ENVELOPE

FLOOD RISK ASSESSMENT

77 AND 109 KAPITI ROAD AND 1 BRETT AMBLER WAY, PARAPARAUMU

DOCUMENT CONTROL RECORD

CLIENT	New Central Park Limited
PROJECT	77 and 109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu
PROJECT NO.	1942-02
DOCUMENT TYPE	R002-v4-1942-02 Flood Risk Assessment
DATE ISSUED	22 October 2026
ADDRESS FOR SERVICE	Envelope Engineering Limited Level 1, 65 Cuba Street, Te Aro, Wellington
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ISSUE AND REVISION RECORD

DATE OF ISSUE	22 October 2026
STATUS	Final for Substantive Application
ORIGINATOR	 Miguel Hernandez – Senior Hydraulic Engineer
REVIEWED	 Louis Freeland – Wellington Civil Manager, CPEng
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CONTENTS

1.0 INTRODUCTION 1
2.0 PROJECT BACKGROUND 1
3.0 SITE DESCRIPTION 2
3.1 SITE DESRCIPTION 2
3.2 PROPOSED DEVELOPMENT 3
4.0 BACKGROUND 4
4.1 PREVIOUS STUDIES AND REPORTS 4
4.2 RELATIONSHIP TO OTHER PLANS 4
5.0 MODEL BUILD 5
5.1 MODEL SOFTWARE 5
5.2 MODEL PRECISION 5
5.3 MODEL DATUM AND COORDINATES 5
5.4 MODEL SCENARIOS 5
5.5 LIMITATIONS 6
6.0 MODEL UPDATES 6
6.1 SURFACE 6
6.2 OUTPUT ZONE 7
6.3 NETWORK 8
6.4 BUILDINGS 9
6.5 WHAREMAUKU BATHYMETRY 9
6.6 ALL LAYERS 9
7.0 EXISTING DEVELOPMENT FLOOD HAZARD 10
7.1 EXISTING MAPPED HAZARD 10
7.2 MODELLED PRE-DEVELOPMENT FLOOD HAZARD 11
7.3 PRE-DEVELOPMENT FLOOD HAZARD CLASIFICATION 13
8.0 POST DEVELOPMENT MODEL UPDATES 16
8.1 MODEL UPDATES 16
9.0 POST-DEVELOPMENT FLOOD HAZARD 21
9.1 FLOOD DEPTH 22
9.2 DEPTH DIFFERENCE 24
9.3 FLOOD VELOCITES 26
9.4 FLOOD HAZARD CLASSIFICATION 28
9.5 CROSS SECTIONS 30
9.6 NZTA EFFECTS 34
10.0 SENSITIVITY TESTING 34
10.1 INCREASED RAINFALL 34
10.2 PIPE BLOCKAGE 35
10.3 SEDIMENTATION 37
10.4 CHANNEL ROUGHNESS 37
11.0 ASSESSMENT OF EFFECTS 38
12.0 NPS – NATURAL HAZARDS 39
13.0 RECOMMENDATIONS 40
14.0 DISCLAIMER 41

APPENDICES

APPENDIX 1 BASE LAYER DESCRIPTION
APPENDIX 2 RULES FLOOD HAZARD
APPENDIX 3 FLOOD MODEL RESULTS MAPS
APPENDIX 4 CROSS SECTIONS FLOWS
APPENDIX 5 CROSS SECTIONS LEVELS
APPENDIX 6 LONGITUDINAL PROFILES

1.0 INTRODUCTION

New Central Park Limited (NCPL) is proposing the comprehensive development of land at 77 and 109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu, together with associated works on adjoining land. The Project is a comprehensive, master-planned mixed-use development providing for the expansion of the Paraparaumu Metropolitan Centre.

The Project comprises:

- Approximately 600 residential dwellings, including apartments, townhouses, duplexes, courtyard housing and standalone dwellings;
- Approximately 20,000 m² GFA of Large Format Retail (LFR);
- Approximately 3,800 m² of other retail and commercial activities, including specialty retail and drive-through activities;
- Subdivision to create residential, commercial, LFR and other development allotments, together with roads, reserves and infrastructure;
- A new internal transport network, including the Town Centre Link Road, local roads and JOALs, together with pedestrian and cycling connections and provision for public transport;
- Three waters infrastructure required to service the development;
- An extensive network of open space, landscaping and blue-green infrastructure; and
- Wetland reclamation and creation and ecological restoration and enhancement, including a constructed indigenous wetland primarily providing ecological offsetting and compensation, together with complementary flood-storage functions.

The development has been comprehensively master-planned to integrate the residential, commercial, transport, infrastructure, ecological, landscape and open space components of the Project. It is intended to proceed progressively in stages as an integrated extension to the existing Paraparaumu town centre.

The Project has been referred for consideration under the Fast-track Approvals Act 2024. This report forms part of the technical documentation supporting the substantive application for the Project and covers an assessment of flood risk at the site, in particular:

- Existing mapped flood hazard at the site.
- Post-development assessments of flood hazard at the site including technical summaries of changes made to the model.
- An Assessment of Effects relating to flooding, particularly how mitigation measures ensure that off-site effects are less than minor.
- An assessment of model sensitivity to a range of parameters to help determine appropriate freeboard and ongoing function of stormwater conveyance systems.

It is expected that readers of this report are familiar with the site and proposed development. This report should be read alongside other project documentation and reports submitted with the substantive application.

2.0 PROJECT BACKGROUND

A previous masterplan was prepared for the site and formed the basis of resource consent applications lodged with Kapiti Coast District Council (KCDC) and Greater Wellington Regional Council (GWRC) in 2024 for subdivision, bulk earthworks and associated infrastructure works. The previous proposal was subject to technical review and requests for further information from both Councils, including in relation to stormwater management.

The development has subsequently been redesigned, and the current proposal differs from the earlier masterplan in a number of respects, including the development layout, earthworks,

stormwater and flood management approach, and infrastructure requirements. The current engineering design has been developed having regard to the technical investigations, modelling and feedback obtained through the previous consent process, where these remain relevant to the revised proposal. A key difference between this application and the previous application is that this is a substantive application, considering land use in addition to subdivision as opposed to the previous "superlot" approach.

Where appropriate, previous technical work has been updated to reflect the current masterplan and development yield.

The previous application received Section 92 requests for information, which have been addressed through the design process.

3.0 SITE DESCRIPTION

3.1 SITE DESRCIPTION

The site is comprised of 7 lots – Section 3 and 4 SO 501569, Section 2 SO 570550, Lot 2 and 4 DP 470759, Lot 13 DP 361734 and Lot 7 DP 342714 which have an approximate area of 37.45ha. The proposed development works will also be undertaken on portions of land owned by and in conjunction with external parties (e.g. Kapiti Coast District Council). The site development extents are shown in our drawings (Appendix 3) and in Figure 1.



Figure 1. Site Extents Plan.

The site is at an elevation of approximately RL 3 – 20 m and is comprised of two distinctive landforms:

- Sand dunes with steep sides in the centre of the site.
- Lower flatland areas to the north and south of the dunes.

There are several watercourses which run through the site including the Wharemauku Stream on the southern boundary, and various drainage channels which run through the site including a channel which conveys stormwater from the reticulated Council stormwater network discharging adjacent to Kapiti Road. Bioresearches have conducted a watercourse assessment of the site which provides further detail on the various drains and streams and assigns ecological values and classifications to these. Figure 2 shows the watercourses around the site, together with the flood model extent.

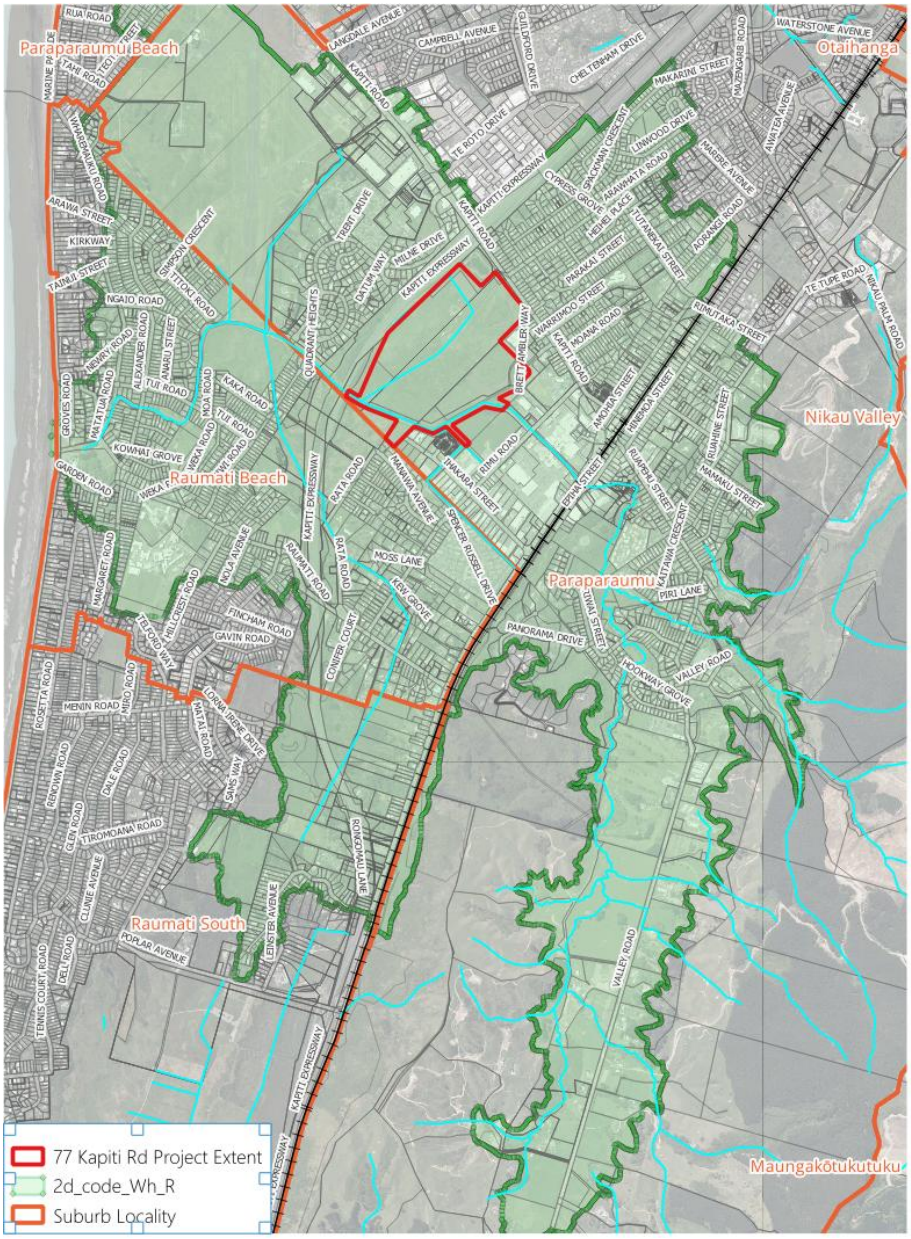


Figure 2. Project location within model extent.

3.2 PROPOSED DEVELOPMENT

The proposed development will deliver approximately 600 residential units in a varied range of typologies, together with approximately 20,000 m² of large format retail and 3,800 m² of other commercial and retail activities. It also includes significant infrastructure works, including a new east–west link road ('the spine road') and Iver Trask extension, three waters servicing, and an integrated network of open space, wetland and flood management areas.

The Fast-track application seeks the land use and subdivision consents required to enable the comprehensive development of the site, including the residential, large format retail, commercial and retail development shown on the architectural plans. The application also seeks approval for the associated earthworks, roads, three waters infrastructure, stormwater and flood management works, and other supporting infrastructure required to service the development.

The civil infrastructure described in this report has been designed to service the full development proposed as part of the Fast-track application, with infrastructure sizing and servicing requirements based on the anticipated residential and commercial development yield.

4.0 BACKGROUND

4.1 PREVIOUS STUDIES AND REPORTS

Several previous studies have considered the site and surrounding areas. These include:

- Jacobs Wharemauku Catchment Integrated Modelling Reports (2021, 2022) provides an assessment of the effects of proposed developments, enhancements and stormwater upgrades on the catchment. This includes the area of the proposed development, with and without mitigation measures. The modelling shows that mitigation measures are required to minimise off site effects and that these can address flood hazard and offsite effects.
- Awa Environmental conducted a 2020 flood model and options assessment, to assess options to mitigate flood risk in the Amohia and Ruahine Street catchments, which discharge adjacent to the site in Iver Trask Place.

4.2 RELATIONSHIP TO OTHER PLANS

This report should be read in conjunction with the following plans and reports:

- Te Ātiawa ki Whakarongotai Kaitiakitanga Plan, which outlines kaupapa, huanga and tikanga relating to land development.
- Envelope Engineering Earthworks and Construction Management Plan (2026), which outlines construction management measures, including erosion and sediment control.
- Envelope Engineering Infrastructure Report (2026), which assesses the proposed infrastructure and servicing arrangements.
- Envelope Stormwater Management Plan (2026), which assesses stormwater management requirements for the development.
- Williamson Water & Land Advisory (WWLA), Hydrological Effects Assessment Report – Kapiti Road Development (October 2026), which assesses surface water, groundwater, recharge, stream flows and wetland hydrology.
- Bioresearches, 77–109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu – Assessment of Ecological Effects (October 2026), which assesses freshwater and terrestrial ecological values and the effects of the proposed development.
- Bioresearches, 77–109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu – Wetland Residual Effects Analysis Report (October 2026), which assesses residual wetland effects and the proposed compensation measures.
- Bioresearches, Ecological Management Plan – 77–109 Kapiti Road and 1 Brett Ambler Way, Paraparaumu (Draft, 2026), which outlines ecological management, restoration, monitoring and adaptive management measures.
- Torlesse, Geotechnical Assessment report (October 2026).
- Torlesse, Geotechnical Desktop Study – 77 Kapiti Road (September 2026), which identifies the site's geotechnical conditions and development constraints.

5.0 MODEL BUILD

The hydraulic model was provided by Awa Environmental on behalf of Kapiti Coast District Council in June 2026, and it has the following characteristics:

5.1 MODEL SOFTWARE

The model was imported and run on TUFLOW software, version 2026.0.0.

5.2 MODEL PRECISION

The model was run with the TU FLOW HPC (Heavily Parallelised Compute) solver with a single point model precision.

5.3 MODEL DATUM AND COORDINATES

The heights used in the model and referenced in this report are in terms of New Zealand Vertical Datum 2016 (NZVD16). Care should be taken when referencing these results and comparing them to designs within different datums.

For the coordinate system, the model uses NZGD2000 / New Zealand Transverse Mercator 2000 (EPSG:2193).

5.4 MODEL SCENARIOS

The model was provided with several scenarios that accounted for a range of variables, including climate change scenarios, storm return periods and boundary conditions. Table 1 shows the scenarios that have been simulated for the different model scenarios and events different storm events to assess any flood effects resulting from the proposed development and any flood risks within the development area.

Pre-development (or existing development) refers to the site and network in its current state and is also referred as the KCDC supplied model. Post – development (or proposed development) accounts for the changes to the landform inside the lots at 77 Kapiti Road.

For simplicity, the events are simply referred to as "X-year ARI". However, this is inclusive of climate change unless expressly mentioned otherwise.

The 10- and 100-year ARI events are commented on in this report as these are typical events and the type of events that the hydraulic model is suitable for analysing. However, other events such as the 2- and 5-year ARI events are included in Appendix 3 as these are useful reference materials and can be used to make conclusions about the performance of the site (particularly the wetland) in lower magnitude events.

Table 1. Main model scenarios.

No	Development Scenario	Storm Event (ARI)	Spring Tide Conditions	Network	Predefined Model Events
1	Pre-Development	10 yr	1.4 years (HRC50) Correspond to 2.613 mRL at Paraparaumu Beach	Existing network updated with project survey as seen in section 7.0.	Representative Shared Socioeconomic Pathway (SSP): SSP5-8.5M (medium). Tide year: 2130 No Stream Event
2		100 yr	2.8 years (HRC30) Correspond to 2.673 mRL at Paraparaumu Beach		
3	Post - Development	10 yr	1.4 years (HRC50) Correspond to 2.613 mRL at Paraparaumu Beach	Existing network updated with project survey plus proposed network. See section 9.0 for the update description.	
4		100 yr	2.8 years (HRC30) Correspond to 2.673 mRL at Paraparaumu Beach		

5.5 LIMITATIONS

Any flooding depths +/- 25 mm have not been shown as these are considered by Envelope to be minor discrepancies outside the tolerances of the model.

Envelope have reviewed the model within the immediate area of the development but have not undertaken a full review of the flood model.

This assessment does not account for issues or effects beyond the scope of the flood risk assessment, e.g. hydraulic neutrality, civil design, etc.

6.0 MODEL UPDATES

The base model was checked against site-specific information in the immediate vicinity of the development. The following changes were made to the model for the predevelopment scenario to better represent the site and surrounding areas within the model space.

References to model file names are provided for KCDC model audit purposes (a process separate to the RMA effects assessment).

6.1 SURFACE

Table 2 lists the dataset of survey information which has been added to the model surface to get more accurate existing elevations within the site and surrounding areas. Some edits were made across the low-lying areas of LiDAR where there were localised high points which were clearly where dense vegetation was located – so these localised high points were removed. The surfaces filename with the updated data is:

- Wh_MIKE11_openchannels_0p5m_PRETkapitiV2_NZVD2016.tif
- EGL_NoLumps-Contours-Masters_NZTM-NZVD16_NZTM.asc

Table 2. Surfaces added to the model from bottom to top.

No	Surface	Description
1	Wellington-Kapiti-Coast-Lidar-1m-DEM-2024	This surface underlays all other surfaces to generate contours outside of any topo surveyed areas. See orange area in Figure 3.
3	Envelope Topo Survey (06-2021)	Wharemauku stream – Western parts. See green area in Figure 3.
2	Envelope Drone Survey (05-2023)	Only in grass areas in the Northern areas of the site. See red area in Figure 3.
4	Envelope Topo Survey (07-2023)	Small additional critical areas surveyed. See blue area in Figure 3.
5	Spencer Holmes Topo Survey (05-2026)	Kapiti Road/Brett Ambler Way and Balance of Wharemauku stream including Ihakara Street and low-lying areas adjacent. See survey points in Figure 3.

