

Rent A Space Brookvale

Flood Management Report

Harding Architects Pty Ltd

20 March 2020

Ref: 20192073R002RevA



Building exceptional
outcomes together



Document History and Status

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1 Introduction

Rent A Space (RAS) are proposing to construct a new multi-storey storage facility at 4 Cross Street, Brookvale. The proposed development will include construction of a three-storey self-storage building, on-site parking, a one-way driveway through the site and two driveway crossovers.

Flood information provided by Northern Beaches Council (Council) has identified the proposed development site as flood-affected in a 1% annual exceedance probability (AEP) storm event (Northern Beaches Council, 2020). A Flood Management Report is therefore required to support the Development Application (DA) process.

Tonkin has been engaged by Harding Architects Pty Ltd, on behalf of RAS, to prepare the Flood Management Report in order to assess the flood risk and any impact the proposed development may have on existing flood levels, storage and flow paths.

2 Development description

2.1 General

The proposed development is located at 4 Cross Street, Brookvale, and occupies approximately 2,600 m² of land. The location and extents of the site are shown in Figure 2.1. The site can be accessed from the north, via a 40 m long laneway leading out of a cul-de-sac in Cross Street, or from the south as the property fronts Cross Street.

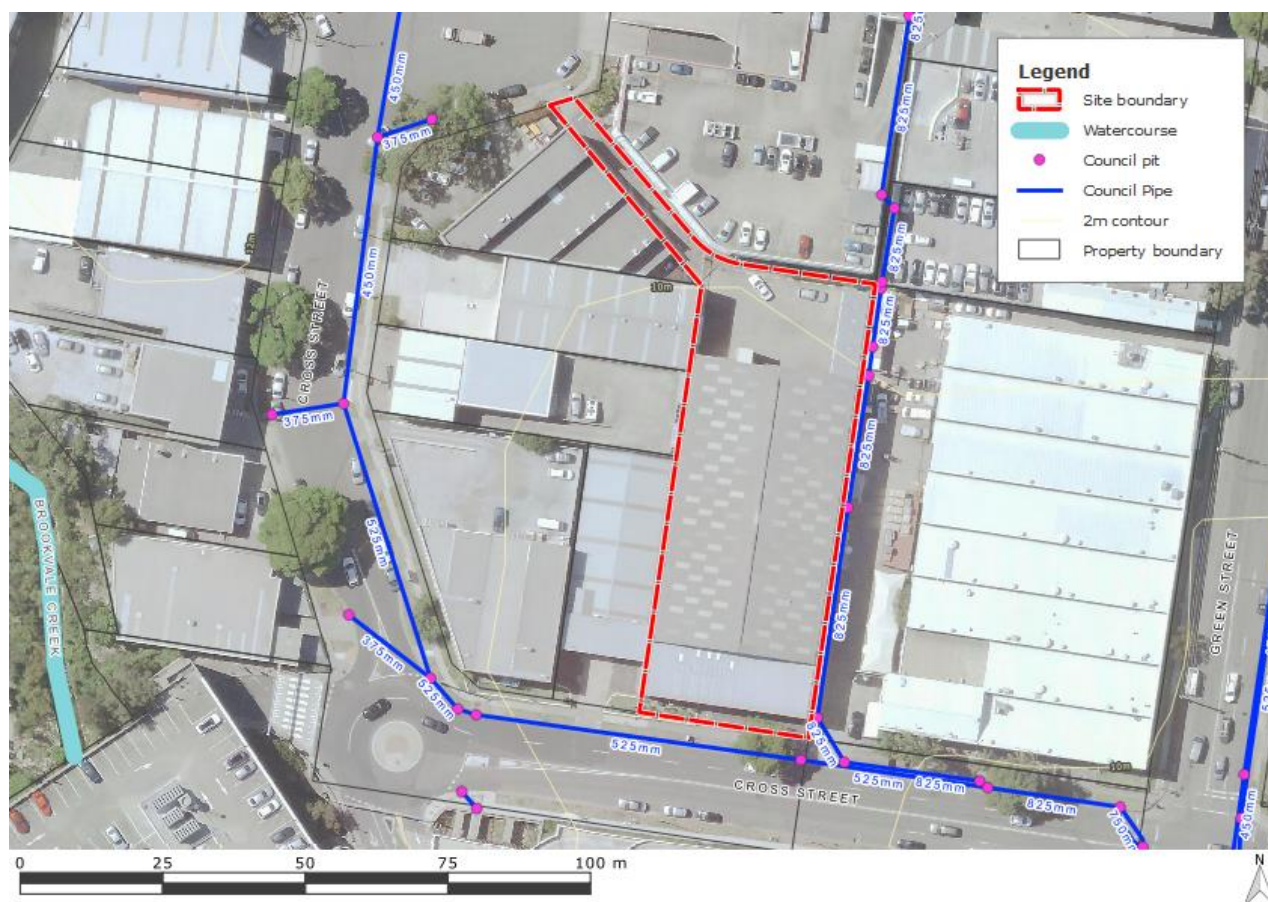


Figure 2.1 Locality plan

Detailed survey indicates that the main portion of the site generally falls in a south-easterly direction at an approximate grade of 0.8% (LandPartners, 2019). The laneway does however lead into the site at a steeper grade of approximately 2.7%.

2.2 Existing development

Before its demolition, the site comprised a two-storey self-storage building that extended across the full width of the allotment with on-site parking at the rear of the allotment. It was almost completely impervious, with only a small portion (approximately 30 m²) of pervious surface within a garden bed at the front of the allotment.



2.3 Proposed development

The proposed development will include:

- replacing the existing two-storey building with a new three-storey building. The new building will include:
 - three levels of storage units
 - offices and amenities on the ground level
 - a driveway through the western side of the building to provide a one-way path for storage trucks to move through the site, unload and exit via the laneway
- upgrades to the laneway, to tie into new building levels
- on-site parking at the front (southern end) of the property
- two driveway crossovers; one leading out of the laneway, and another at the front entrance providing both access and egress.

Details on the proposed development can be found in the latest set of architectural drawings (Harding Architects, 2019).

The footprint of the new building will occupy a larger portion of the allotment, as carparking at the rear will be redeveloped into part of the new building. The total imperviousness of the site will however remain the same – approximately 98% of the total site area.

