Auckland Council - Healthy Waters

Ngā Wairau – Stage 1 A F Thomas Park Works

Preliminary Flood Hazard Assessment

11 November 2025

3-AWWAI.02

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Preliminary Flood Hazard Assessment

Auckland Council - Healthy Waters

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REV	DATE	DETAILS
1	7 October 2025	Final
2	11 November 2025	Updated based on Council feedback

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Reviewed by:	James Reddish	11 November 2025
Approved by:	Rebecca Francis	12 November 2025

TABLE OF CONTENTS

1 PROJECT OVERVIEW

1.1 INTRODUCTION

Auckland Council's Healthy Waters and Flood Resilience Department (Healthy Waters) is lodging a referral application to increase flood storage at A F Thomas Park, Wairau Valley under the Fast-track Approvals Act 2024.

The project broadly involves:

a) Flood resilience infrastructure works; and

b) Reserve reinstatement, including site stabilisation, landscaping, new footpaths/boardwalks, and formal and informal recreation.

This report provides a high-level flood hazard assessment of the proposal.

1.2 PROJECT DESCRIPTION

The Ngā Wairau project is part of Auckland Council's Making Space for Water – Blue-green Network programme and is focused on the key areas within the Wairau catchment that were impacted by the 2023 storm events. Given the large scale of the Wairau catchment, the Ngā Wairau project is being delivered in three stages. This proposal covers Stage 1, which involves increasing the existing flood storage at A F Thomas Park, together with reserve reinstatement. The stormwater detention capacity created through Stage 1 works is critical to enabling future Stages 2 and 3. Further design development and funding confirmation is required for Stages 2 and 3, and they therefore do not form part of this proposal.

The works proposed under Stage 1 enable the delivery of flood resilience in the catchment by increasing flood storage within A F Thomas Park, initially for the downstream residential area, and undertaking additional stormwater improvement works.

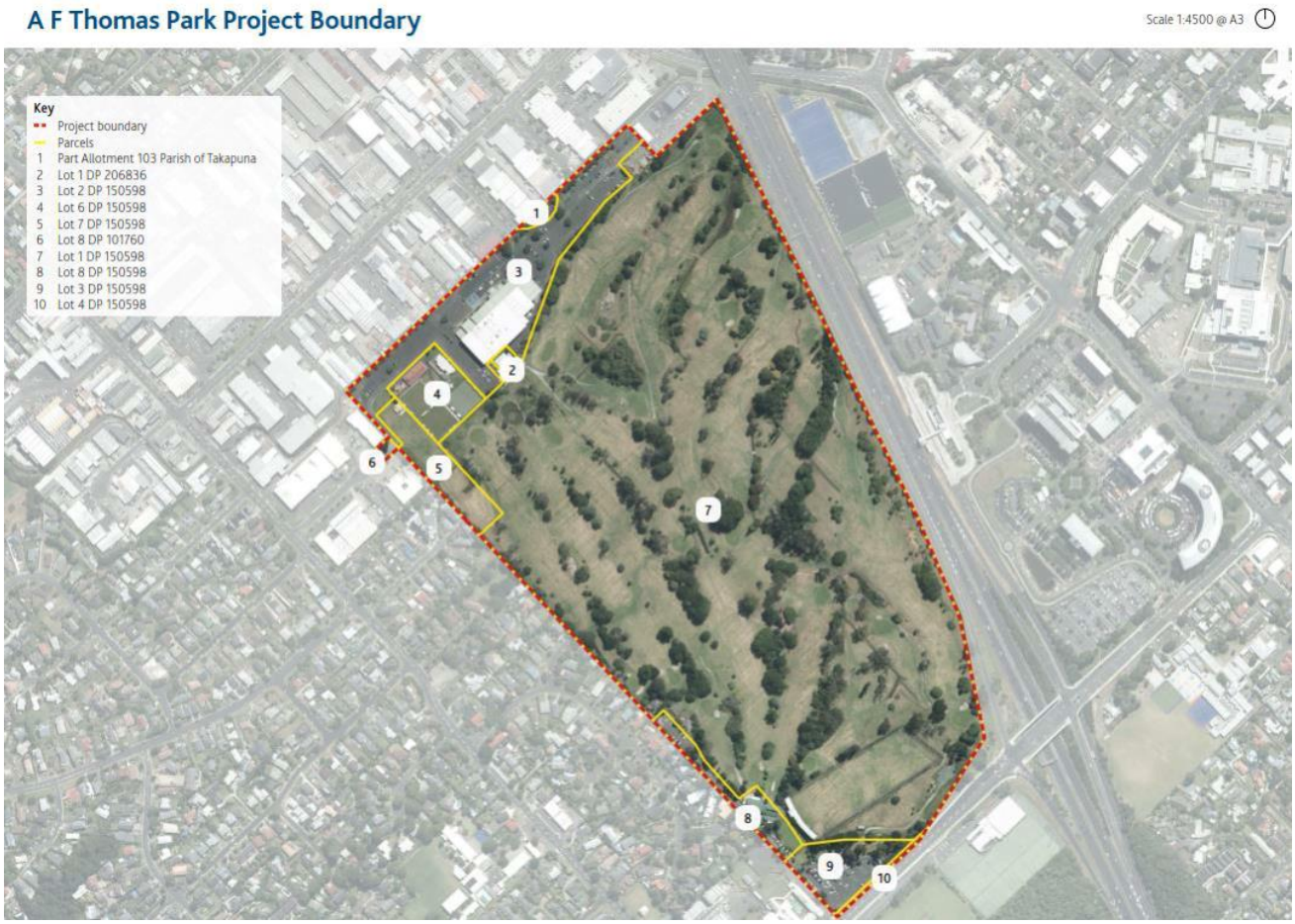
The proposed works to increase flood storage at A F Thomas Park include the following:

- Excavate the park to increase the existing flood storage to reduce flood flows and flood levels. Formalisation of a wetland on the northern end of the park where water naturally ponds as a result of the works and dry detention in other areas of the park. At this stage the earthworks on the site are indicatively estimated to be in the order of 700,000 m^3 – 800,000 m^3 (cut and fill) to achieve a flood storage volume of approximately 550,000 m^3. All excavated material is to remain onsite unless unsuitable.
- The proposed flood storage changes will amend the consented dam. At this stage, the proposed changes may include reducing the dam height, increasing the flood storage capacity and providing an additional spillway.
- Construct a new spillway channel linking the existing channel north of A F Thomas Park that flows east under State Highway 1 to A F Thomas Park to optimise storage and release of flood flows in the park to maximise benefits.
- Reshaping ground using cut material to convey flood flows between proposed raise areas.
- Vegetation removal is required to facilitate the works.
- A temporary construction laydown area will be established on-site (location TBC).
- Reinstatement of A F Thomas Park and constructing new multi-use maintenance accessways.