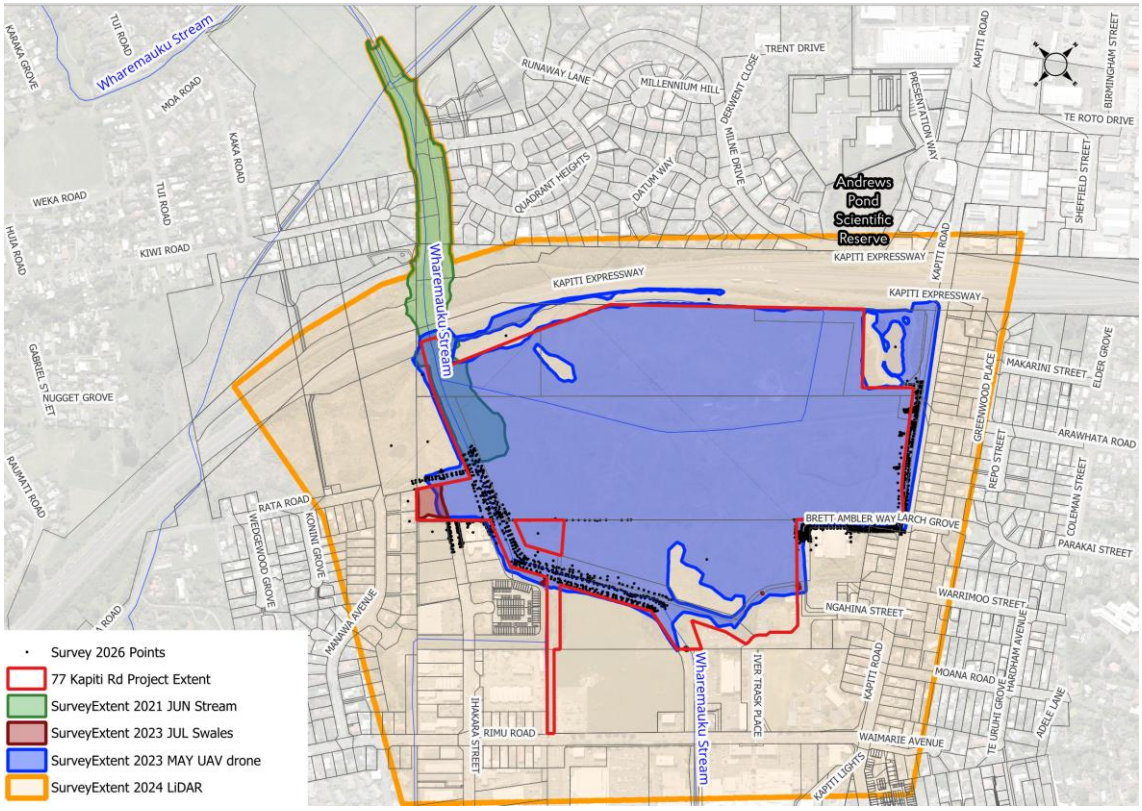


Figure 3. Pre-development - Survey extents

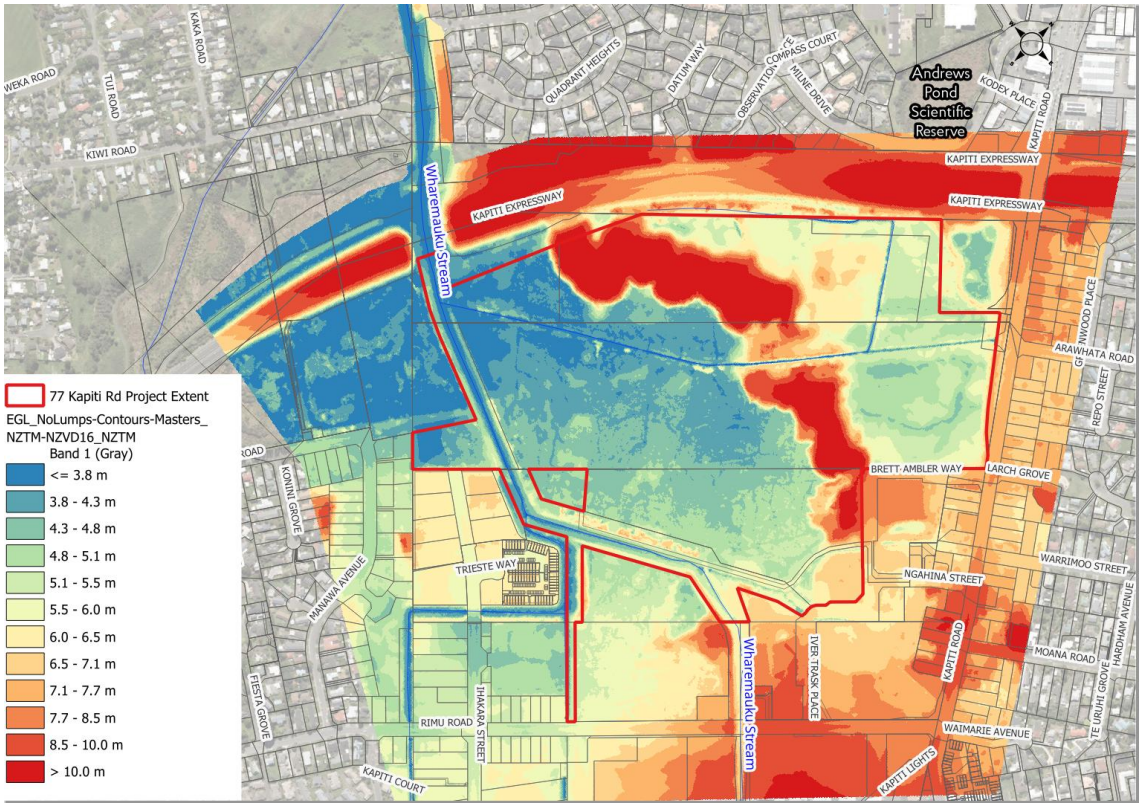


Figure 4. Pre-development - Modified Existing Ground Levels.

6.2 OUTPUT ZONE

To reduce the dynamic output file size and the computational time, an output zone was applied, see Figure 5. The following layer has been updated to represent this change.

- 2d_oz_ZoneA_R.shp

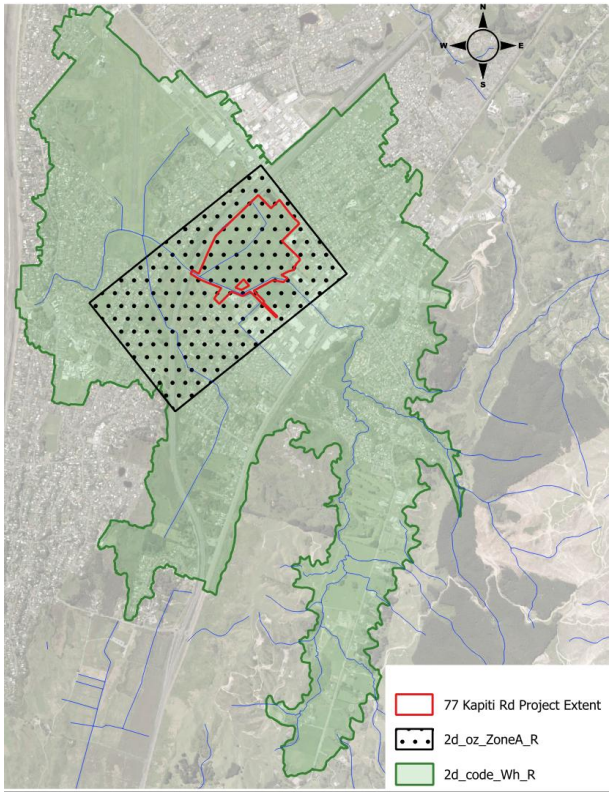


Figure 5. Pre-development - Zone Results

6.3 NETWORK

From the survey information described in section 6.1 four culverts were added to the model. Dimensions and invert levels are shown in Figure 6. The following layers have been updated to represent this change.

- 1d_nwk_pipe_WhKapitiRdPRE_L.shp
- 2d_bc_WhKapitiRdPRE_P.shp
- 2d_zsh_WhKapitiRdPRE_R.shp

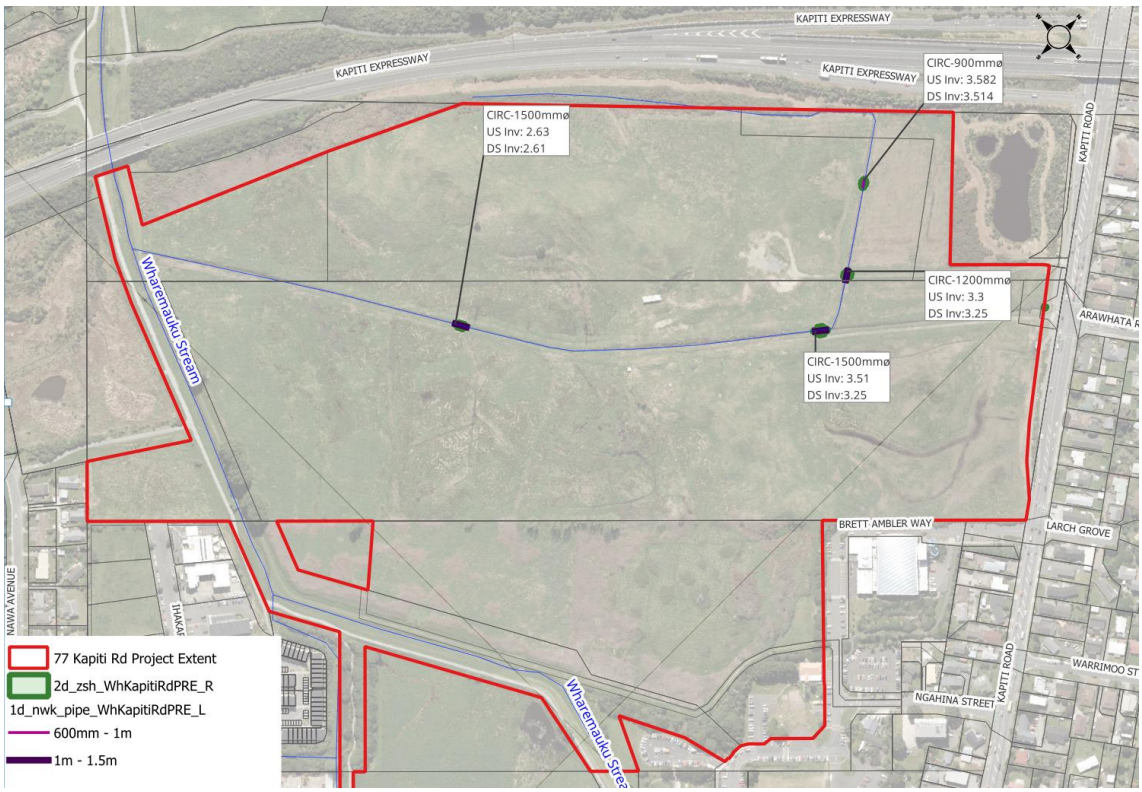


Figure 6. Pre-development network updates.

6.4 BUILDINGS

Four buildings polygons (representing obstructions on the overland flow) within the project extent were deleted from the provided data. The following layer has been updated to represent this change.

- 2d_zsh_WhKapitiRdPRE_buildings_R.shp

6.5 WHAREMAUKU BATHYMETRY

The bathymetry of the Wharemauku Stream within the model was discussed with KCDC's stormwater and coastal assets Manager. Based on these discussions it was decided to keep the bathymetry of the provided model (as opposed to new surveyed cross sections) as this better aligned with upstream and downstream channel cross sections and ensures consistency across models.

6.6 ALL LAYERS

These are the list of the layers used to represent the changes in the pre-development scenarios.

- 1d_nwk_pipe_WhKapitiRdPRE_L.shp
- 2d_bc_WhKapitiRdPRE_P.shp
- 2d_oz_ZoneA_R.shp
- 2d_po_WhKapitiRdPRE_R.shp
- 2d_po_WhKapitiRdPREandPOST_L.shp
- 2d_zsh_WhKapitiRdPRE_buildings_R.shp
- 2d_zsh_WhKapitiRdPRE_R.shp

7.0 EXISTING DEVELOPMENT FLOOD HAZARD

7.1 EXISTING MAPPED HAZARD

There is an identified current flood hazard across parts of the site. This has been studied previously and is represented by the current KCDC (GIS) hazard map shown in Figure 7.

KCDC are in the process of updating flood modelling for the Wharemauku catchment and this is not yet reflected in Figure 7. The modelling referenced in this report and covered within the Flood Risk Assessment submitted with the substantive application accounts for this new modelling.



Figure 7. KCDC flood hazard mapping (GIS).

A brief description of the relevant items in the legend is as follows:

- **Storage** - Areas adjacent to streams providing temporary storage of floodwater during storm events. Filling or development of these areas is likely to have a direct effect on flood levels elsewhere. There is a significant existing storage area identified on the site just to the north of the Wharemauku Stream. An area of 152,302 m² (15.2 ha) is covered by this hazard within the project extent covering a 41.8% of the site area.
- **Stream Corridor** – The areas identified on the hazard map as stream corridors are expected to function as streams during a 1% AEP event. They include natural streams and artificially formed drains. The extent shown on the map is the expected width of the stream during the storm event. The Wharemauku Stream is clearly visible near the bottom of the image. The stream corridors shown within the site are primarily open drains. An area of 47,841 m² (4.78 ha) is covered by this hazard within the project extent filling a 13.5% of the site area.
- **Ponding** – These areas are similar in function to storage but not necessarily directly connected to a stream. Within the site they are typically low-lying open ground. An area of 33,813 m² (3.38 ha) is covered by this hazard within the project extent generating a 9.3 % of the site area.
- **Overflow Path** – These act as channels for floodwaters. They can be natural or artificially formed.

In addition to the site, there are significant existing flooding problems upstream and downstream of the site and any development of the site needs to include suitable mitigation measures to ensure that the flooding problems are not worsened.

7.2 MODELLED PRE-DEVELOPMENT FLOOD HAZARD

The updates outlined in Section 6.0 were made to the provided model. This allows for a site-specific understanding of flood risk and modelling of mitigation measures.

Figure 8 and Figure 9 show the pre-development flood depths across the site using the proposed model for the 10- and 100-year events inclusive of climate change. These show that there is flooding concentrated along the lower portions of the site adjacent to the Wharemauku Stream, south of the existing dunes. There is also flooding within and adjacent to channels across the site as well as other general ponding in low-lying areas.

The maximum accumulated flood volume in the 10- and 100-year ARI events in the pre-development scenario is 61,311 m³ and 105,863 m³ respectively. Most of this is concentrated in the deeper ponding areas shown in Figure 8 and Figure 9.

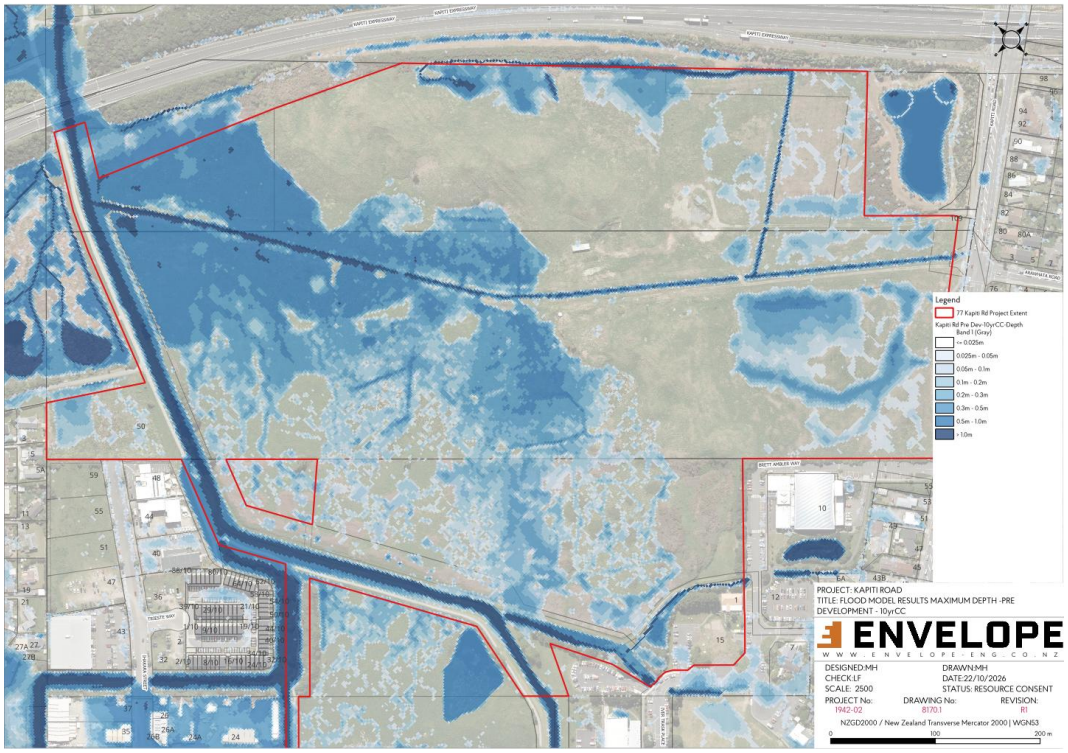


Figure 8. Pre-development maximum flood depth, 10-year ARI event.

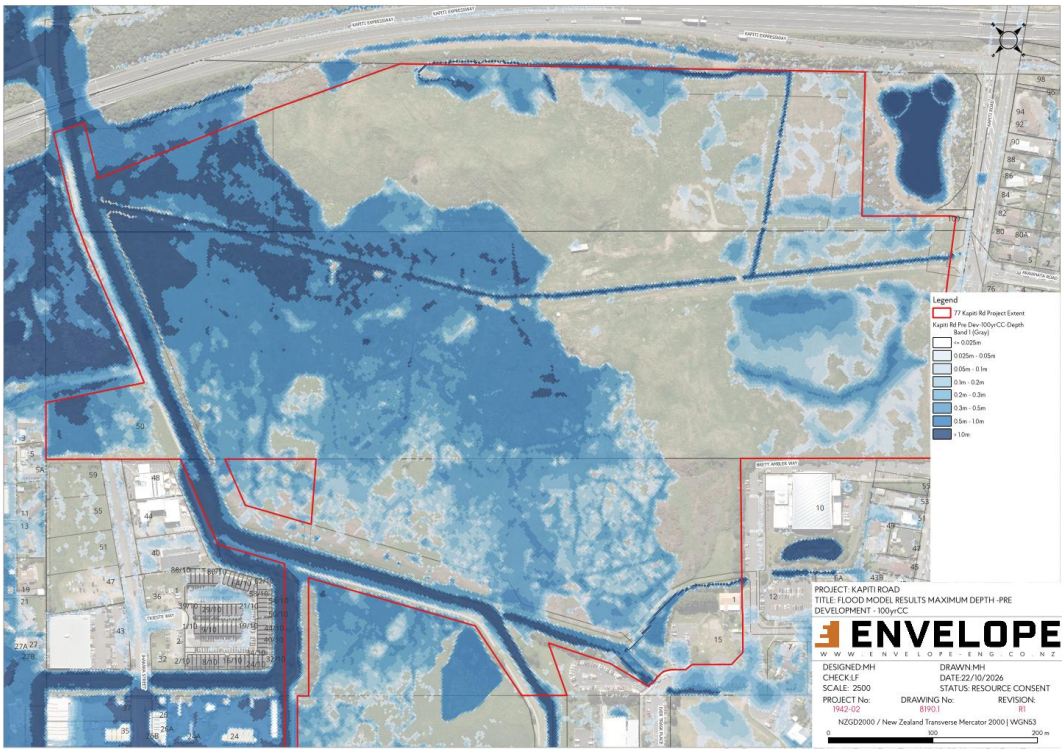


Figure 9. Pre-development maximum flood depth, 100-year ARI event.

Figure 10 and Figure 11 show the pre-development flood velocities across the site using the proposed model for the 10- and 100-year events inclusive of climate change. These show that there are higher velocities in the stream corridors and flow paths within the site, with minimal velocity in the lower lying ponding areas.

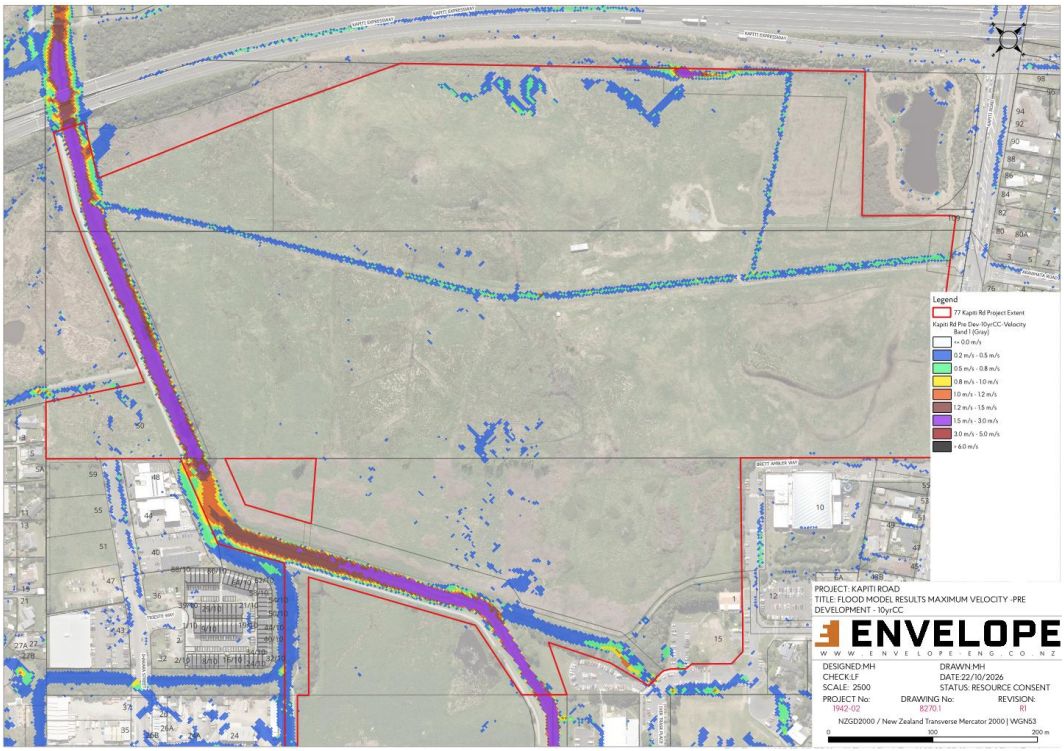


Figure 10. Pre-development maximum flood velocity, 10-year ARI event.

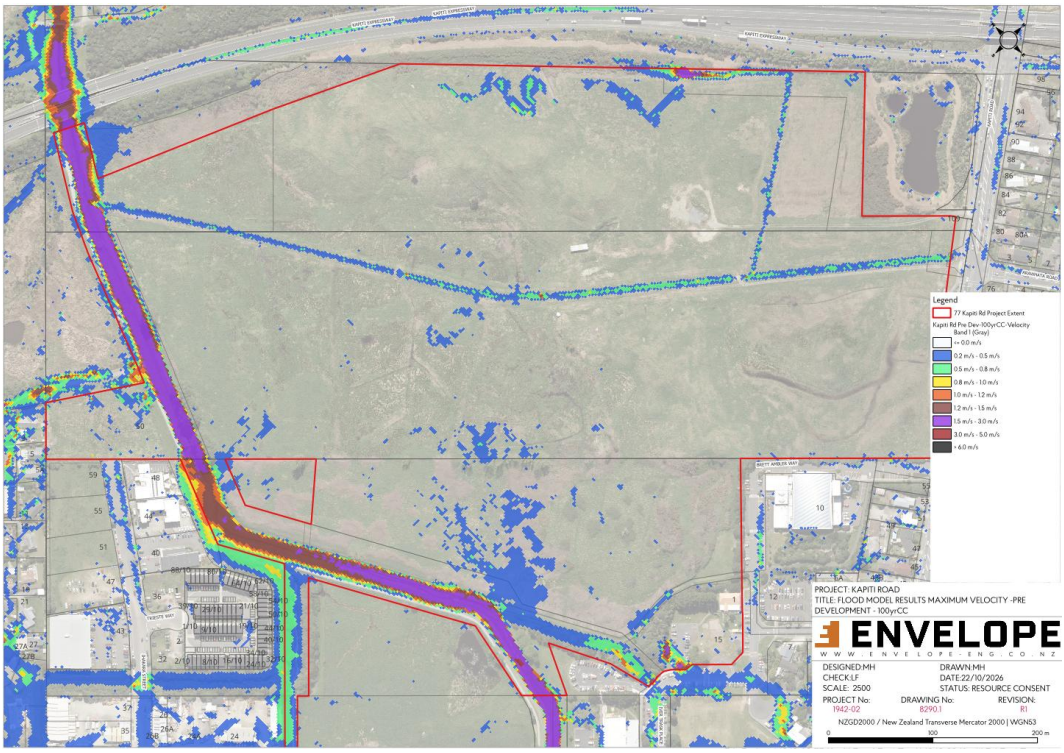


Figure 11. Pre-development maximum flood velocity, 100-year ARI event.