All aspects of operation at the existing development will remain the same, as the existing self-storage facility was also owned and operated by RAS. Details of operational aspects include:

- **Type of use:** business and industrial
- **Use of the building:** self-storage units
- **Hours of operation:** normal business hours, 7-days a week
- **Proposed traffic:** storage trucks (typically 3.5 tonne Pantech truck) and some passenger vehicles for those visiting and parking on-site
- **Traffic movement:** all storage trucks will move in a northerly direction through the site, entering at southern driveway on Cross Street and following the one-way driveway through the building and exiting at the cul-de-sac in Cross Street. Other passenger vehicles will enter and exit via the southern driveway, only to access on-site parking.

3 Flood analysis

The following analyses are based on the flood information provided by Council (Northern Beaches Council, 2020). The flood information is based on the Manly Lagoon Flood Study undertaken by BMT WBM in 2013. A copy of the flood information report is provided in Appendix A.

3.1 General

3.1.1 1% AEP flooding

Flood extents at the proposed development site in a 1% AEP storm event are shown in Figure 3.1.



1% AEP floodplain without climate change

1% AEP floodplain with climate change

Figure 3.1 1% AEP flooding (Northern Beaches Council, 2020)

It can be seen that there are floodwaters moving through the development site in a 1% AEP storm event. The flood mapping indicates that floodwaters overtop kerbs at the cul-de-sac in Cross Street and move in a south-easterly direction through the site.

Most of these flows are seen moving through adjacent buildings as the modelling does not capture the obstruction caused by these large industrial buildings. As the external walls of these buildings are built up to boundary lines, there is no space in between buildings for flow to travel. Instead floodwaters are likely to head in a southerly direction out front of these buildings and continue to flow onto Cross Street.

As ground levels at the property north of the site are higher than those within the site, there is potential for floodwaters moving across the front of this property to flow onto the laneway and enter the development site.



By comparing flood levels with surveyed levels at the cul-de-sac, it does not seem likely that floodwaters in a 1% AEP storm event would ever reach a level that could overtop the verge fronting the northern property (LandPartners, 2019). As the ground surface levels used for flood mapping match surveyed levels within this area, it is possible that the adopted grid resolution has not captured the crest levels within the verge.

The flood mapping does however show a flood depth of 0.02 m at the upstream end of the laneway. It is possible for these floodwaters to overtop the driveway crossover and move along the laneway, heading into the site.

Based on the assumption that 1% AEP floodwaters can overtop the 4.5 m wide driveway crossover at a depth of 0.05 m (conservatively larger than the modelled 0.02 m depth), it is estimated that 80 L/s would flow down the laneway and into the site. The weir calculations used to estimate this flow rate are provided in Appendix B.

3.1.2 PMF flooding

Flood extents at the proposed development site in the Probable Maximum Flood (PMF) event are shown in Figure 3.1.



Figure 3.2 PMF flooding (Northern Beaches Council, 2020)

It can be seen that the total site is inundated with floodwaters in the PMF event. Similar to the 1% AEP storm event, these flood flows will enter the site via the laneway leading out of the cul-de-sac in Cross Street.

At the bottom of the laneway, where the building starts, flood levels in the PMF event are estimated to be 12.40 mAH (Northern Beaches Council, 2020).



3.2 Flood planning levels

The eastern end of the laneway is where the building begins and where the building is at risk of floodwaters entering the building. Based on flood levels at this location, Council's pre-lodgement advice has specified a Flood Planning Level of 11.4 mAHD for all storage units. This allows sufficient freeboard to the 1% AEP flood levels.

The driveway through the building should be set at or above the 1% AEP level (11.1 mAHD) at this location.

3.3 Flood risk

Based on the flood mapping, and as shown in Figure 3.3, the site is located within a Medium Flood Risk Precinct. This means that the site is located within the 1% AEP floodplain but is not subject to significant evacuation difficulties.



Figure 3.3 Flood risk precincts (Northern Beaches Council, 2020)

On this basis, the site must comply with the requirements for sites located within Medium Flood Risk Precincts.

3.4 Hydraulic categorisation

Flood flows coming down the laneway are considered part of a floodway as there is a constant fall across the rear of allotment car park. Modelling results show these flows continuing to move across the car park in a south-westerly direction and on to the adjacent property.

It is however likely that the eastern fencing along the property boundary will act as a barrier to these flows, which would cause the flows to become trapped within the carpark and risk inundation of the existing building.



The proposed development will replace the existing car park to form part of the building, which will also act as a barrier to flows moving along the laneway. It will however relocate the location of where floodwaters will become trapped and pool. An underground system has been provided to replace the function of the existing floodway.

3.5 Recommendations

In order to prevent floodwaters from entering the building via the laneway it is recommended that levels at the driveway crossover are maintained. This will maintain the current level of protection provided by the driveway without adversely affecting flooding at the neighbouring properties.

As there is potential for flood flows in the order of 80 L/s to overtop the driveway and head down the laneway in a 1% AEP storm event, it is recommended that the development includes drainage to manage these flows in all events up to and including a 1% AEP storm event. It is proposed that two grated inlet pits at the downstream end of the laneway and one strip drain along the roller door are installed to capture the 80 L/s in addition to runoff generated by the driveway itself (Tonkin, 2020).

The pits and pipes will be connected to an underground piped system with sufficient capacity to convey the 1% AEP flows through the site and discharge to Council's drainage system within Cross Street.

By capturing all of the 1% AEP flood flows before they reach the building, it will prevent flows from ponding up against the building and will mitigate the issue of the building obstructing floodwaters.

Although design of the above drainage infrastructure has made allowance for 50% blockage, there is potential for this system to be completely blocked. In case the system is completely blocked, it is recommended that the driveway through the building has a gradual fall in elevation, from north to south, so as to provide a safe overland flow path to Cross Street.



4 Assessment of impacts

Compliance with the requirements outlined in Councils Development Control Plan (DCP) are summarised in Table 4.1 and justification is provided in the following sections (Northern Beaches Council, 2011).

Table 4.1 Compliance checklist

	Compliance	
	N/A	Yes No
A – Flood effects caused by the development		✓
B – Drainage infrastructure and creek works		✓
C – Building components and structural		✓
D – Storage of goods		✓
E – Flood emergency response		✓
F – Floor levels		✓
G – Car parking		✓
H – Fencing	✓	
I – Pools	✓	

4.1 Flood effects caused by the development

While the proposed building is likely to block any flood flows coming down the driveway, the stormwater drainage design includes compensatory works to transfer flood flows underground and discharge to Council's drainage system in Cross Street. This provides a path for flood flows to leave the site, as opposed to existing conditions, where flood flows would become trapped within the carpark.

4.2 Drainage infrastructure and creek works

New drainage infrastructure at the site has sufficient capacity to convey 1% AEP flows through the site and discharge to Council's existing drainage system in Cross Street. This is based on a 50% blockage allowance for all pits.

