REPORT

Tonkin+Taylor

Downtown Carpark Site Development

Flood hazard and risk assessment

Prepared for
Precinct Properties Holdings Limited
Prepared by
Tonkin & Taylor Ltd
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1 Introduction

Precinct Properties NZ Ltd (Precinct), engaged Tonkin & Taylor Ltd (T+T) to complete flood assessment studies to assist Precinct in the substantive consent application process for the Downtown Car Park Site Development project ("Project").

The purpose of this report is to present flood hazard information and a flood hazard risk assessment to support the substantive application. This builds on flood hazard assessment work completed by T+T In December 2020. A coastal hazard and risk assessment is provided as a separate report.

All levels presented in this document are in New Zealand Vertical Datum 2016 (NZVD2016). An offset value of 320 mm has been applied to flood levels previously reported in Auckland 1946 vertical datum (AVD1946), in line with the offset applied to the architectural drawing set of the substantive consent application.

The report structure is as follows:

- Flood hazard.
- Freeboard.
- Flood hazard risk assessment.

2 Flood hazard

2.1 Background information

The Auckland Council (AC) mapped 1% AEP[1] floodplain, flood prone area and overland flow paths are shown in Figure 2.1.

The site is adjacent to a floodplain area identified on Lower Hobson Street, Customs Street West and the Service Lane. There is an overland flowpath identified along the roads adjacent to the site on Customs Street West and Lower Hobson Street.

Auckland Council GeoMaps identifies a "flood prone area" located at the northeastern area of the site. The mapped extents of the flood prone area are incorrect, and the flood prone area is only confined to the Service Lane area. Flood prone areas can provide useful information relating to flood hazard when an outlet is blocked and this can support flood risk decision making when evaluated alongside considerations regarding likelihood of blockage.

[1] Annual Exceedance Probability (AEP). A 1% AEP is also referred to as a 100 year ARI (Average Recurrence Interval).

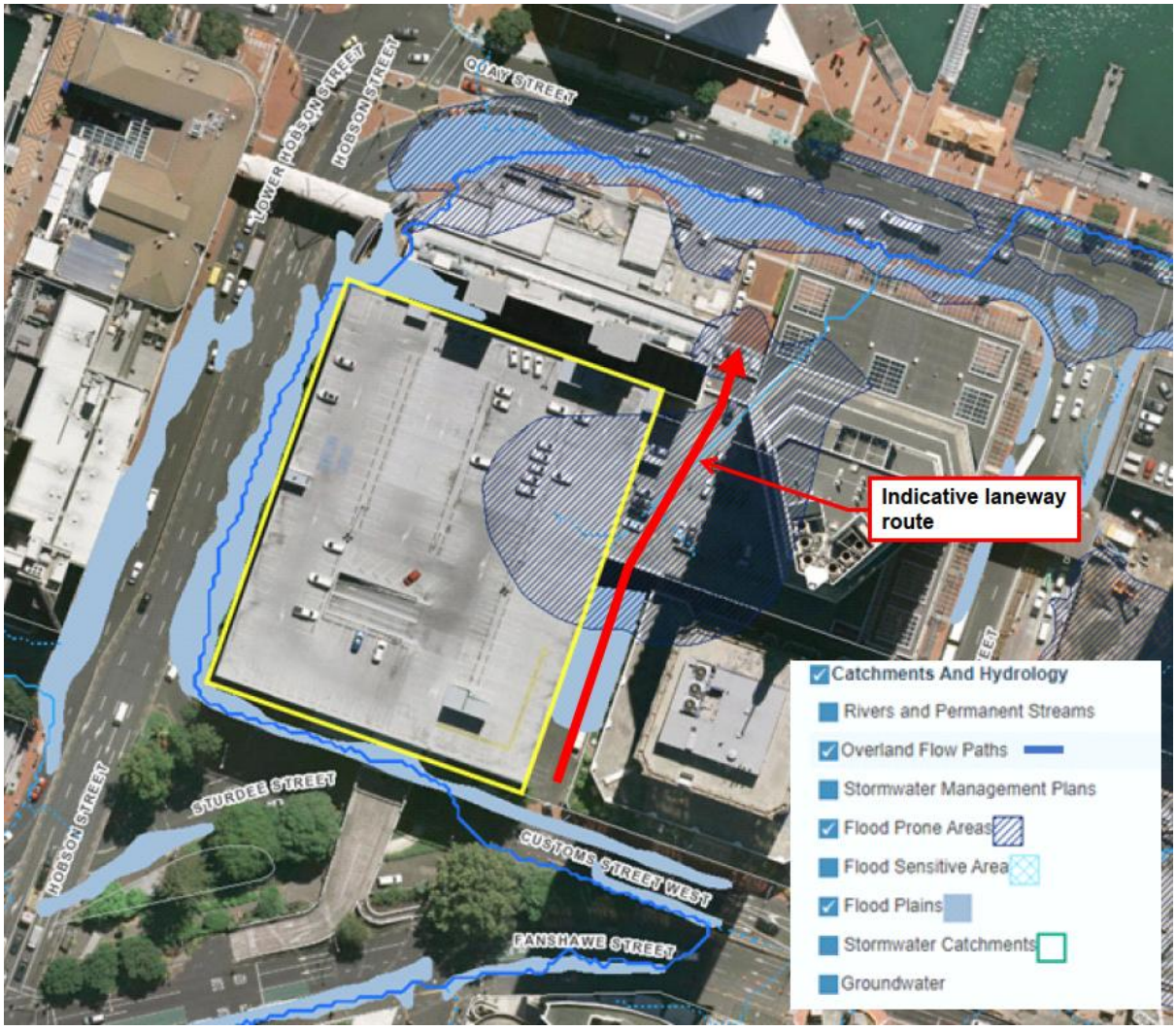

Figure 2.1: Overland flow paths, floodplain and flood prone areas (source: Auckland Council GeoMaps).

2.2 Flood hazard assessment

Auckland Council provided a copy of their Auckland CBD coupled (1D/2D) model (DHI software) for this flood assessment.

The hydraulic model used was the AC "2018 baseline" CBD model. Updates made for this assessment are summarised below:

Hydraulics:

- Galway St model (December 2016, Stage 2, ACO Drain modified) in area encompassed by Queen St/Fort St/Britomart Pl:
  - Terrain update.
  - Pipe network update.
  - Catchment hydrology update.
- Myers Park pre-development model (August 2015) in Myers Park area:
  - Pipe network update.
- Downtown/Queen Elizabeth Square post-development model (November 2015):
  - Terrain update.

- Beca Survey (March 2018) of downtown area:
  - Terrain update.
- Quay Street Enhancements As-built survey (April 2021)
  - Terrain update.
- Service Lane terrain survey (June 2023)
  - Terrain update.

Climate change scenarios

The TP108 24 hour 100 year rainfall depth has been used as the baseline rainfall. The future climate change 2.1 and 3.8 degrees scenarios have been assessed, with rainfall increases applied based on Table 1 of the Stormwater Code of Practice (SWCOP v4).

The downstream boundary was increased to 3.04 mRL, which represents the following scenario:

- 1% AEP tidal storm surge event plus.
- One meter sea level rise based on SWCoP v4 guidance.