7.3 PRE-DEVELOPMENT FLOOD HAZARD CLASIFICATION

The flood hazard at the site was mapped according to the Combined Flood Hazard Curves within the Australian Runoff and Rainfall Guidelines (ARR), which consider depth and velocity to assess flood hazard risks. These curves are shown in Figure 12, with the mapped flood hazard shown in Figure 10. Pre-development maximum flood velocity, 10-year ARI event.

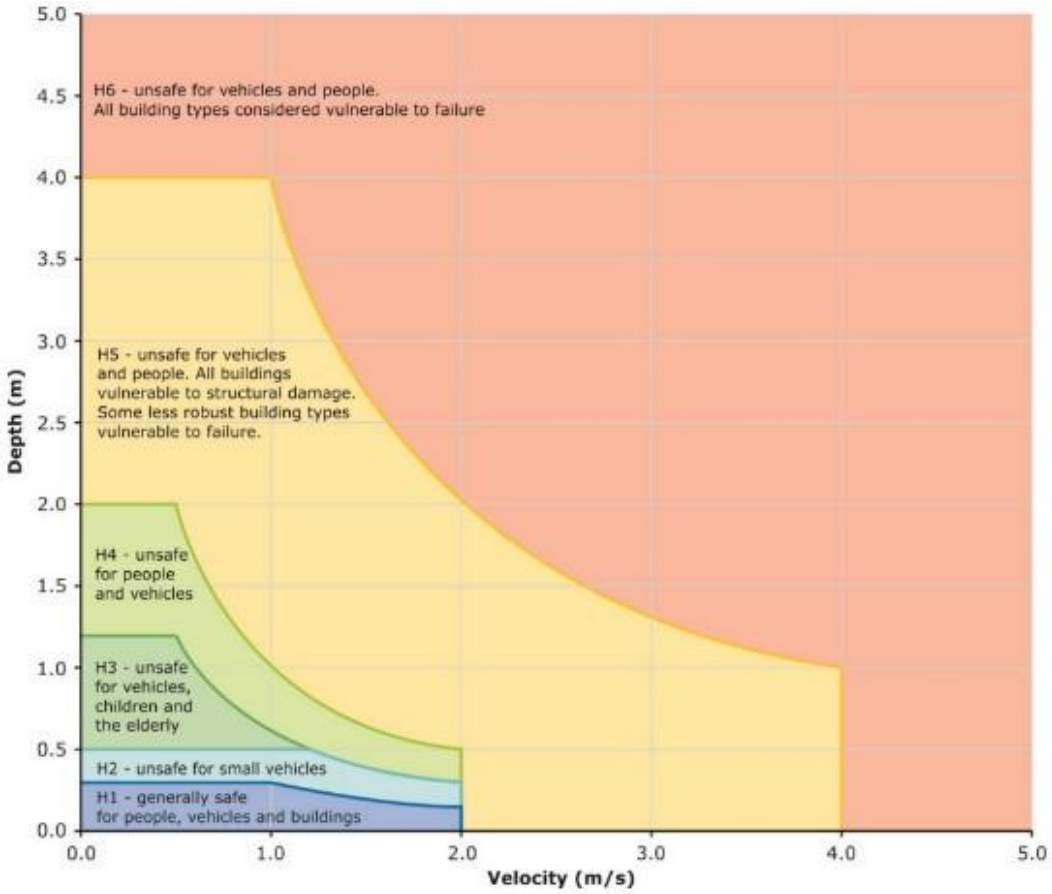


Figure 12. Combined Flood Hazard Curves.

Figure 13 and Figure 14 shows that the flood hazard for the 10-year ARI and 100-year ARI scenarios respectively. Out of the swale and open draining areas, H1 to H3 classification cover most of the site, meaning that it is generally unsafe for people and vehicles. There are areas of higher flood hazard around the site (H4 and H5) concentrated on the lower land that intersects the internal existing draining and the Wharemauku Stream.

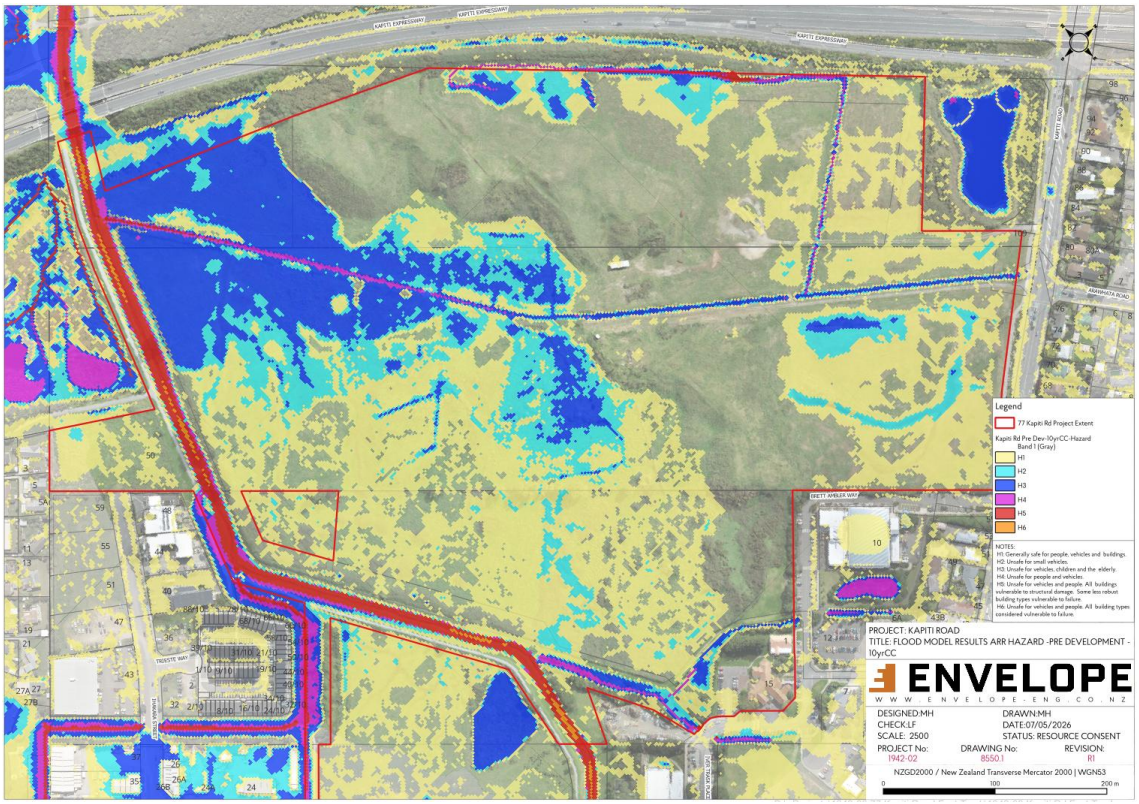


Figure 13. Pre-development. ARR Hazard classification for 10yrCC scenario.

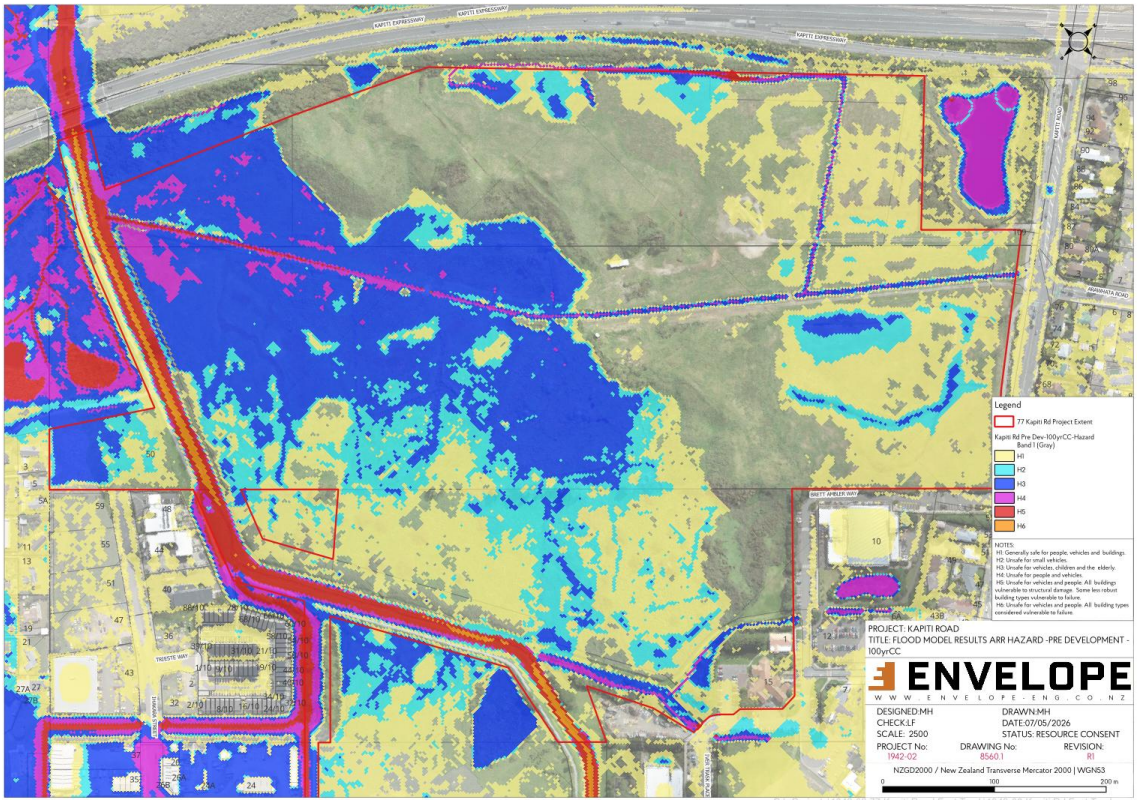


Figure 14. Pre-development. ARR Hazard classification for 100yrCC scenario.

8.0 POST DEVELOPMENT MODEL UPDATES

Based on the pre-development scenario presented within Section 4, a design response is required to manage the potential risks associated with flooding on the site and to ensure that any proposed changes to the landform do not adversely affect adjacent areas of the catchment.

The KCDC District Plan emphasises that development within flood storage areas should maintain an equivalent hydraulic function. This is anticipated within the Metropolitan Centre Zone Structure Plan, which outlines the provision of a flood management area to enable development on the balance of the site. The MCZ chapter also sets out the following as an activity that will be provided for on the site: a large consolidated stormwater management area and, if practicable, wetland to provide for flood storage, ecological values and amenity values.

In response to this, flood mitigation works are proposed to earthwork the site in a manner that realigns the current flood extents to reflect the future intended masterplan development of the site.

8.1 MODEL UPDATES

Based on the pre-development scenario presented within Section 6, the model was modified to represent the changes for the post-development scenario. For full context of the proposed changes, refer to the civil engineering plans and other documents submitted with the substantive application.

8.1.1 TOPOGRAPHY

The topography within the model was updated to reflect the changes in landform that will occur as a result of the proposed development, as referred to Figure 15. Elevations within these changes are between 3.3 m and 16.0 m.

While not forming part of the application, the form of the Airport Link Road has been included within the modelled topography, so the flooding effects of future construction of this have been included within our assessment. This is so the construction of this road is not precluded by the development in the future.

The following layer has been updated to represent the changes in the topography.

- POST-KapitiRd\FGL-_20261013_NZTM_NZVD16.asc [new]
- POST-KapitiRd\Wh_MIKE11_openchannels_0p5m_POSTkapiti_NZVD2016.tif [edited]
- POST-KapitiRd\2d_zsh_WhKapitiRdPOST_UMM_cut_R.shp [edited]
- POST-KapitiRd\2d_zsh_WhKapitiRdPOST_R.shp
- POST-KapitiRd\2d_zsh_WhKapitiRdPOST_L.shp|gis\POST-KapitiRd\2d_zsh_WhKapitiRdPOST_P.shp

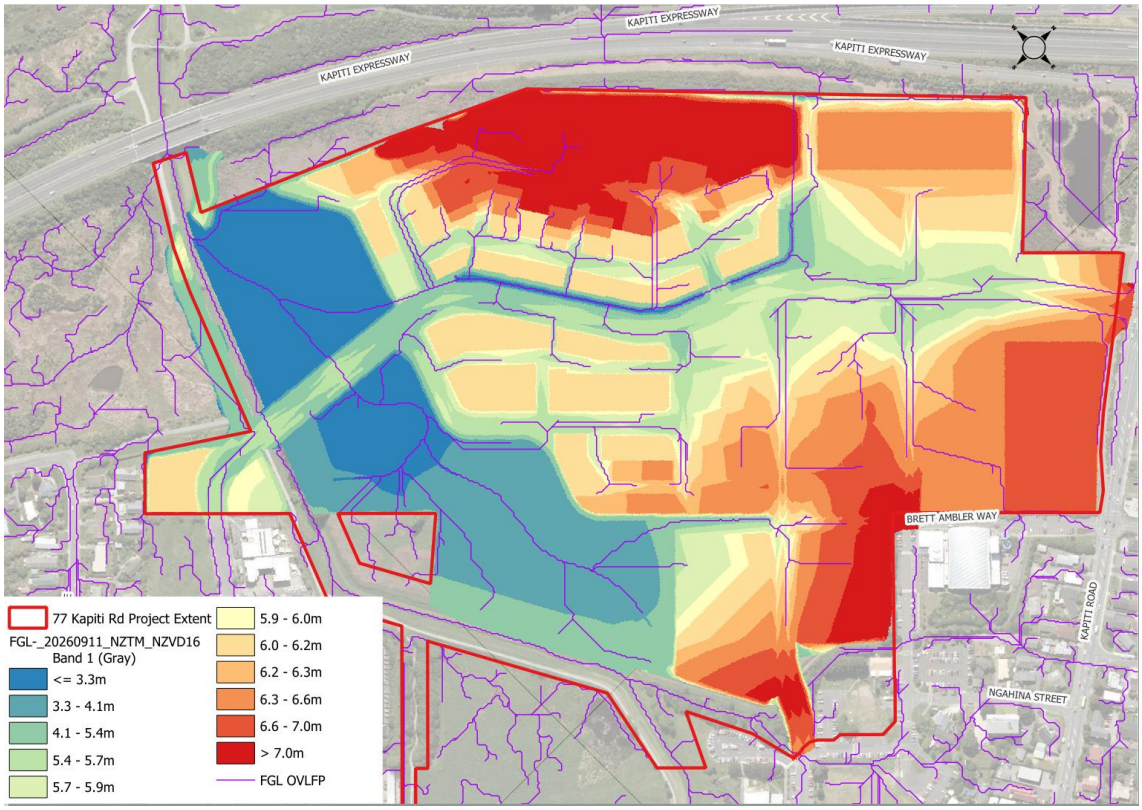


Figure 15. Post development topography

8.1.2 SW NETWORK

The proposed stormwater system was brought into the post-development scenario to the primary and secondary system. These elements are listed below and shown in **Figure 16**:

Primary System:

- 49 between single and double cesspits.
- 87 manholes.
- 10 outfalls.
- 134 pipes with diameters between 225 mmø and 750 mmø. Total length 3680 m approximately.

Secondary System:

- Pipelines connection between existing pond at Kapiti Road and the proposed swale. This consists in the connection between the existing manhole KSWN014132 through a 900mmø pipeline. Two manholes and one outlet are included on this update.
- Culvert to connect the artificial drain on the west boundary (next to Kapiti Expressway) and the proposed swale via 1050 mmø pipe.
- Culvert along the proposed swale through projected internal road via 1 x 1600 mmø.
- Culvert from the proposed swale to the upgraded wetland trough a 2.0 m width by 1.5 m height.
- Culvert along the existing eastern drain through the proposed road (connection to Iver Trask Place) via 2 x 1350 mmø.
- Connection culverts between the upgraded wetlands via one 3.0 m by 1.5 m and two 2.0 m by 1.5 m rectangular culverts.
- Proposed connection between the southern wetland and Wharemauku Stream via one 4.0 m by 1.5 m and two 2.0 m by 1.5 m rectangular culvert.
- Additional connection between southern wetland and the Wharemauku Stream with a 1050ø culvert.

The following stormwater network layers have been added to:

Primary System	POST-KapitiRd\1d_nwk_pit_WhKapitiRdPOSTnwk_P.shp
	POST-KapitiRd\1d_mh_WhKapitiRdPOSTnwk_P.shp
	POST-KapitiRd\1d_nwk_pipes_WhKapitiRdPOSTbase_L.shp
	POST-KapitiRd\1d_nwk_pipes_WhKapitiRdPOSTnwk_L.shp
	Boundary Conditions
	POST-KapitiRd\2d_bc_WhKapitiRdPOSTbase_P.shp
	POST-KapitiRd\2d_bc_WhKapitiRdPOSTnwk_P.shp
Secondary System	POST-KapitiRd\1d_mh_WhKapitiRdPOST_P.shp
	POST-KapitiRd\1d_nwk_pipes_WhKapitiRdPOST_L.shp
	Boundary System
	POST-KapitiRd\2d_bc_WhKapitiRdPOST_P.shp
	POST-KapitiRd\2d_bc_WhKapitiRdPOST_connections_L.shp

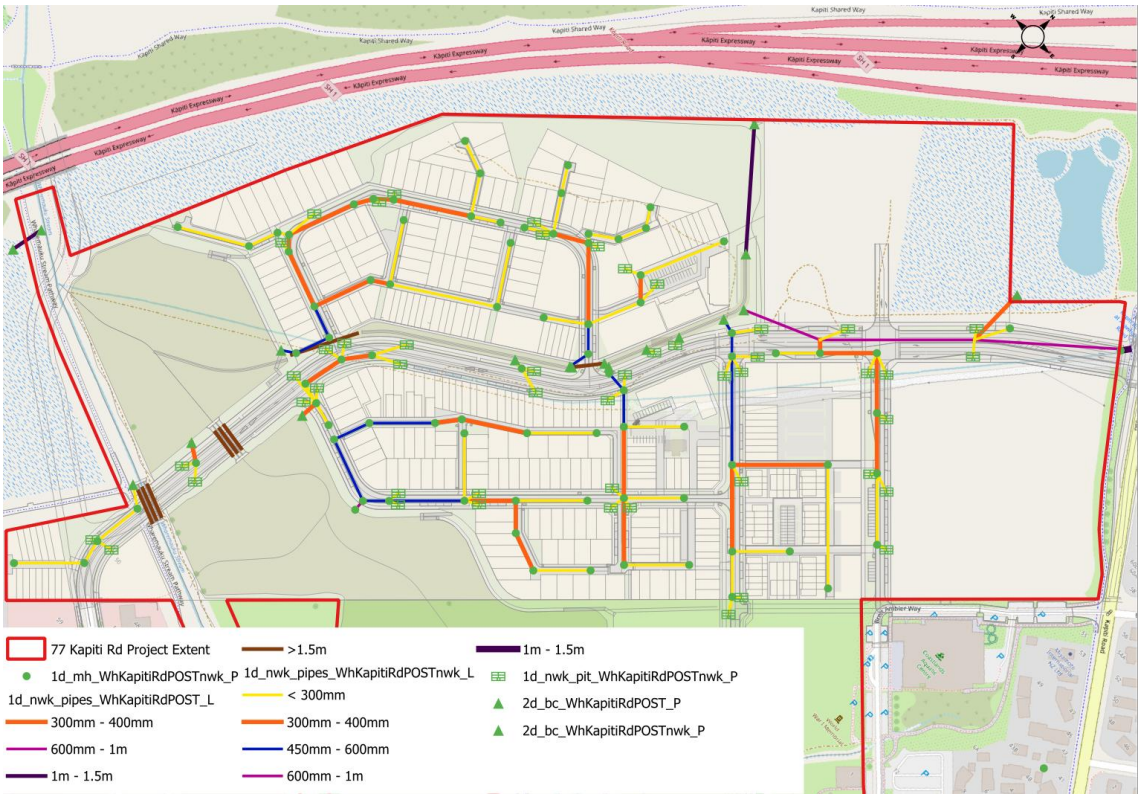


Figure 16. Post-development. Proposed stormwater network.