The technical parameters provided above are indicative, as design is ongoing. The referral is sought on the basis of the broader project description provided above (i.e. (a) flood resilience infrastructure works and (b) reserve reinstatement, including site stabilisation, landscaping, new footpaths/boardwalks, and formal and informal recreation), with final design specifications and precise quantities to follow in the substantive application.

1.3 PROJECT BOUNDARY

The project boundary is outlined in the figure below; the red line is the project boundary and the parcels that make up the project area are shown with yellow lines and associated numbering.



1.4 SITE ADDRESS

The site addresses and the legal descriptions for the project area are as follows:

Property address	Legal description
R 21 and 21 Northcote Road	Lot 1 DP 150598, Lot 3 DP 150598, Lot 4 DP 150598, Lot 8 DP 150598 and Lot 8 DP 101760
17 Silverfield Lane	Lot 2 DP 150598
17A Silverfield Lane	Lot 5 DP 150598
17B Silverfield Lane	Lot 6 DP 150598
17C Silverfield Lane	Lot 7 DP 150598
Nil	Part Allot 103 PSH OF Takapuna

1.5 CONSTRUCTION PERIOD

The works are scheduled to commence in September 2027 to coincide with the earthworks season (October to March).

1.6 DISCLAIMER

Use and Reliance

1 This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') for Auckland Council ('Client') in relation to the Fast-track Referral Application Ngā Wairau - Stage 1 A F Thomas Park Works and in accordance with the terms of the agreement between WSP and Client. The Report relates to the project and scope set out in the Report and the stated purpose for which it was prepared. Subject to clause 2 below, the Report is not to be used or relied on for any other project or purpose, or by any person other than our client, without WSP's prior written agreement. WSP does not accept liability for any unauthorised use or reliance.

2 WSP acknowledge and agree that this Report may be used and relied on by the Minister deciding on the Fast-track Referral Application under section 21 of the Fast-track Approvals Act 2024, and by any expert consenting panel appointed under that Act to determine a subsequent substantive application.

3 In preparing this Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or rec1ommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable for any incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

2 MODELLING APPROACH

2.1 SUPPLIED MODEL

The Wairau Catchment Flood Hazard Model (ID1416) was provided by Auckland Council to test options. The model was developed in 2023 by AECOM and is in draft format (4th draft). Key details of the model are summarised below in Table 2-1. The details of the catchment model build are covered in the *Wairau Valley Catchment Stormwater Modelling, Model Build and Validation Report* (AECOM, 2023).

Table 2-1 Model details

Model Component	Description
Software	InfoWorks ICM Version 2024.2
Coordinate System	New Zealand Transverse Mercator 2000
Vertical Datum	Auckland 1946

2.2 BASE MODEL UPDATES

Updates to the Wairau Model by WSP have been made based on a review of the remaining peer review comments (by Auckland Council) and general model checks. Only updates to the model that might directly affect results relating to the study area have been considered. These updates have been made to provide a more accurate representation of the hydraulic mechanisms and improve validation for the 27 January 2023 flooding event. The updates made to the model are summarised below:

- Bank point spacing on 1D river reaches between the Auckland Northern Motorway to Kitchener Road Bridge and 107-63 Nile Road has been updated from a point spacing of approximately 20 m spacing to a spacing of 2 m along both sides of the river reaches.
- River reach cross sections have been widened by 2 m on either side of each cross section from Wairau Road to Kitchener Road Bridge. Levels for the new cross section points have been extracted from 2016 LiDAR.
- Representation of Wairau Creek immediately downstream of Kitchener Road Bridge has been updated from a 1D conduit with cross-sectional geometry to a 1D river reach. Cross sections for the river reach have been extracted from the DEM with roughness coefficients assigned from site visit and aerial imagery.
- Several cross sections immediately downstream of Wairau Road Bridge and Alma Road Bridge have been updated to better represent walls along the channel at these locations.
- The roughness coefficient defined in the 2D Zone has been updated from 0.05 to 0.1 for the remaining area outside roads and other impervious areas.
- A mesh level zone has been included in the model on Wairau Road beneath the Northern Motorway to remove artifacts in the DEM from the motorway and allow flow along Wairau Road.
- Several mesh level zones in the Wairau Valley commercial areas that represent bridge decks have been adjusted to snap to the adjacent ‘void’ polygon due to meshing errors.
- Woodbridge Lane access bridge has been included in the model as a 1D bridge structure. The bridge opening geometry and dimensions have been assumed from photographs. The bridge deck level has been assumed to approximately represent the top of the solid rail.

- Rain radar data for the 27 January 2023 event has been downloaded from MOATA and used in model validation event in place of the rain gauge data.
- The tidal boundary has been updated for the 27 January event with level data from the Port of Auckland tide gauge applied as a dynamic water level boundary. Previously a constant water level of 1.55 m RL was adopted for this event.

The updated base model has been run for the 27 January 2023 storm event and the results compared to observed flood levels where available. A series of improvements have been made to the base model to enhance how it validates to the 27 January 2023 event. These improvements have increased confidence in the model, however further work can be undertaken to improve how the model validates. The model has been used to test potential options and is considered suitable for assessing relative benefits of options

Note that the Wairau Catchment Model has since been updated to help improve model validation (WSP, 2025), however this updated model was not available at the time of modelling potential options for Stage 1 and as such the partially updated draft model has been used for concept design.

HAL Consulting completed a model review of the Wairau model, and no significant errors were identified. HAL provided recommendations to consider in future design stages to inform design.

2.3 SOILS AND LANDFORM

The catchment is predominantly Waitemata soil (Group C) with low infiltration and so a correspondingly higher runoff. There are some areas of alluvial (Group B) and volcanic (Group A) soils that typically have higher infiltration, however, the model assumes compacted topsoil in developed residential and commercial zones (regardless of soil type), resulting in lower infiltration rates, and so higher runoff, similar to Group C.

The Project proposes significantly lowering of the ground levels in A F Thomas Park to create storage to attenuate Wairau Creek flows. Figure 2-1 shows the existing and proposed stage-storage curve in A F Thomas Park, the Project provides an increase of approximately 500,000 m^3 of storage at 14 m RL.

Figure 2-2 compares the existing ground levels from the 2016 LiDAR to the A F Thomas Park Concept design ground levels. As part of the design there is some raising of ground levels within the 1% annual exceedance probability (AEP) flood plain but the proposed construction of the flood storage results in more storage volume than the current situation. The cut and fill plan in Figure 2-3 readily shows the differences between the existing and proposed ground surfaces.