More extreme sea level rise scenarios are considered in the coastal hazard risk assessment. Note that Mean High Water Springs (MHWS) is approximately 1.30 mRL.

Development scenarios

The post-development modelled scenario incorporates the development as shown in Warren and Mahoney GA Level 00 drawing FTA-10-100 dated 03/10/25. In comparison to the existing development the land use remains the same (i.e. 100% impervious) and the ground footprint remains similar (slight reduction). The ground footprint remains similar despite a smaller building footprint because of the raised walkway.

It is currently proposed to include flood barriers at either end of the Service Lane to prevent potential flood flows from entering the Service Lane and basement. These were represented in the post-development model, at the locations shown in drawing FTA-10-100 noted above.

The design of the flood barriers is yet to be finalised. A range of proprietary devices are under consideration. These include, but are not limited to tilting, self-actuating and concealed, swinging, and manually installed demountable options.

Design opportunities to refine the location and design of the barriers remain open during subsequent design stages. For example, there is low likelihood of flood flows entering the Service Lane from Customs Street West, particularly after detailed design, where opportunities to divert overland flows away from the Service Lane can be considered. In this instance the southern flood barrier may not be necessary. The flood effects of the barriers are discussed further in the risk assessment in section 4 of this report.

2.3 Flood hazard assessment results

Figures 2.2 – Figure 2.5 present the floodplain extents and flood depth around the property. The four figures represent scenarios with and without the proposed development and two different climate scenarios (2.1 degrees of warming and 3.8 degrees of warming).

There are six locations identified on each figure, and Table 2.1 identifies the flood depths and flood levels at each location. Locations 1, 4, 5 and 6 are situated within the road corridor. Locations 2 and 3 are located on footpaths adjacent to the Service Lane entrances.

Table 2.1: Predicted flood levels (refer to Figures 2.1 – 2.5 for ID locations)

ID	Predevelopment				Post development			
	2.1 degrees climate change		3.8 degrees climate change		2.1 degrees climate change		3.8 degrees climate change	
	Depth	Level	Depth	Level	Depth	Level	Depth	Level
1	0.18	3.51	0.19	3.52	0.19	3.52	0.21	3.54
2	0.13	3.30	0.14	3.30	0.13	3.30	0.14	3.30
3*	0.08	5.24	0.10	5.25	0.09	5.25	0.11	5.27
4	0.09	4.40	0.11	4.42	0.10	4.41	0.12	4.42
5	0.39	3.59	0.41	3.62	0.39	3.60	0.42	3.63
6	0.40	3.58	0.42	3.61	0.41	3.59	0.43	3.62
*The higher flood levels associated with Location 3 are due to the higher ground. There is a flowpath draining from east to west.								

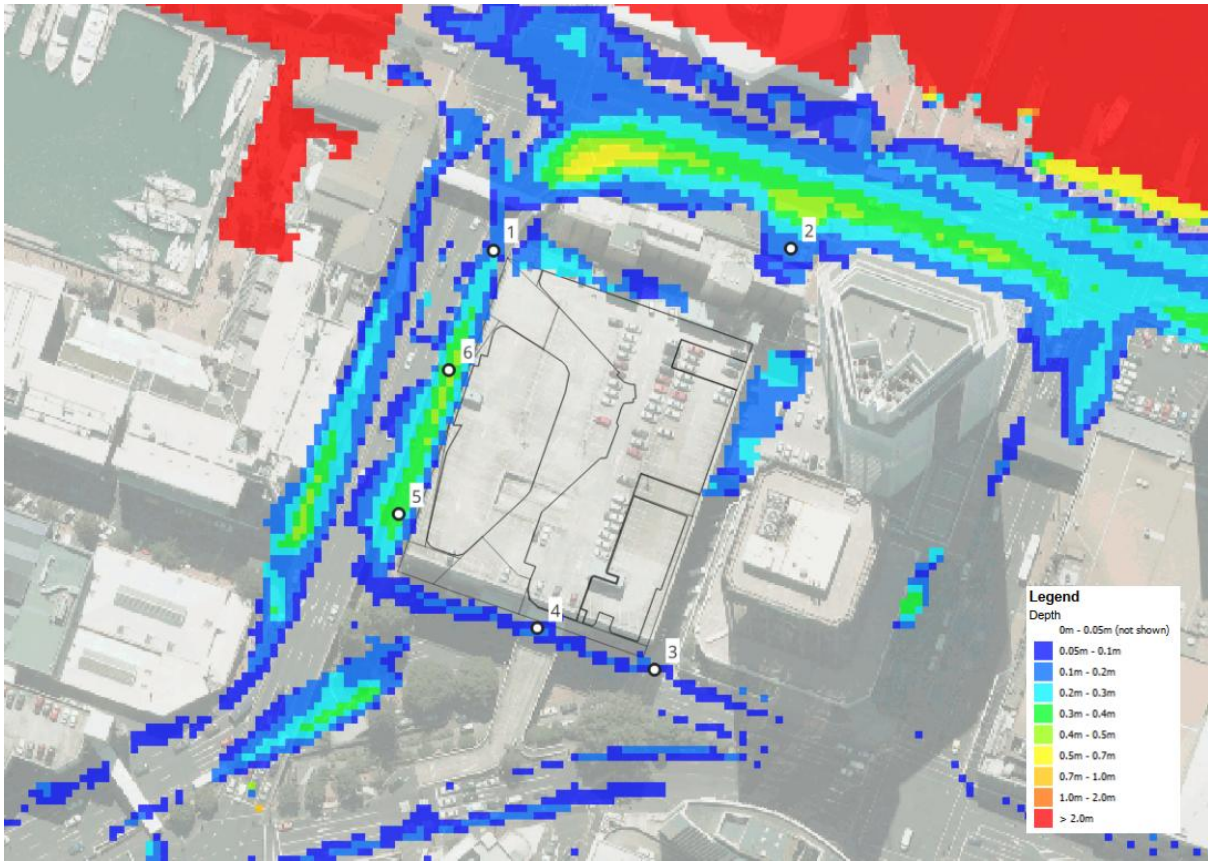

Figure 2.2: Pre-development 1% AEP floodplain - climate change 2.1 degrees.