8.1.3 ROUGHNESS

Changes to surface roughness are shown in Figure 17 to reflect a better alignment within the development area. The Manning values for the used in the update correspond to the values used in the provided model and shown in Table 3. The following layers have been updated in the model database to represent this change.

- 2d_mat_WhKapitiRdPOST-Road_R.shp
- 2d_mat_WhKapitiRdPOST-Openspace_R.shp
- 2d_mat_WhKapitiRdPOST-Grass_R.shp
- 2d_mat_WhKapitiRdPOST-Residential_R.shp
- 2d_mat_WhKapitiRdPOST-Raingarden_R.shp
- 2d_mat_WhKapitiRdPOST_openchannels_R.shp

Table 3. Post-development – Roughness values

SURFACE	Manning		
	Material Code	Name	n
Grass	15	Grass (Maintained Grass)	0.03
Open space	7	Rough low vegetation (Scrub)	0.2
Raingarden	15	Grass (Maintained Grass)	0.03
Residential	31	Other impervious (Paved)	0.02
Road	30	Roads (Paved)	0.02
Main channels	2	Water (Channel Bed)	0.025
Wetlands proposed	42	Pond / wetland	0.08
Stream bed	5	River (Channel Bed)	0.03



Figure 17. Post-development roughness.

8.1.4 SOIL

Due the changes on the land use some changes on the soil were made to the model. are shown in Figure 17 to reflect a better alignment within the development area. The soil parameters correspond to the values used in the provided model and shown in Table 4. The following layers have been updated in the model database to represent this change.

- 2d_soil_WhKapitiRdPOST-Road_R.shp
- 2d_soil_WhKapitiRdPOST-Openspace_R.shp
- 2d_soil_WhKapitiRdPOST-Grass_R.shp
- 2d_soil_WhKapitiRdPOST-Residential_R.shp
- 2d_soil_WhKapitiRdPOST-Raingarden_R.shp

Table 4. Post-development soil parameters.

SURFACE	Soil					
	Soil Code	Name	Initial Loss	Continuing Loss	Porosity	Initial Moisture
Grass	84	! sand compacted Low Producing Grassland	10	70	0.2	0
Channel and Wetland	36	! peat compacted Water	5	0	0.21	0
Raingarden	191	! loess compacted Bushes and trees	10	10	0.03	0
Residential	19	! river loam uncompacted Other impervious	5	0	0.25	0
Road	107	! river loam compacted Roads	5	0	0.21	0
Wetland	38	! peat uncompacted Rough low vegetation	20	6	0.01	0



Figure 18. Post-development soil type.

8.1.5 LOT DP470759

As noted in the Substantive Application, Lot 2 DP 470759 was initially included within the earlier masterplan but has subsequently been excluded from the current Proposal. Accordingly, the proposed works and associated flood mitigation measures have been designed to ensure that flood risk to this property is not exacerbated by the development.

To achieve this, a protection bund has been incorporated into the hydraulic model (and earthworks design) along with three drainage pipes fitted with flap valves to enable drainage from within the protected area while preventing floodwaters from entering the property. These measures are intended to ensure that the proposed development does not increase flood risk to Lot 2 DP 470759.

The following layers have been updated in the model database to represent this change.

- POST-KapitiRd\2d_zsh_WhKapitiRdPOSTwall_L.shp
- POST-KapitiRd\1d_nwk_pipes_WhKapitiRdPOSTFlapPipe_L.shp
- POST-KapitiRd\2d_bc_WhKapitiRdPOSTFlapPipe_P.shp
- POST-KapitiRd\2d_zsh_WhKapitiRdPOSTwall_L.shp



Figure 19. Post-development. Lot DP470759 flood protection.

9.0 POST-DEVELOPMENT FLOOD HAZARD

For an easier interpretation of the results the following check elements have been created to assess the flood hazard:

- 11 checkpoints were selected to extract the maximum flood depth, maximum velocity and maximum water level.
- 8 cross section to extract flow, water levels and velocities.
- 3 long profiles to extract to the see the maximum water levels along the Wharemauku Stream.

These check elements are shown in and Table 4 and they have been included in the following sections.

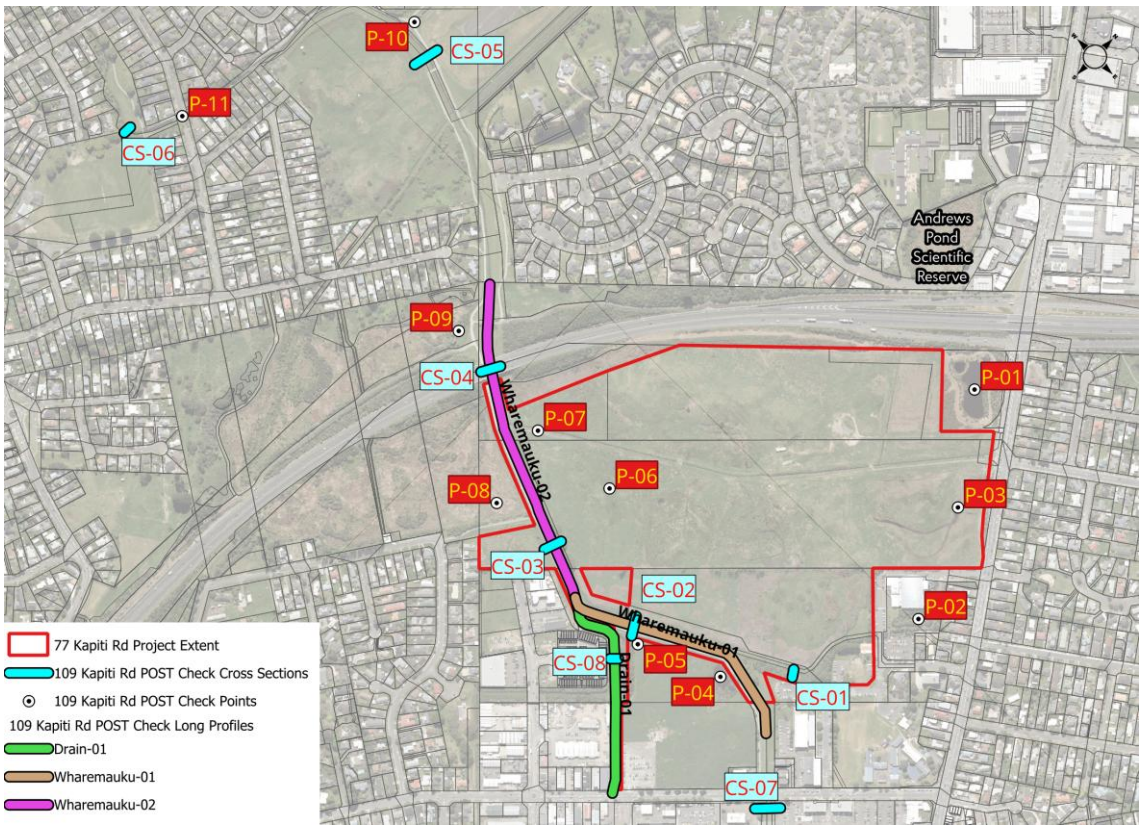


Figure 20. Model results check elements

9.1 FLOOD DEPTH

The updates outlined in Section 8.1 were made to the provided model. This allows for a site-specific understanding of flood risk and modelling of mitigation measures.

Figure 21 and Figure 22 show the post-development flood depths across the site for the 10- and 100-year ARI events. These show that, as anticipated, flooding is now concentrated in the flood storage wetland and the roadside swales. There is limited ponding in some areas of the road network at isolated low points.

The flood volume in the 10- and 100-year ARI events in the pre-development scenario is 90,030 m³ and 132099 m^3 respectively. Most of this is concentrated in the deeper ponding areas shown in Figure 21 and Figure 22. There is an increase in provided flood volume across the site of approximately 26,000 m^3 in the 100-year ARI event.

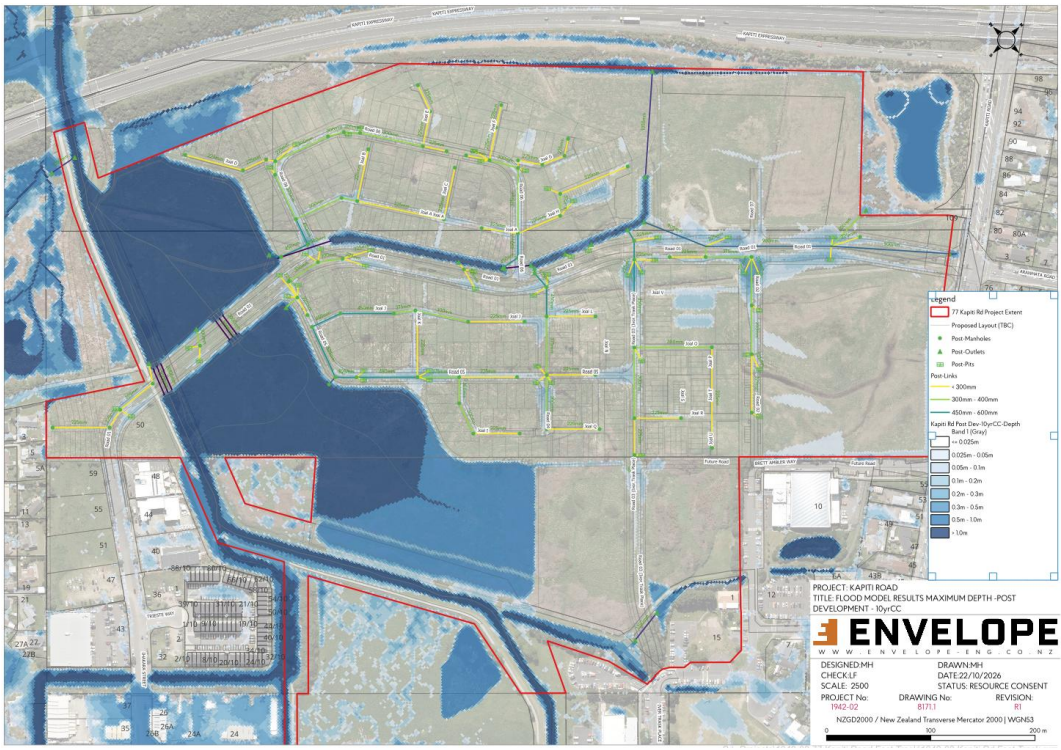


Figure 21. Post-development flood depth hazard, 10-year ARI event.

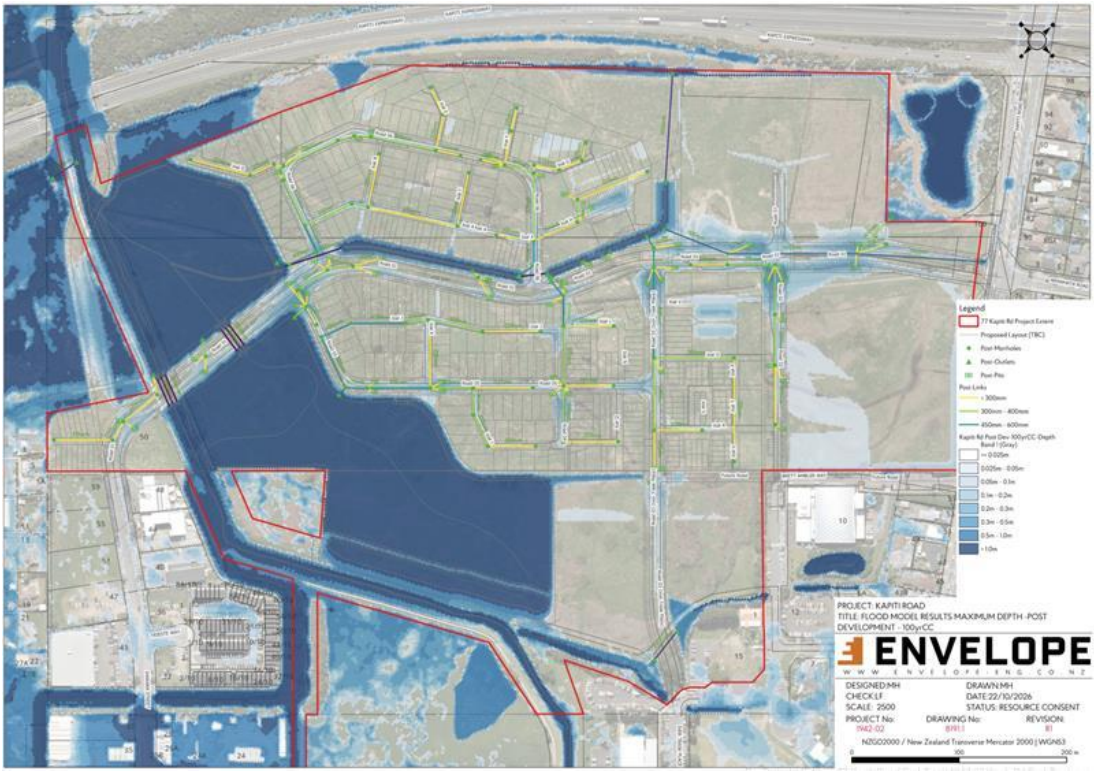


Figure 22. Post-development flood depth hazard, 100-year ARI event.

Table 5. Post-development. Check Points Maximum depth and maximum water level.

ID	Name	Pre-Development				Post-Development			
		10yrCC		100yrCC		10yrCC		100yrCC	
		Depth	WL	Depth	WL	Depth	WL	Depth	WL
		[m]	[mRL]	[m]	[mRL]	[m]	[mRL]	[m]	[mRL]
P-01	Kapiti Road Pond	0.90	5.85	1.29	6.24	0.90	5.84	1.31	6.26
P-02	Coastlands Aquatic Centre	1.20	6.00	1.53	6.32	1.64	6.44	1.81	6.61
P-03	77 Kapiti Rd - North	0.51	5.15	0.58	5.22	0.01	6.76	0.02	6.77
P-04	179 Rimu Rd - North	0.63	5.35	0.86	5.58	0.63	5.35	0.81	5.53
P-05	179 Rimu Rd - South	0.57	5.21	0.94	5.58	0.43	5.08	0.90	5.54
P-06	77 Kapiti Rd - Southeast	0.69	4.48	1.01	4.80	1.78	4.82	2.42	5.47
P-07	77 Kapiti Rd - South	1.51	4.48	1.82	4.79	2.07	4.61	2.47	5.02
P-08	Kapiti Reserve - Southeast	1.31	3.84	2.11	4.64	1.35	3.88	2.12	4.65
P-09	Kapiti Reserve - Southwest	2.50	4.14	2.97	4.61	2.47	4.11	2.99	4.63
P-10	Kapiti airport	2.74	3.42	3.31	3.99	2.71	3.39	3.32	4.00
P-11	Tui Rd West	3.11	3.13	3.64	3.66	3.10	3.12	3.65	3.66

9.2 DEPTH DIFFERENCE

A comparison of the peak depth difference was undertaken for the 10-year and 100-year ARI events. Figure 23, Figure 24 shows the afflux depth maps for these scenarios. Table 6 shows the depth differences for these on the check points located in Figure 20. There are increases of the peak flood depth on the site. However, these are generally confined to the proposed roads, channels and flood management area.

10-year ARI changes

There are sporadic increases to the north of the site. These are related to an interaction with the modelled surface adjacent to the Aquatic Centre on Brett Ambler Way. As the stormwater layout for the Large Format Retail is not resolved, the landform modification "pushes" stormwater towards the existing sumps on Brett Ambler Way, with no surface water control currently modelled on the site. This causes an increase in water levels in the pond adjacent to the Aquatic Centre and minor increase in flood depth upstream of this resulting from a change in the downstream conditions. This can be readily resolved with additional modelling once the design of stormwater for the large format retail lot is confirmed.

There are also increases in the NZTA flood Management area opposite the site and Mass Planting area adjacent to the expressway. These are considered acceptable, as the purpose of this area (from consent documentation) is for flood management and planting. The increases are minor in terms of depth and there will be negligible change in effects from this (i.e. no increased maintenance).

We note that the flood model does not account for any attenuation from the site as this is not the purpose of the model. At lower flows, the effect of not modelling this is more pronounced. With attenuation included, the increases in depth will likely be negligible.

There are significant areas of flood depth decrease around the Rimu Road and Ihakara Street intersection and directly west of the expressway i.e. positive effects on the wider catchment.

100-year ARI changes

The 100-year ARI event shows similar patterns of increase and decreases adjacent to the site. These are reduced in magnitude as the assumptions made within the model e.g. surface and drainage



simplifications, have less effect in larger order events as the net flow is larger i.e. the effects are driven by hydraulics, and flood flows rather than runoff and differences in catchment parameters.

Table 6. Afflux Depth in metres. Check Points

ID	Name	Pre-Development		Post-Development		Afflux Depth	
		10yrCC	100yrCC	10yrCC	100yrCC	10yrCC	100yrCC
P-01	Kapiti Road Pond	0.90	1.29	0.90	1.31	-0.002	0.021
P-02	Coastlands Aquatic Centre	1.20	1.53	1.64	1.81	0.438	0.285
P-03	77 Kapiti Rd - North	0.51	0.58	0.01	0.02	-0.491	-0.558
P-04	179 Rimu Rd - North	0.63	0.86	0.63	0.81	0.000	-0.050
P-05	179 Rimu Rd - South	0.57	0.94	0.43	0.90	-0.135	-0.042
P-06	77 Kapiti Rd - Southeast	0.69	1.01	1.78	2.42	1.081	1.409
P-07	77 Kapiti Rd - South	1.51	1.82	2.07	2.47	0.562	0.649
P-08	Kapiti Reserve - Southeast	1.31	2.11	1.35	2.12	0.035	0.007
P-09	Kapiti Reserve - Southwest	2.50	2.97	2.47	2.99	-0.031	0.021
P-10	Kapiti airport	2.74	3.31	2.71	3.32	-0.022	0.009
P-11	Tui Rd West	3.11	3.64	3.10	3.65	-0.008	0.007

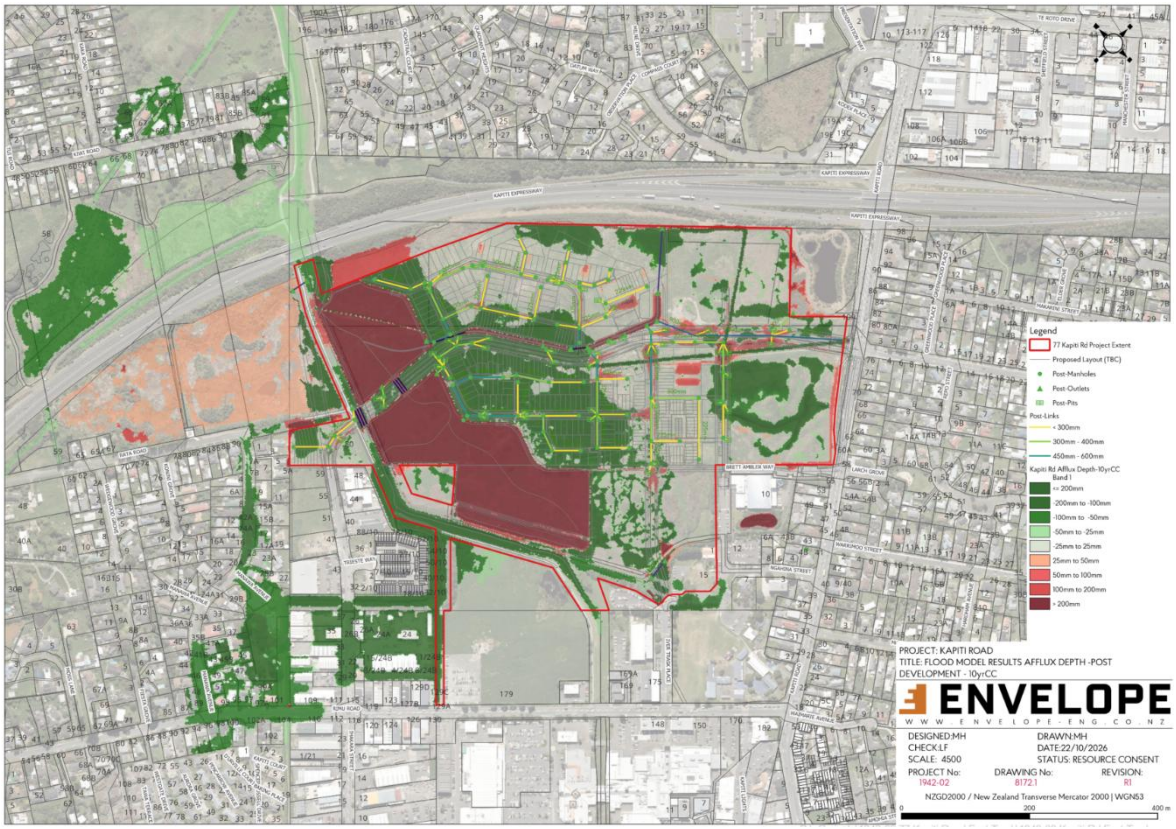


Figure 23. Afflux Depth – 10yrCC scenario

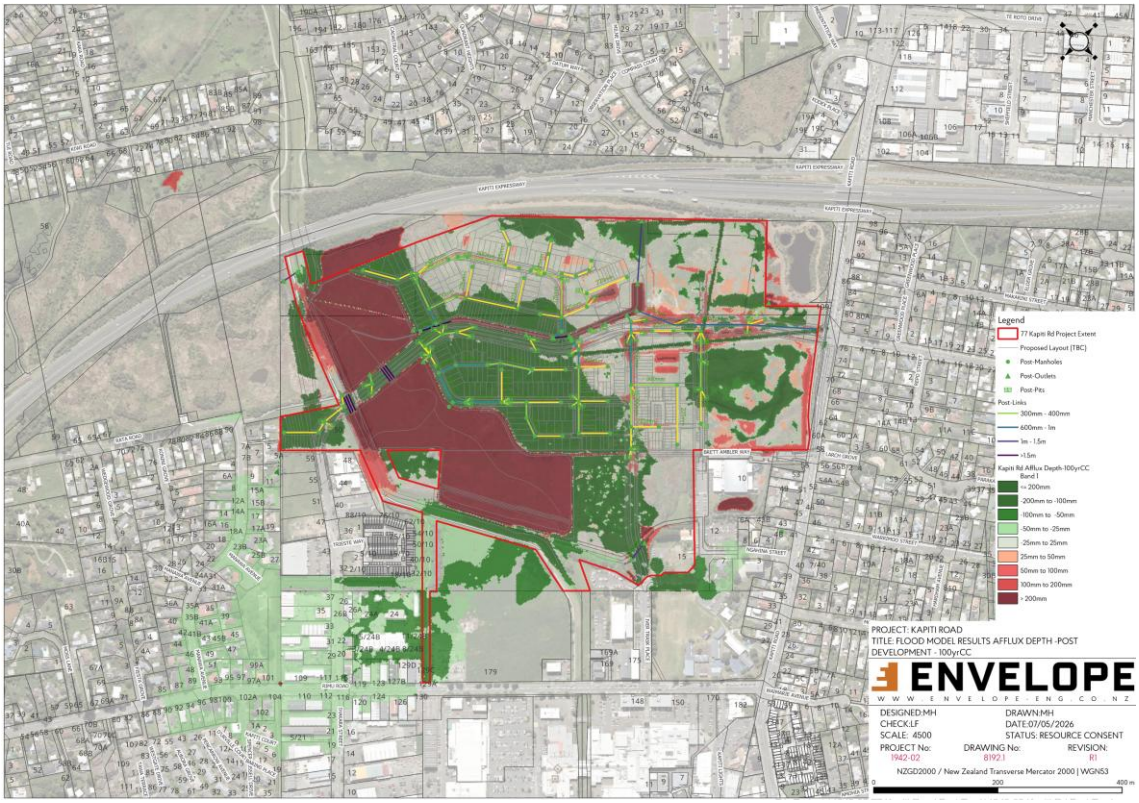


Figure 24. Afflux Depth – 100yrCC scenario.