The proposed drainage infrastructure designed to cater for 1% AEP flood flows is an improvement on existing development conditions, where there was previously no safe flow path for floodwaters.

4.3 Building components and structural

As any floodwaters moving through the site will be shallow (less than 100 mm) in a 1% AEP storm event, the building will be capable of withstanding the forces of floodwaters, wave action, flowing water with debris, buoyancy and immersion. Particularly since the finished floor level of the building will be set above the 1% AEP flood levels.

All new electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections will need to be waterproofed and/or located above the Flood Planning Level.

4.4 Storage of goods

All goods susceptible to water damage will be stored within the storage units, where they will be protected against flood waters in all events up to and including 1% AEP storm events.



4.5 Flood emergency response

In the PMF event, floodwaters within the building footprint are expected to reach a level of 12.4 mAHD, which is 1.0 m above the Flood Planning Level of 11.4 mAHD. Therefore, floodwaters are expected to enter the building and flood the ground level of the building.

People will be able to evacuate to safe shelter on the first and second floors of the building, as both of these levels are adequately sized, located above PMF levels and can be accessed from both sides (north and south) of the site via stairwells.

A flood emergency response plan, including adequate warning systems, signage and exits, will also need to be implemented as part of this development.

4.6 Flood levels

Floor levels of the storage units have been set to the Flood Planning Level specified in the prelodgement advice (11.4 mAHD). This will help to protect the storage units from inundation in all events up to and including a 1% AEP storm event.

Surface levels along the driveway moving through the building have been set lower than the Flood Planning Level so as not to impede flood flows and provide an overland flow path in case the upstream drainage infrastructure blocks more than has been allowed.

4.7 Car parking

Carparking at the existing site was located at the rear of the allotment, within the 1% AEP floodway. Redevelopment of the site is proposing to relocate on-site parking to the front (southern) end of the site, within an area located outside the extents of the 1% AEP floodplain.

Parking for storage trucks is located along the driveway that runs through building. The site drainage system aims to capture all flood flows upstream of the building so that there are no bypass flows entering the internal driveway. This will provide protection to parked vehicles along the internal driveway in a 1% AEP storm event.

4.8 Fencing

Fencing at the proposed development will not be located anywhere that may affect or obstruct the 1% AEP flood flows.

4.9 Pools

The proposed development does not include construction of a pool.



5 Summary

Rent A Space are proposing to develop a new self-storage facility on a site that has been identified as flood-affected in a 1% AEP storm event. This Flood Management Report has been prepared to assess the flood risk and any impact the proposed development may have on existing flooding within the area.

The proposed development has been identified as a business and industrial and one which is located within a medium flood risk precinct.

Based on the above assessments, the following recommendations/requirements have been incorporated into the stormwater management design in order to comply with Council requirements for developing on flood prone land:

- it is recommended that the existing levels at the driveway crossover leading into the laneway are maintained so as to maintain the same level of flood protection to the site
- finished flood levels at all storage units must be set at or above 11.4 mAHd
- drainage infrastructure at the downstream end of the laneway shall be designed to have sufficient capacity to convey all flood flows in a 1% AEP storm event, so as to prevent floodwaters from entering the building
- surface levels along the driveway that runs through the building must have a gradual fall in elevation (from north to south) to provide a safe overland flow path in case the upstream drainage system blocks up.



6 References

Harding Architects (2019). *Rent A Space Self Storage – 4 Cross Street, Brookvale NSW*. Ref no. 1915.

LandPartners (2019). *Detail Survey of Lot 2 in DP543012 – 4 Cross Street, Brookvale*. Ref no. SY074811.000.1. Rev 1.

Northern Beaches Council (2011). *Warringah Development Control Plan*. Amend No. 17. Accessed 18/03/2020.

<https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/pages/plan/book.aspx?exhibit=DCP>

Northern Beaches Council (2020). *Flood Information Request – Comprehensive*. Property: 4 Cross Street, Brookvale. Issue Date: 14/02/2020. Flood Study Reference: Manly Lagoon Flood Study 2013, BMT WBM.

Tonkin (2020). *Rent A Space Brookvale – Stormwater Drainage Concept Design Report*. Ref no. 20192073R002RevA.



Appendix A – Flood information report

FLOOD INFORMATION REQUEST – COMPREHENSIVE

Property: 4 Cross Street Brookvale

Lot DP:

Issue Date: 14/02/2020

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

Flood Information for lot:

Flood Life Hazard Category – See Map A

1% AEP – See Flood Map B

1% AEP Maximum Water Level³: 12.44 mAHD

1% AEP Maximum Peak Depth from natural ground level³: 0.26 m

1% AEP Maximum Velocity: 0.62 m/s

1% AEP Provisional Flood Hazard: Low **See Flood Map E**

1% AEP Hydraulic Categorisation: Flood fringe **See Flood Map F**

Flood Planning Area – See Flood Map C

Flood Planning Level (FPL) ^{1, 2, 3 & 4}: 12.74 m AHD

Probable Maximum Flood (PMF) – See Flood Map D

PMF Maximum Water Level²: 13.83 m AHD

PMF Maximum Depth from natural ground level: 1.83 m

PMF Maximum Velocity: 2.78 m/s

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

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

Flooding with Climate Change (See Flood Map I)

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

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

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

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

Flood Risk Precinct – See Map J

Indicative Ground Surface Spot Heights – See Map K

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

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

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

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

General Notes:

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

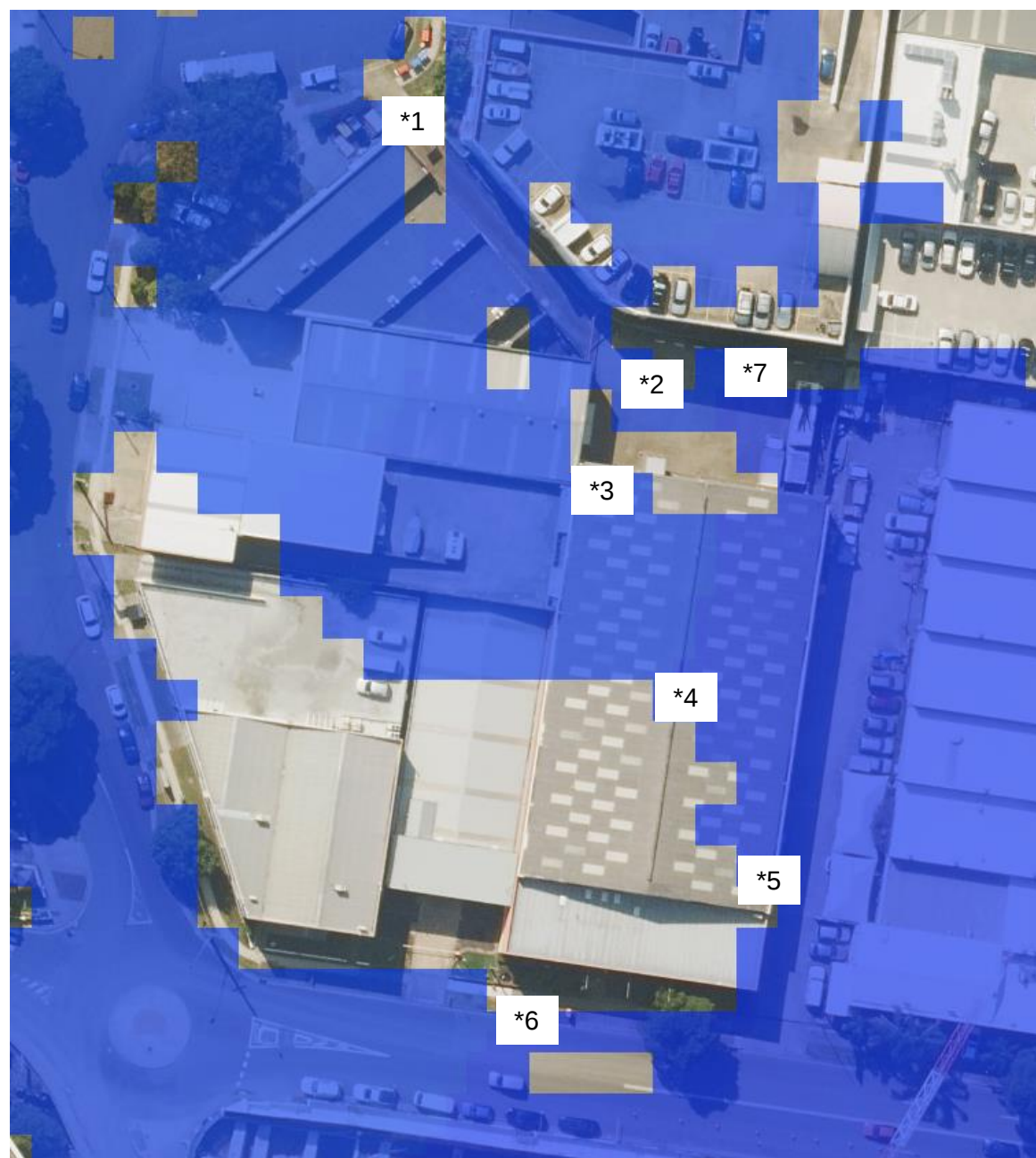
FLOOD MAP A: FLOOD LIFE HAZARD CATEGORY

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

Notes:

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

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	12.4	0.02	N/A	12.38	13.83	1.43	N/A
2	N/A	N/A	11.1	0.13	N/A	11.51	12.40	1.23	N/A
3	N/A	N/A	11.4	0.06	N/A	11.67	12.45	1.18	N/A
4	N/A	N/A	11.0	0.05	N/A	11.30	12.39	1.43	N/A
5	N/A	N/A	10.7	0.06	N/A	11.05	12.30	1.66	N/A
6	N/A	N/A	10.8	0.05	N/A	11.27	12.29	1.35	N/A
7	N/A	N/A	10.9	0.14	N/A	11.53	12.40	1.26	N/A

WL – Water Level

PMF – Probable Maximum Flood

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

Climate Change Flood Levels (30% Rainfall intensity and 0.9m Sea Level Rise)
N/A

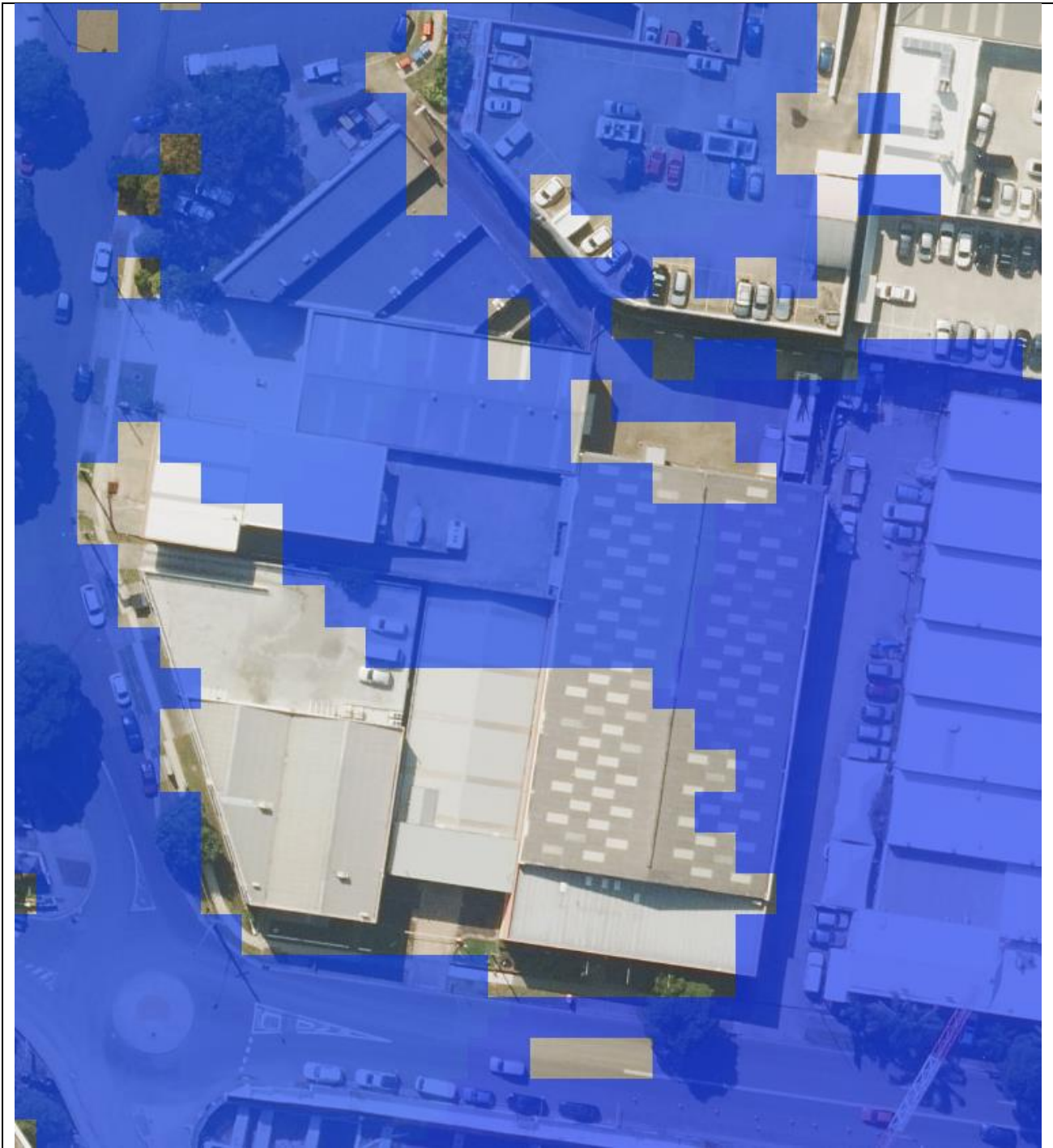
A variable Flood Planning Level might apply - 0.5m above 1% AEP max water level (for Mainstream flooding) or 0.5m above the 1% AEP max water level flow path extent with depth greater than 0.3m and 0.3m above the 1% AEP max water level flow path with depth 0.3m and less (for overland flow)