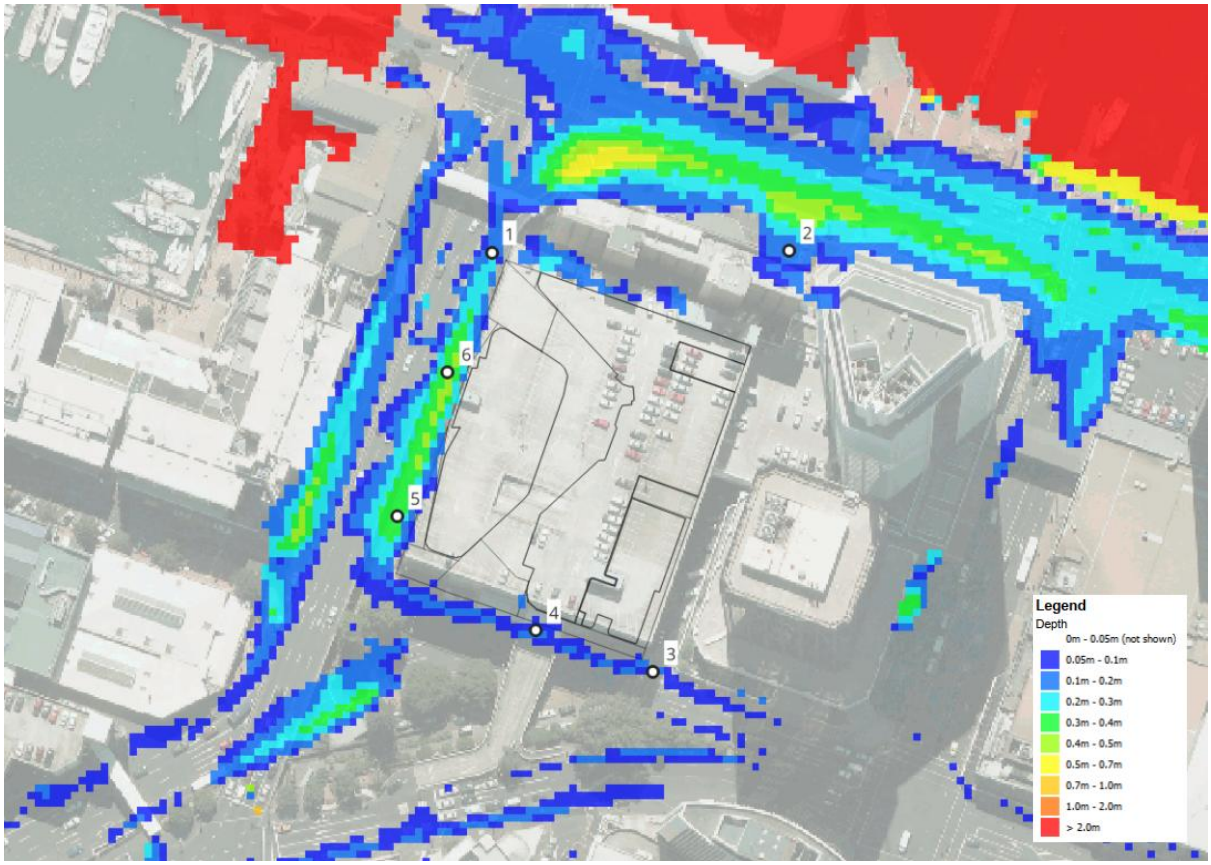

Figure 2.3: Post-development 1% AEP floodplain - climate change 2.1 degrees.

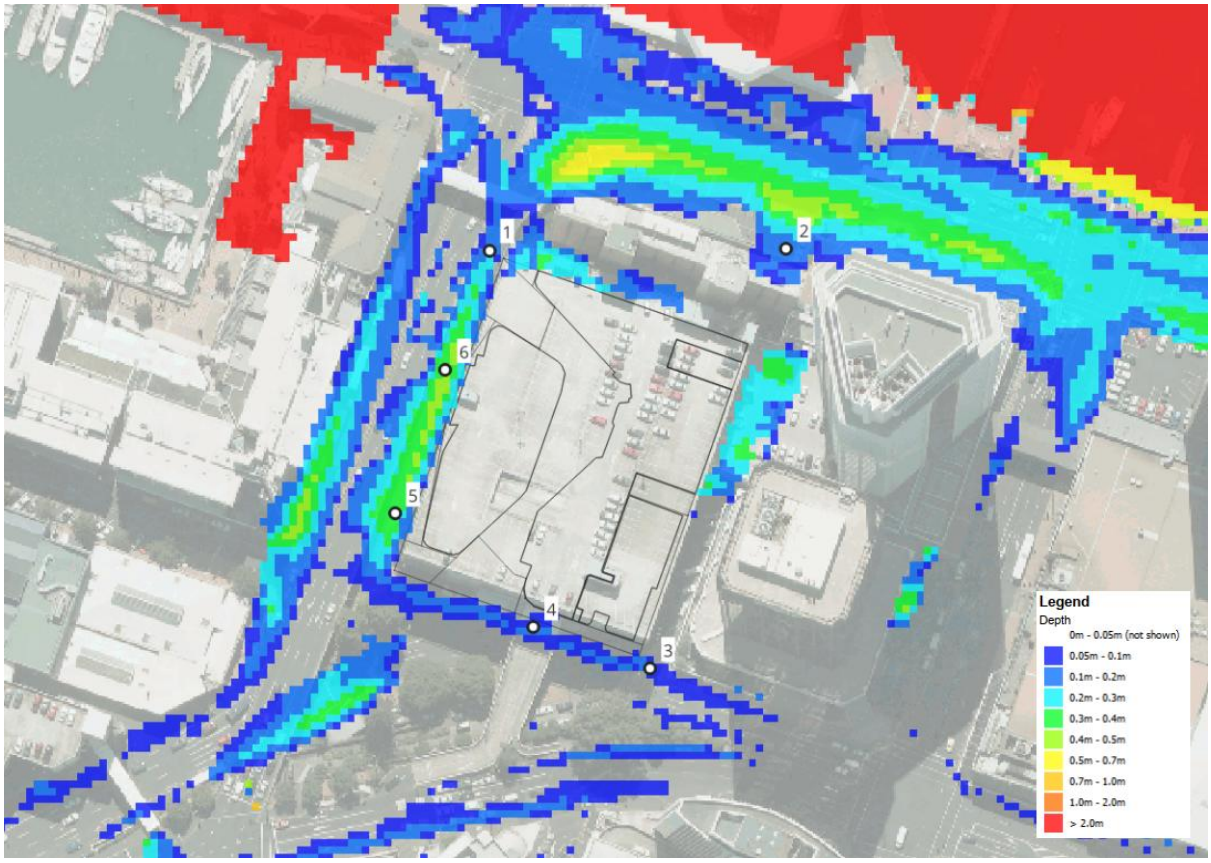

Figure 2.4: Pre-development 1% AEP floodplain - climate change 3.8 degrees.