9.3 FLOOD VELOCITES

The flood model velocities results for the site under the post-development scenarios are shown in Figure 25 to Figure 26, with afflux shown in Figure 27 and Figure 28 These show that there are generally decreases off site for velocity. Velocities within the wetland are within acceptable levels although specific detailing will be required at the detailed design stage for isolated areas of higher velocity. Velocities within the channels and particularly the Wharemauku Stream are generally reduced, which will reduce the impacts of scour and erosion. There are isolated increases in velocity adjacent to Rimu Road and Ihakara Street. However, these occur in conjunction with reduction in depths.

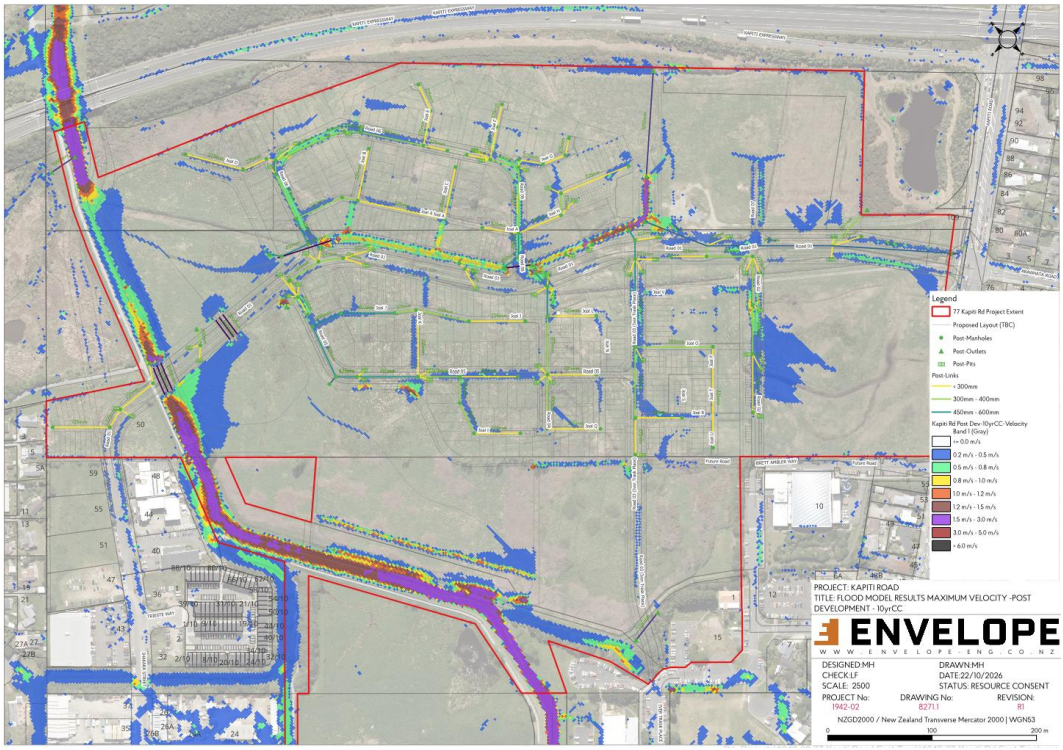


Figure 25. Post-development flood velocities hazard, 10-year ARI event.

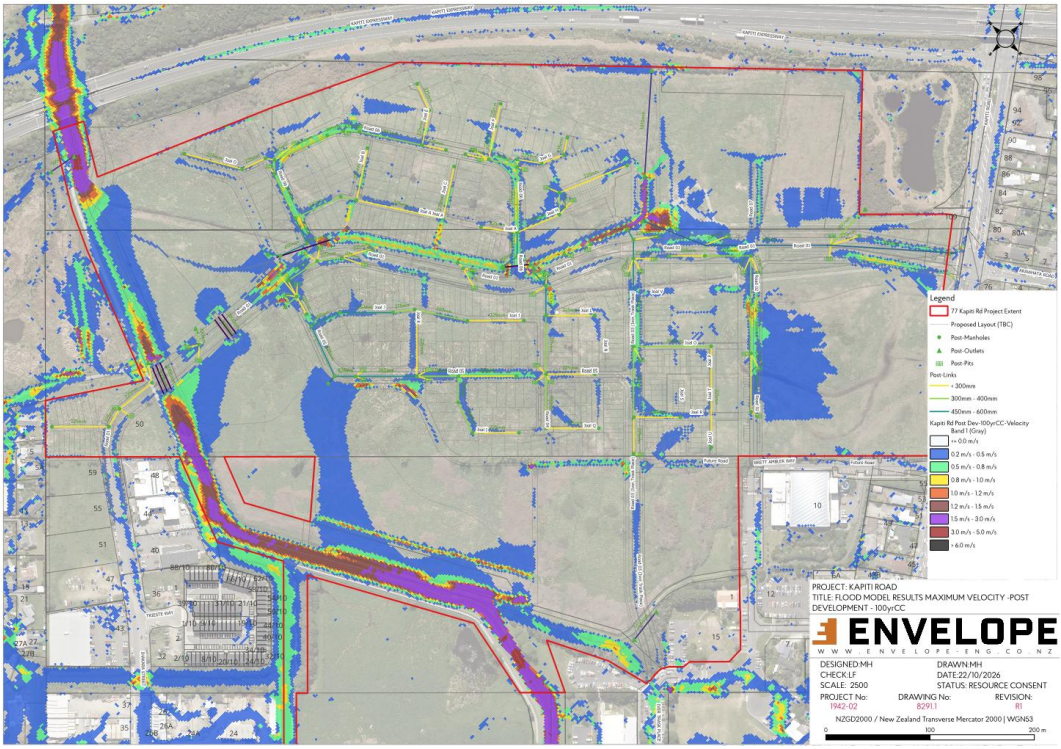


Figure 26. Post-development flood velocities hazard, 100-year ARI event.

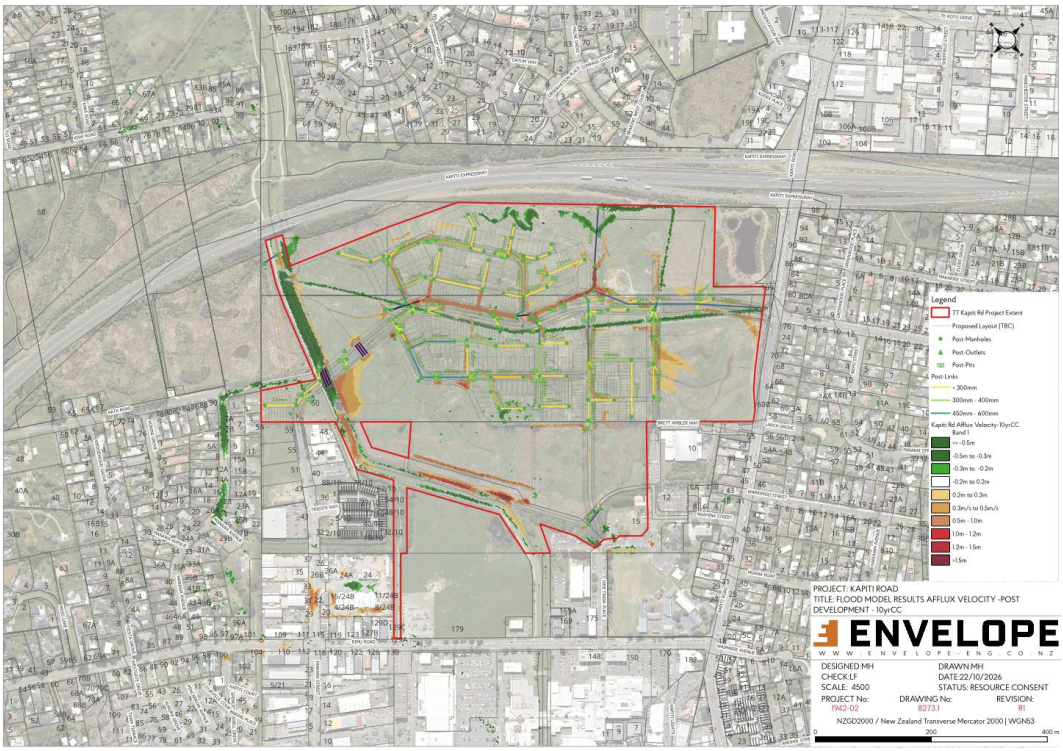


Figure 27. Afflux Velocity – 10yrCC scenario

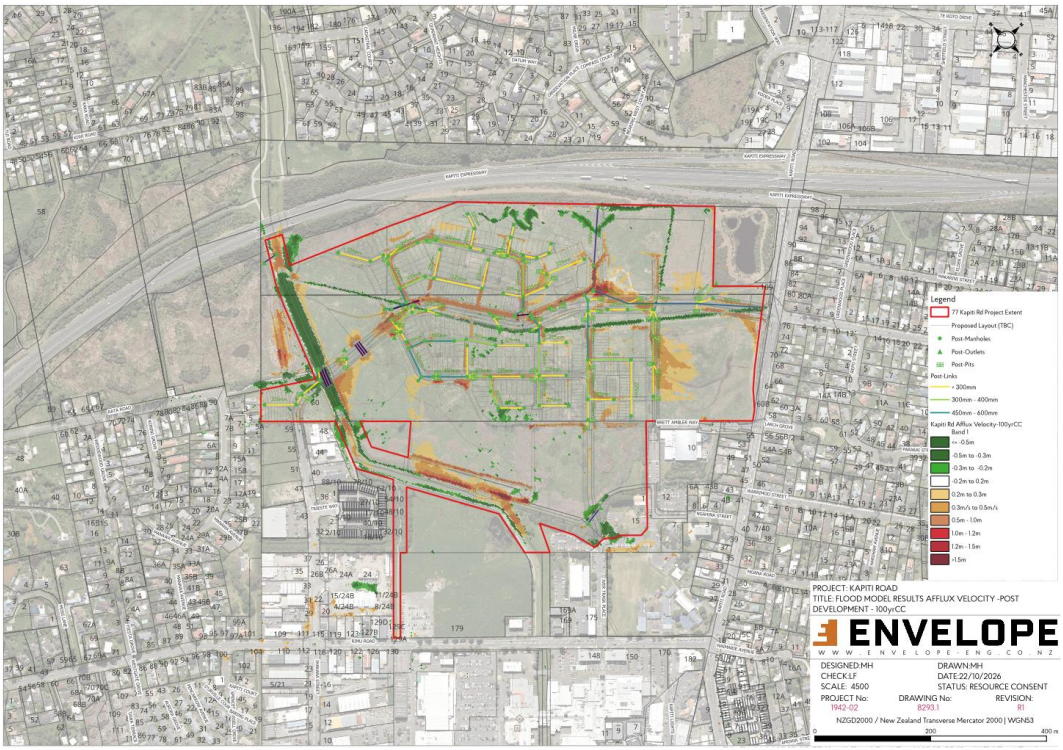


Figure 28. Afflux Velocity – 100yrCC scenario.

9.4 FLOOD HAZARD CLASSIFICATION

Figure 29 and Figure 30 shows the flood hazard classification following the guidelines of the ARR (as seen in Figure 12) for the 10-year and 100-year ARI events respectively. The proposed design can achieve a classification no higher than H1 for the residential and commercial areas (and roads) within the project extent. This means that in terms of flood risk, the proposed project can is generally safe for people, vehicles and buildings. There are some isolated areas of H2 hazard in localised low points,

which is considered acceptable for the 100-year event. The flood management area has a higher hazard classification (H3 to H5) which is expected and allowed for within the design of this area.

Figure 31 and Figure 32 show that there are no significant changes in mapped hazard between pre and post-development in the 10- and 100-year ARI events.

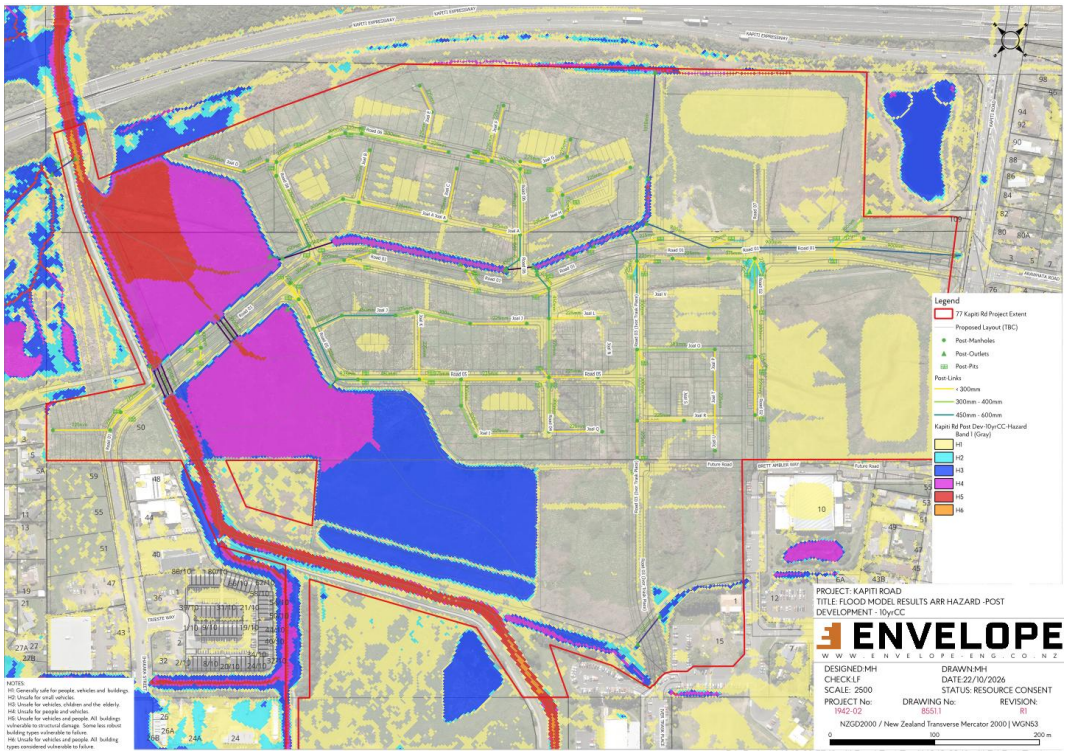


Figure 29. Post-development flood hazard classification, 10-year ARI event.

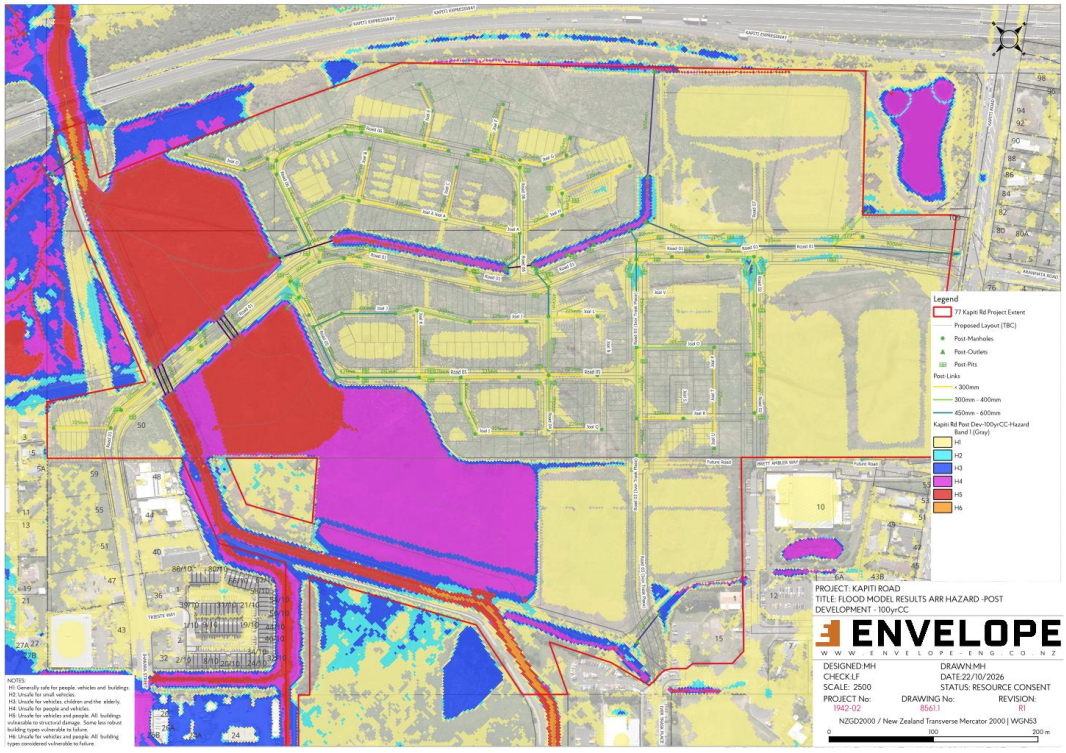


Figure 30. Post-development flood hazard classification, 100-year ARI event.

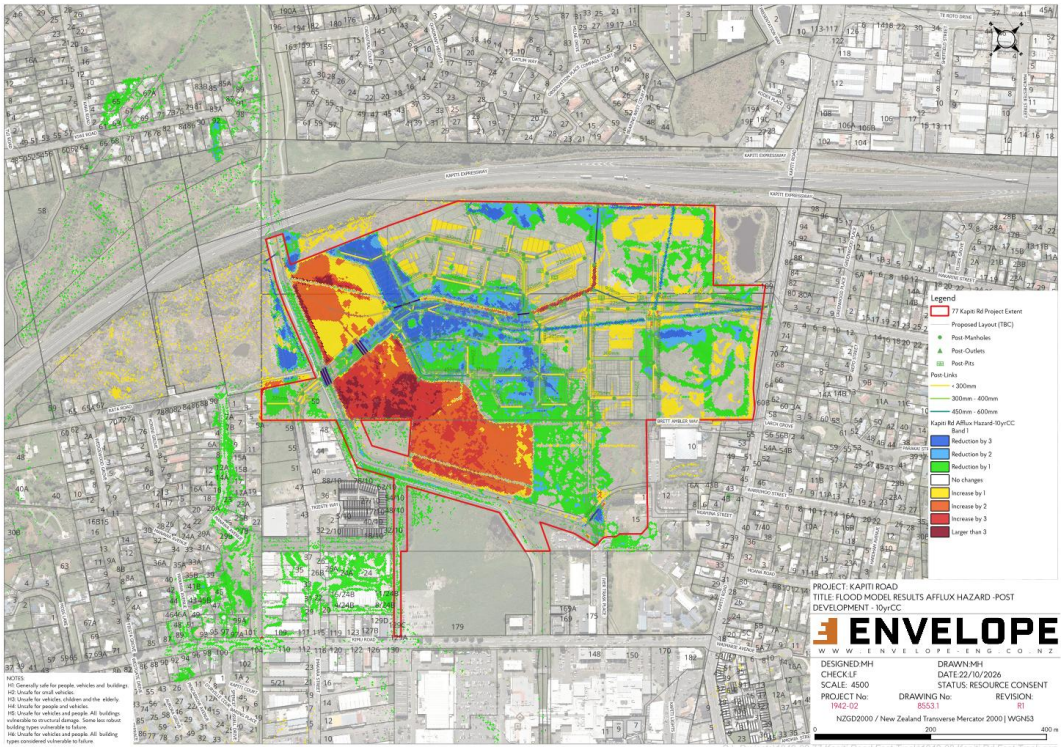


Figure 31. Afflux ARR Hazard – 10-year ARI event.

