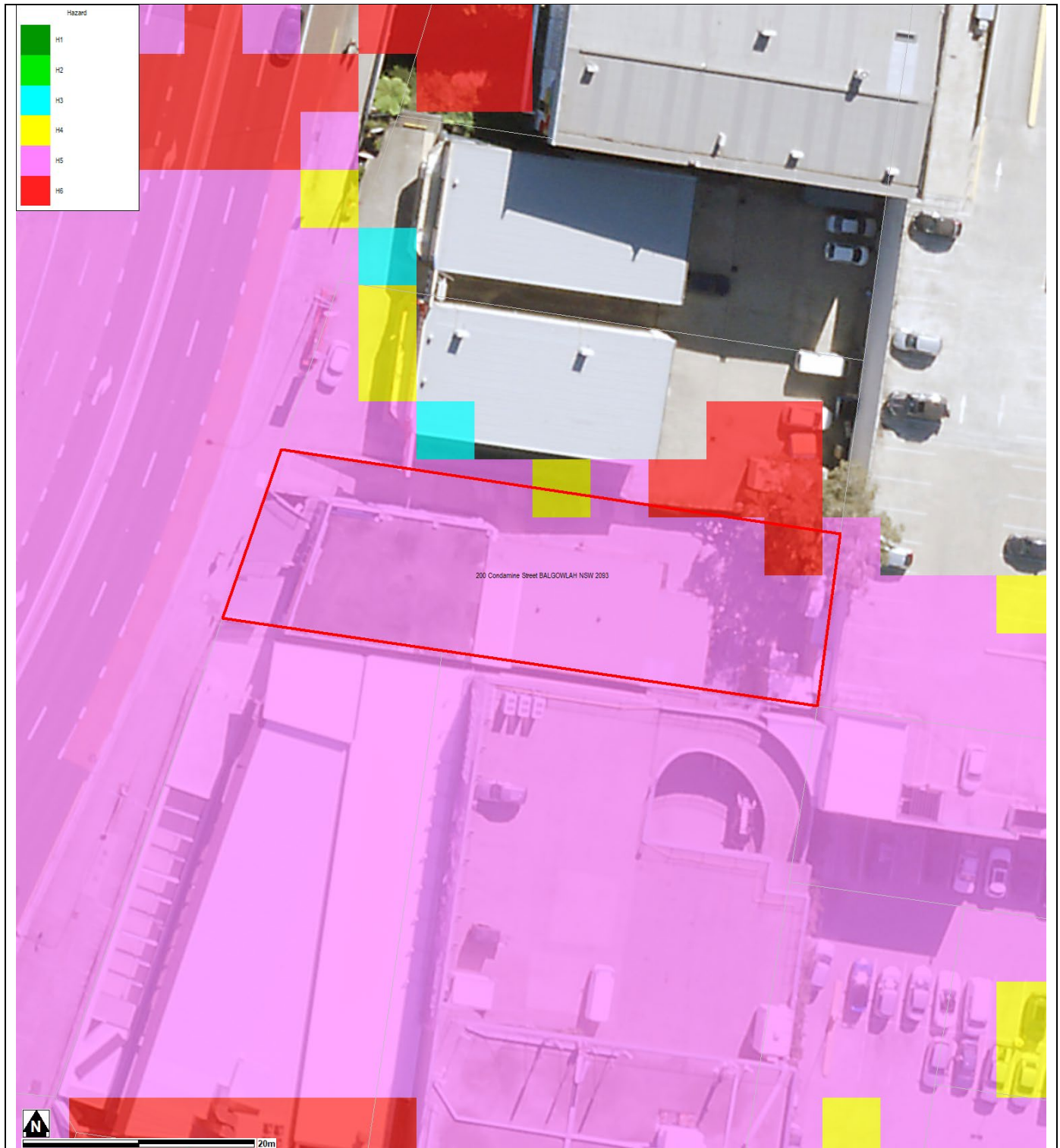
FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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

FLOOD MAP H: FLOOD LIFE HAZARD CATEGORY



Notes:

- For additional information on Flood Life Hazard Categories, refer to the 'Flood Emergency Response Planning for Development in Pittwater Policy'.
- 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.

MAP I: 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) – 6.3 Flood Planning	Manly DCP (2013) – 5.4.3 Flood Prone Land
Warringah LEP (2011) – 6.3 Flood Planning Warringah LEP (2000) – 47 Flood Affected Land *	Warringah DCP (2011) – E11 Flood Prone Land
Pittwater LEP (2014) – 7.3 Flood Planning Pittwater LEP (2014) – 7.4 Flood Risk Management	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. 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 floor level is above the Probable Maximum Flood level
- 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

For further information please contact Council's Flood Team on 1300 434 434 or by email at floodplain@northernbeaches.nsw.gov.au .

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 202 Condamine Street BALGOWLAH NSW 2093

Lot DP: Lot 18 DP 819775

Issue Date: 08/02/2021

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}: 11.67 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: 11.17 mAHD

1% AEP Maximum Depth from natural ground level³: 2.32 m

1% AEP Maximum Velocity: 3.18 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: 12.26 m AHD

PMF Maximum Depth from natural ground level: 4.30 m

PMF Maximum Velocity: 6.27 m/s

PMF Flood Hazard: High See Flood Map F

PMF Hydraulic Categorisation: Floodway See Flood Map G

Flooding with Climate Change – N/A

Flood Life Hazard Category – See Map H

Indicative Ground Surface Spot Heights – See Map I

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

² Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

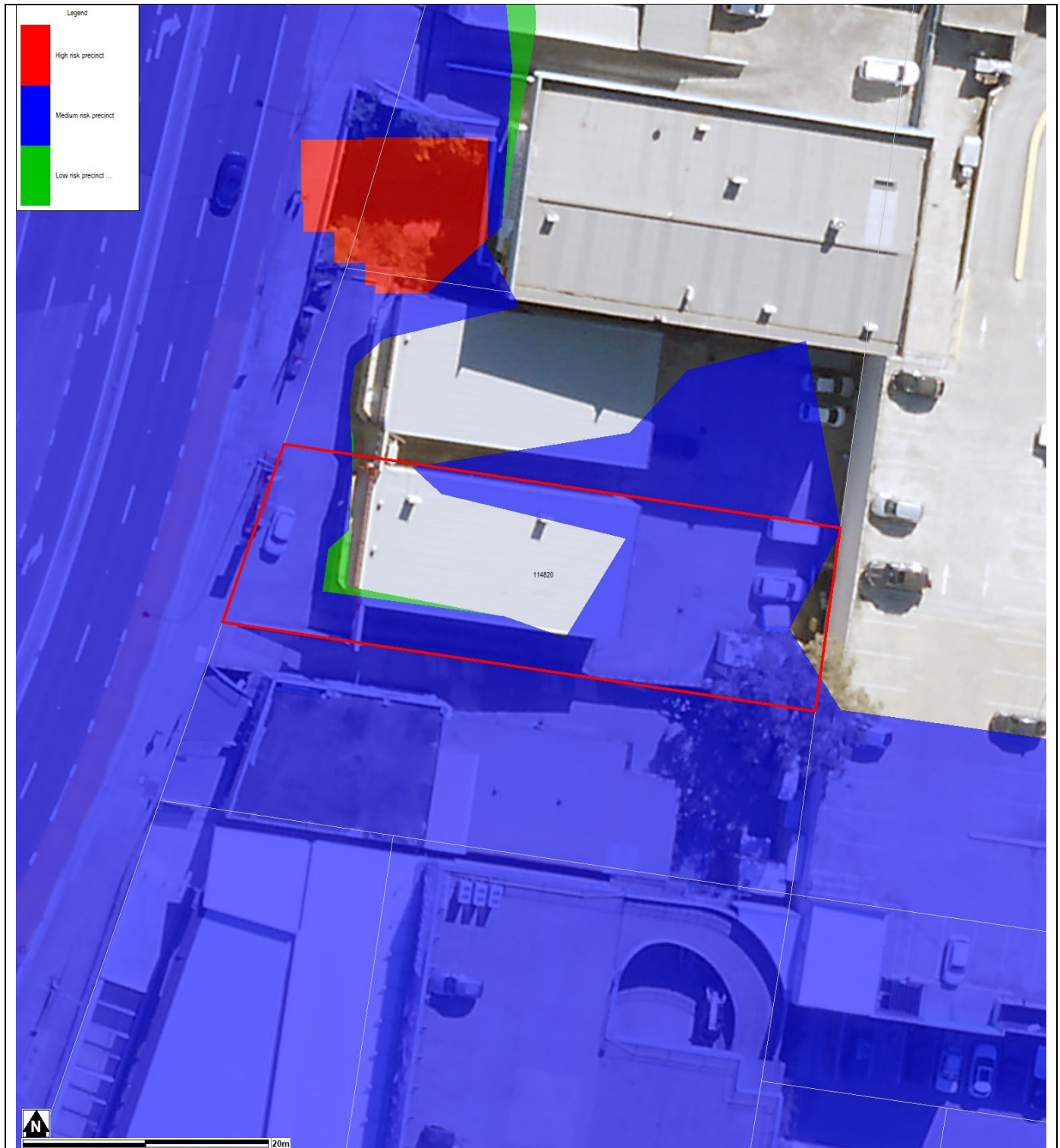
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

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

General Notes:

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

FLOOD MAP A: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 or H6 Life Hazard Classification).
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

FLOOD 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.