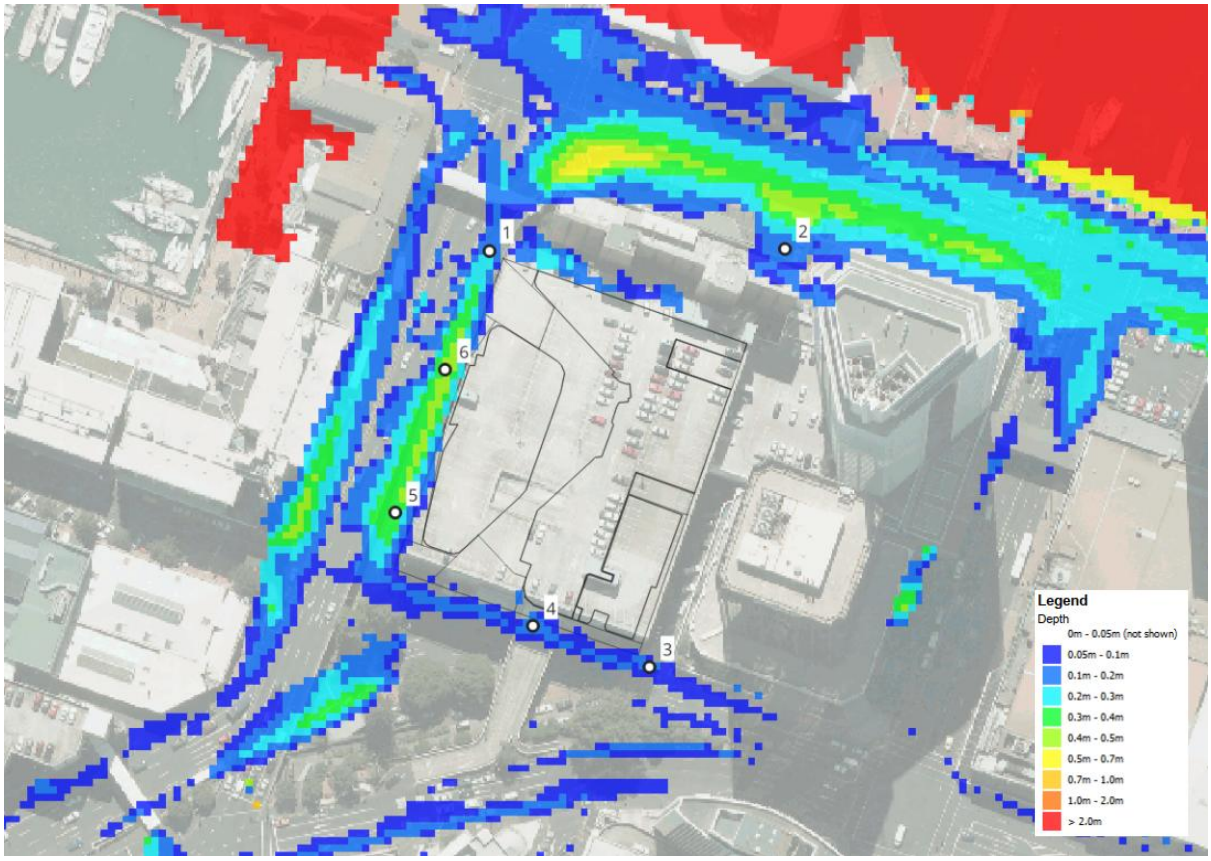

Figure 2.5: Post-development 1% AEP floodplain - climate change 3.8 degrees.

Figure 2.6 and Figure 2.7 represent maximum velocity values with and without the proposed development for the 3.8 degrees climate change scenario.

Depth and velocity hazards have been classified using the flood hazard curves provided in the ARR (Australian Rainfall and Runoff) Book 6 – Flood Hydraulics[2] (Figure 2.10) and are shown in Figure 2.8 and Figure 2.9. The hazard categories are used to determine risk to people, vehicles and buildings for a range of depths and velocities.

Table 2.2 below identifies maximum velocity and ARR hazard classification values at 6 locations on each figure (these are the same locations as in Table 2.1 above). For each location, the 'flood hazard area' in accordance with Table J1.3A of AUP Chapter J1 under Plan Change 120 (PC120) has also been provided. The flood hazard thresholds have been added to the ARR hazards for comparative purposes on Figure 2.10

Locations 1, 2, 3 and 4 are generally safe for people, vehicles and buildings. Points 5 and 6 are unsafe for small vehicles. The results show that there are no changes predicted for the hazard classification as a result of the development and very similar velocities (<0.1 m/s difference) at all locations.

[2] ARR (Australian Rainfall and Runoff) Book 6 – Flood Hydraulics figure 6.7.9. Combined Flood Hazard Curves (Smith et al., 2014).

Table 2.2: Predicted maximum velocity, ARR hazard classification values and 'flood hazard areas' as defined in AUP Chapter J1 - Definitions

ID	Pre-development			Post-development		
	ARR Hazard Category	AUP PC 120 Flood hazard area	Velocity (m/s)	ARR Hazard Category	AUP PC 120 Flood hazard area[3]	Velocity (m/s)
1	H1	Low	0.10	H1	Low	0.10
2	H1	Low	0.81	H1	Low	0.90
3	H1	Low	0.81	H1	Low	0.84
4	H1	Low	0.28	H1	Low	0.29
5	H2	Medium	0.22	H2	Medium	0.22
6	H2	Medium	0.84	H2	Medium	0.91

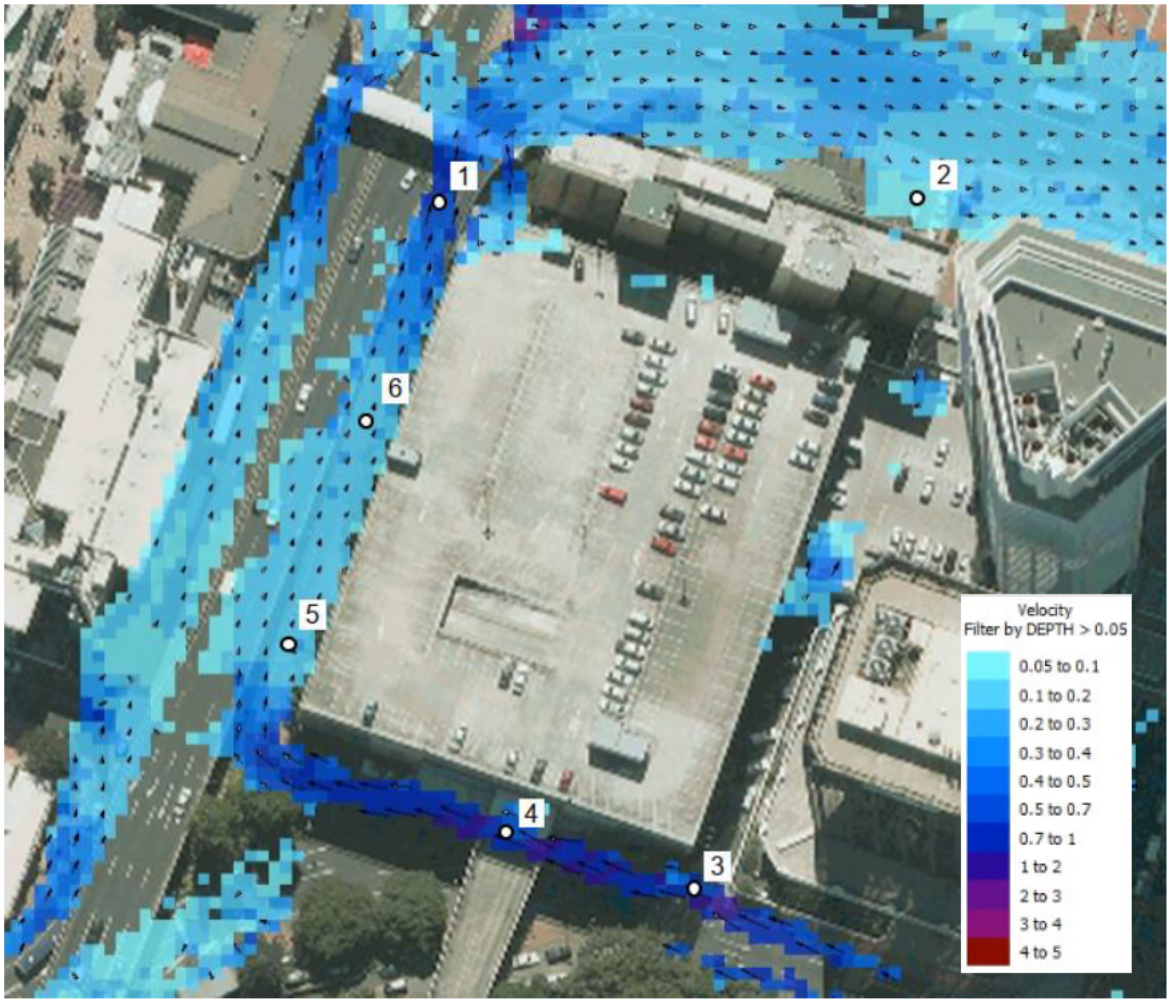

Figure 2.6: Pre-development 1% AEP maximum velocity values - climate change 3.8 degrees.