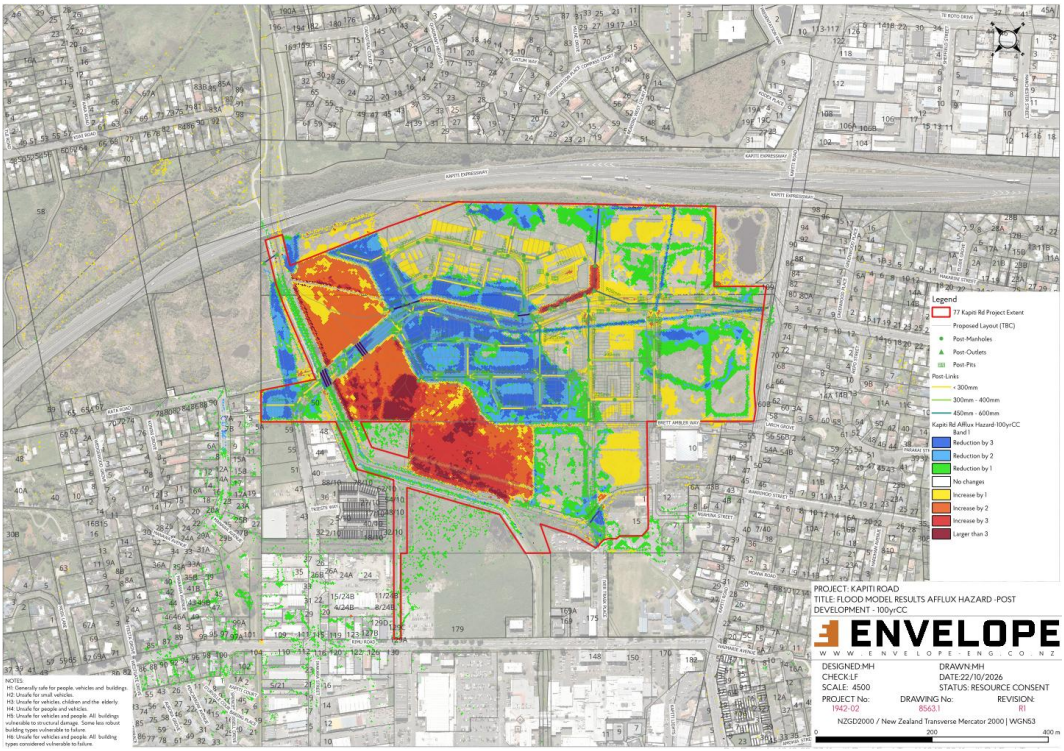


Figure 32. Afflux ARR Hazard – 100-year ARI event.

9.5 CROSS SECTIONS

Table 7, Table 8 and Table 9 shows the maxima flow, accumulated volume and maxima velocity respectively through the cross sections shown in Figure 20. Appendix 4 shows the flows on this cross section along the simulation time and Appendix 5 shows the maxima water elevations for all the scenarios listed in Table 1. Below some comments related to the cross sections assessment.

- As expected, flows along Wharemauku Stream are reduced compared with the existing scenario. the proposed project reduced the peak flows on the stream between -23 m^3/s and -5.8 m^3/s for the 100-year and 10-year ARI events respectively as seen on CS-03. This is due to the diversion of flow into the wetland.
- Dynamic flow behaviour shown in Appendix 4 shows how the 10-year and 100-year ARI scenario on sections CS-02 and 03 are lower before the existing peak time. This demonstrates the volume reduction towards the proposed wetland on the right bank of the stream.

Table 7. Pre and Post-development. Maximum Flow in m^3/s

Name	Pre-Development		Post-Development	
	10yrCC	100yrCC	10yrCC	100yrCC
01 Wharemauku Stream-Rimu Rd	28.8	37.7	28.5	37.8
02 Wharemauku Stream-Ihakara	30.0	35.8	24.2	24.5
03 Wharemauku Stream-Reserve	37.3	52.4	28.6	29.4
04 Wharemauku Stream-Kapiti Expressway	33.3	48.5	32.0	49.8
05 Wharemauku Stream-Airport	25.5	36.8	24.6	37.1
06 Wharemauku Stream-Weka Park	23.0	27.4	22.3	27.2
07 Drain East	7.9	17.8	8.8	17.3
08 Drain Northeast	3.4	4.7	3.6	6.3

Table 8. Pre and Post-development. Accumulated Volume (x 100 m^3)

Name	Pre-Development		Post-Development	
	10yrCC	100yrCC	10yrCC	100yrCC
01 Wharemauku Stream-Rimu Rd	547	952	541	945
02 Wharemauku Stream-Ihakara	636	1091	589	834
03 Wharemauku Stream-Reserve	744	1321	663	1022
04 Wharemauku Stream-Kapiti Expressway	786	1451	786	1461
05 Wharemauku Stream-Airport	876	1638	878	1635
06 Wharemauku Stream-Weka Park	869	1543	871	1540
07 Drain East	95	198	99	205
08 Drain Northeast	93	171	94	184

Table 9. Pre and Post-development. Maximum Velocity in m/s

Name	Pre-Development		Post-Development	
	10yrCC	100yrCC	10yrCC	100yrCC
01 Wharemauku Stream-Rimu Rd	3.2	3.7	3.2	3.7
02 Wharemauku Stream-Ihakara	1.4	1.4	1.4	1.4
03 Wharemauku Stream-Reserve	1.7	2.0	1.3	1.2
04 Wharemauku Stream-Kapiti Expressway	1.2	1.2	1.2	1.3
05 Wharemauku Stream-Airport	1.1	1.2	1.1	1.2

Name	Pre-Development		Post-Development	
	10yrCC	100yrCC	10yrCC	100yrCC
06 Wharemauku Stream-Weka Park	0.9	1.0	0.9	0.9
07 Drain East	0.4	0.6	0.4	0.6
08 Drain Northeast	0.7	0.7	0.7	0.7

9.5.1 LONGITUDINAL PROFILE

Appendix 6 shows the maxima water levels along the profiles shown in Figure 20 and Figure 33 shows the longitudinal on the proposed swale.



Proposed Swale

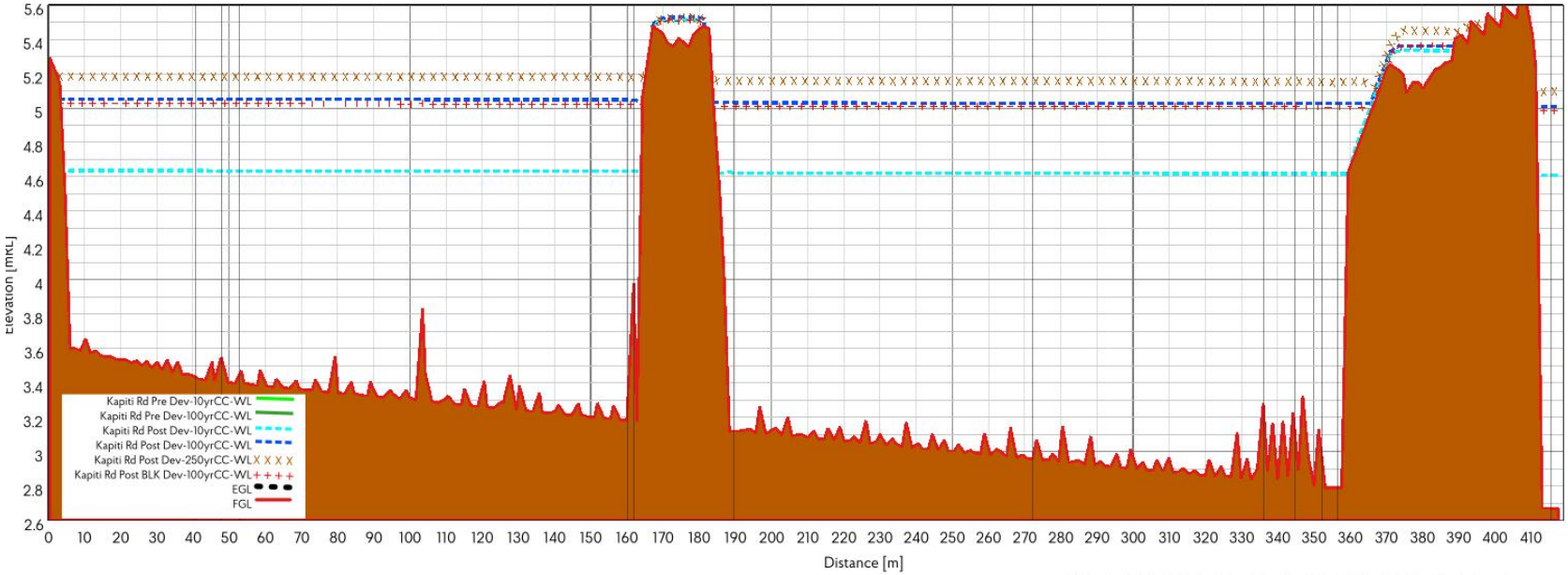


Figure 33. Post-development. Longitudinal profile along proposed swale

9.6 NZTA EFFECTS

NZTA has requested specific commentary around the effects on their land and the expressway. In the 10-year and 100-year ARI event, there are small increases in flood depth in the existing flood management area and mass planting area. These are considered acceptable, as the purpose of this area (from consent documentation) is for flood management and planting. The increases are minor in terms of depth and there will be negligible change in effects from this (i.e. no increased maintenance). There are no mapped changes in flood velocity.

10.0 SENSITIVITY TESTING

To assess the sensitivity of the model's outputs, various sensitivity testing scenarios have been undertaken. These have been done on the 100-year ARI post-development scenario. The purpose is to test what areas of the site are susceptible to changes in the input parameters to determine freeboard and requirements for floor levels. Additionally, the sensitivity testing shows how the system will respond to changes in parameters over time (e.g. changes in roughness from vegetation maturing).

10.1 INCREASED RAINFALL

Increased rainfall has been assessed primarily as a test of how the flood management system copes with additional rain compared to the design event. The 250-year ARI event has been assessed as this is a scenario that is already present within the KCDC provided flood model. This represents an approximately 15% increase in rainfall depth.

It should be noted that the KCDC flood models use the SSP5-8.5M. However, recent analysis by the Coupled Model Intercomparison Project (CMIP7) for the Intergovernmental Panel on Climate Change have suggested that real-world trends have diverged from the assumptions underpinning this scenario, making this scenario less plausible.[1]

With this context, the use of the 250-year ARI event is considered suitable for sensitivity testing.

The results in Figure 34 and Figure 35 shows the maximum flood depth and velocity hazard respectively. Also, maps are found in Appendix 3.

[1] Detlef P. van Vuuren et al., "The Scenario Model Intercomparison Project for CMIP7 (ScenarioMIP-CMIP7)," *Geoscientific Model Development* 19, no. 7 (2026): 2627–2656, https://doi.org/10.5194/gmd-19-2627-2026.

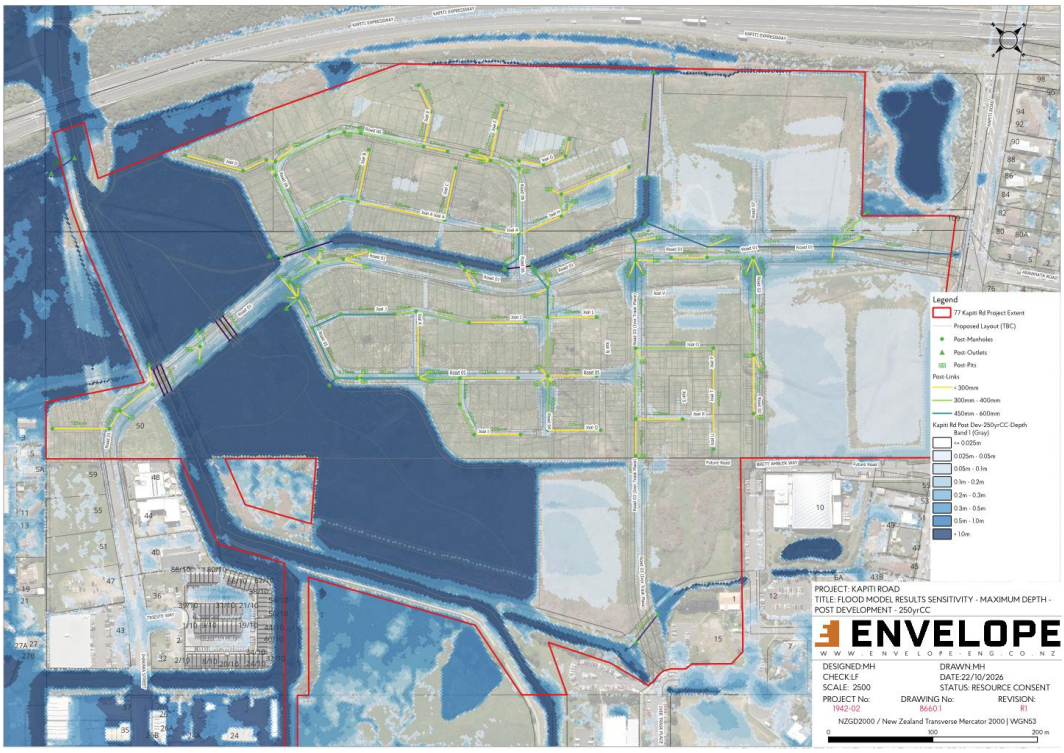


Figure 34. Post-development flood depth hazard, 250-year ARI event.

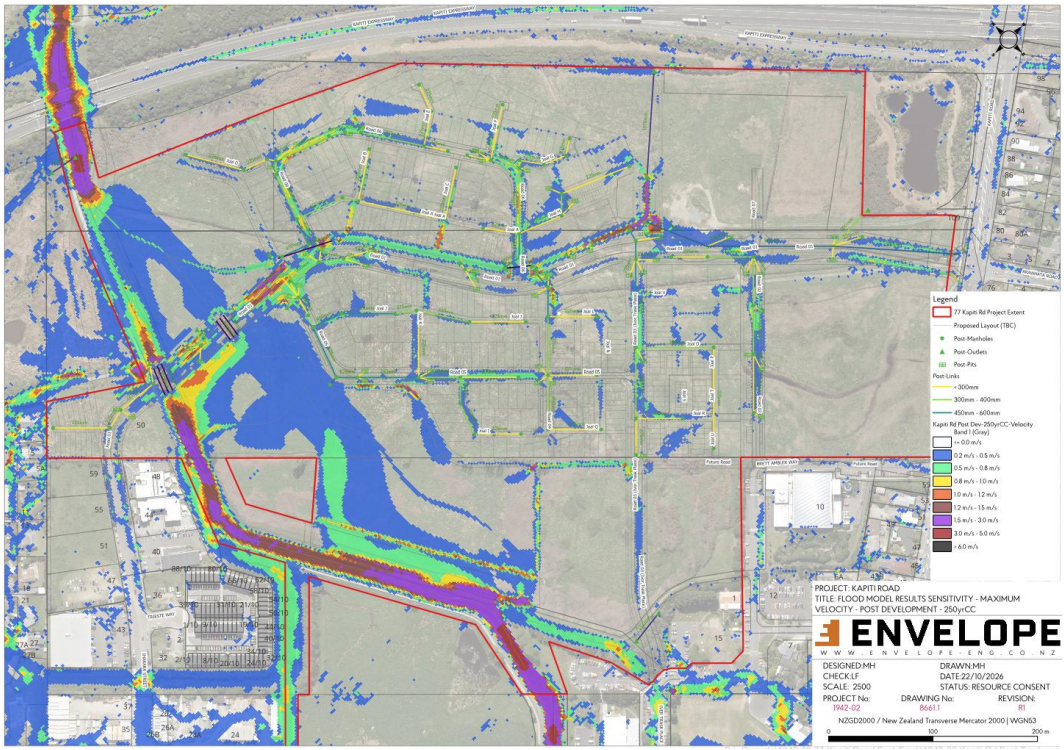


Figure 35. Post-development flood velocity hazard, 250-year ARI event.

10.2 PIPE BLOCKAGE

To test the effects of blockages of the stormwater network on the site, a model run was undertaken with blockage simulated, in accordance with the method in the Auckland Council Code of Practice in the section 4.3.5.6, and described below:

- For pipelines up to and including DN600, assume that the pipeline is 100% blocked.

- For pipelines between DN600 and DN1050, assume that the pipeline's capacity has been reduced by 50%.
- For pipelines in excess of DN1050, assume that the pipeline's capacity has been reduced by 10%.

These changes were applied to the secondary network described in section 8.1.2 of this report.

Blocked scenario model results are shown in Appendix 3, **Figure 36** and **Figure 37**.

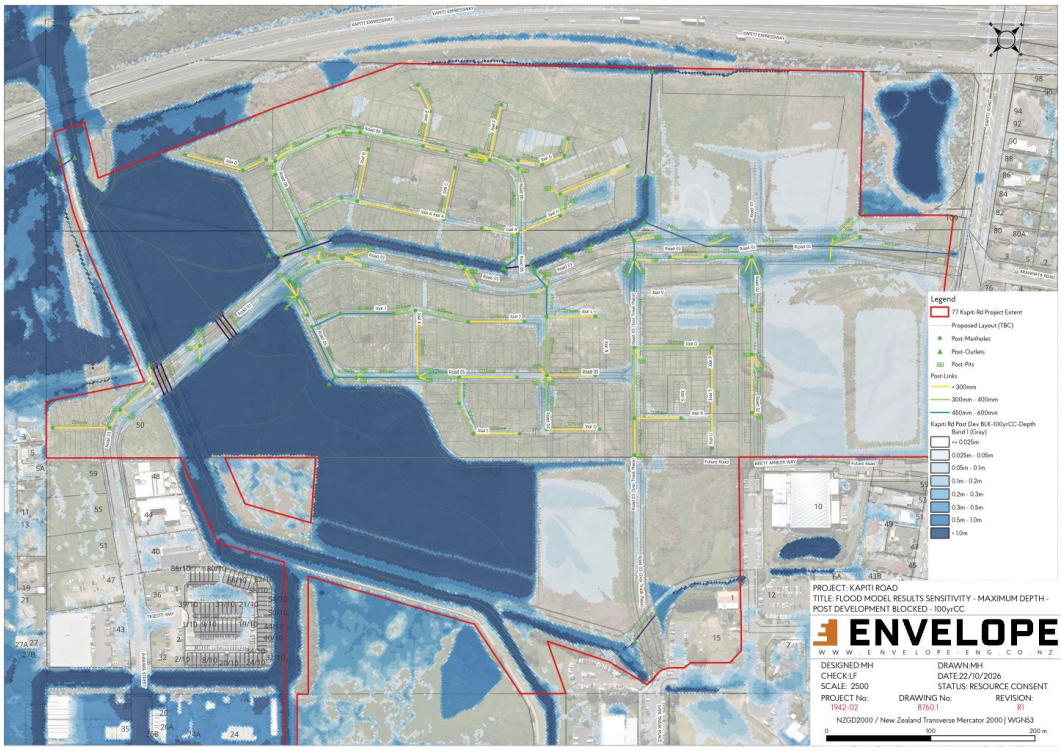


Figure 36. Post-development blocked flood depth hazard, 100-year ARI event.