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	11.15	0.38	0.87	11.65	12.25	1.47	1.76
2	N/A	N/A	11.18	0.37	0.35	11.68	12.26	0.61	1.14
3	N/A	N/A	10.09	2.25	1.28	10.59	12.06	4.22	1.87
4	N/A	N/A	10.92	0.46	2.03	11.42	12.19	1.72	3.37
5	N/A	N/A	10.11	1.15	1.87	10.61	12.11	2.69	2.53
6	N/A	N/A	10.04	1.55	1.26	10.54	11.99	3.17	1.47

WL – Water Level

PMF – Probable Maximum Flood

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

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than $0.3\text{m}^2/\text{s}$, a freeboard of 0.3m may be able to be justified.

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.

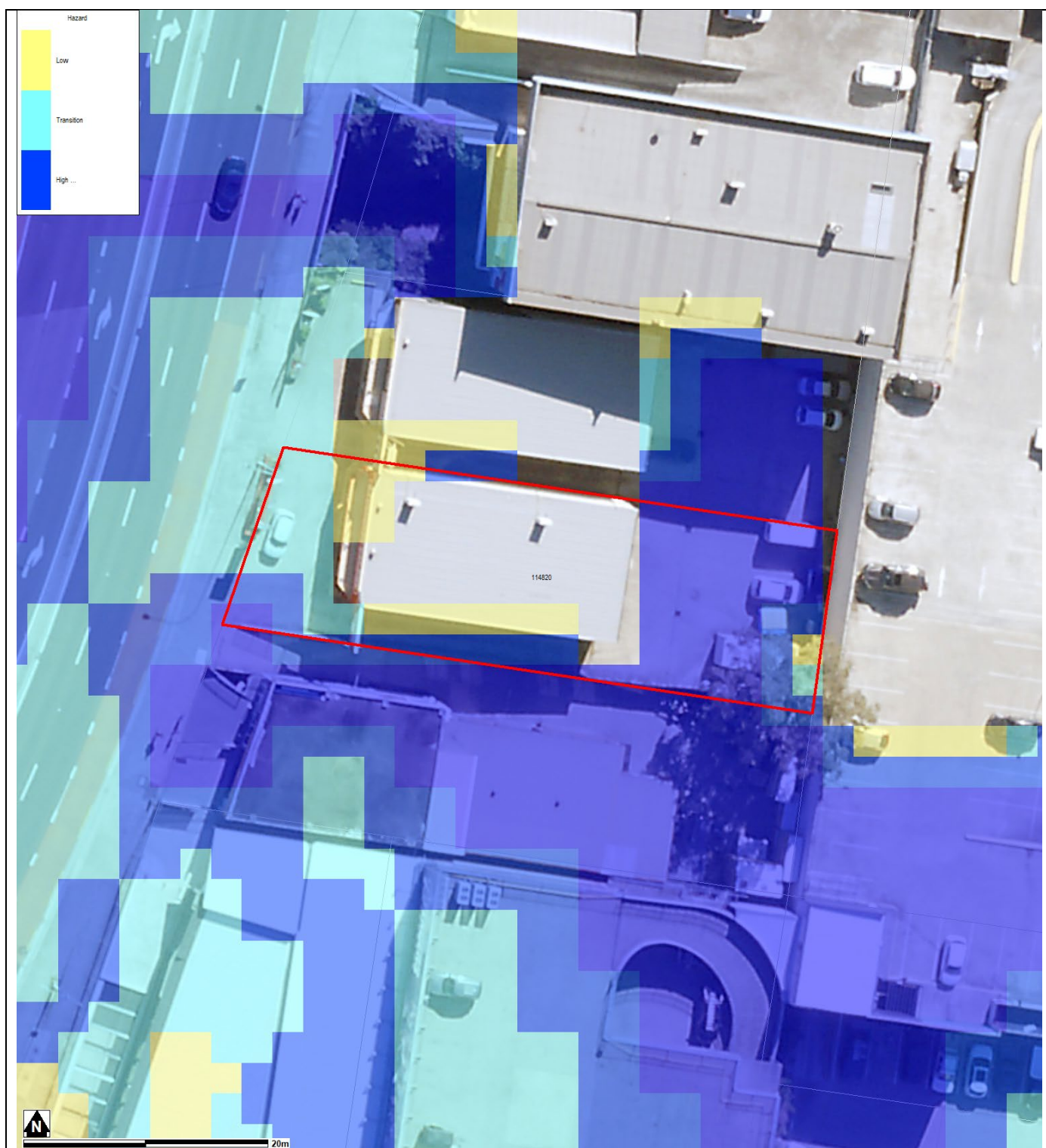
FLOOD MAP C: PMF EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event
- Extent does not include climate change
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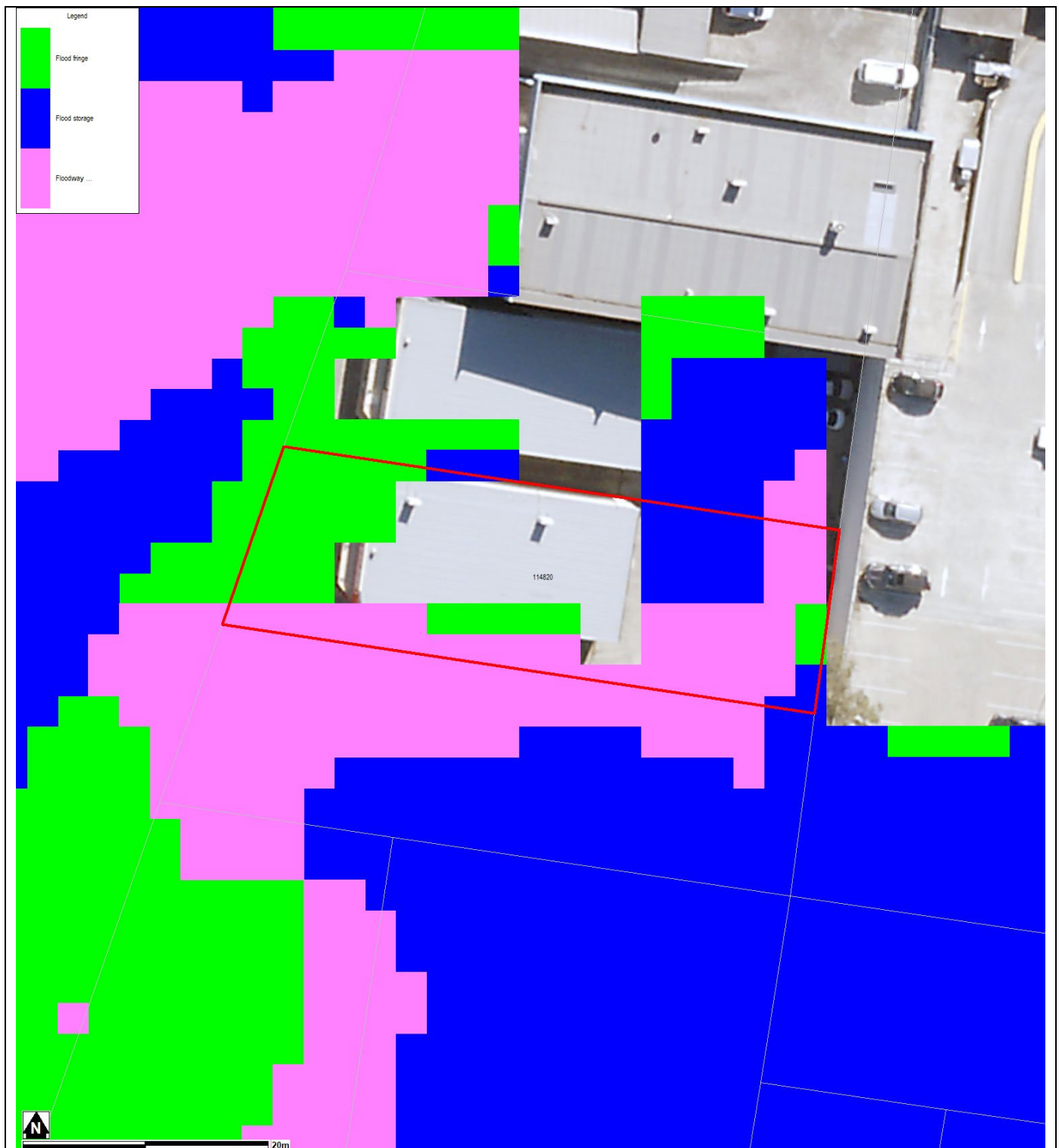
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
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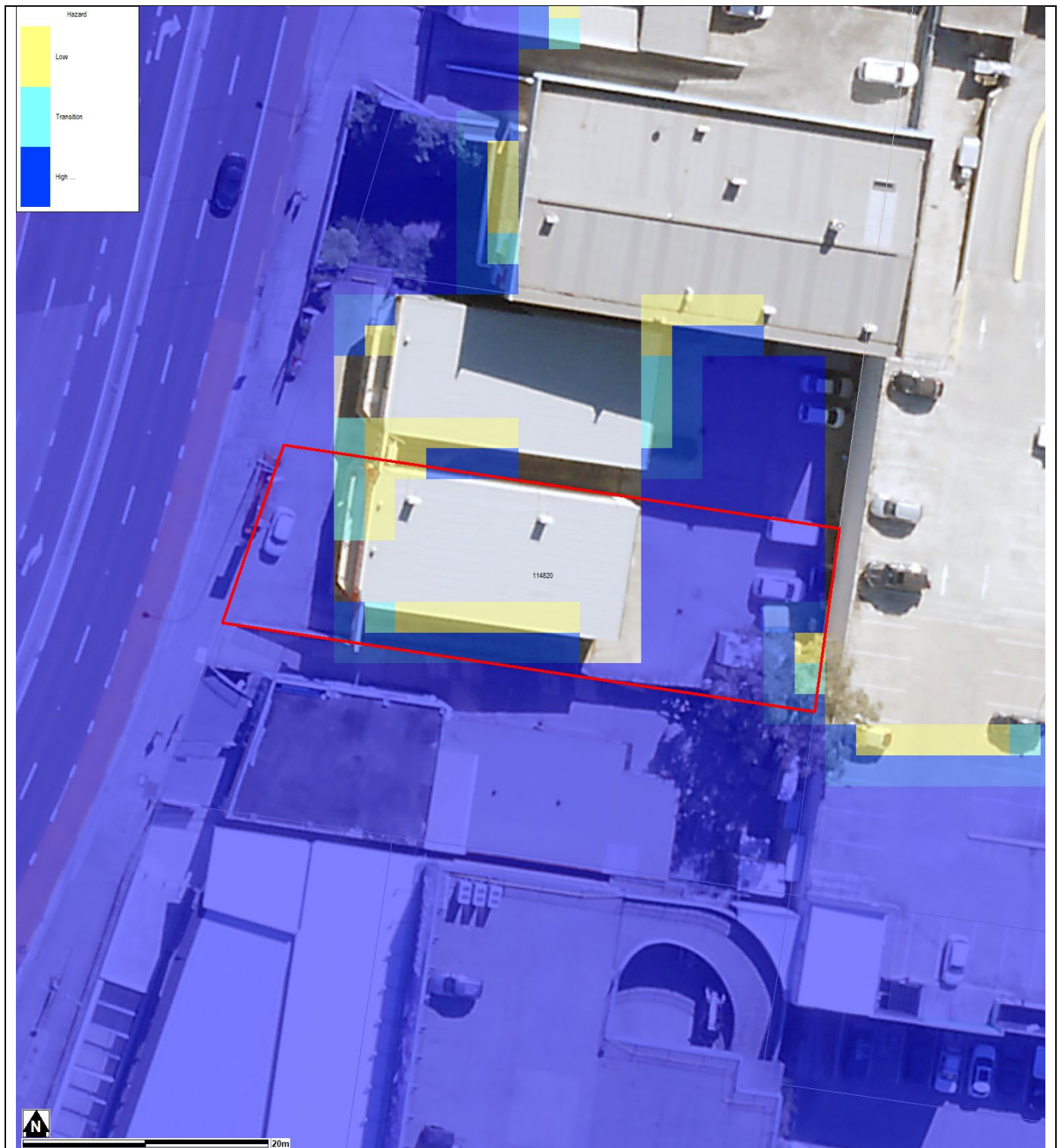
FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
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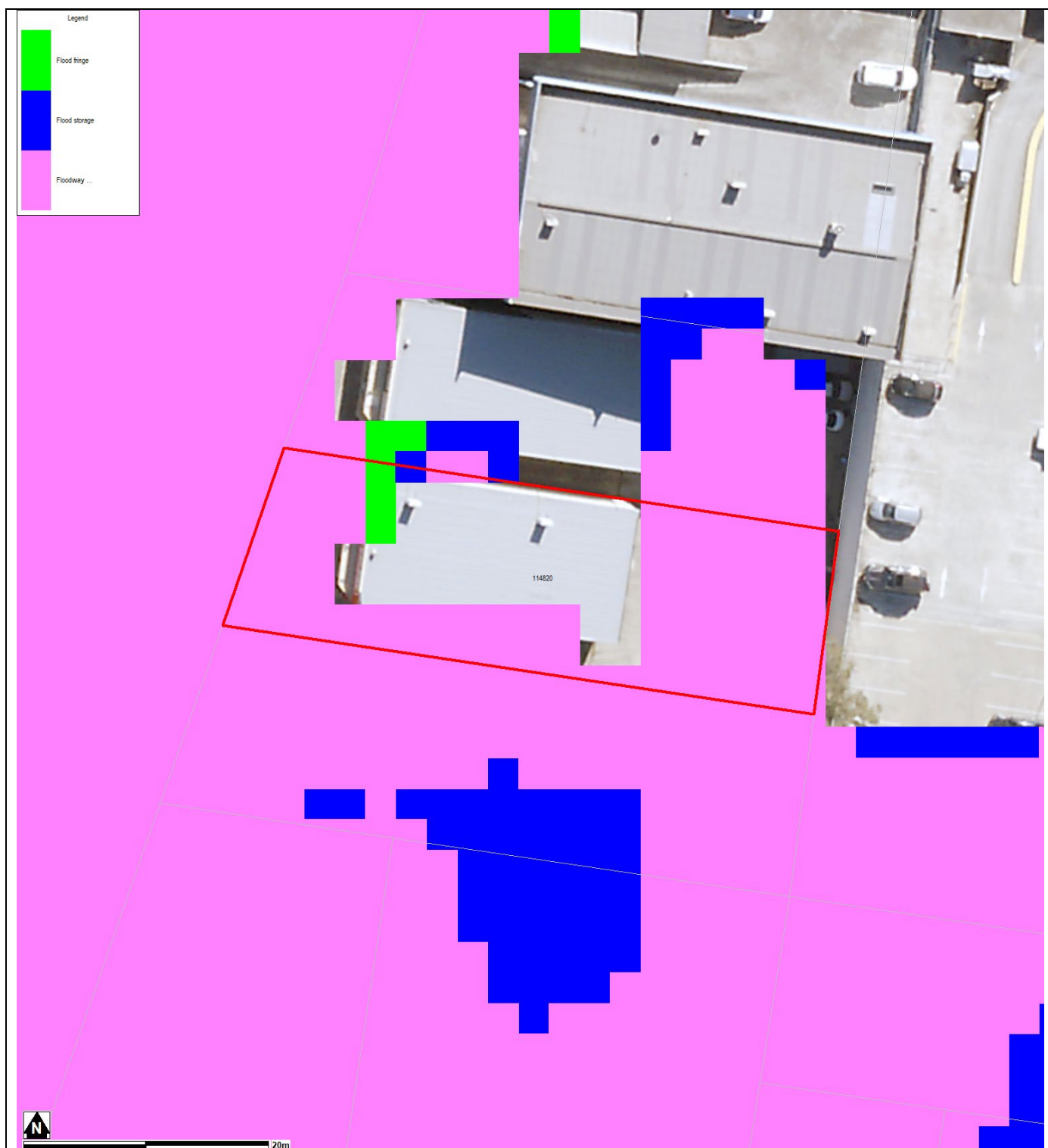
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