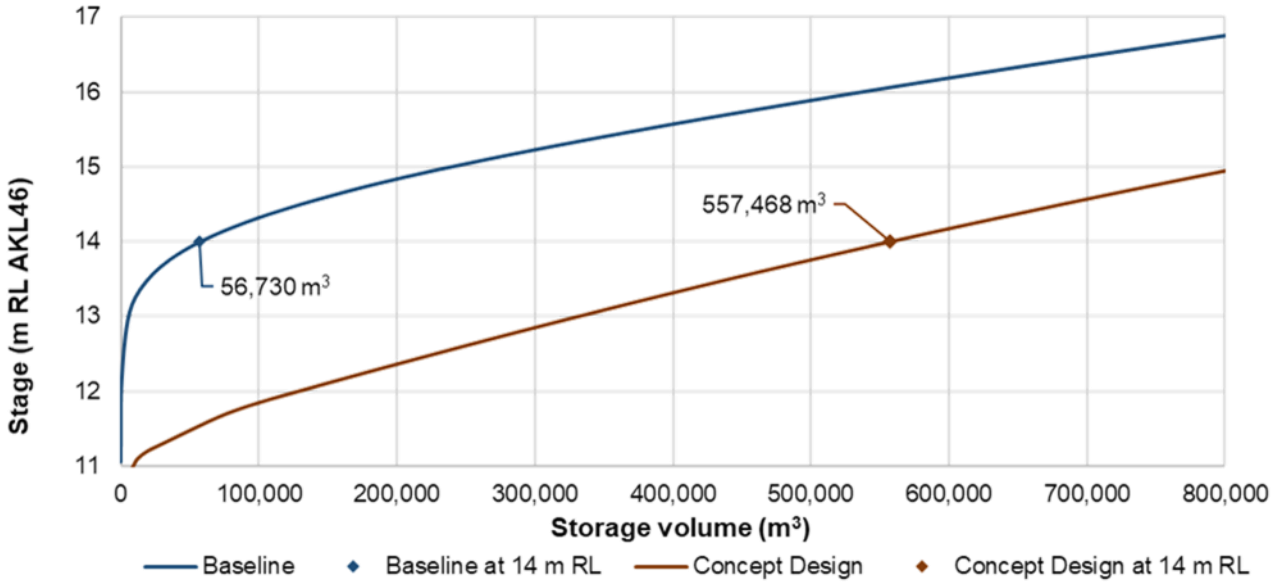


Figure 2-1: Stage-storage curve in A F Thomas Park from 11.1 m RL for baseline and concept design

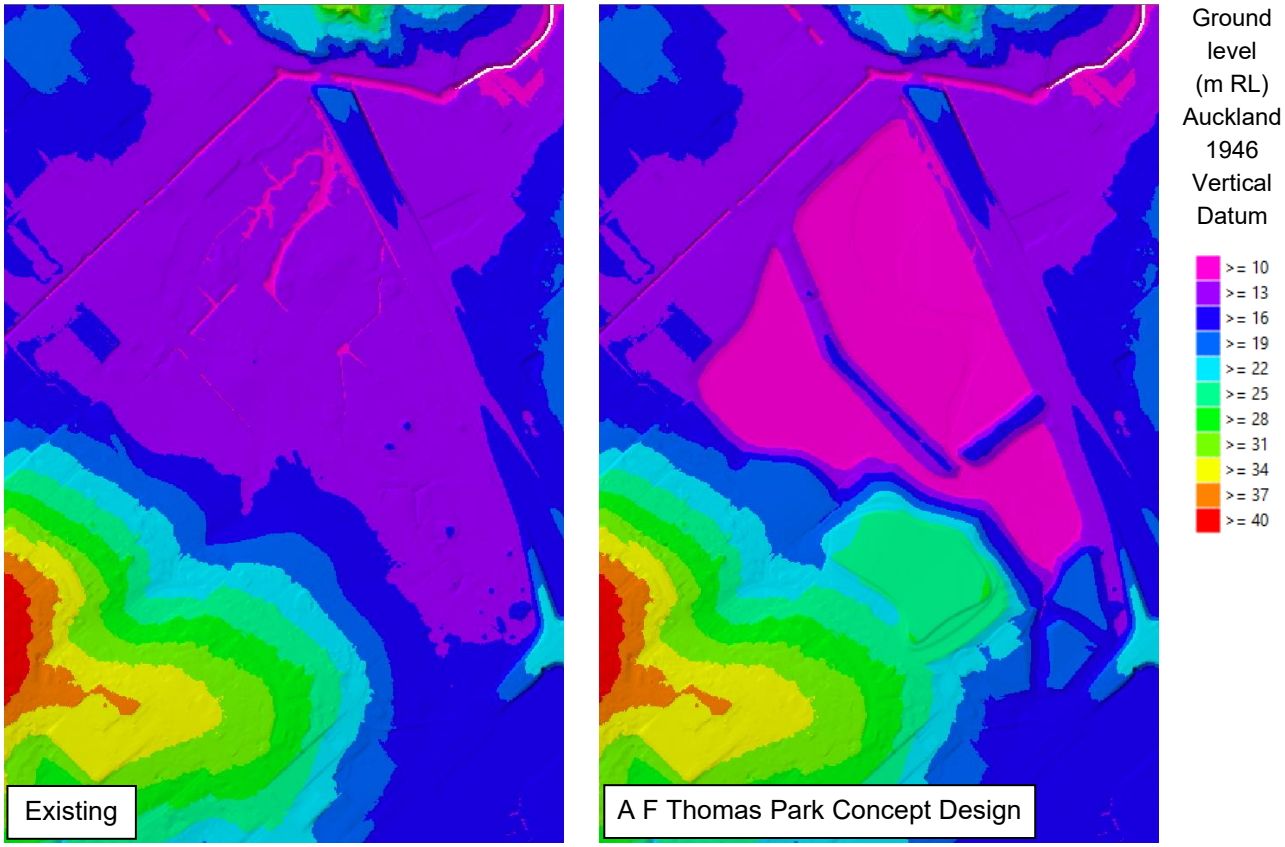


Figure 2-2: Ground levels in A F Thomas Park. Existing (left) and Concept Design (right).