WL – Water Level

PMF – Probable Maximum Flood

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

FLOOD MAP B: FLOODING - 1% AEP EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event.
- Flood events exceeding the 1% AEP can occur on this site.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

FLOOD MAP C: FLOOD PLANNING AREA EXTENT



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event + freeboard.
- Extent does not include climate change.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source Near Map 2014) are indicative only.

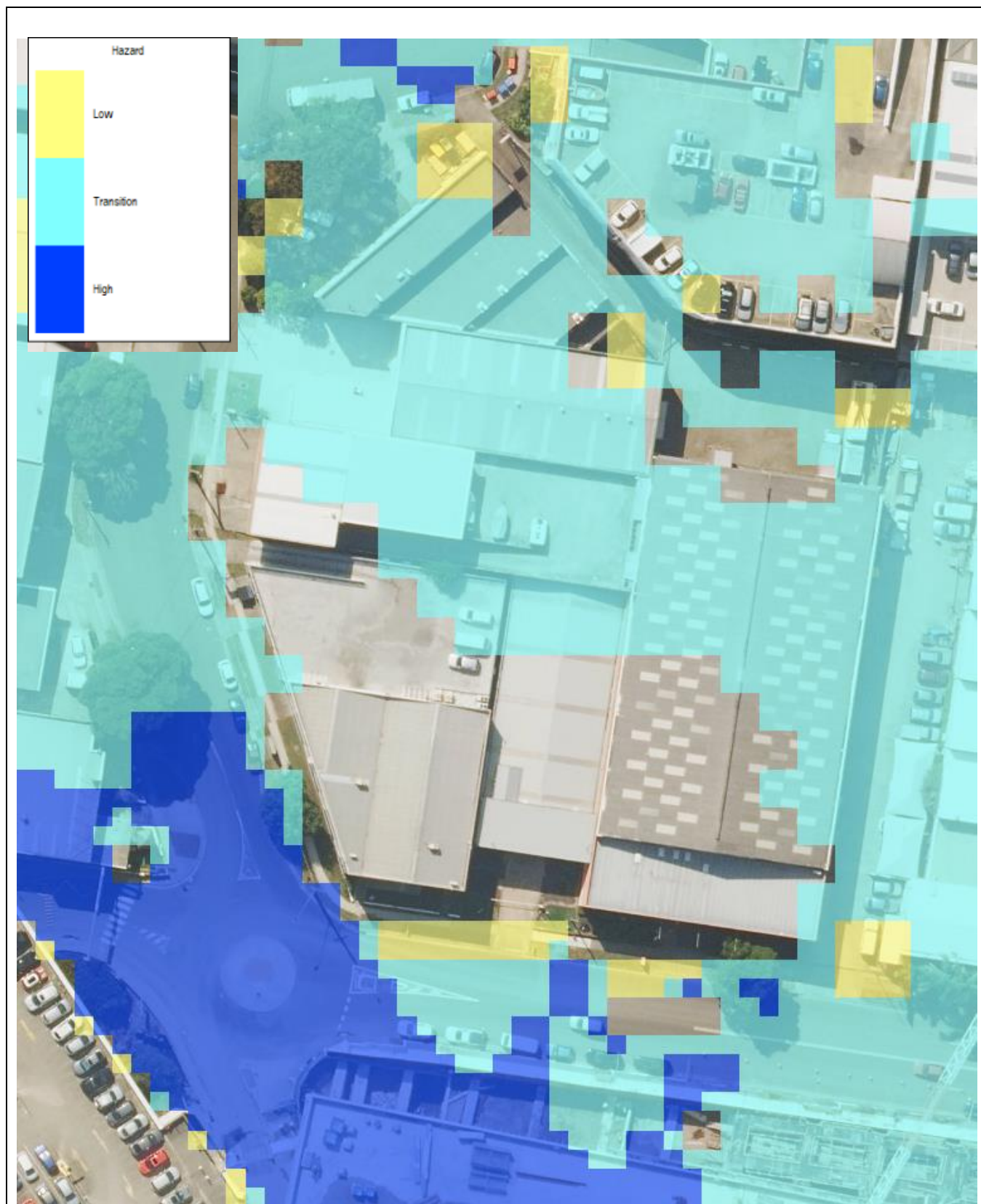
FLOOD MAP D: PMF EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP E: 1% AEP FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