Notes:

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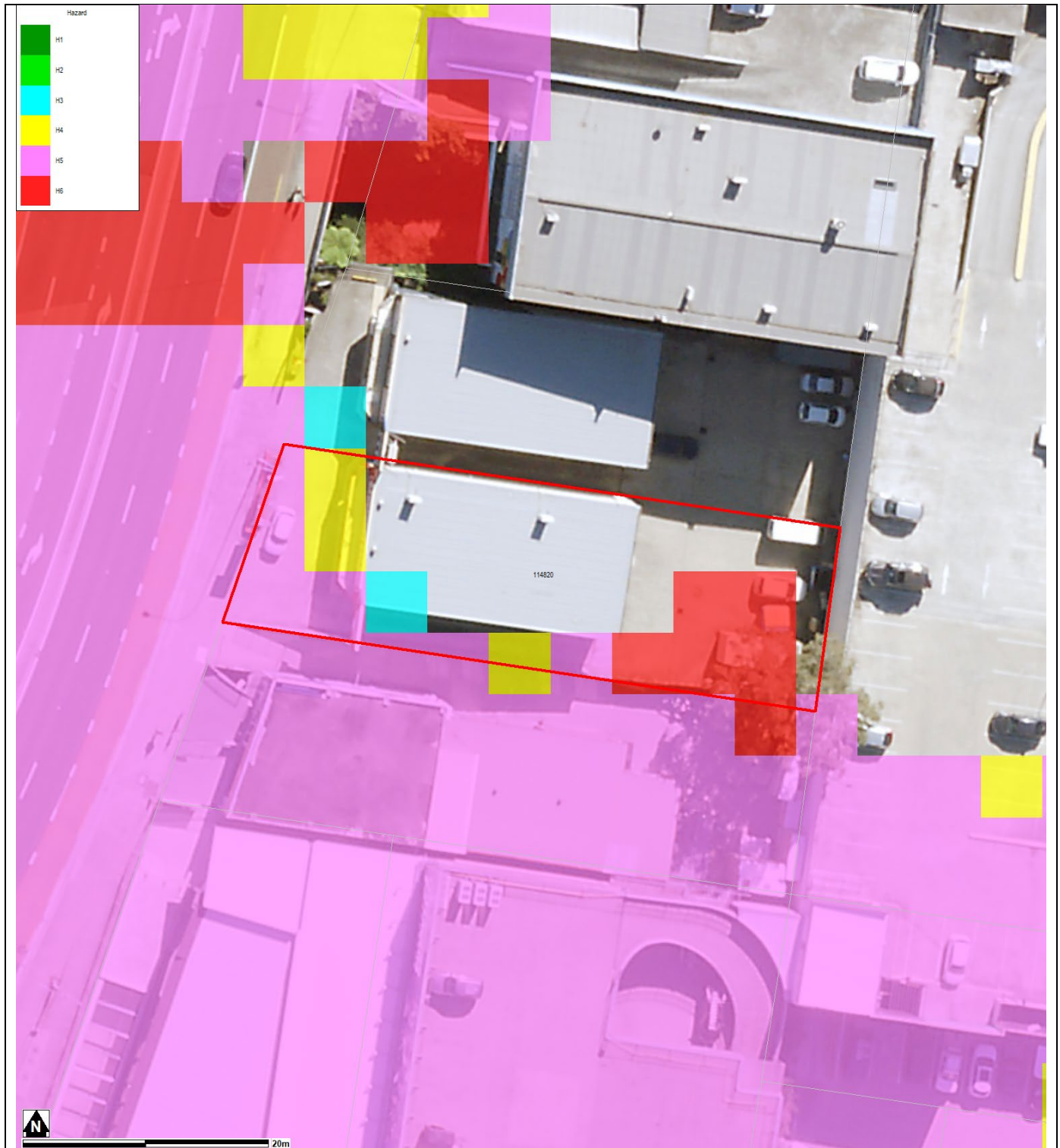
FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



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

FLOOD MAP H: FLOOD LIFE HAZARD CATEGORY



Notes:

- For additional information on Flood Life Hazard Categories, refer to the 'Flood Emergency Response Planning for Development in Pittwater Policy'.
- 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.

MAP I: INDICATIVE GROUND SURFACE SPOT HEIGHTS



Notes:

- The surface spot heights shown on this map were derived from Airborne Laser Survey and are indicative only.
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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) – 6.3 Flood Planning	Manly DCP (2013) – 5.4.3 Flood Prone Land
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Pittwater LEP (2014) – 7.3 Flood Planning Pittwater LEP (2014) – 7.4 Flood Risk Management	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. 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 floor level is above the Probable Maximum Flood level
- 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

For further information please contact Council's Flood Team on 1300 434 434 or by email at floodplain@northernbeaches.nsw.gov.au .

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 204 Condamine Street BALGOWLAH NSW 2093

Lot DP: Lot 17 DP 819775

Issue Date: 08/02/2021

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}: 11.69 m AHD

1% AEP Flood – See Flood Map B

1% AEP Maximum Water Level ^{2, 3}: 11.19 mAHD

1% AEP Maximum Depth from natural ground level³: 3.24 m

1% AEP Maximum Velocity: 1.77 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: 12.92 m AHD

PMF Maximum Depth from natural ground level: 4.97 m

PMF Maximum Velocity: 5.01 m/s

PMF Flood Hazard: High See Flood Map F

PMF Hydraulic Categorisation: Floodway See Flood Map G

Flooding with Climate Change – N/A

Flood Life Hazard Category – See Map H

Indicative Ground Surface Spot Heights – See Map I

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

² Overland flow/mainstream water levels may vary across a sloping site, resulting in variable minimum floor/flood planning levels across the site. The maximum Flood Planning Level may be in a different location to the maximum 1% AEP flood level.

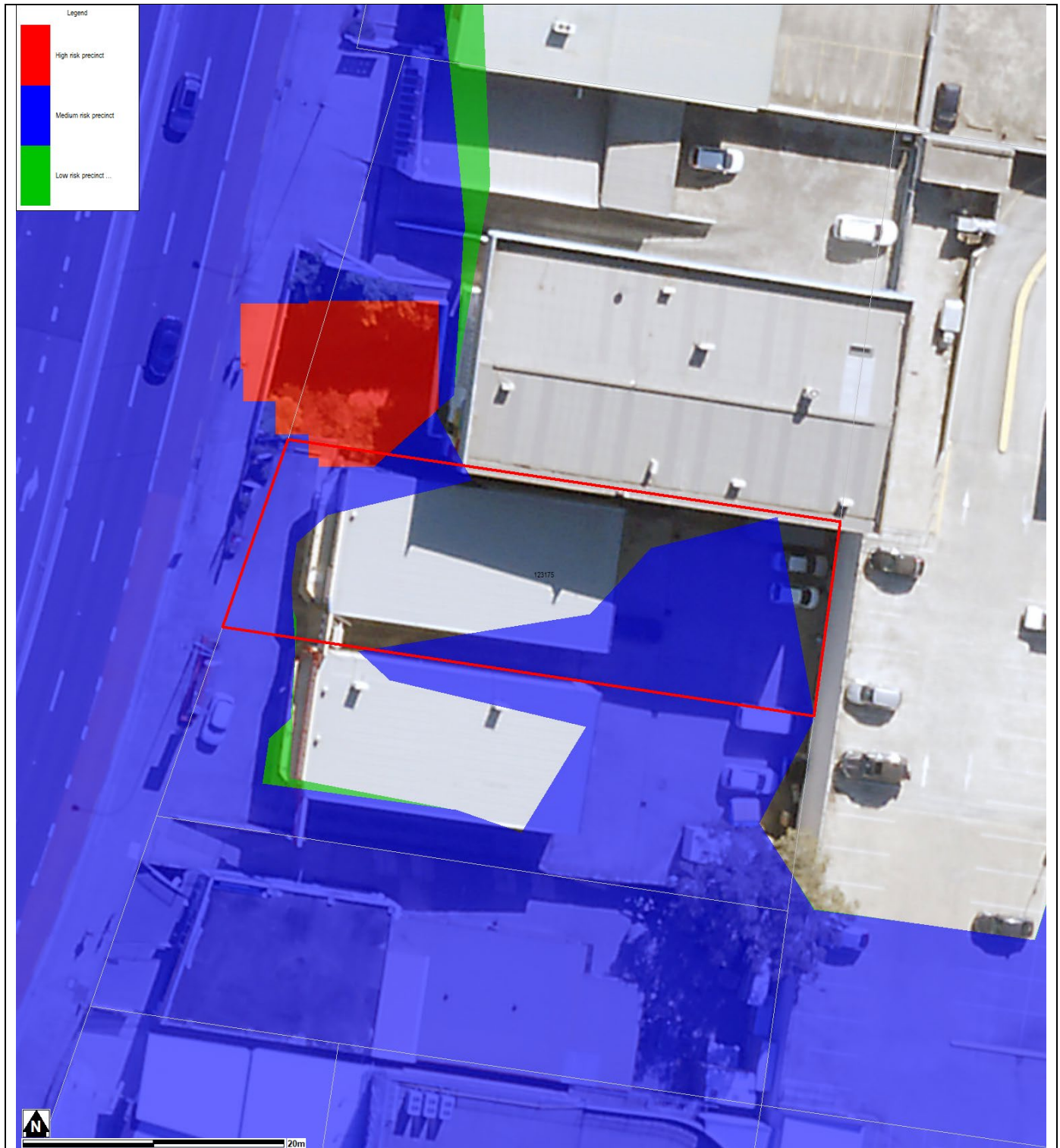
³ Intensification of development in the former Pittwater LGA requires the consideration of climate change impacts which may result in higher minimum floor levels.