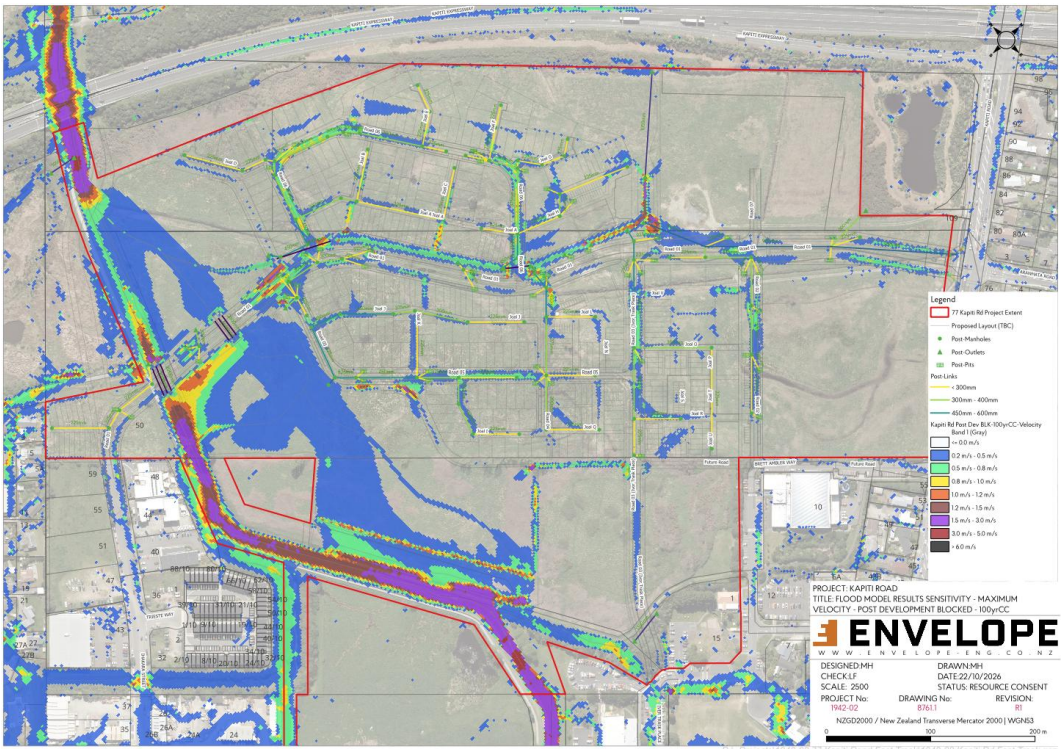


Figure 37. Post-development blocked flood velocity hazard, 100-year ARI event.

10.3 SEDIMENTATION

As outlined within the Envelope Engineering Stormwater Management Plan, the Wharemauku is subject to sediment aggradation in the lower channel reaches. While measures have been put in place within the design to reduce the amount of sediment that will enter the proposed wetland, we consider that a sensitivity test of wetland levels is appropriate to model and assess effects of possible sedimentation.

Water quality testing referenced in the SMP shows that sedimentation is primarily within flood events, with negligible TSS reported in KCDC monitoring during normal flows.

A desktop estimate has been made of the mean annual sediment load carried by the Wharemauku Stream past the site at 77 Kapiti Road. It is based on the catchment-specific Contaminant Load Model (CLM) assessment prepared for the MacKays to Peka Peka Expressway (Beca, 2011). That assessment predicted an existing sediment load of approximately 2,300 t/yr from the 1,499 ha Wharemauku catchment, an average yield of about 153 t/km²/yr. This yield has been applied to an assumed contributing catchment of approximately 10 km² upstream of the site, getting approximately 750 m³/year.

For sensitivity testing, we have assumed that 5% of this material is deposited in the wetland. Across a planning horizon of 100 years, this results in an approximate 75 mm increase in depth. We have modelled this as a 200 mm and 500 mm increase for sensitivity testing purposes.

The analysis shows that the flood storage on the site is relatively insensitive to increases in sedimentation depth, and reasonable allowances for sedimentation do not significantly increase on or off-site flood risk.

10.4 CHANNEL ROUGHNESS

The roughness for the channels and wetland has been adopted using the same roughness values as similar established parts of the catchment. The roughness used for the proposed wetland is 0.08. This is comparable to the adjacent flood management area on the south of the Wharemauku Stream constructed by NZTA as part of the Kapiti Expressway. Similarly, the open channels use roughness of 0.025 which is consistent with the wider catchment for channels.

Despite roughness coefficients being used for established catchment parameters, it is appropriate to test the sensitivity of the model to the roughness. Roughness values have been increased by 25% and 50% for channel and wetland areas.

The analysis shows that the flood storage on the site is relatively insensitive to increases in roughness, and reasonable allowances for roughness increase as a result of maturing vegetation do not significantly increase on or off-site flood risk.

11.0 ASSESSMENT OF EFFECTS

The effects of the proposed development on surrounding areas have been assessed by comparing the pre-development and post-development model results for the 10-year and 100-year ARI events, including climate change. The assessment considers changes in flood levels, depths, extent, flows, velocities and flood hazard classifications.

Flood Storage

The proposed earthworks change the distribution of flood storage across the Site, with existing low-lying areas raised to accommodate development and additional storage provided within the proposed wetland and flood management areas adjoining the Wharemauku Stream.

The modelling shows that the proposed development does not result in a net loss of flood storage. Approximately 26,000 m^3 of additional flood storage is provided during the 100-year ARI event compared with the pre-development scenario.

The increased flood depths within the proposed wetland are expected, as this area has been specifically designed to accommodate floodwaters displaced from other parts of the Site.

Flood Levels and Depths

The modelled changes in flood depths are shown in Figure 23 and Figure 24, with the results at the selected checkpoints summarised in **Error! Reference source not found.**.

The results show that flood depths generally remain unchanged or reduce in areas surrounding the Site. Reductions are identified around Rimu Road, Ihakara Street and parts of the adjoining residential and commercial areas.

There are some localised increases in flood depths outside the development area. These are generally small, with increases of approximately 7–21 mm identified at several downstream checkpoints during the 100-year ARI event. These changes are within the adopted model tolerance of 25 mm and are not considered to represent a material change in flood conditions.

In general, the proposed works have a positive effect on the immediately upstream and downstream flood depths.

Flood Extent

The proposed development changes the distribution of flooding within the Site, with floodwaters directed towards the proposed swales and flood management areas.

The post-development flood extent maps show that flooding is largely contained within these areas, with the proposed residential and commercial development areas generally remaining outside the principal flood extents.

There are no areas of significant increase of flood extent beyond the model boundary. There are however, decreases in flood extent. Particularly around the Ihakara Street, Rimu Road intersection.

Flood Flows

Peak flows have been compared at eight cross-sections along the Wharemauku Stream and associated drainage channels.

The results show reductions in peak flows along parts of the Wharemauku Stream adjoining the Site. At CS-03, peak flows reduce from 37.3 m^3/s to 28.6 m^3/s in the 10-year ARI event and from

52.4 m^3/s to 29.4 m^3/s in the 100-year ARI event. These reductions reflect the additional flood storage provided within the proposed wetland and flood management areas.

Flood Velocities

The pre-development and post-development velocity results are shown in Figure 25 and Figure 26.

The modelling shows that flood velocities generally reduce along parts of the Wharemauku Stream adjoining the development. Within the proposed wetland, velocities are generally between 0.1 m/s and 0.6 m/s, with higher velocities concentrated within the defined drainage channels and swales.

The model also identifies some localised increases in velocity associated with the reconfigured drainage network and wetland connections.

Flood Hazard

Flood hazard classifications have been assessed using the Australian Rainfall and Runoff depth and velocity hazard categories.

The post-development results show that the proposed residential and commercial areas and most of the road network achieve an H1 classification. Small areas of H2 hazard are identified at isolated low points within the road network during the 100-year ARI event.

Higher hazard classifications are concentrated within the proposed wetland and flood management areas, where deeper flooding is expected.

There are no material changes in flood hazard category to areas outside of the site.

Summary

The hydraulic modelling shows that the proposed development increases the flood storage capacity within the Site and generally maintains or reduces flood levels and depths in surrounding areas.

The proposed earthworks and stormwater infrastructure change the distribution of floodwaters within the Site, with flows directed towards the proposed wetland and flood management areas. The modelling indicates that this can be achieved without materially increasing flood flows, velocities or hazard in surrounding areas.

There are some localised changes in flood levels, depths and flows which require further explanation, particularly around the Coastlands Aquatic Centre pond. Subject to confirming these effects with additional modelling at detailed design stage, the modelling indicates that the proposed development will not result in a material increase in flood risk to surrounding properties or infrastructure.

12.0 NPS – NATURAL HAZARDS

The National Policy Statement for Natural Hazards 2025 (NPS-NH) came into force on 15 January 2026 and applies to flooding, among other hazards. Its objective is that natural hazard risk to people and property associated with subdivision, use and development is managed using a risk-based proportionate approach.

To achieve this, risk must be assessed using a prescribed risk matrix that combines the likelihood of a natural hazard event occurring (expressed as AEP/ARI) with the consequence of a natural hazard event for life and property, taking into account existing and proposed mitigation measures and the residual risk that arises when design thresholds of any existing and proposed mitigation measures are exceeded.

Very high risk must be avoided, high or medium risk must be avoided or mitigated in proportion to the level of risk, and any creation of, or increase in, significant natural hazard risk on other sites must likewise be avoided or mitigated. Assessments must be based on the best available information, and the potential impacts of climate change to at least 100 years into the future must be considered.

This assessment has been prepared consistent with that framework. It uses the most recent KCDC Wharemauku catchment model, supplied in June 2026 and refined with site-specific survey, and the design scenarios adopt SSP5-8.5 (medium) climate projections to 2130, extending beyond the 100-year horizon required by the NPS-NH.

Under the NPS-NH likelihood table, the 1% AEP (100-year ARI) design event falls within the "Possible" category and the 10% AEP (10-year ARI) event within "Almost certain". With the proposed mitigation in place, the residential and commercial areas and most of the road network achieve an ARR H1 hazard classification in both events, and building floor levels are recommended to have appropriate freeboard above the adjacent maximum 1% AEP flood level, so the consequence for life and property in these areas is expected to be no greater than Minor/Negligible, giving a low level of natural hazard risk under the risk matrix.

Residual risk from exceedance of design thresholds has been considered through sensitivity testing of increased rainfall, pipe blockage, sedimentation and channel roughness, which informs the recommended freeboard. Regarding effects on other sites, the development provides approximately 35,000 m^3 of additional flood storage in the 100-year ARI event, reduces peak flows in the adjoining reach of the Wharemauku Stream, and results in no material change in flood hazard category outside the site, with modelled off-site depth changes within the adopted 25 mm model tolerance. On this basis, and subject to confirming the localised effects around the Coastlands Aquatic Centre pond through detailed design, the Project is not expected to create or increase significant natural hazard risk on other sites and is considered consistent with the objective and policies of the NPS-NH.

13.0 RECOMMENDATIONS

The site is suitable for development, provided the following recommendations are adhered to:

Floor Levels

Recommended Build Levels (to underside of concrete slab or timber joist) should be a minimum of 500 mm above immediately adjacent flood levels in the 100-year ARI event. Building levels can be set in accordance with Building Code requirements, where the adjacent flooding is less than 100 mm depth, with a suitable overland flow path away from the building.

Additional Modelling

It is recommended that the flood modelling is updated at the engineering approval stage, to confirm that the conclusions and recommendations apply to the final design.

The updated Flood Modelling Report shall:

- Incorporate the final proposed ground levels, road levels, culverts, stormwater infrastructure, overland flow paths and flood storage areas relevant to the stage;
- Demonstrate that the proposed flood storage and conveyance arrangements maintain the flood management functions relied upon in the Flood Risk Assessment;
- Assess the effects of the final design on flood levels, extents and flow velocities within and beyond the Site, including comparison with the outcomes identified in the Flood Risk Assessment;
- Incorporate the proposed wetland compensation area's final landform and appropriate hydraulic roughness assumptions, having regard to the proposed vegetation and planting characteristics;
- Demonstrate that the flood management arrangements are compatible with the proposed wetland compensation area, including the hydrological conditions required for wetland establishment and ongoing functioning;
- Adopt rainfall, climate change, tidal boundary and other hydraulic modelling assumptions consistent with those used in the Flood Risk Assessment, unless alternative assumptions are supported by the updated technical assessment; and
- Identify any changes to the proposed flood management measures required as a result of detailed design and demonstrate that the resulting flood effects remain consistent with those assessed in the Flood Risk Assessment.

14.0 DISCLAIMER

This report is for the use of New Central Park Limited only and should not be used or relied upon by any other person or entity or for any other project.

This report has been prepared for the project described to us and its extent is limited to the scope of work agreed between the client and Envelope Engineering Limited. No responsibility is accepted by Envelope Engineering Limited or its directors, servants, agents, staff or employees for the accuracy of information provided by third parties and/or the use of any part of this report in any other context or for any other purposes.



APPENDICES

APPENDIX 1 BASE LAYER DESCRIPTION

GROUNDWATER – (BC_DBASE FOLDER)

Groundwater levels were approximated from vector polygon layers provided by Tonkin & Taylor on 20 January 2022 from a project for GWRC (Gyopari et. al. (2014). These layers are based on the 50th percentile estimate of groundwater table elevation from 20-year MODFLOW simulations with the sea level rise projections used as the Mean Level of the Sea.

RAINFALL – (BC_DBASE FOLDER)

HIRDS v4 has been used to generate the range of design storms for modelling purposes. Rainfall estimates for 2030 have been used for the baseline model scenarios. While conservative, 2030 has been adopted on the basis that it will take 3-5 years to implement the outcomes of this modelling work and embed funding for mitigating risk.

Future climate change scenario rainfall depths were generated by scaling baseline rainfall depth estimates with augmentation factors taken from NIWA (2018a) and temperature increase (anomaly) estimates from the appropriate RCP scenario and climate horizon.

TIDAL – (BC_DBASE FOLDER)

The proximity of Kāpiti to the coastline, together with its topography make flooding prone to tidal influence. Hence one of the key boundary conditions on the KCDC flood models is the design tide. Design tide is the simulation of tidal conditions during a storm event. Tides are composed of the elements listed below:

- Sea level rise (SLR) associated with climate change,
- Mean level of sea (MLoS) anomaly,
- Astronomical tidal cycle, including daily cycles and spring tides,
- Storm surge (wind setup and atmospheric pressure effects), and
- Wave setup and wave run-up.

RIVER BOUNDARIES – (BC_DBASE FOLDER)

Only two catchments use river flow as a boundary condition: Ōtaki (Ōtaki River and Waitohu Stream) and Waikanae (Waikanae River). The ARI hydrographs used for these catchments were drawn from MIKE models from GWRC prepared by Wallace (2012 and 2013). 50-year and 100-year ARI hydrographs were already available for the Otaki and Waikanae rivers. For 10-, 5- and 2-year ARI storm scenarios, river hydrographs were adjusted in line with Otaki and Waikanae rating curves supplied by GWRC (2022), which had been generated in May 2021.

MATERIALS_V0.5.CSV (MODEL FOLDER)

This csv contains the roughness values for the various land-use types in the district; no new roughness values can be added to this table without discussion with KCDC.

PIT_DBASE (MODEL FOLDER) *

This folder contains the dimensions and depth/flow relationship for all of the known sump and scruffy dome types in the KCDC district, no new sump type values can be added to this table without discussion with KCDC.

XS (MODEL FOLDER)

This folder contains the original open channel cross-section survey data used as the basis to create the 2D open channel dimensions.

SUB-CATCHMENTS *

Some of the TUFLOW models (Paekākāriki, Wharemauku, Waikanae and Te Kowhai include sub-catchment discharges in the steeper hill catchments. If development is to occur in these sub-catchments, then KCDC should be notified so a modelling approach can be agreed upon before modelling commences.

APPENDIX 2 RULES FLOOD HAZARD

NH-FLOOD- R1	Any activity not specified as a *permitted, controlled, restricted discretionary, discretionary, non-complying* or *prohibited activity* in NH-FLOOD rules.
Activity	1. The activity complies with all permitted activity standards in rules NH-FLOOD-R2 to NH-FLOOD-R7. Note: See NH-FLOOD-R2 for separation of buildings and structures from waterbodies standards, and INF-MENU in relation to water and stormwater rules for all development.
NH-FLOOD- R2	Any building or structure in any zone.
Permitted Activity	Standards 1. Separation from waterbodies a. Buildings (excluding minor buildings) shall not be sited within the river corridor or stream corridor (unless they are permitted activities under NH-FLOOD-R7): i. For the stream corridor and other waterbodies, including ephemeral and intermittent rivers or streams (except lakes) the minimum setback for any building or structure (other than a bridge or culvert structure for which a resource consent is required from the Regional Council) from the natural banks of any waterbody greater than 3 metres wide shall be 10 metres; ii. For streams/drains less than 3 metres wide, the minimum setback must be 5 metres where the average width of the stream or waterbody is measured as an average within the site. 2. Buildings (excluding minor buildings) must not be sited within 5 metres of a lake.
NH-FLOOD- R3	New or relocated buildings (excluding minor buildings) in ponding, residual ponding and shallow surface flow areas.
Permitted Activity	Standards 1. The building floor level of any new or relocated building (excluding minor buildings) in the ponding, shallow surface flow or residual ponding area shall be constructed above the 1% AEP flood event level.
NH-FLOOD- R4	Earthworks except where associated with the matters listed below: 1. the maintenance of a watercourse or stormwater control; 2. activities permitted under NH-FLOOD-R6; 3. maintenance activities within the legal road; 4. private farm tracks which are ancillary to permitted farming activities and are not within an outstanding natural features and landscapes;

	5. residual ponding areas where the earthworks permitted activity standards for the relevant zone are complied with (see EW-Earthworks for rules on earthworks); 6. earthworks subject to NH-FLOOD-R8 (i.e. within a flood storage or fill control area); 7. extractive industries (see NH-FLOOD-R7);
	8. the removal or replacement of underground fuel storage tanks; and 9. "earthworks" as defined in and regulated by the NESCF.
Permitted Activity	Standards 1. In an overflow path or residual overflow path (excluding fill which is addressed in NH-FLOOD-R10), earthworks: a. shall not involve the disturbance of more than 10m3 of land in any 10 year period; b. shall not alter the original ground level by more than 0.5 metres, measured vertically; and c. shall not impede the flow of floodwaters. 2. In ponding areas (excluding residual ponding areas) and shallow surface flow areas, earthworks: a. shall not involve the disturbance of more than 20m3 (volume) of land in any 10 year period; and b. shall not alter the original ground level by more than 1.0 metre, measured vertically. 3. In a stream corridor or river corridor (excluding fill which is addressed in NH-FLOOD-R15), earthworks: a. shall not exceed 10m3 in any 10 year period. This standard applies whether in relation to a particular work or as a total or cumulative; and b. must be carried out by Wellington Regional Council, Kāpiti Coast District Council, the Department of Conservation or their nominated contractors. Note: Any works carried out within the bed of lakes and rivers are within the jurisdiction of Wellington Regional Council and are not covered in this District Plan.
NH-FLOOD- R5	Fences in any flood hazard area.
Permitted Activity	Standards 1. Fences in the river corridor, stream corridor, an overflow path or residual overflow path shall be post and wire and shall not impede the free flow of flood waters.
NH-FLOOD- R6	Flood protection, erosion control and natural hazard mitigation measures including associated structures in the Open Space or Natural Open Space Zones (but not the Private Recreation and Leisure Precinct), and the stream or river corridor.
Permitted Activity	Standards 1. All works must be carried out by Wellington Regional Council, Kāpiti Coast District Council, the Department of Conservation or their nominated contractors.

	Note: Any works carried out within the bed of lakes and rivers are within the	
	jurisdiction of Wellington Regional Council and are not covered in this District Plan.	
NH-FLOOD- R7	Gravel extraction activities in the river corridor on land outside of the beds of any lake or river.	
Permitted Activity	Standards 1. All works must be carried out by Wellington Regional Council, Kāpiti Coast District Council, the Department of Conservation or their nominated contractors. 2. Mobile plants for processing extracted materials, and associated temporary buildings (excluding minor buildings) shall not be located on any site for longer than any 12 month period. Note: Any gravel extraction carried out within the bed of a lake or river requires resource consent from the Wellington Regional Council.	
NH-FLOOD- R8	Development and earthworks within any flood storage or fill control area. The following are excluded from this rule: • earthworks managed under the NESCF extractive industries (see EW-EXT) • earthworks associated with the removal and replacement of underground fuel storage tanks.	
Controlled Activity	Standards 1. Equivalent compensatory storage or another solution to achieve *hydraulic neutrality* shall be created. 2. *Development* proposals shall be accompanied by sufficient hydraulic modelling of relevant streams to fully test consequences of the activity. 3. The *building floor level* of any new or relocated *building* (excluding *minor buildings*) shall be constructed above the *1% AEP* flood event level.	Matters of Control 1. Future management of the *flood storage* or *fill control area*. 2. *Natural hazard effects*. 3. *Nuisance effects* including *dust*. 4. Location and design of *buildings* and *structures*. 5. Suitability of access.
NH-FLOOD- R9	Any activity listed as a *permitted* or *controlled activity* listed in Rules NH-FLOOD- R1 to NH-FLOOD-R8 which does not comply with one or more of the associated standards, unless otherwise specified.	
Restricted Discretionary Activity	Standards	Matters of Discretion 1. Consideration of the *effects* of the standard not met. 2. Measures to avoid, remedy or mitigate adverse *effects*. 3. Cumulative *effects*

NH-FLOOD-R10	In an *overflow path*, or *residual overflow path*, fill *earthworks*, or *earthworks* which do not comply with one or more of the *permitted activity* standards under NH-FLOOD- R4. The following are excluded from this rule: *earthworks* • managed under the *NESCF extractive industries* • (see EW-EXT) • *earthworks* associated with the removal and replacement of underground fuel storage tanks.	
Restricted Discretionary Activity	Standards	Matters of Discretion 1. The *effect* of the *earthworks* on the effective functioning of the *overflow path, residual overflow path* or *ponding* or *shallow surface flow area*. 2. The avoidance or mitigation of adverse *effects* on the effective functioning of the *overflow path, residual overflow path* or *ponding* or *shallow surface flow*.
NH-FLOOD- R11	In a *ponding* or *shallow surface flow area*, *earthworks* which do not comply with one or more of the *permitted activity* standards under NH-FLOOD-R4. The following are excluded from this rule: • *earthworks* managed under the *NESCF extractive* • *industries* (see EW-EXT) • *earthworks* associated with the removal and replacement of underground fuel storage tanks.	
Restricted Discretionary Activity	Standards	Matters of Discretion 1. The *effect* of the *earthworks* on the effective functioning of the *overflow path, residual overflow path* or *ponding* or *shallow surface flow*. 2. The avoidance or mitigation of adverse *effects* on the effective functioning of the *overflow path, residual overflow path* or *ponding* or *shallow surface flow*.
NH-FLOOD-R12	*Additions* to existing *buildings* (excluding *minor buildings*) in any *overflow path* or *residual overflow path*.	