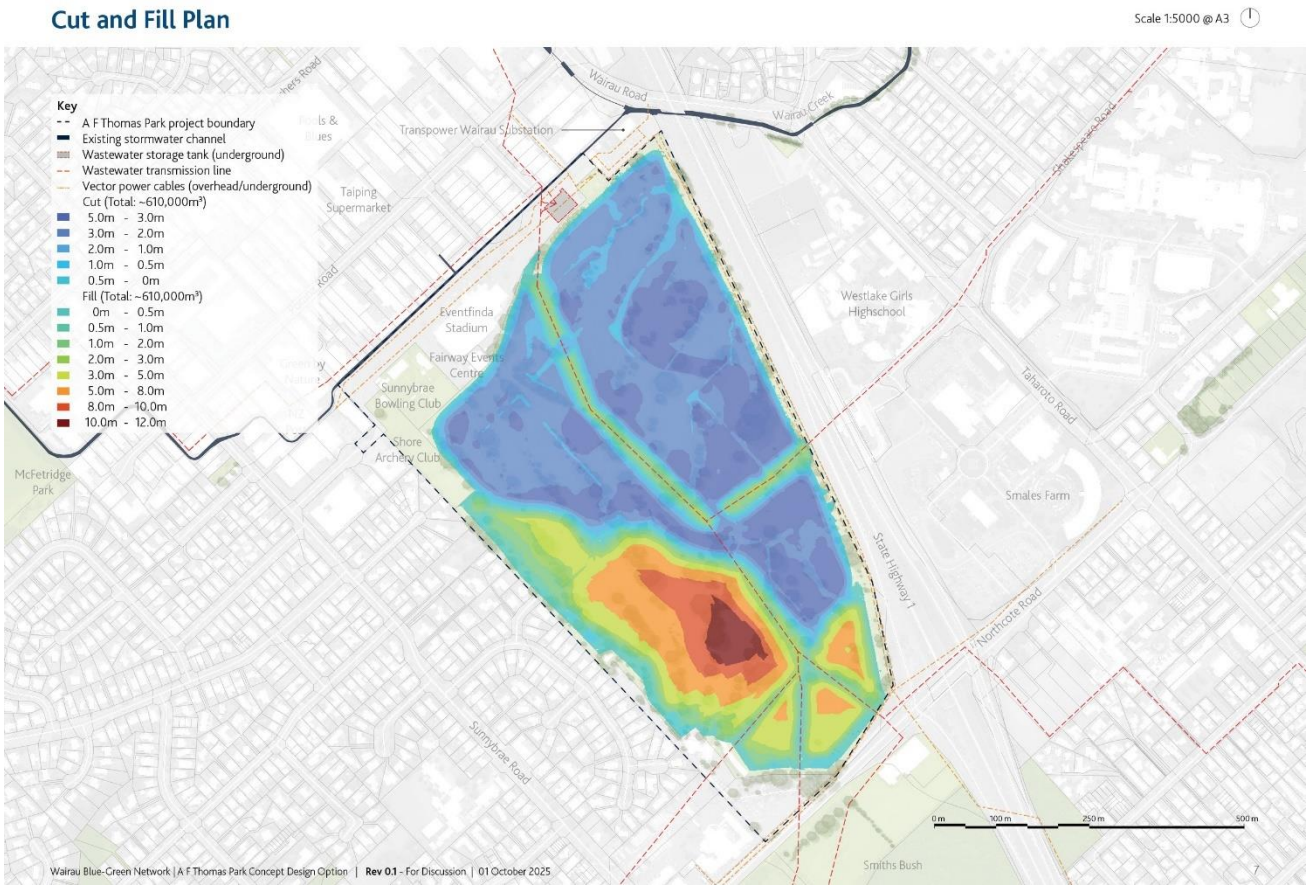


Figure 2-3: Proposed cut and fill plan for A F Thomas Park Concept Design

2.4 MODEL RUN PARAMETERS

Table 2-2 lists the model run parameters used. The design event to test the impact of the proposed concept design was the MPD scenario run with the 1% AEP 3.8°C temperature increase climate change design storm.

This event was selected by Auckland Council and is the most extreme event from the *Stormwater Modelling Specifications* (Auckland Council, December 2023). Modelling this event helps future proof designs as in multiple areas of Auckland during the Auckland Anniversary floods, observed flooding was greater than that predicted for the 100-year existing development (ED) event.

Table 2-2: Model run parameters

Inputs	Details
Development	The Maximum Probable Development (MPD) scenario was provided which is based on future maximum imperviousness estimates defined in the Auckland Unitary Plan.
Design rainfall	The rainfall events were based on: — The 1% Annual Exceedance Probability (AEP), 24-hour interim rainfall. The interim rainfall was higher than the design rainfall depths from the *TP108* (ARC, 1999) design rainfall contour maps for existing rainfall depth (292 mm compared to 260 mm after adjusting for climate change). — A 32.7% increase in the 24-hour design rainfall depth due to future climate change as per Table A1-1 of the *Stormwater Modelling Specifications* (Auckland Council, December 2023)[1]. — The TP108 normalised 24-hour temporal rainfall intensity profile from Table A1-2 of the *Stormwater Modelling Specifications* (Auckland Council, December 2023) for future climate change (3.8°C increase in temperature).
Tidal boundary	The constant tidal boundary used was that provided in the model database which had the design tide level of 2.55 m RL for the future scenario. The A F Thomas Park Concept Design is unaffected by the tide as the park outlet is around 11 m RL which is higher than the design tide level.
Initial conditions	The initial conditions used were: — The downstream 1D and 2D elements to match the downstream tide level. — The A F Thomas Park 2D elements to match the invert level of the lowest culvert that drains the park (11.1 m RL).
Inflow	No inflow files were used, consistent with the provided model database.

[1] This is for the 3.8°C increase in temperature corresponding to the annual average value for climate change scenario RCP8.5 at 2101-2120 (2110) in Table 3-1 of *Auckland Region Climate Change Projections and Impacts* (NIWA, September 2020).

3 ASSESSMENT

This assessment has been based on hydraulic modelling and desktop review of available information about existing natural hazards published on Auckland Council's GeoMaps.

3.1 AUCKLAND COUNCIL GEOMAPS

Auckland Council's GeoMaps shows that most of the site is within the 1% AEP flood plain and overlaps with a very high hazard area, with multiple overland flow paths entering the site (Figure 3-1 and Figure 3-2).