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

N/A

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

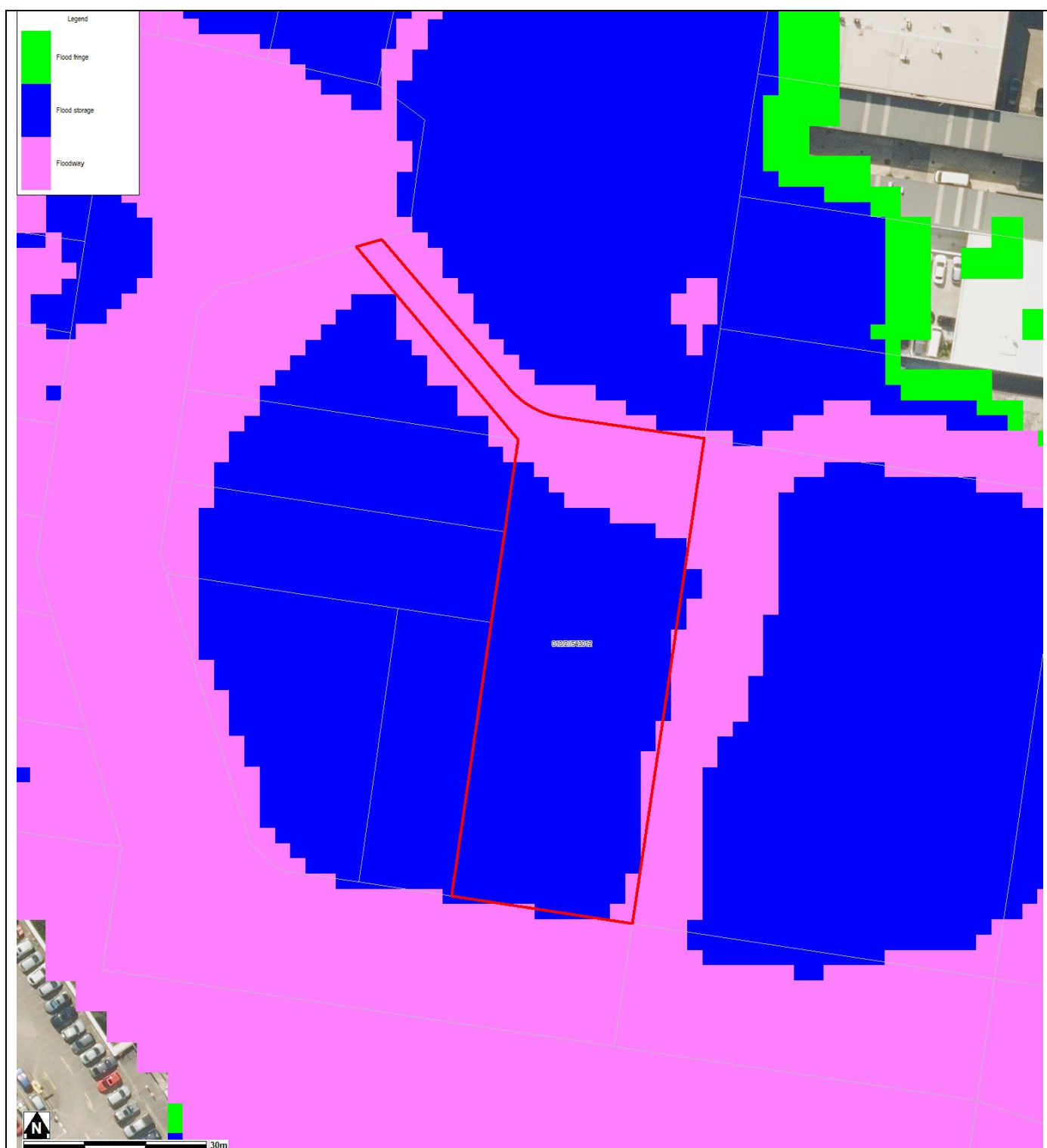
FLOOD MAP G: PMF FLOOD HAZARD EXTENT MAP



Notes:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event
- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

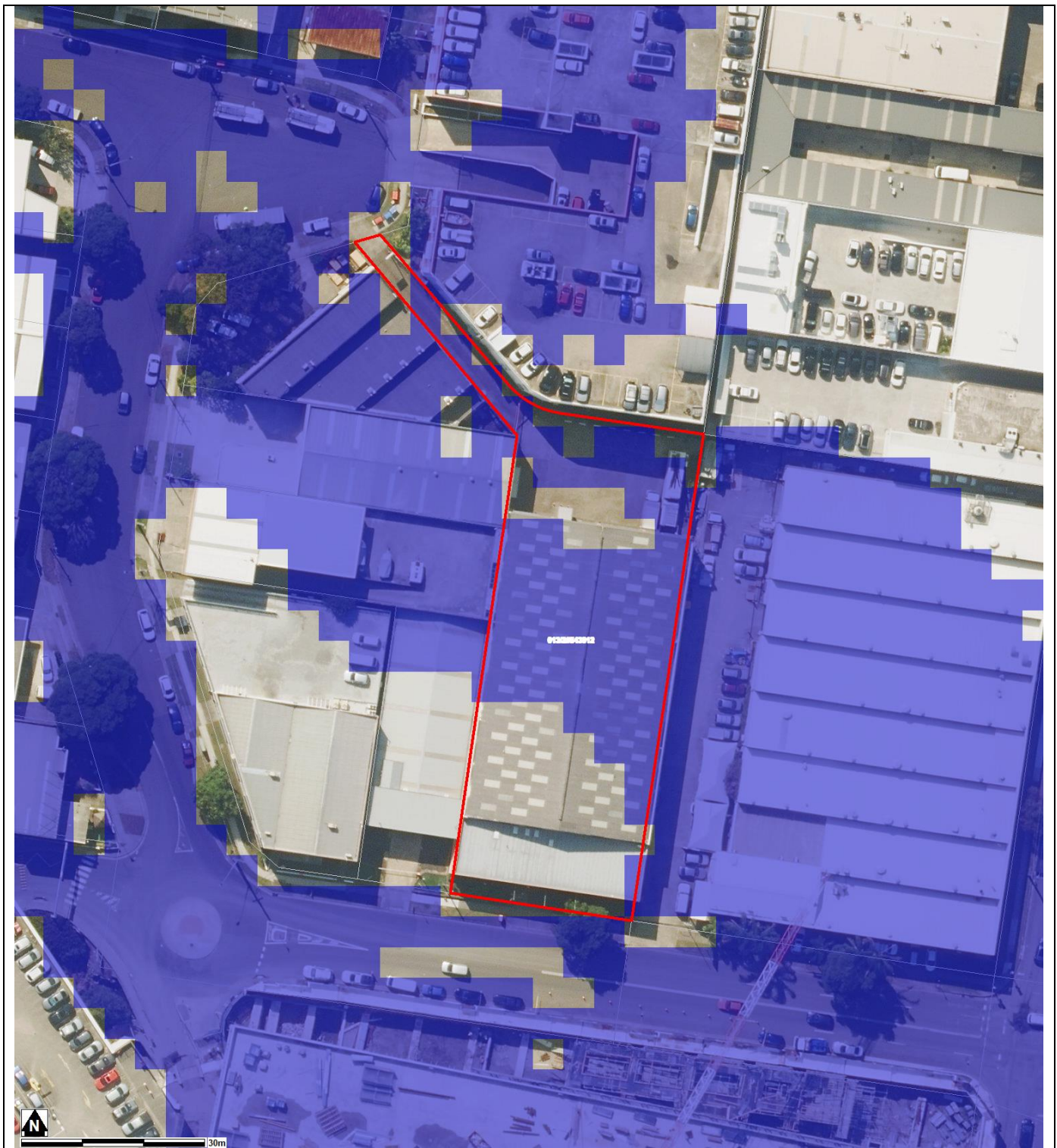
FLOOD MAP H: PMF FLOOD HYDRAULIC CATEGORY EXTENT MAP



Notes:

- Extent represents the Probable Maximum Flood (PMF) event
- Extent does not include climate change
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

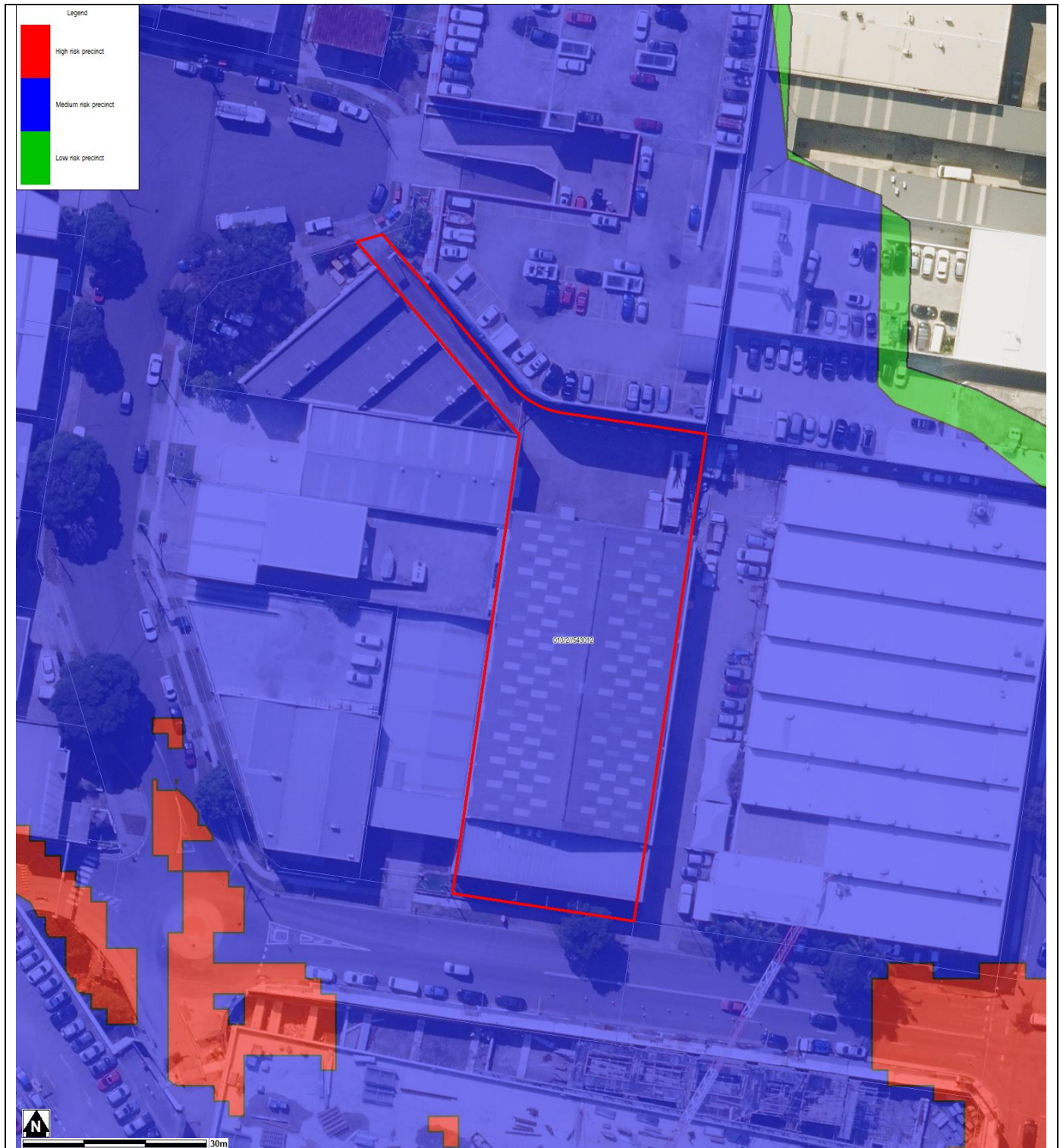
FLOOD MAP I: FLOODING – 1% AEP EXTENT PLUS CLIMATE CHANGE



Note:

- Extent represents the 1% annual Exceedance Probability (AEP) flood event including 30% rainfall intensity and 0.9m Sea Level Rise climate change scenario
- Flood events exceeding the 1% AEP can occur on this site.
- Cadastre Lines (Source: NSW Government Land and Property Information), flood levels/extents (Source: Manly Lagoon Flood Study 2013, BMT WBM) and aerial photography (Source: NearMap 2014) are indicative only