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

General Notes:

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

FLOOD MAP A: FLOOD RISK PRECINCT MAP



Notes:

- **Low Flood Risk precinct** means all flood prone land not identified within the High or Medium flood risk precincts.
- **Medium Flood Risk precinct** means all flood prone land that is (a) within the 1% AEP Flood Planning Area; and (b) is not within the high flood risk precinct.
- **High Flood Risk precinct** means all flood prone land (a) within the 1% AEP Flood Planning Area; and (b) is either subject to a high hydraulic hazard, within the floodway or subject to significant evacuation difficulties (H5 or H6 Life Hazard Classification).
- The **Flood Planning Area** extent is equivalent to the Medium Flood Risk Precinct extent, and includes the High Flood Risk Precinct within it. The mapped extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- None of these mapped extents include climate change.

FLOOD 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.

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	10.61	1.57	11.08	1.95	1.77	11.58	12.78	3.64	4.52
2	N/A	N/A	10.09	0.46	0.17	10.59	12.06	0.88	0.24
3	N/A	N/A	10.09	2.21	0.44	10.59	12.06	4.18	0.45
4	N/A	N/A	11.15	0.41	0.92	11.65	12.25	1.50	1.82
5	N/A	N/A	11.18	1.70	0.12	11.68	12.26	2.53	0.26
6	N/A	N/A	10.09	2.25	1.28	10.59	12.06	4.22	1.87

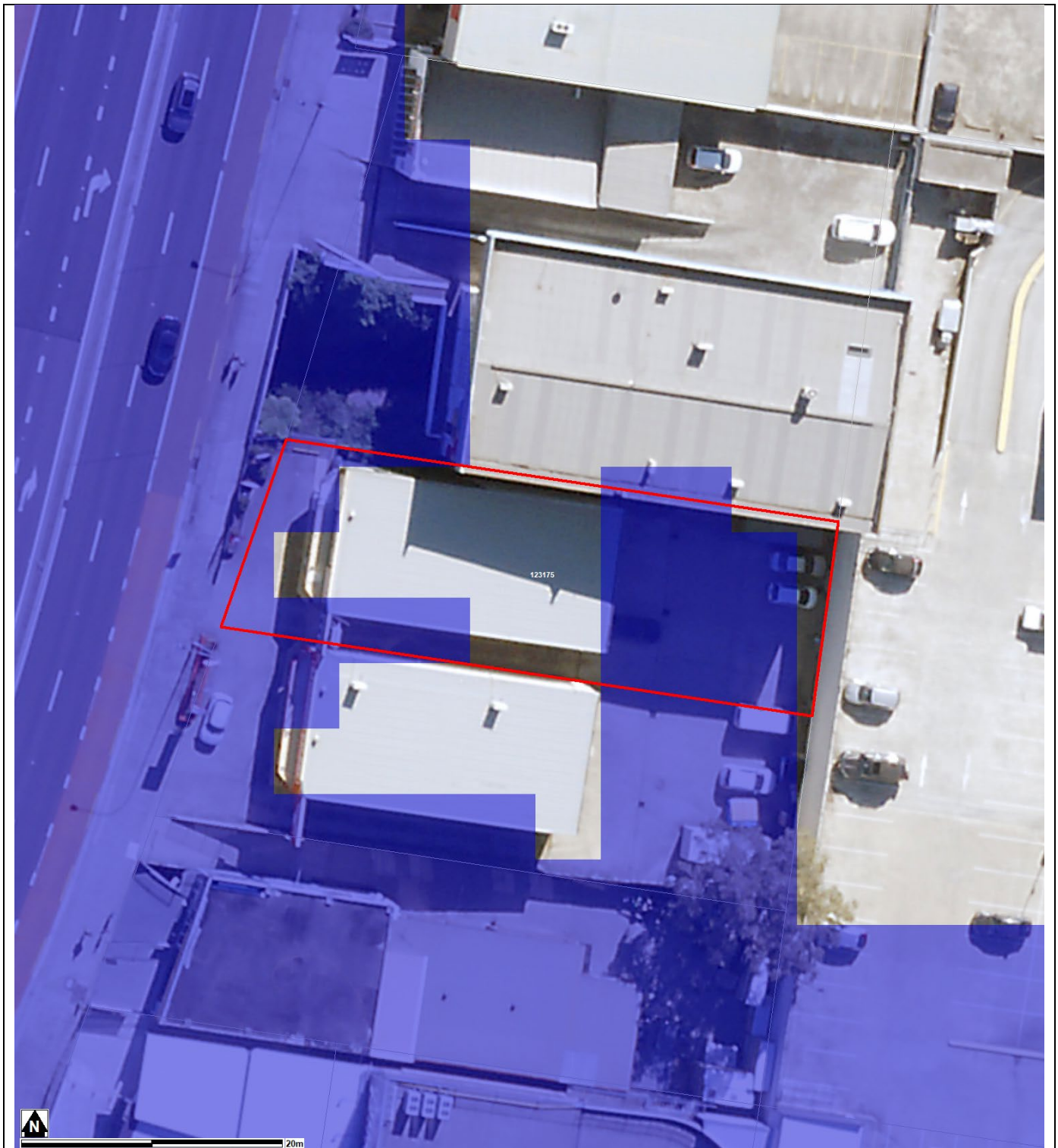
WL – Water Level

PMF – Probable Maximum Flood

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

A variable Flood Planning Level might apply. Freeboard is generally 0.5m above the maximum 1% AEP water level. However for overland flow with a depth less than 0.3m and a VelocityxDepth product less than $0.3\text{m}^2/\text{s}$, a freeboard of 0.3m may be able to be justified.