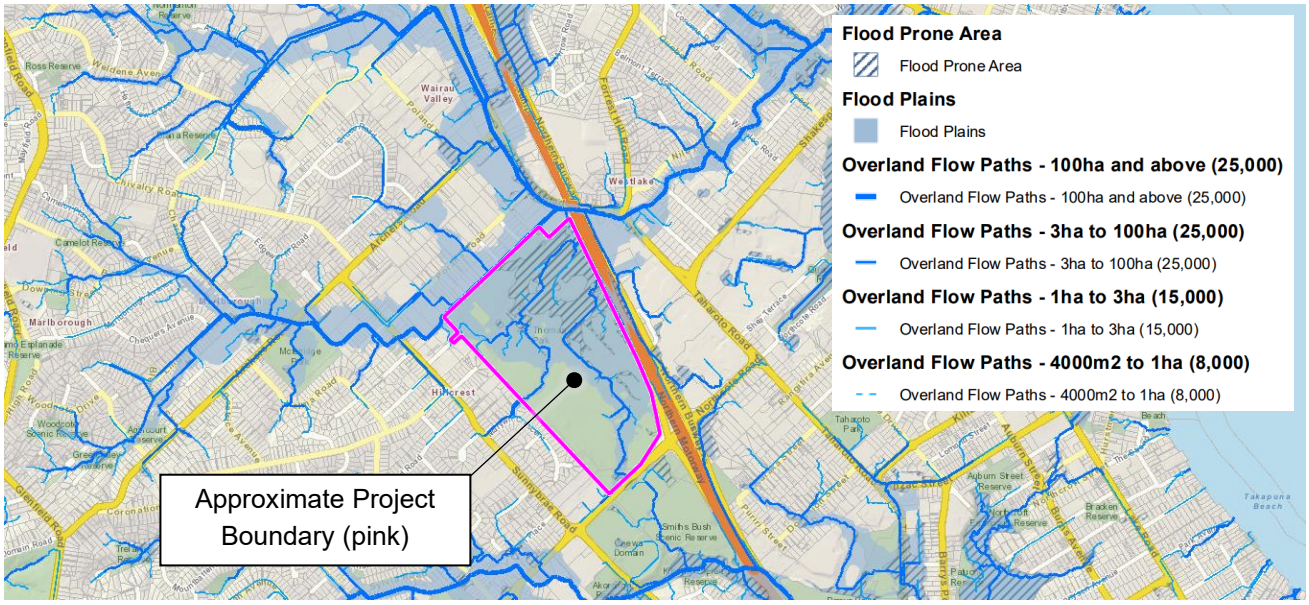


Figure 3-1: Natural hazards retrieved from Auckland Council's GeoMaps

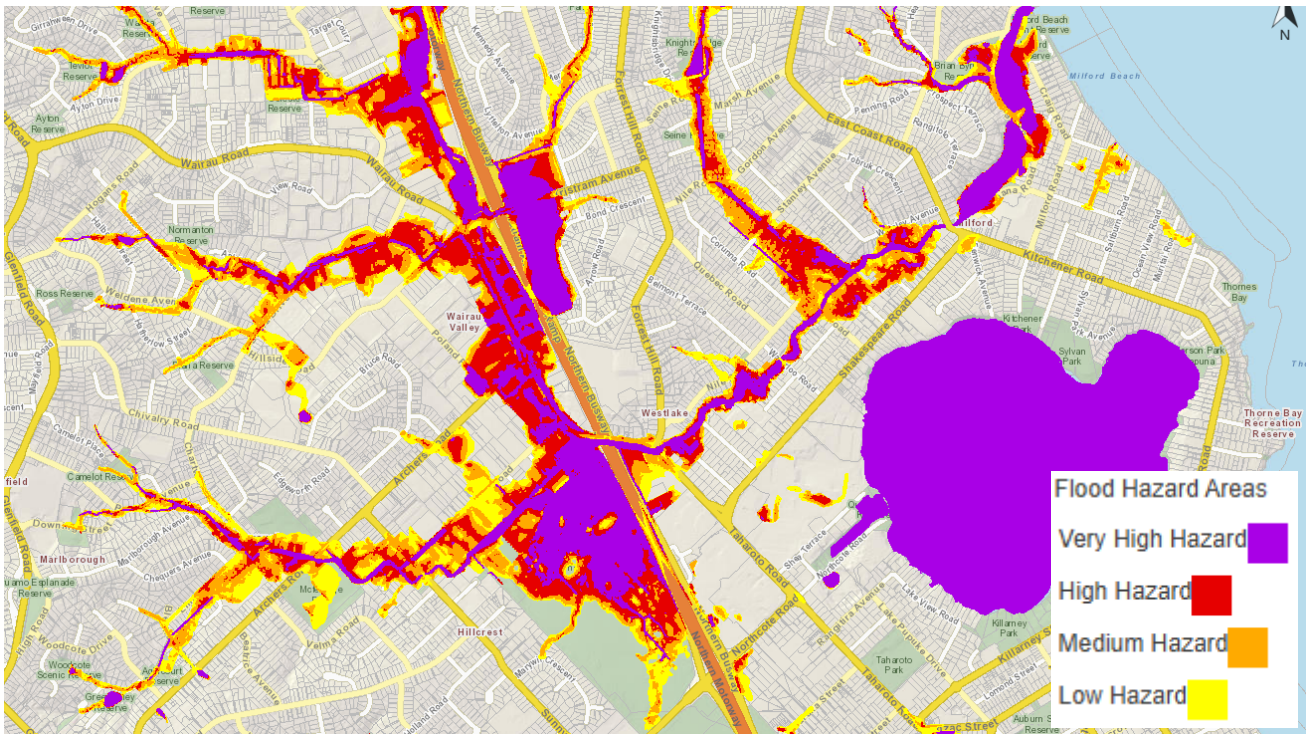


Figure 3-2: Flood hazard areas retrieved from Auckland Council's GeoMaps

3.2 HYDRAULIC MODELLING

We assessed the proposed concept design with the parameters described in 2.4.

3.2.1 EXISTING FLOOD MECHANISMS

Figure 3-3 shows the areas of key flow contributions into A F Thomas Park. The flood mechanisms are as follows:

- Overland flow from the commercial area flows south-east towards A F Thomas Park. The catchment that the channel along Wairau Road drains provides most of the flow to Wairau Creek at this location.
- Break out of the Porana Tributary adjacent to Eventfinda Stadium, with overland flow entering A F Thomas Park through the carpark. There is a Watercare wastewater pipe that crosses the Porana Tributary which exacerbates breakout of the channel. The Porana Tributary conveys flows from the west and is the second largest contributor to the Wairau Creek at this location.
- There are some small flow contributions to A F Thomas Park in the south via the DN 525 pipe that drains Marywil Crescent, the DN 450 pipe from the local shops near the intersection of Sunnybrae Road and Northcote Road, and smaller overland flow paths (OLFPs) than those from the Porana Tributary and commercial area.
- Breakout of the Wairau Creek near the Vector substation combined with overland flow from the commercial area floods the Vector substation. There is a small bund separating the substation and A F Thomas Park which overtops at high flows and flow from the substation enters A F Thomas Park.
- Natural depressions in A F Thomas Park provide some flood storage before floodwaters flow back by the DN 600 and DN 1350 culverts that drain the park and overland flow through the Vector substation to Wairau Creek.

Table 3-1 presents peak flow rates at the locations identified in Figure 3-3, illustrating the magnitude of flows from different contributing areas. The flow in Wairau Creek downstream of the two culverts draining A F Thomas Park is lower compared to the upstream inflow due to attenuation provided by the significant ponding area within the park.