[3] 'Low flood hazard areas' are defined as floodwaters having depth equal to or less than 300mm or depth x velocity product less than or equal to 0.24m²/s in a 1 per cent AEP event. 'Medium flood hazard areas' are defined as floodwaters having depth between 500mm and 300mm or depth x velocity product between 0.4m²/s and 0.24m²/s in a 1 per cent AEP event.

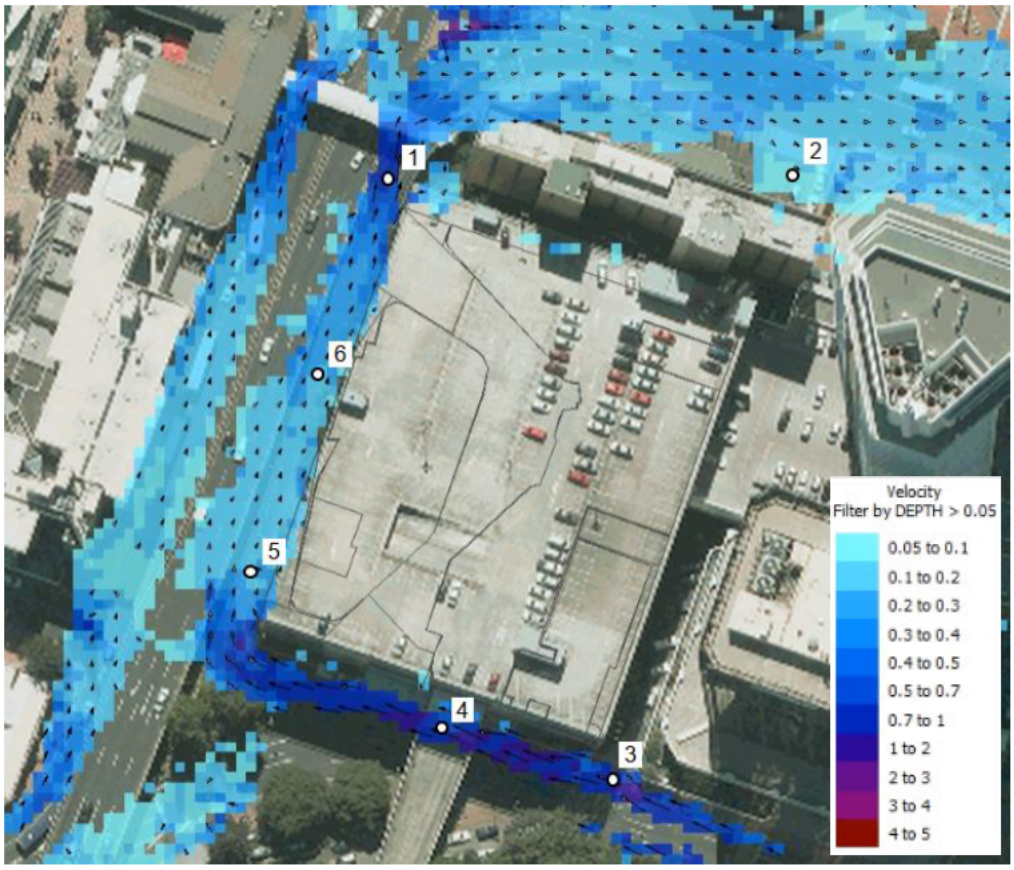

Figure 2.7: Post-development 1% AEP maximum velocity values - climate change 3.8 degrees.

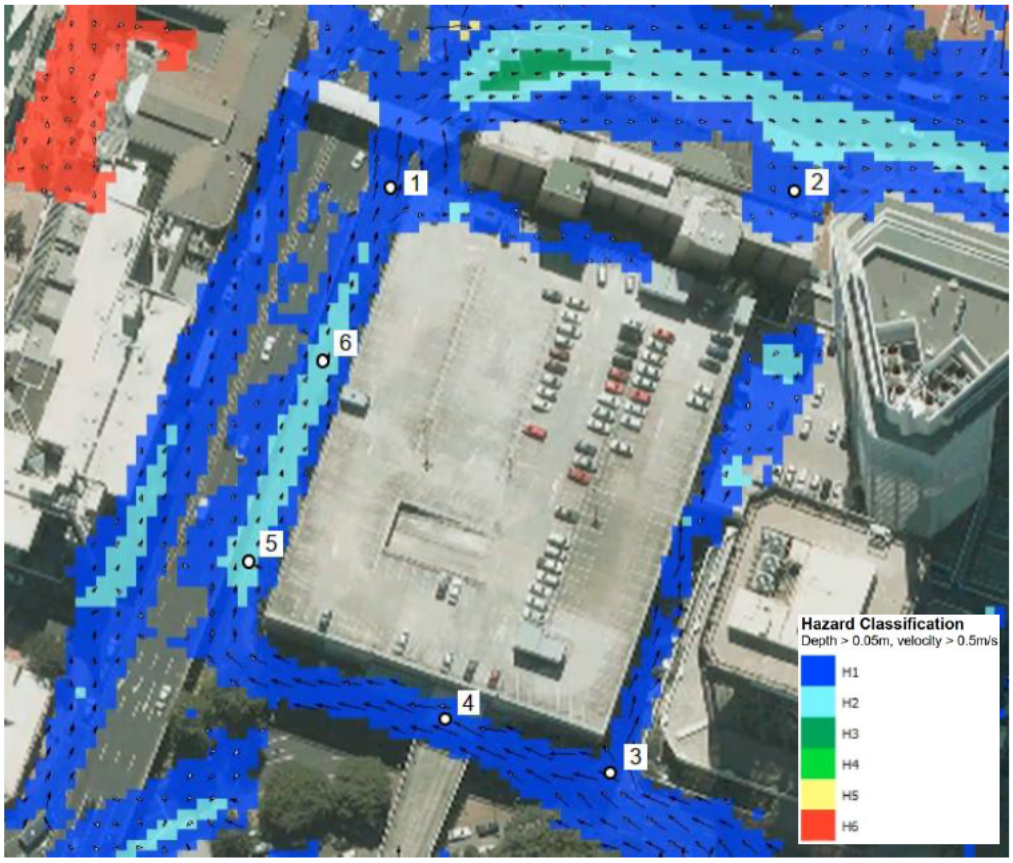

Figure 2.8: Pre-development 1% AEP ARR hazard classification values - climate change 3.8 degrees.