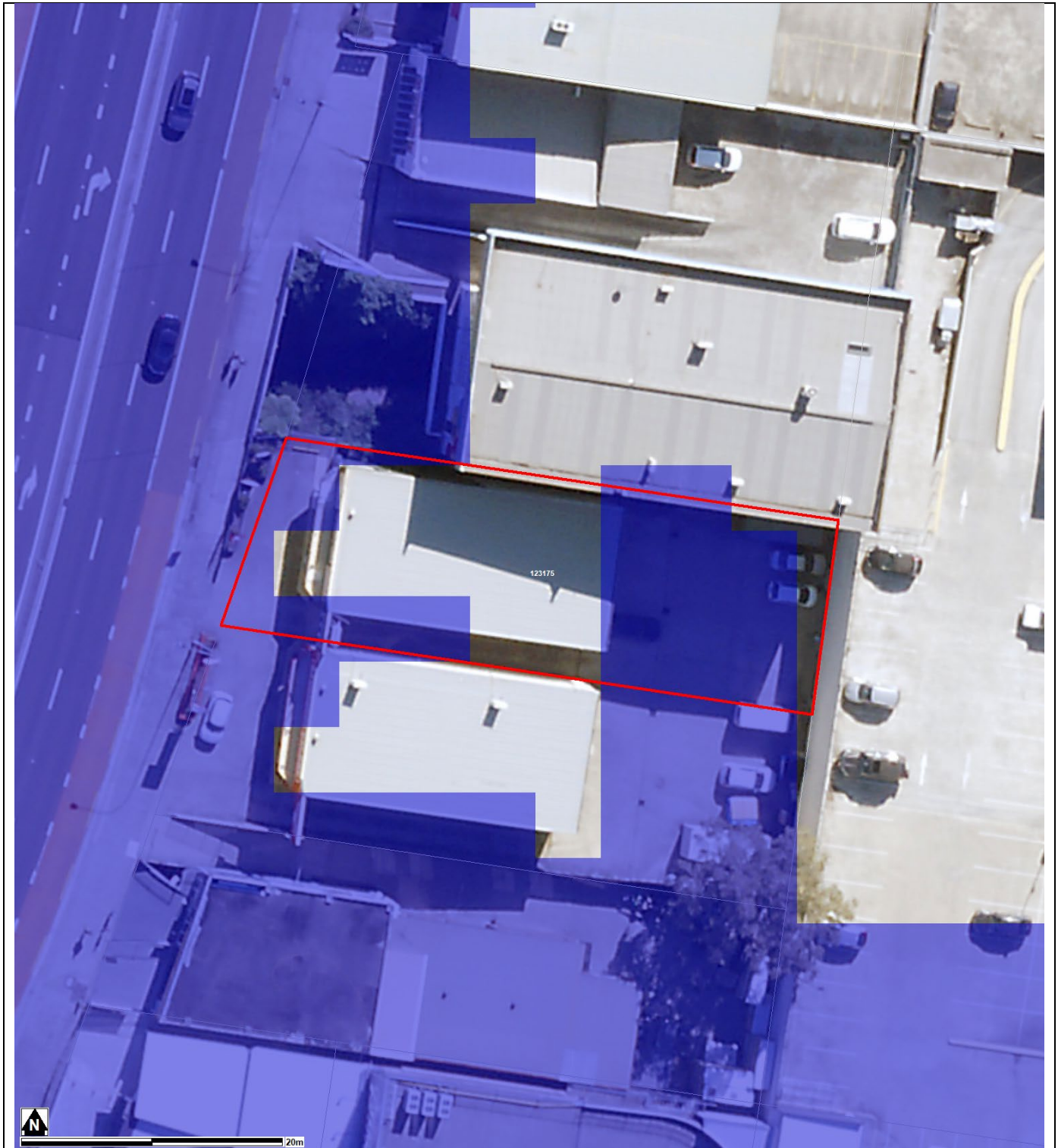
FLOOD MAP B: FLOODING - 1% AEP EXTENT



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.