Table 3-1: Peak flows from areas around A F Thomas Park

Location	Peak Flow (m^3/s)
Inflows	
Wairau Road commercial area	97.8
Porana Tributary	60.7
OLFP 1 (at DN 525 pipe)	2.3
DN 525 pipe from Marywil Crescent	0.4
OLFP 2 (at DN 450 pipe)	4.0
DN 450 pipe from the shops near the intersection of Sunnybrae and Northcote Roads	0.1
Outflows	
DN 600mm Culvert	0.8
DN 1350mm Culvert	4.6
Wairau Creek Downstream of the two culverts that drain A F Thomas Park	107.4

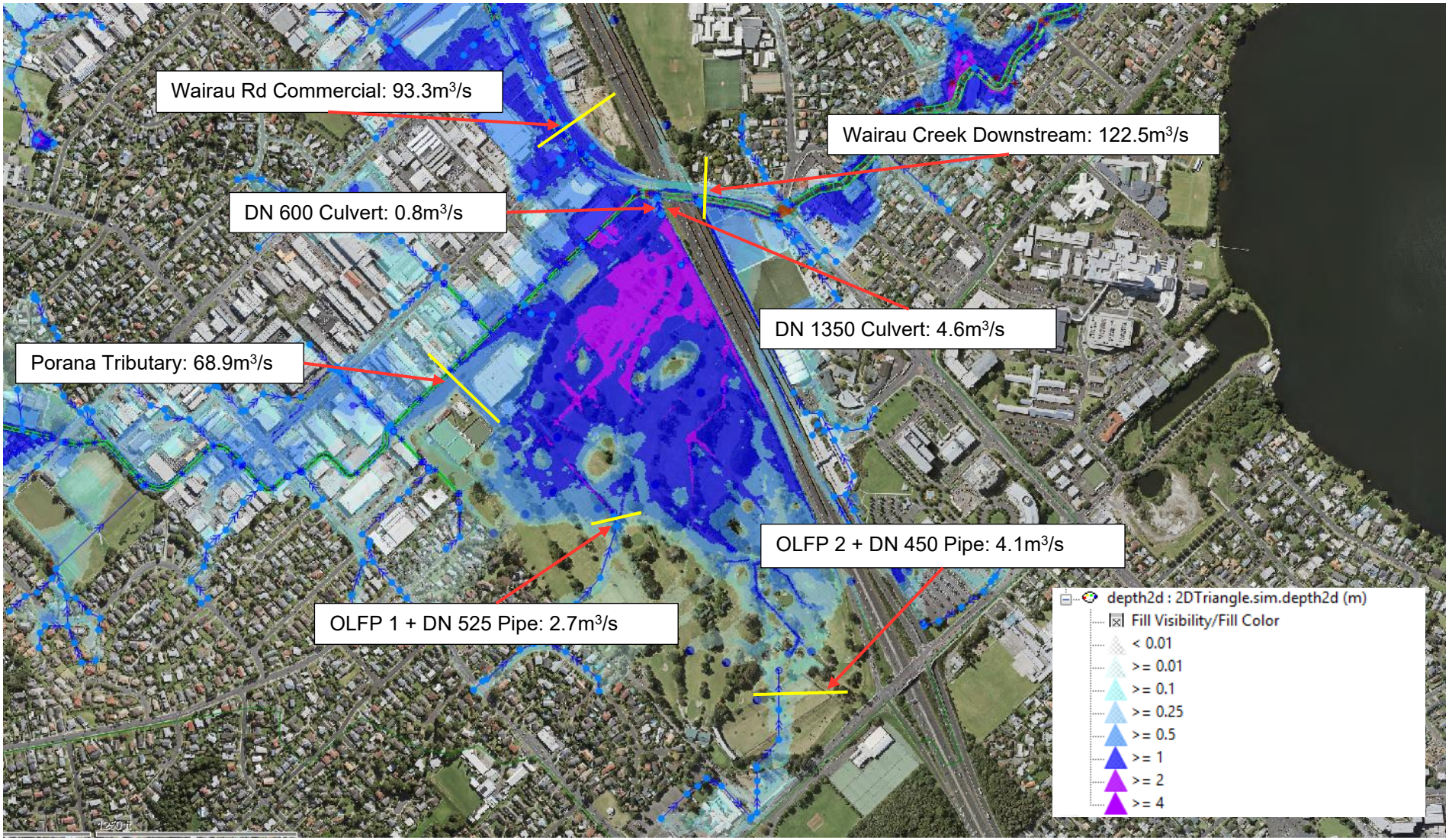


Figure 3-3: Predicted flood water depths for the 1% AEP MPD event at A F Thomas Park and peak flow at key locations

3.2.2 COMPARISON OF THE CONCEPT DESIGN TO THE BASELINE

Figure 3-4 shows that the additional flood storage lowers the peak flow in the Wairau Creek upstream of State Highway 1 i.e. at the point downstream of the two culvert outlets that drain A F Thomas Park. Following the storm event, water levels in A F Thomas Park remain elevated due to the storage gradually releasing, providing attenuation over time.

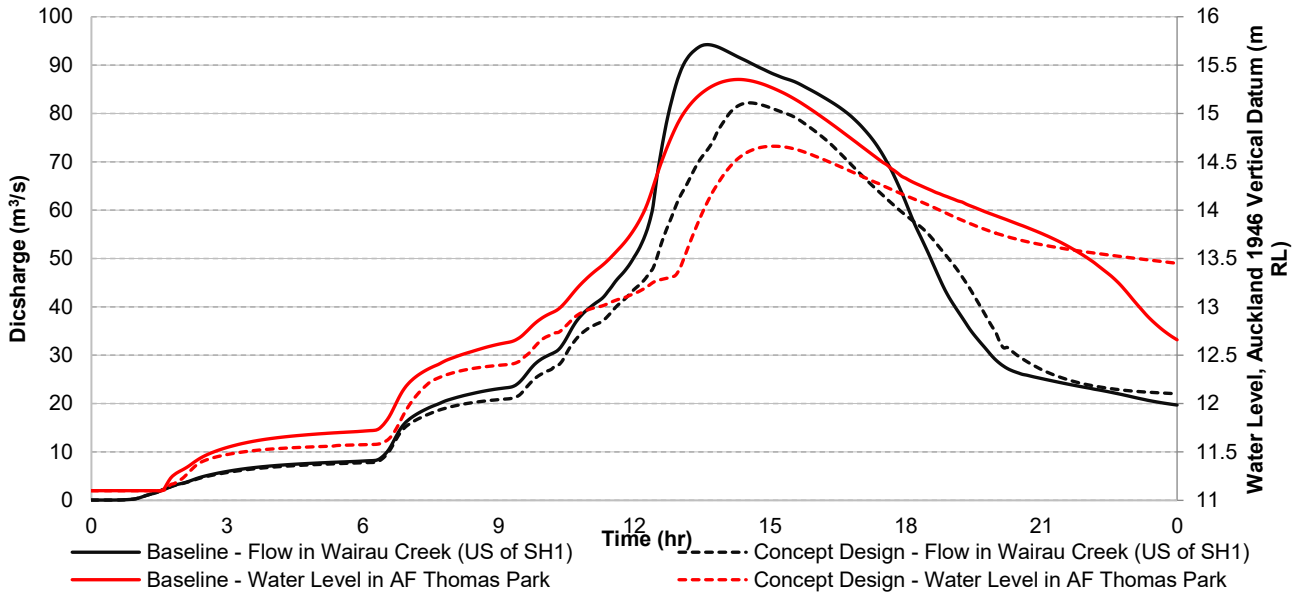


Figure 3-4: Water level in A F Thomas Park and flow in the Wairau Creek upstream of State Highway 1