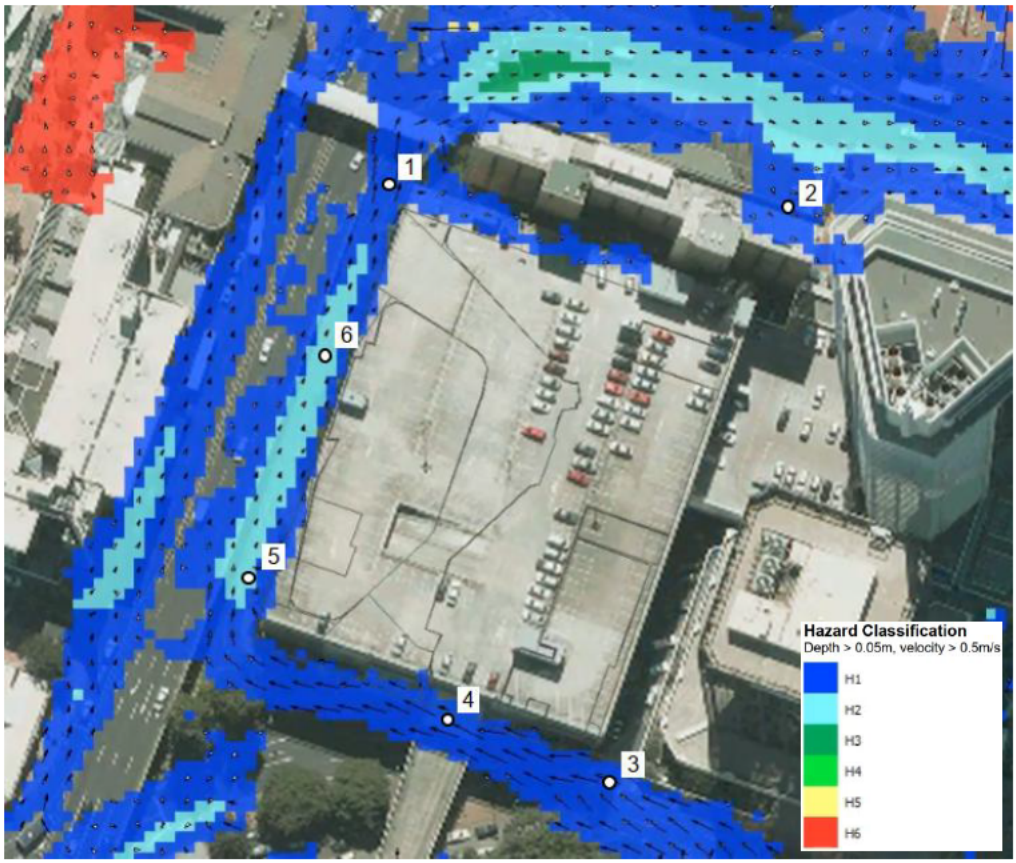

Figure 2.9: Post-development 1% AEP ARR hazard classification values - climate change 3.8 degrees.

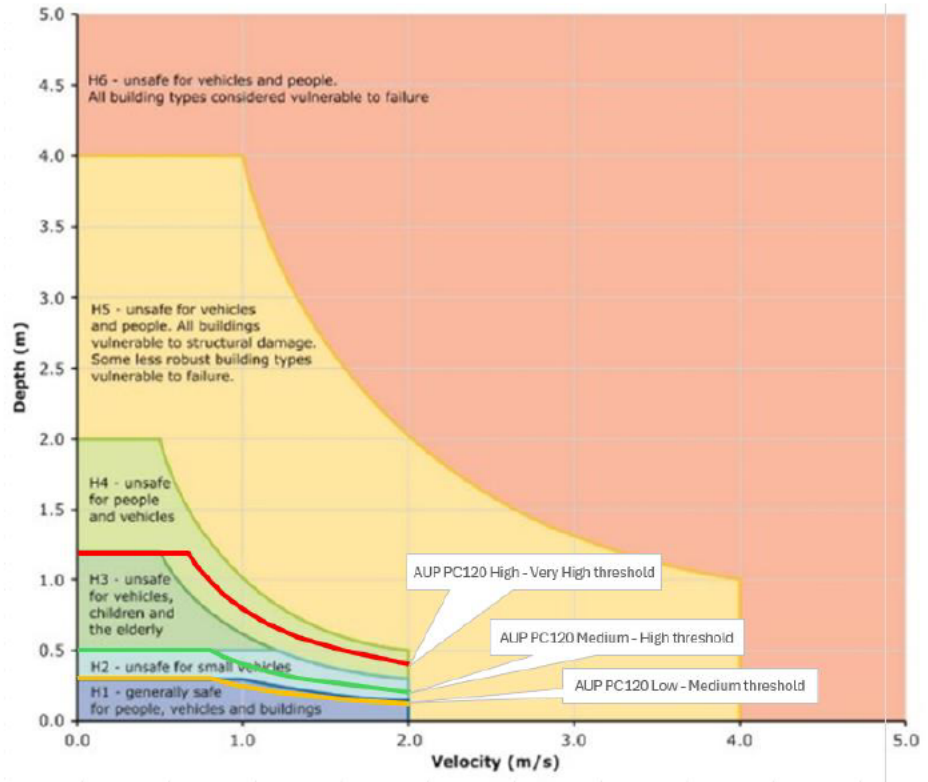

Figure 2.10: ARR Combined Flood Hazard Curves - ARR Book 6 - Flood Hydraulics (figure 6.7.9), overlaid with AUP PC 120 hazard thresholds.

3 Freeboard

Table 3.1 summarises freeboard guidelines as applicable to the Downtown carpark, in relation to more vulnerable and less vulnerable activities (as defined in the AUP). The reader is referred to Freeboard for the Auckland Region Guidelines document GD13 (December 2024) for further guidance and information[4].

Freeboard is a factor of safety that provides for the imprecision and/or uncertainties in the estimation of flood/inundation water levels. It is important to note that the final decision on freeboard allowances should consider the levels of uncertainty and commercial risk tolerance.

Table 3.1: Freeboard guidelines for the 1% AEP flood plain

Scenario	Freeboard	Relevance for Downtown carpark
More Vulnerable Activities* in floodplains	500 mm	N/a – vulnerable activities (habitable floor levels/dwellings) are located above Level 00.
Less Vulnerable Activities* in floodplains	300 mm	Entrance/s to the retail areas/residential lobby/hotel lobby/office lobby/basement.
Overland flow paths, where flow is less than 2 m^3/s	500 mm where surface water has a depth of 100 mm or more and extends from the building directly to a road or car park, other than a car park for a single dwelling. 150 mm for all other cases.	Where a floodplain and overland flowpath exists, adopt floodplain freeboards. Adopt overland flowpath guidance where only overland flowpaths exist. This may only apply to the laneway, although the presence of the overland flow path is subject to finalisation of the flood barrier arrangement.
Overland flow paths, where flow is equal to or greater than 2 m^3/s	500 mm for More Vulnerable Activities* 300 mm for Less Vulnerable Activities*	
*** As defined in the AUP J1 Definitions**		

4 Flood hazard risk assessment

The following flood hazard risk assessment has been written in accordance with Chapter E of the Auckland Unitary Plan (AUP) PC120.