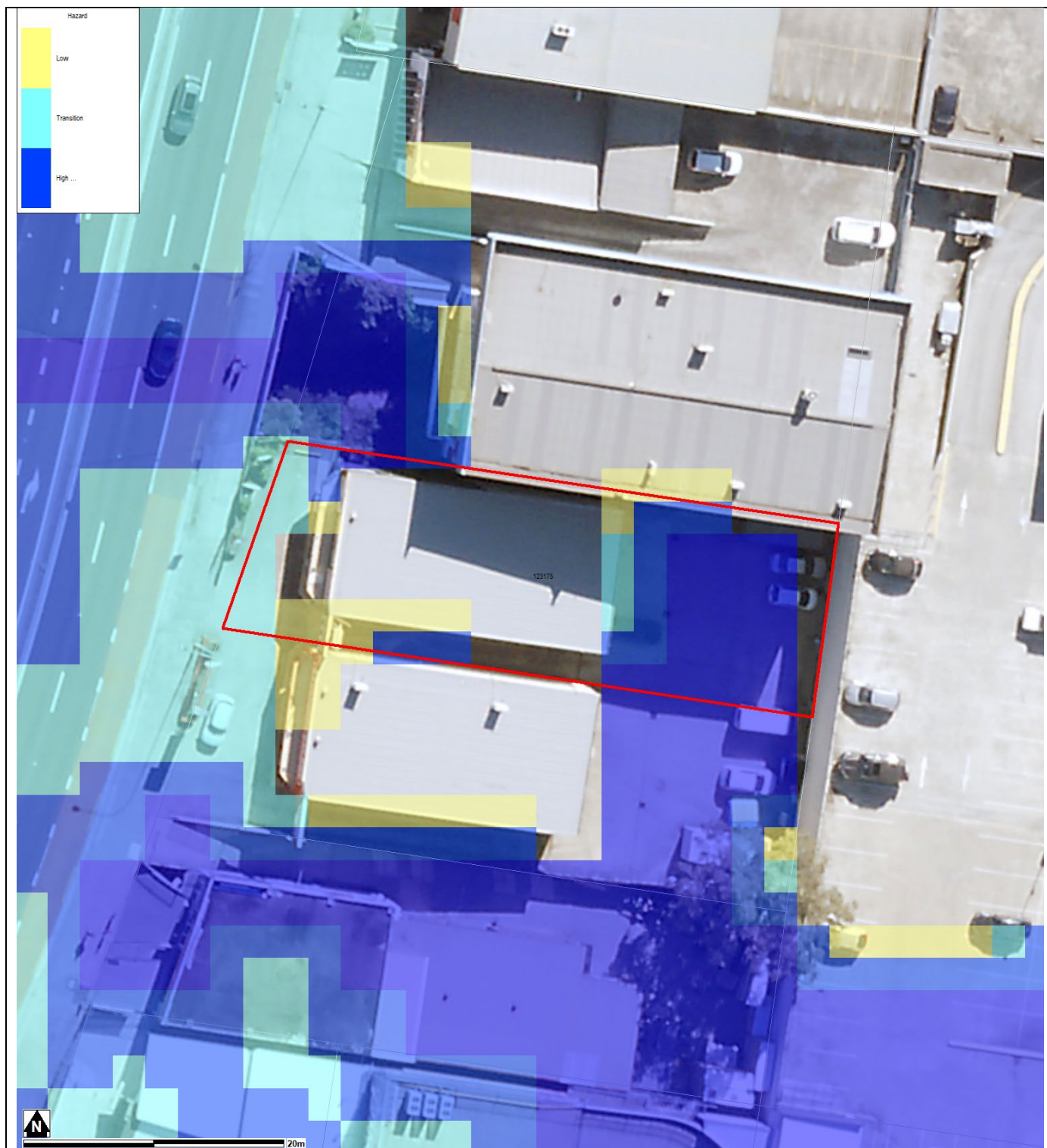
FLOOD MAP C: PMF EXTENT MAP



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

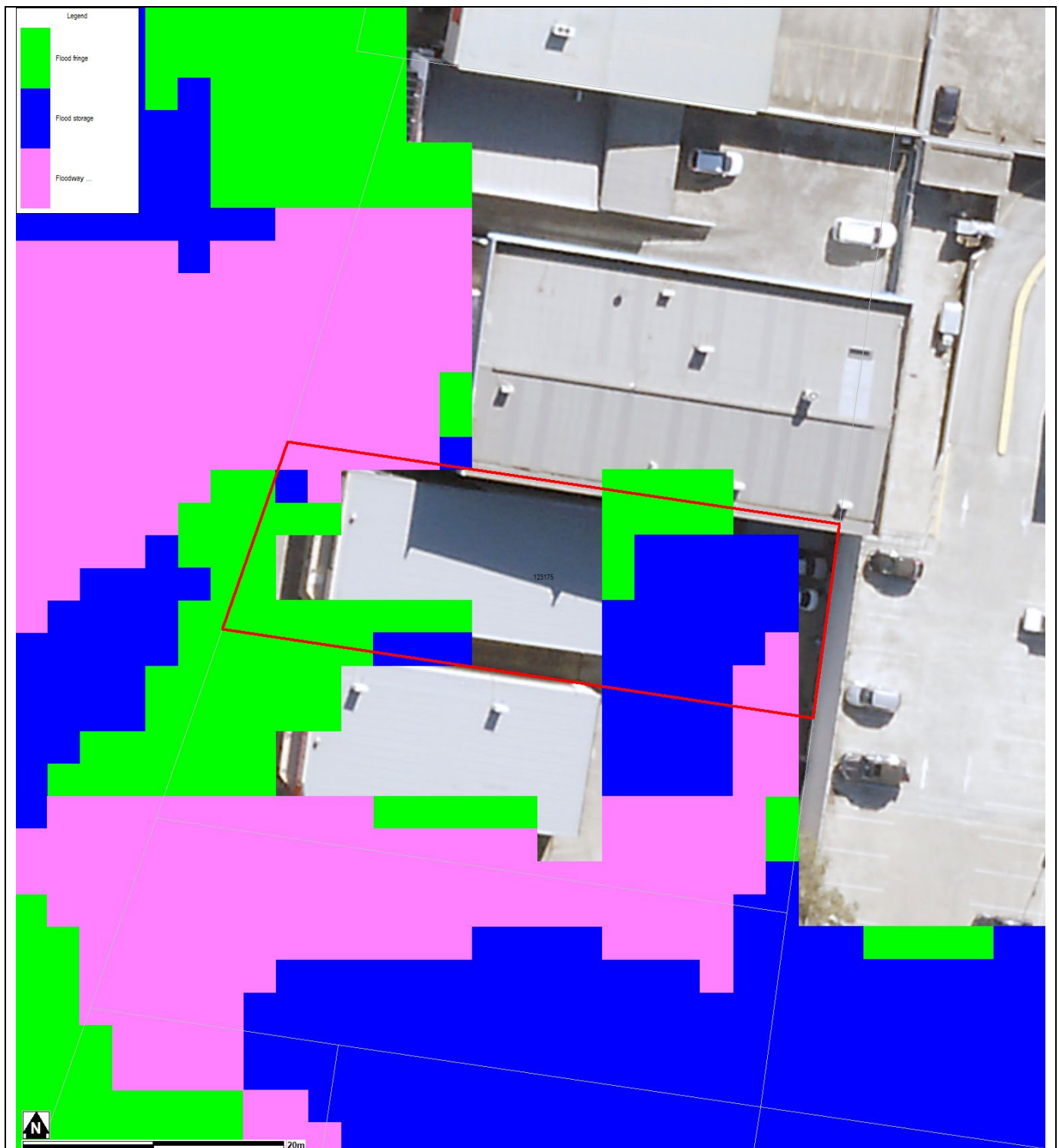
FLOOD MAP D: 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

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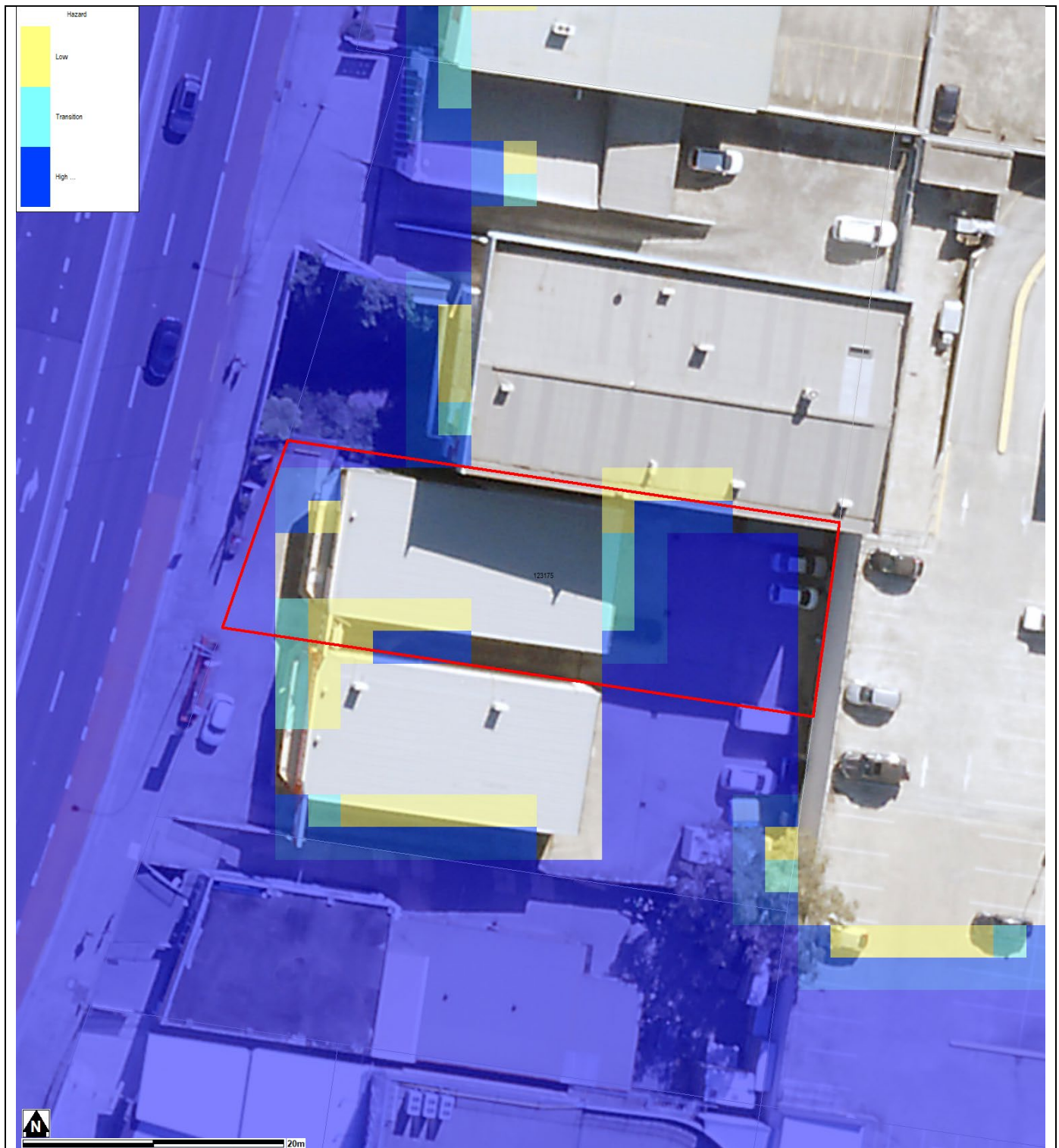
FLOOD MAP E: 1% AEP FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

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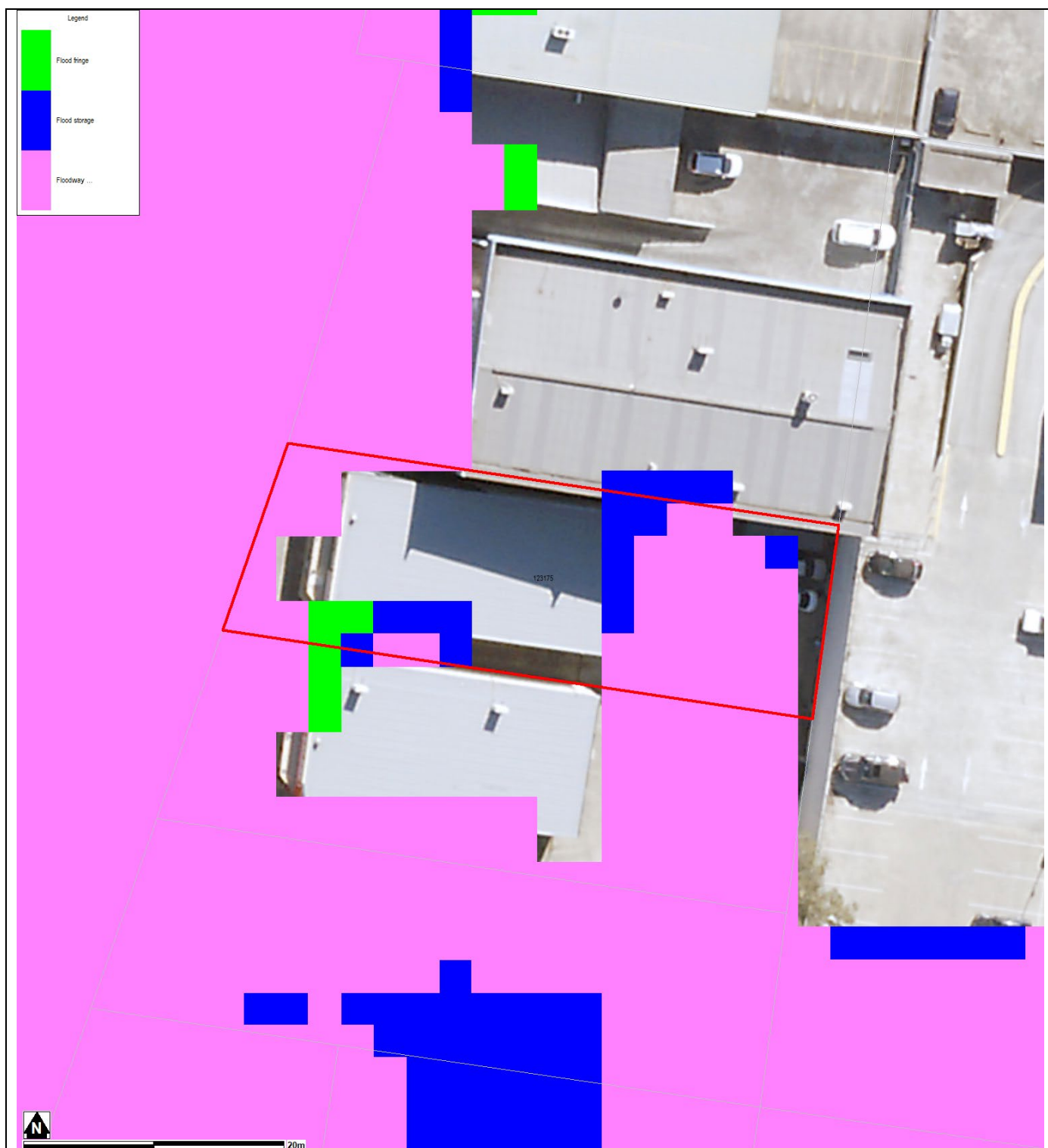
FLOOD MAP F: PMF FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) event
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- 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