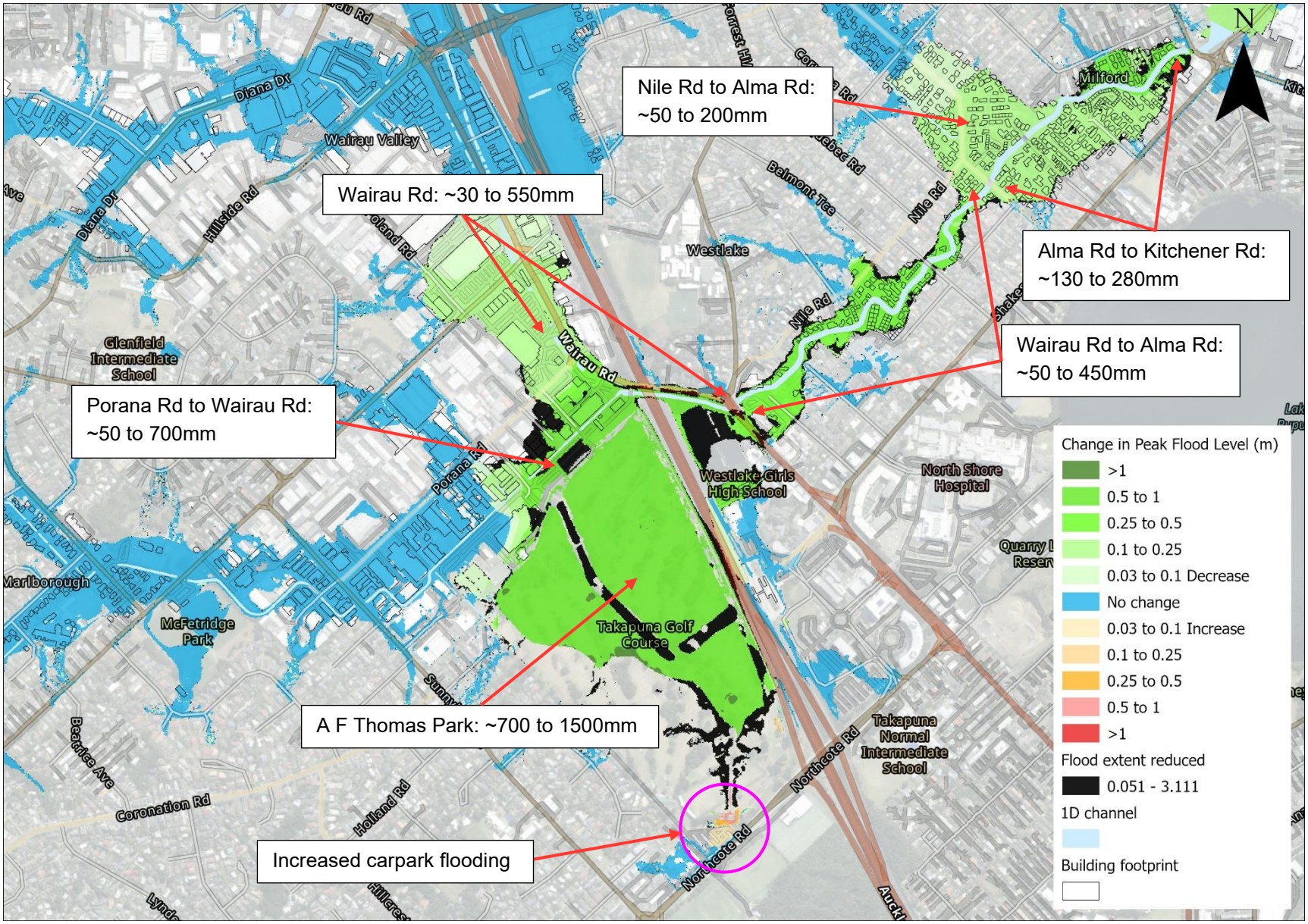
Figure 3-5 shows the benefits that the Project provides. Significant reductions are achieved in the upstream local commercial area and reductions downstream in the residential area along Wairau Creek are predicted due to the reduced peak flow as a result of the attenuation. This represents a reduction in flood hazard to the commercial and residential areas.

Figure 3-6 compares the flood depths with and without the Project at A F Thomas Park. Some water levels are increased by between 60 and 550 mm in the carpark of the reserve by Northcote Road. Design optimisation through the ongoing stages of the project are expected to resolve this issue. However, there are no significant increases in water levels outside of the reserve in a 1% AEP design event.

Figure 3-7 shows a long section of the Wairau Creek and the peak water levels with and without the Project. This shows that the reduced water levels continue all the way downstream, though the magnitude gradually reduces, particularly at the culverts where the flow is more constrained than in the open channel. Table 3-2 shows the peak water level reduces by 0.67 m near the substation to 0.12 m downstream of Kitchener Road. Water level reductions are also predicted for smaller events, although less than the 1% AEP design event. For events larger than the 1% AEP design event, the reductions are generally similar or even greater.

Table 3-2: Peak flood level and flood reduction at key locations

Location	Baseline peak water level (m RL)	Concept Design peak water level (m RL)	Change in peak water level (m)
Substation	15.30	14.63	-0.67
Wairau Road	14.31	13.88	-0.43
Waterloo Road	12.36	11.99	-0.37
Alma Road	9.17	8.94	-0.23
Kitchener Road	6.71	6.34	-0.37
Downstream of Kitchener Road	4.46	4.34	-0.12



Green colours represent lower water levels with the A F Thomas Park Concept Design and yellow to red colours represent higher water levels.