The draft E36 associated with PC120 has updated flood hazard and risk characterisation requirements including additional matters beyond those listed in the current operative AUP. Therefore, while the draft E36 is notified but yet to be operative, it has been adopted to evaluate risk of development on land potentially exposed to flood hazard.

This assessment addresses the updated special information requirements of section E36.9, and the risk assessment requirements and relevant matters outlined in section E36.3.

The need to carry out the assessment is triggered by the property's location alongside a 1% AEP floodplain.

Three 'risk elements' in relation to flood hazards have been considered in this assessment:

- Flooding of non-habitable floor levels (Level 00 and above).

[4] https://www.aucklanddesignmanual.co.nz/content/dam/adm/adm-website/developing-infrastructure/infrastructure-technical-guides/gd13-freeboard/FINAL_Freeboard_GD13v1_December_2024.pdf

- Flooding of the basement levels.
- Flooding of surrounding land and street access.

Flooding of habitable floor levels are above the floodplain and therefore not considered as a risk element.

Based on Table E36.3.1B.1 (AUP E36.3 and J – Definitions), "activities sensitive to natural hazards"[5] and "activities potentially sensitive to natural hazards"[6] are "potentially tolerable" at this site. "Less sensitive" activities such as parking and loading areas are acceptable.

'Default level of risk' has been classified as acceptable, potentially tolerable or significant for the three risk elements as follows:

- **Non-Habitable floor levels (Level 00 and above)** include activities potentially sensitive to flood hazard (offices, retail and commercial services) and are located adjacent to a low to medium flood hazard area. The default level of risk is classified as potentially tolerable.
- **The basement levels** are non-habitable spaces however they contain other activities potentially sensitive to flood hazard, such as the storage of hazardous substances, critical plant infrastructure and 'back of house' facilities for building staff. The default level of risk is classified as potentially tolerable.
- **Surrounding land and street access** areas include activities potentially sensitive to flood hazard (access and egress to the activities above). Access and egress points to the property are located alongside both low and medium flood hazard areas. The default level of risk is classified as potentially tolerable.

The following sub-sections cover the risk assessment requirements of PC120.

4.1 The type, frequency, range and scale of the natural hazard

The development is exposed to an adjacent flood hazard temporarily under extreme scenarios (1% AEP with allowance for the 3.8 degrees of warming high emission future climate scenario) until flood waters pass. The duration of flooding is likely to be less than one hour, although ponding along Lower Hobson Steet is likely to last longer because it relies on the stormwater pipe capacity to drain.

Coastal hazard has potential to coincide with the flood hazard. This has been allowed for in the flood hazard assessment by applying 1% AEP tidal storm surge (with allowance for one meter sea-level rise) downstream boundary conditions to the flood model. Coastal hazards for further timeframe and climate change scenarios are addressed in the T+T Coastal Hazard Risk Assessment.

Non-habitable floor levels (Level 00 and above) are positioned above the 1% AEP floodplain located alongside the property on Lower Hobson Street and outside the floodplain located on Customs Street West. Flood waters located on Quay Street are prevented from entering the basement by the proposed flood barriers at the Service Lane entrances.

Non-return valves will be included in the private stormwater drainage to prevent backflow from flooding on Quay Street. Under the scenarios considered for this assessment, a flow path from the Quay Street floodplain through to the Service Lane or basement via the adjacent HSBC/AON buildings has not been identified. This is because internal floor levels are above the predicted flood level.

[5] Including residential

[6] Including offices, retail and commercial services

Surrounding land and street access is exposed to a low to medium flood hazard, however safe egress routes from the property remain unchanged. Therefore, flood hazard events of lower intensity and higher frequency are not considered to impact the property and proposed activities.

4.2 The consequences of the natural hazard in relation to the proposed activity

There are no increases in flood hazards caused by the development.

The development changes the natural hazard risk profile for the area because of changes in use by people:

- There will be a reduction in the number of car parks at the property from approximately 2000 spaces to 454.
- There will be an increase in the patronage of the area as a result of the:
  - Two podium buildings between 7 and 9 levels.
  - Two towers between 45 and 54 levels.
  - Public spaces and new laneways to provide connection across the city.

Given the mitigation measures discussed below that have made the property resilient to flooding, we consider the risks to people on the property to be acceptable. Given the low flood depths along Custom Street West (which are approximately 0.1 m at their deepest) we also consider that there will be safe egress routes from the area.

Non-Habitable floor levels

The property design incorporates measures that fully mitigate the flood consequences to non-habitable floor levels up to the 1% AEP flood scenario with allowance for the 3.8 degrees of warming high emission future climate scenario. All units at floor Level 00 (set at 4.18 mRL) and above are situated above the predicted flood levels (3.63 mRL in Lower Hobson Street) and allow a minimum freeboard of 500 mm, or are located outside the floodplain.

Basement levels

The property design incorporates measures that fully mitigate the flood consequences to the basement levels through the installation of flood barriers, which prevent water ingress via the Service Lane into the basement. The above surface, ground floor walls will be in contact with floodwaters during extreme events however these will be tanked to prevent water ingress to the basement. Following detailed design, the Customs Street West barrier may not be required.

Surrounding land and street access

Some surrounding land and streets are exposed to flooding of varying depths up to approximately 0.4 m. For example, Lower Hobson Street, located adjacent to the Project will temporarily flood up to approximately 0.4 m in depth.

Customs Street West will temporarily flood up to approximately 0.1 m in depth.

Effects on other properties

We consider there to be no accelerating, exacerbating or creating of flood effects on other properties and the rationale for this is provided below both qualitatively, and quantitatively using the model.

In general terms, the hydraulic and hydrological effects of a development are caused when there are changes in land use and landform (i.e. topography). The land use for the proposed development remains hydrologically the same as the carpark on the site (i.e. both are 100% impervious).

Therefore, because there are no changes in hydrological land use, land use changes cannot cause an adverse effect[7].

Changes to the landform within the floodplain have the potential to cause an effect. With the exception of the proposed flood barriers to the Service Lane, there are no notable changes[8] to the landform within the floodplain and therefore the proposed development will not create new adverse flood effects.

To confirm that the changes in property footprint do not cause adverse effects, and to consider the effects of the flood barriers, the flood model was used to compare pre-development and post-development flood levels and flood depths. The model results are presented in Table 2.1 and in Figures 2.1 - 2.5. Changes in modelled flood level and flood depth were all less than 0.02 m and located along the public roads to the south (Customs Street West) and west (Lower Hobson Street). There were no flood increases observed along Quay Street, which is due to the small influence that the Service Lane flood volumes can have on the large floodplain that exists along Quay Street.

The up-to 0.02 m increase in flood levels does not alter the flood hazard on the road network. Therefore, the effects of the development on the road network for public users and emergency service vehicles remains unchanged. Refer to Figure 2.8, Figure 2.9 and Figure 2.10 for mapped hazards and Table 2.2 for tabulated hazards.