FLOOD MAP G: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

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- 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

FLOOD MAP H: FLOOD LIFE HAZARD CATEGORY



Notes:

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Preparation of a Flood Management Report

Introduction

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- 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			

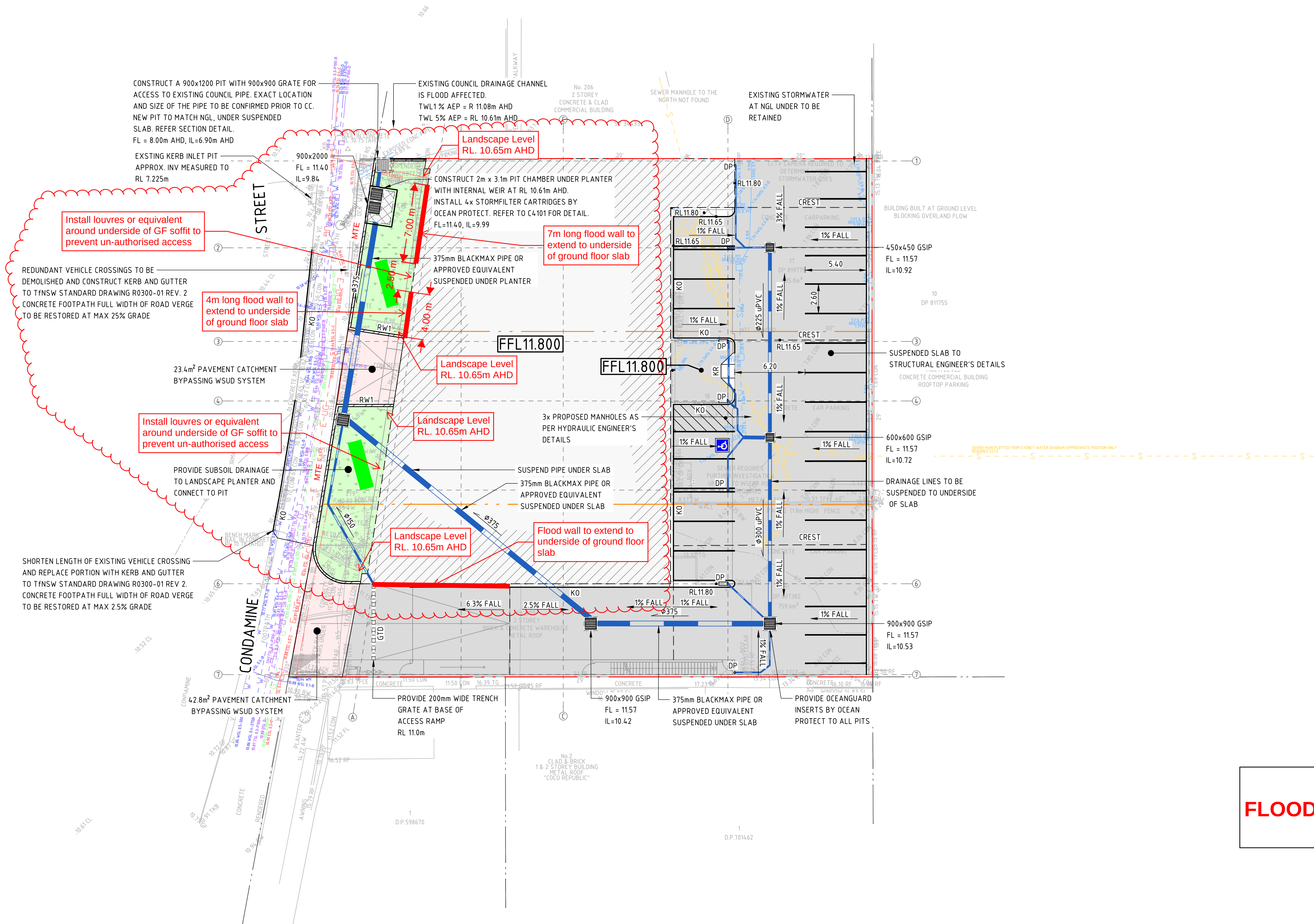
- Demonstration of how the development complies with any relevant flood planning requirements from the DCP, LEP, Water Management for Development Policy, and if it is in the Warriewood Valley Urban Land Release Area, with the Warriewood Valley Water Management Specification (2001)

- 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

For further information please contact Council's Flood Team on 1300 434 434 or by email at floodplain@northernbeaches.nsw.gov.au .

Appendix C – Updated Concept Civil Drawings

DESIGNED: J. DI FONZO
DRAWN: M. MAI
JOB MANAGER: N. SUTHERLAND
VERIFIER:



LEGEND

SITE BOUNDARY

INTERNAL SITE BOUNDARY

ADJACENT SITE BOUNDARY

EASEMENT LINE

ROOF OUTLINE

EXISTING ELECTRICITY

EXISTING ELECTRICITY (UNDERGROUND)

EXISTING GAS

EXISTING TELSTRA

EXISTING WATER

EXISTING STORMWATER

EXISTING SEWER

PROPOSED KERB

KERB ONLY

KERB TRANSITION (OVER LENGTH SHOWN)

VEHICULAR CROSSING

KERB RAMP

MATCH TO EXISTING

PROPOSED SPOT HEIGHT

PROPOSED FINISHED FLOOR LEVEL

DIRECTION OF GRADE

BATTERS

CONTOURS

EXISTING CONTOURS

NEW DRAINAGE STRUCTURE

STORMWATER PIPE

GRADED TRENCH DRAIN

RETAINING WALL

PLANTER BOXES - REFER TO ARCHITECT FOR DETAILS

CONCRETE - REFER TO STRUCTURAL ENGINEER FOR DETAILS

GENERAL NOTES:

- ALL GRATED INLET PITS TO HAVE OCEAN PROTECT OCEANGUARD INSERTS

**NORTHROP MARKUP
FLOOD MANAGEMENT MEASURES
DATE 22/11/2022**

NOT FOR CONSTRUCTION

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
01	ISSUED FOR DA	EE		NS	28.10.22

CLIENT

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ARCHITECT

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PROJECT

KING LIVING

200, 202 & 204 CONDOMINE STREET

BALGOWLAH

DRAWING TITLE

CIVIL ENGINEERING PACKAGE

SITeworks AND STORMWATER

MANAGEMENT PLAN

JOB NUMBER

213791

DRAWING NUMBER

DAC3001

REVISION

01

DRAWING SHEET SIZE = A1