Figure 3-5: Predicted 1% AEP flood water level difference map

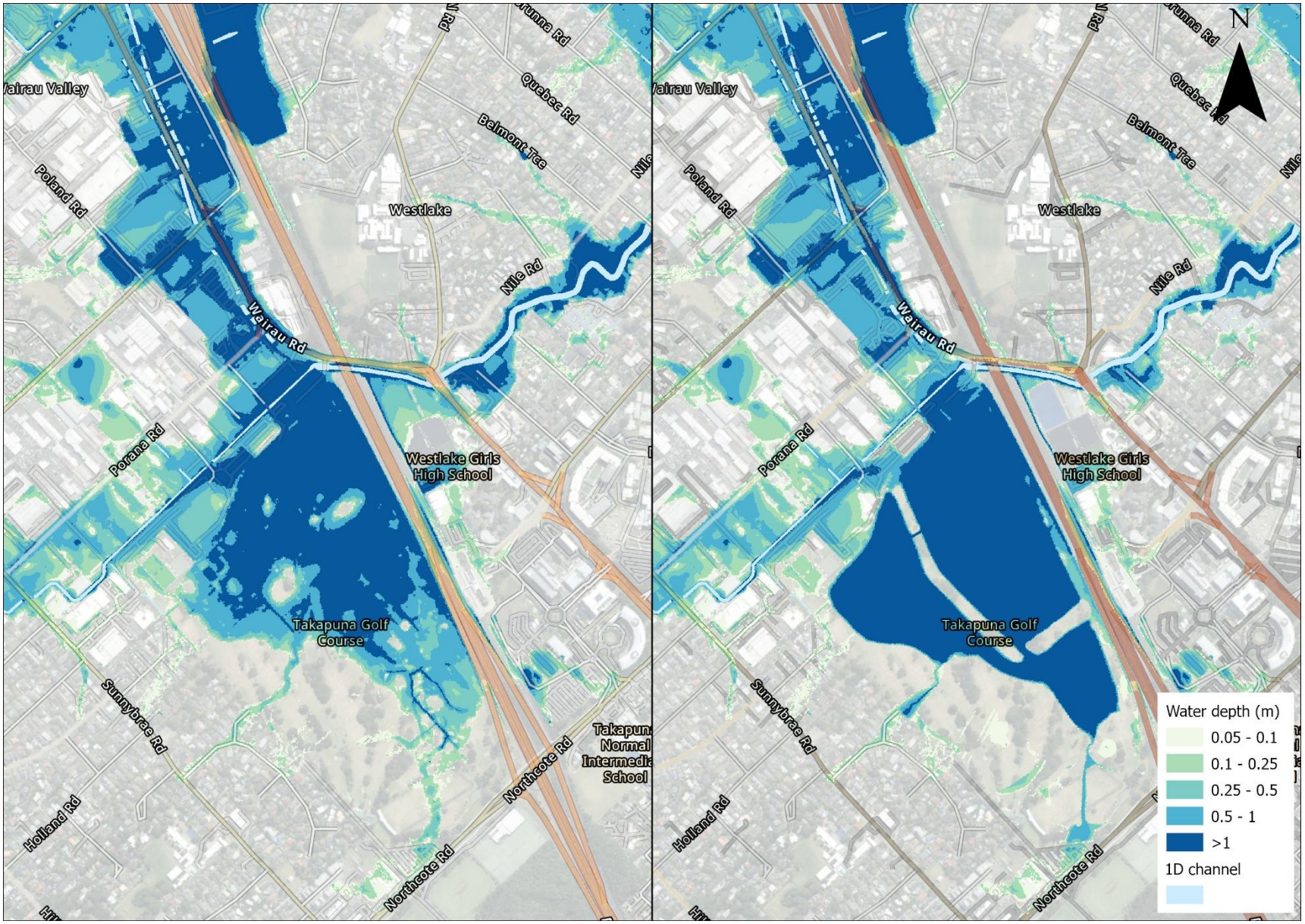


Figure 3-6: Predicted flood water depths for the 1% AEP design event at A F Thomas Park – MPD (baseline) left, and with the Project (right)

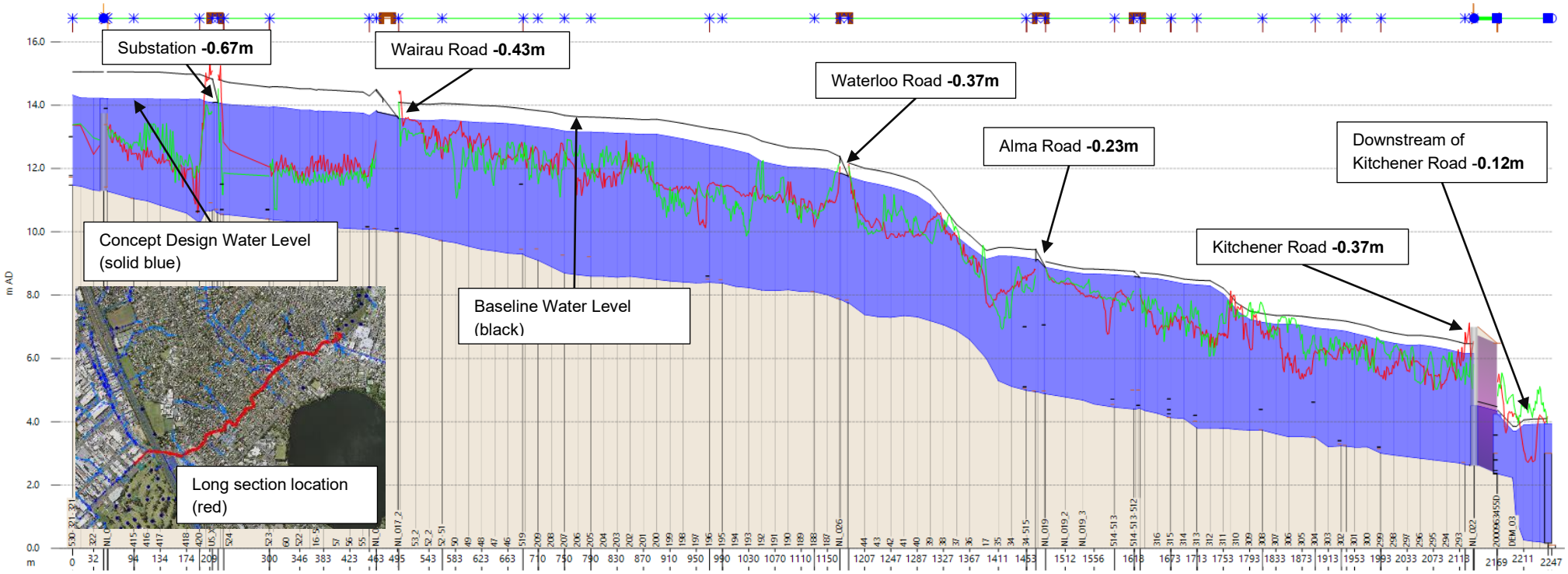


Figure 3-7: Long section along the Wairau Creek for the 1% AEP design event from near the substation to just downstream of Kitchener Road. Baseline water level shown in black, and concept design water level shown in solid blue. The bold numbers represent the predicted reduction in peak water levels with the Concept Design.

4 CONCLUSIONS

This report provides a preliminary flood hazard assessment of the Project. The final flood hazard assessment will be produced after completion of the developed design.

The Ngā Wairau – Stage 1 A F Thomas Park project significantly increases flood storage by excavating in the park. By storing approximately 550,000 m^3 of water in an extreme event, the project is predicted to reduce flood levels upstream in the commercial area by up to 700 mm, and for the downstream Milford area by up to 450 mm for the 1% AEP design event.

The proposed works also show no significant increase in water levels outside of A F Thomas Park.

In the earthworks areas, interaction between flood hazards and construction could result in overland flow and floodplains flooding the earthworks. While undesirable, these consequences are improbable during the construction period. General mitigative measures could include the constant monitoring of weather forecasts, bunding, progressive reinstatement and ensuring that goods and materials are stored outside of the 1% AEP floodplain area.