There are no changes to the overland flow entry and exit points. Overland flow entry and exit points (not shown in GeoMaps) through the Service Lane will remain unchanged between the pre- and post-development scenarios. However, when flood barriers are up, flow will be prevented from passing through. As discussed above, there are no adverse flooding effects resulting from the operation of the flood barriers.

4.3 Existing and proposed mitigation measures

The buildings, structures and activities cannot be relocated within the site or removed. The proposed mitigation measures are detailed below:

Non-Habitable floor levels

The proposed mitigation method is to raise ground levels above the predicted flood levels. All units at floor Level 00 (set at 4.18 mRL) and upwards are situated above the predicted flood levels (3.63 mRL in Lower Hobson Street) and provide a minimum freeboard of 500 mm or are situated outside the floodplain.

Basement levels

The proposed mitigation method is to install flood barriers at either end of the Service Lane to prevent floodwaters entering the Service Lane and draining into the basement. Refer to section 2.2 for discussion of the barrier design options under consideration.

Surrounding land and street access

No mitigation measures are proposed to surrounding land and street access spaces. No mitigation is necessary because there is no change to the flood risk on surrounding properties or the road corridor.

[7] We do not consider that time of concentration differences caused by differences in roof runoff versus path runoff will make a material difference. We are currently unaware of any design intent to include rainwater harvesting or roof gardens in the building design.

[8] There is a small decrease in building footprint within the floodplain caused by the proposed setback from the property boundary. However we do not consider this a noteworthy positive effect.

4.4 Residual risk

Non-Habitable floor levels

We consider the flood risk to be acceptable as the non-habitable spaces are above the flood hazard area with at least 500 mm freeboard or outside the floodplain.

In events that exceed the design parameters of the proposed mitigation measures, floodwaters may enter Level 00 units. There are no further permanent building design characteristics incorporated into the design although this does not preclude additional risk reduction measures such as temporary barriers or operational measures to reduce the consequences of flooding (e.g. by moving sensitive stock and equipment higher).

Basement levels

We consider the flood risk to be acceptable as the proposed flood barriers prevent floodwaters from reaching the basement levels via the Service Lane.

The current assessment considers flood barriers at both entrances to the Service Lane. During subsequent design phases, land recontouring options could be considered further for the Customs Street West access to allow vehicular access and egress under extreme flood scenarios.

The proposed flood barriers require full waterproofing in their design to ensure significant leakage is prevented for the full duration of the flood event. The flood barriers will require regular maintenance throughout their operational life to ensure readiness in the event of the extreme flooding scenario considered. Operation of the flood barriers must be factored into an emergency response plan of the property in the event of flooding.

In events that exceed the design parameters of the proposed mitigation measures, floodwaters could overtop the proposed flood barriers, leading to inundation of the Service Lane and basement. These over-design events, or a structural failure of the barriers have the potential to:

- Damage assets (such as vehicles) and structural components.
- Damage critical plant infrastructure.
- Cause leakage and contamination from hazardous substances, such as diesel storage tanks and packages of maintenance products.

Under such extreme events, opportunities to reduce the consequences of inundation remain, for example by:

- Removing assets (such as vehicles).
- Waterproofing of structural components.
- Raising the ground level approaching the Service Lane above the flood level at both entrances.
- Designing the basement to convey any inflow towards a sump at the lowest level, with a flood management plan/emergency response protocol implemented and pumps designed to reduce risks to any assets and services in that area.
- Placing essential services on a suitable plinth above the floor to reduce exposure to inundation that could pond.
- Having essential services in rooms with flood proof doors and walls.
- Raising transportable hazardous substances to higher levels.

Surrounding land and street access

Safe refuge can be provided in the property within Levels 00 and above. Safe egress is not necessary to manage risk to life, however, given the low flood depths along Custom Street West (which are approximately 0.1 m at their deepest) identified in the flood hazard mapping as H1 “generally safe

for people, vehicles and buildings" (ARR Hazard Classification) we consider that there will be safe egress routes from the area[9]. We therefore consider flood risk to people entering and leaving the property to be acceptable.

4.5 Any relevant management plan, strategy or hazard risk assessment relating to the area

The proposed development was informed by the Auckland Council Waterfront Plan 2012.

This flood hazard risk assessment should be read in conjunction with the T+T coastal hazard risk assessment for the proposed development.

Adaptation measures to mitigate flood risk to the property in future scenarios should include the development of an emergency response protocol. This can be provided within a flood (and coastal inundation) management plan for the property. It is acknowledged that a flood management plan should continuously evolve as design development progresses, throughout the design life of the property and as the understanding of natural hazard risks to the property evolve.

The emergency response protocol for the property should be aligned with advice provided by the Auckland Emergency Management/Civil Defence departments.

Further adaptation measures to mitigate flood risk to the property in future scenarios should align where relevant with adaptive planning approaches of "hold the line" outlined in the draft for consultation Shoreline Adaptation Plan for Auckland Central.

4.6 Conclusions

Flood hazard has been assessed for the proposed development. Key conclusions from the assessment include:

- Given the proposed flood mitigation measures (flood barriers and raising of ground floor levels) that have made the property resilient to flooding, we consider the flood risk to people on the property to be acceptable.
- Safe refuge can be provided within the property.
- Safe access and egress of the property can be provided to Customs Street West. During subsequent design phases, land recontouring options can be considered further for the Custom Street West access to allow vehicular access and egress under extreme flood scenarios.
- We consider there to be no accelerating, exacerbating or creating of flood effects on other properties.
- A flood management plan/emergency response protocol for the property should ensure alignment with advice from the Auckland Emergency Management/Civil Defence departments.
- As a result of the above, we consider there to be no flooding related cultural impacts or consequences for Māori land, Treaty Settlement Land, marae, urupā, man whenua cultural heritage and values.

[9] Furthermore, the flood hazard mapping does not identify any H3 areas near access or egress routes from the property, which is the lowest hazard for which risk to people is identified as "unsafe for vehicles, children and the elderly".

5 Applicability

This report has been prepared for the exclusive use of our client Precinct Properties Holdings Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Panel as the consenting authority will use this report for the purpose of assessing that application. We understand and agree that this report will be used by the Expert Panel in undertaking its regulatory functions.

Compliance with the Environment Court Practice Note 2023

Jon Rix: I confirm that, in my capacity as reviewer of this report, I have read and abided by the Environment Court of New Zealand's Code of Conduct for Expert Witnesses contained in the Practice Note 2023.

I am a Water Resources Engineer at Tonkin & Taylor Ltd (T+T), where I specialise in flood hazard, flood risk and adaptation. I have worked at T+T since 2006.

I have 24 years' experience in flood modelling, catchment planning and natural hazard risk assessment. I hold the following qualifications – MSc Geoenvironmental Engineering; BSc (hons) Marine Geography.

Tonkin & Taylor Ltd
Environmental and Engineering Consultants

Report prepared by:

Ben Luffman

Water Resources Engineer

Report reviewed by: Authorised for Tonkin & Taylor Ltd by:

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Jon Rix
Principal Flood Risk Consultant

Peter Millar
Project Director

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