FLOOD MAP J: FLOOD RISK PRECINCT MAP



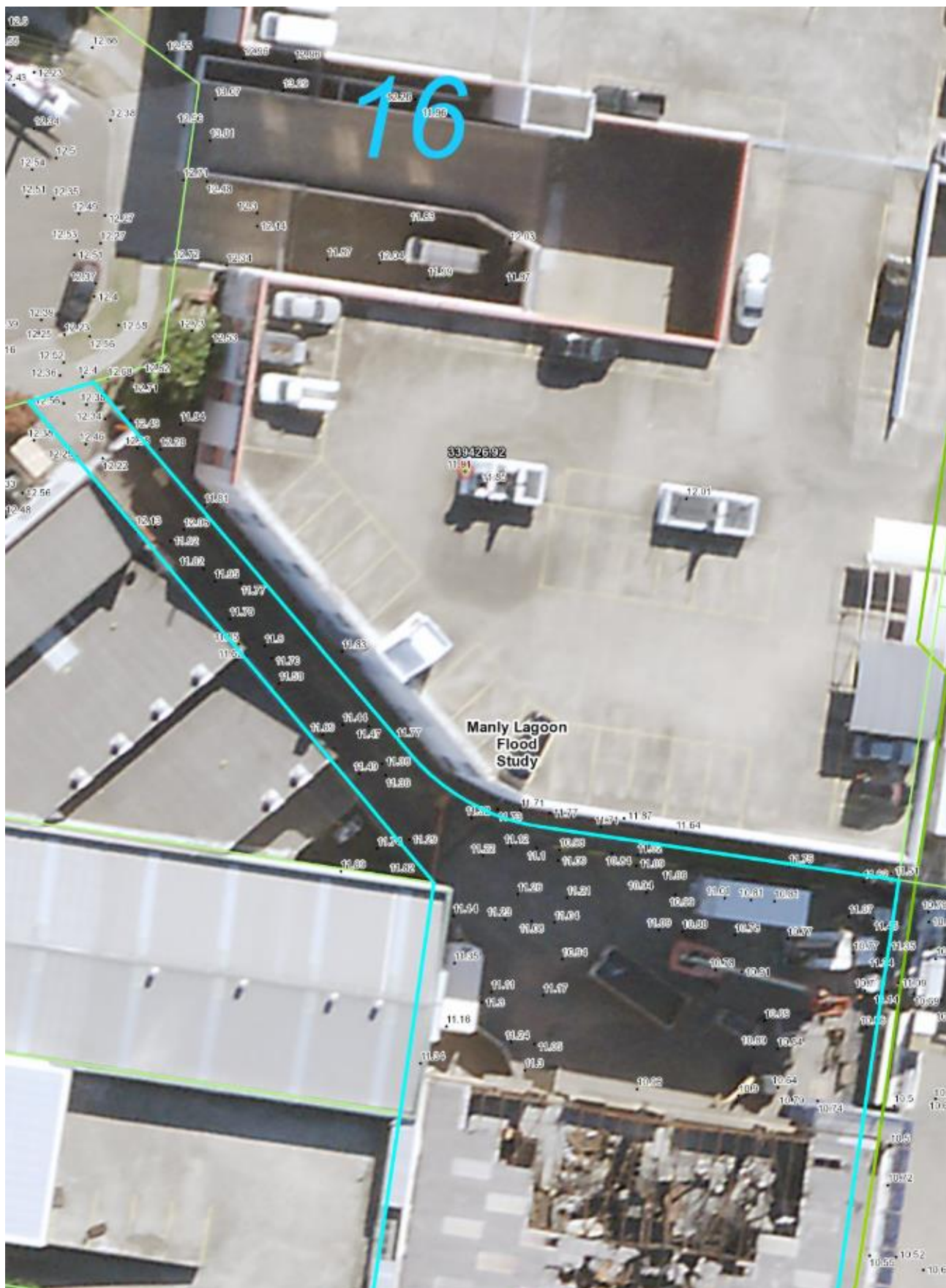
Notes:

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

MAP K: 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.

GUIDELINES for Preparing a Flood Management Report

Introduction

These guidelines are intended to provide advice to applicants on preparing a Flood Management Report. The purpose of a Flood Management Report is to help applicants measure and manage the flood risk to life and property on their site.

When is a Flood Management Report required?

A Flood Management Report must be submitted with any Development Application on flood prone land, for Council to consider the potential flood impacts and 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.

Note that the flood extents shown on the mapping are indicative only. It is recommended that flood levels are compared to registered ground survey to more accurately determine the flood extent.

There are some circumstances where a 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 Flood Planning Level 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 in a Flood Management Report?

The aim of a Flood Management Report is to demonstrate how a proposed development will comply with the flood related 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.

Technical requirements of a Flood Management Report

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

1. Description of development

The description of development should identify:

- 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, ie, critical, vulnerable, subdivision, residential, business, industrial, recreational, environmental or concessional

2. Flood analysis

The flood analysis should include:

- Predicted 1 in 100 year flood level
- Flood Planning Level (FPL)
- Probable Maximum Flood (PMF) level
- Flood Risk Precinct, ie High, Medium or Low
- Flood Life Hazard Category (in former Pittwater Council area only)
- Mapping of relevant extents
- Flood characteristics for the site, eg depth, velocity, hazard and hydraulic category, and the impact these have on the proposed development

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

3. Assessment of impacts

The assessment of impacts should address the various elements of the relevant LEP and DCP. A simple compliance table should be provided, similar to the table one below.

	Compliance		
	Not Applicable	Yes	No
A Flood effects caused by Development			
B Drainage Infrastructure & Creek Works			
C Building Components & Structural			
D Storage of Goods			
E Flood Emergency Response			
F Floor Levels			
G Car Parking			
H Fencing			
I Pools			

Further details of what is required for each of these categories can be found in the *Development Control Plan for Flood Prone Land*.

For any of these categories which are applicable, the assessment should demonstrate how the development complies, or if it doesn't, provide an explanation of why the development should still be considered.

Reporting requirements for a Flood Management Report

The Flood Management Report should include:

- a) Executive summary
- b) Location plan, at an appropriate scale, that includes geographical features, street names and identifies all waterways and Council stormwater pipes, pits and easements
- c) Plan of the proposed development site showing the extent of the predicted 100 year, any high hazard or floodway conditions and the PMF flood event
- d) Development recommendations and construction methodologies
- e) Calculation formulae (particularly for flood storage)
- f) Clear referencing using an accepted academic referencing system (eg. Harvard)
- g) Analysis of development against relevant State Environmental Planning Policies
- h) Analysis of development against relevant Local Environment Plan and Policies
- i) Conclusion detailing key points
- j) Standard Hydraulic Certification (Form A/A1)
- k) Qualifications of author
- l) Any flood advice provided by Council
- m) Any other details which may be relevant

NOTE: 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 Australian Institute of Engineers.

For further information please contact Stormwater and Floodplain Team on 1300 434 434 or via email at floodplain@northernbeaches.nsw.gov.au

Attachment A

NORTHERN BEACHES COUNCIL STANDARD HYDRAULIC CERTIFICATION FORM

FORM A/A1 – To be submitted with Development Application

Development Application for

Address of site: _____

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

I, _____ on behalf of _____
(Insert Name) (Trading or Business/ Company Name)

on this the _____ certify that I am engineer or a
(Date)

professional consultant specialising in flooding and I am authorised by the above organisation/ company to issue this document and to certify that the organisation/ company has a current professional indemnity policy of at least \$2 million.

Flood Management Report Details:

Report Title:

Report Date:

Author:

Author's Company/Organisation:

I: _____
(Insert Name)

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

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

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

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

Signature

Name



Appendix B – Calculations

Project **RAS BROOKVALE**

Job number **2019.2073**

Taken by ..

Date **19/03/20** Page **1** of **1**

Location

Present

☐ Phone ☐ Meeting ☐ Site visit ☐ Other

Calculation **DB**

Checked **KSS**

DRIVEWAY WIDTH = 4.5 m

FLOW DEPTH OVER WEIR = 0.05 m

WEIR COEFFICIENT = 1.6

FLOW, $Q = C.L.H^{1.5}$

$$= 1.6 \times 4.5 \times 0.05^{1.5}$$

$$= 0.080 \text{ m}^3/\text{s}$$

$$= 80 \text{ L/s}$$