Restricted Discretionary Activity	Standards	Matters of Discretion 1. The *effect* of the *addition* on the effective functioning of the *overflow path* or *residual overflow path*. 2. The ability of the design, placement and construction of the *addition* to achieve *hydraulic neutrality*. 3. The avoidance or mitigation of adverse *effects* on the effective functioning of the *overflow path* or *residual overflow*. 4. Whether the potential *risk* to the health and safety of people, and property from flood hazards can be avoided or mitigated.
NH-FLOOD-R13	*Buildings* and plant associated with gravel extraction within the *river corridor* that will be located on site for over 12 months.	
Restricted Discretionary Activity	Standards 1. Proposals shall be accompanied by sufficient hydraulic modelling of the relevant *river* to fully test consequences of the *building* or plant.	Matters of Discretion 1. *Effects* of *buildings* and plant in relation to *hydraulic neutrality*. 2. *Effects* of *buildings* and plant on the recreational use of, and *amenity values* of the *river*. 3. *Natural hazard effects*.
NH-FLOOD-R14	Any *restricted discretionary activity* listed in NH-FLOOD-R9 to NH-FLOOD-R13 that does not comply with one or more of the associated standards, unless otherwise specified.	
Discretionary Activity		
NH-FLOOD-R15	In any a *stream corridor*, or *river corridor*, fill *earthworks*, or *earthworks* that do not comply with one or more of the *permitted activity* standards in NH-FLOOD-R4. The following are excluded from this rule: *earthworks* managed under the *NESCF extractive industries* (see EW-EXT) *earthworks* associated with the removal and replacement of underground fuel storage tanks.	
Discretionary Activity		

NH-FLOOD-R16	New or relocated *building* (excluding *minor buildings*) in any *overflow path* or *residual overflow path*. Note: This does not apply to *additions* to existing *habitable buildings* which are *restricted discretionary activity* under NH-FLOOD-R12 or *structures permitted* under NH-FLOOD-R6. Note 2: Assessment of *sites* where *earthworks* have occurred that have redefined the flood hazards on the *site* will consider the latest information available in addition to the Flood Hazard Maps.
Non-Complying Activity	
NH-FLOOD-R17	The construction, placement or erection of any *building* (excluding *minor buildings*) in the *river corridor* or *stream corridor* except where related to gravel extraction activities and *permitted* by NH-FLOOD-R7 or provided for as a *restricted discretionary activity* under NH-FLOOD-R13, or *structures permitted* under NH- FLOOD-R6.
Non-Complying Activity	
NH-FLOOD-R18	Except as provided for by NH-FLOOD-R6 damage or *destruction* of flood mitigation *structures* or work (including any planting) in the Natural *Open Space Zone* and *river corridor*.
Prohibited Activity	
NH-FLOOD-R19	*Landfills* in the *river corridor*.
Prohibited Activity	

APPENDIX 3 FLOOD MODEL RESULTS MAPS

Due to limitations of the EPA submittal process, the documents in this report have been compressed to reduce file size. Full resolution images are provided in the following link.

https://envelope.egnyte.com/fl/R6WDkFqyxjyJ

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
TRIESTE WAY
IHAKARA STREET
BRETT AMBLER WAY
IVER TRASK PLACE

Legend

77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-2yrCC-Depth Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -PRE DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8150.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

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KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

TRIESTE WAY

IHAKARA STREET

BRETT AMBLER WAY

IVER TRASK PLACE

Future Road

Road 01

Road 02

Road 03 (Ivor Trask Place)

Road 04

Road 05

Road 06

Road 07

Joal A

Joal B

Joal C

Joal D

Joal E

Joal F

Joal G

Joal H

Joal J

Joal K

Joal L

Joal N

Joal O

Joal P

Joal Q

Joal R

Joal S

Joal T

Joal U

Joal V

Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Post Dev-2yrCC-Depth Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -POST DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

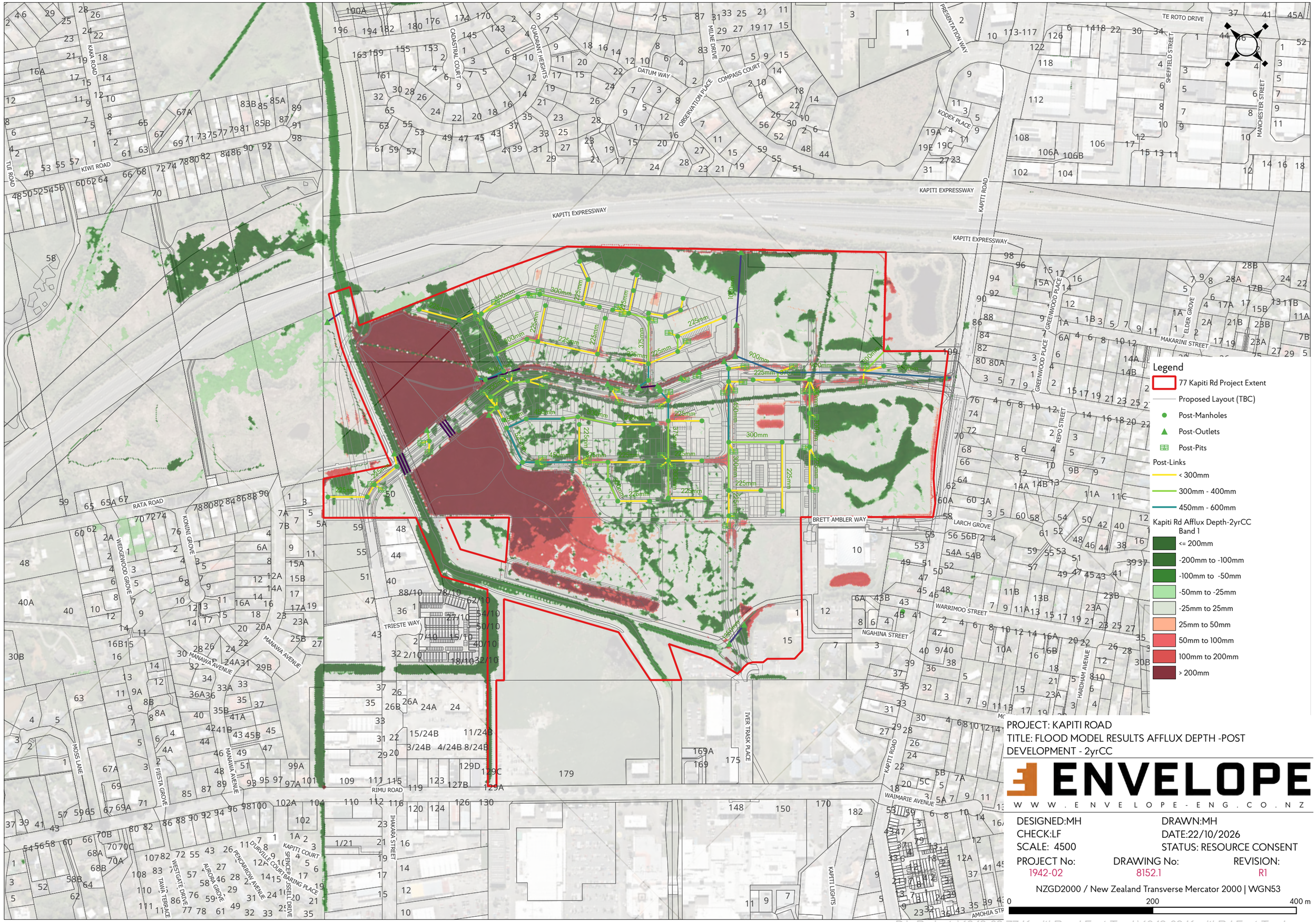
DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8151.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Afflux Depth-2yrCC Band 1

- <= 200mm
- -200mm to -100mm
- -100mm to -50mm
- -50mm to -25mm
- -25mm to 25mm
- 25mm to 50mm
- 50mm to 100mm
- 100mm to 200mm
- > 200mm

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS AFFLUX DEPTH -POST DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 4500	STATUS: RESOURCE CONSENT
PROJECT No: 1942-02	DRAWING No: 8152.1
	REVISION: R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
BRETT AMBLER WAY
TRIESTE WAY
IHAKARA STREET
IVER TRASK PLACE

Legend

- 77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-10yrCC-Depth
Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -PRE DEVELOPMENT - 10yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8170.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

TRIESTE WAY

IHAKARA STREET

BRETT AMBLER WAY

IVER TRASK PLACE

Future Road

Road 01

Road 02

Road 03 (Ivor Trask Place)

Road 04

Road 05

Road 06

Road 07

Joal A

Joal B

Joal C

Joal D

Joal E

Joal F

Joal G

Joal H

Joal I

Joal J

Joal K

Joal L

Joal N

Joal O

Joal P

Joal Q

Joal R

Joal S

Joal T

Joal U

Joal V

Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Post Dev-10yrCC-Depth Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -POST DEVELOPMENT - 10yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

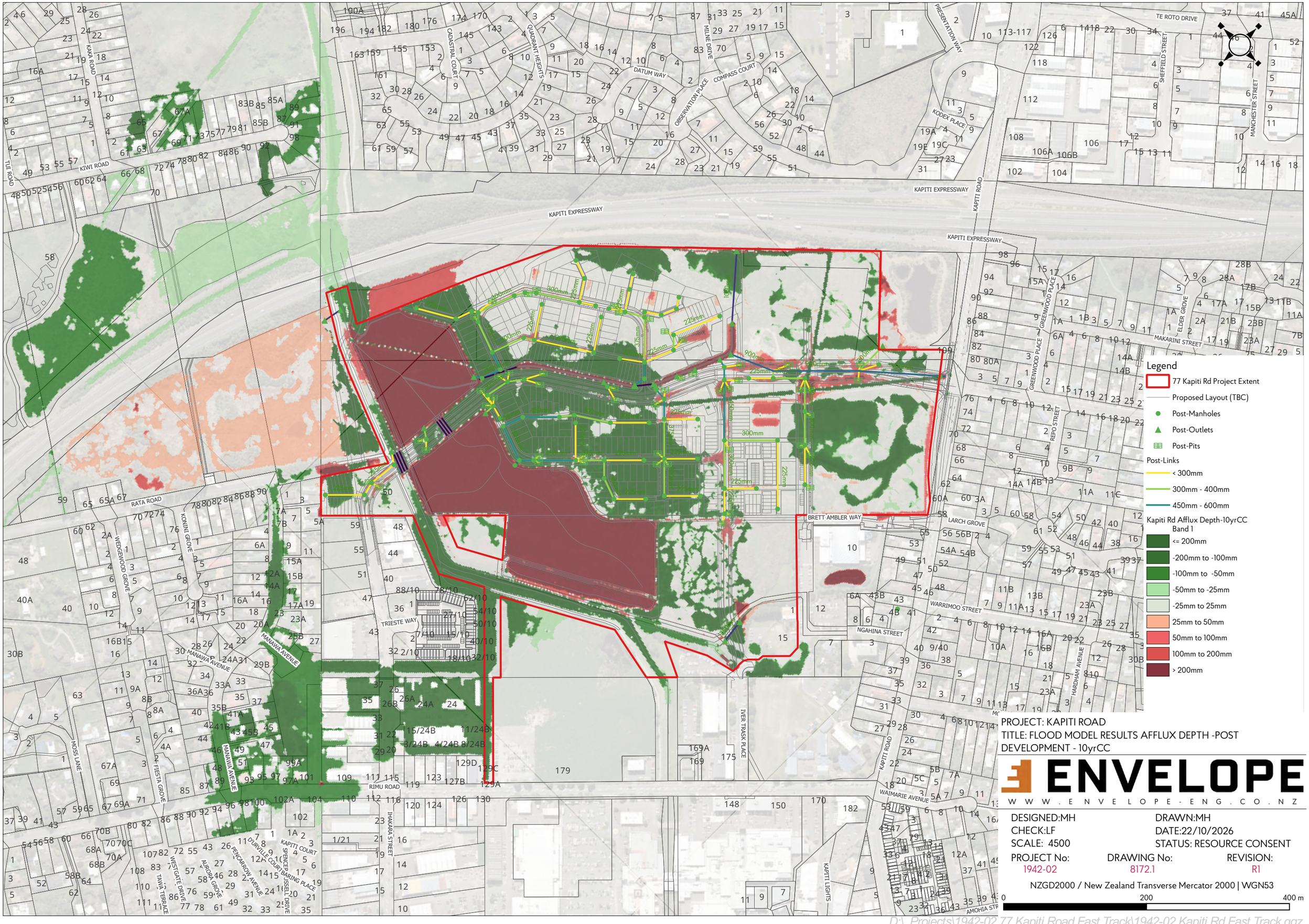
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DATE:22/10/2026
SCALE: 2500
STATUS: RESOURCE CONSENT

PROJECT No: 1942-02
DRAWING No: 8171.1
REVISION: R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Afflux Depth-10yrCC Band 1

- <= 200mm
- -200mm to -100mm
- -100mm to -50mm
- -50mm to -25mm
- -25mm to 25mm
- 25mm to 50mm
- 50mm to 100mm
- 100mm to 200mm
- > 200mm

PROJECT: KAPITI ROAD

TITLE: FLOOD MODEL RESULTS AFFLUX DEPTH -POST DEVELOPMENT - 10yrCC

ENVELOPE

WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH	
CHECK:LF	DATE:22/10/2026	
SCALE: 4500	STATUS: RESOURCE CONSENT	
PROJECT No: 1942-02	DRAWING No: 8172.1	REVISION: R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
TRIESTE WAY
IHAKARA STREET
BRETT AMBLER WAY
IVER TRASK PLACE

Legend

77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-100yrCC-Depth Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -PRE DEVELOPMENT - 100yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8190.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

TRIESTE WAY

IHAKARA STREET

IVER TRASK PLACE

BRETT AMBLER WAY

Future Road

Road 01

Road 02

Road 03 (Ivor Trask Place)

Road 04

Road 05

Road 06

Road 07

Joal A

Joal B

Joal C

Joal D

Joal E

Joal F

Joal G

Joal H

Joal J

Joal K

Joal L

Joal N

Joal O

Joal P

Joal Q

Joal R

Joal S

Joal T

Joal U

Joal V

Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Post Dev-100yrCC-Depth Band 1 (Gray)

- <= 0.025m
- 0.025m - 0.05m
- 0.05m - 0.1m
- 0.1m - 0.2m
- 0.2m - 0.3m
- 0.3m - 0.5m
- 0.5m - 1.0m
- > 1.0m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM DEPTH -POST DEVELOPMENT - 100yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

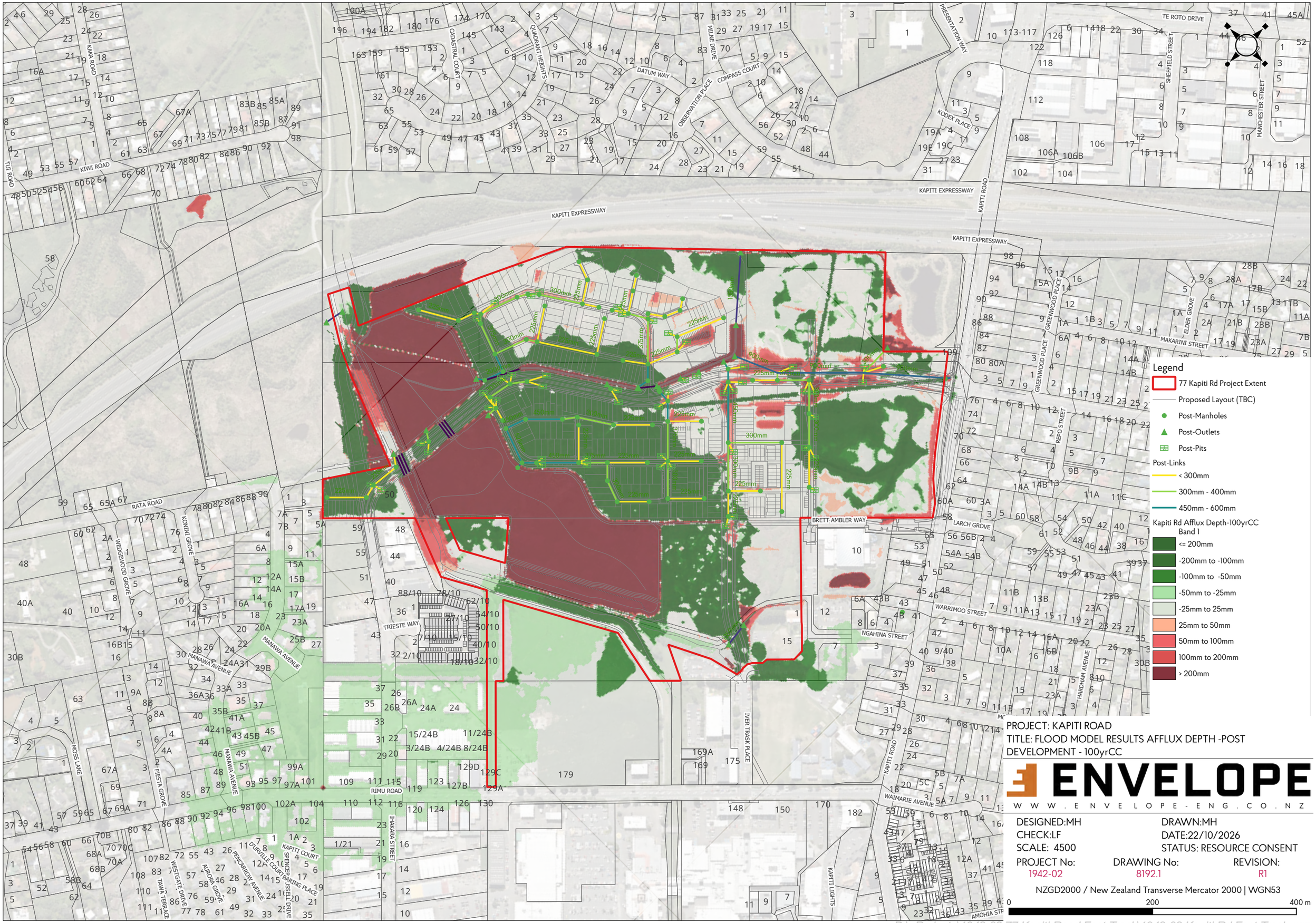
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CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8191.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Afflux Depth-100yrCC Band 1

- <= 200mm
- -200mm to -100mm
- -100mm to -50mm
- -50mm to -25mm
- -25mm to 25mm
- 25mm to 50mm
- 50mm to 100mm
- 100mm to 200mm
- > 200mm

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS AFFLUX DEPTH -POST DEVELOPMENT - 100yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 4500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8192.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
TRIESTE WAY
IHAKARA STREET
BRETT AMBLER WAY
IVER TRASK PLACE

Legend

77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-2yrCC-Velocity Band 1 (Gray)

- <= 0.0 m/s
- 0.2 m/s - 0.5 m/s
- 0.5 m/s - 0.8 m/s
- 0.8 m/s - 1.0 m/s
- 1.0 m/s - 1.2 m/s
- 1.2 m/s - 1.5 m/s
- 1.5 m/s - 3.0 m/s
- 3.0 m/s - 5.0 m/s
- > 6.0 m/s

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -PRE DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8250.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

BRETT AMBLER WAY

TRIESTE WAY

IHAKARA STREET

IVER TRASK PLACE

Future Road

Road 01

Road 02

Road 03 (Ivor Trask Place)

Road 04

Road 05

Road 06

Road 07

Joal A

Joal B

Joal C

Joal D

Joal E

Joal F

Joal G

Joal H

Joal J

Joal K

Joal L

Joal N

Joal O

Joal P

Joal Q

Joal R

Joal S

Joal T

Joal U

Joal V

Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Post Dev-2yrCC-Velocity Band 1 (Gray)

- <= 0.0 m/s
- 0.2 m/s - 0.5 m/s
- 0.5 m/s - 0.8 m/s
- 0.8 m/s - 1.0 m/s
- 1.0 m/s - 1.2 m/s
- 1.2 m/s - 1.5 m/s
- 1.5 m/s - 3.0 m/s
- 3.0 m/s - 5.0 m/s
- > 6.0 m/s

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -POST DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

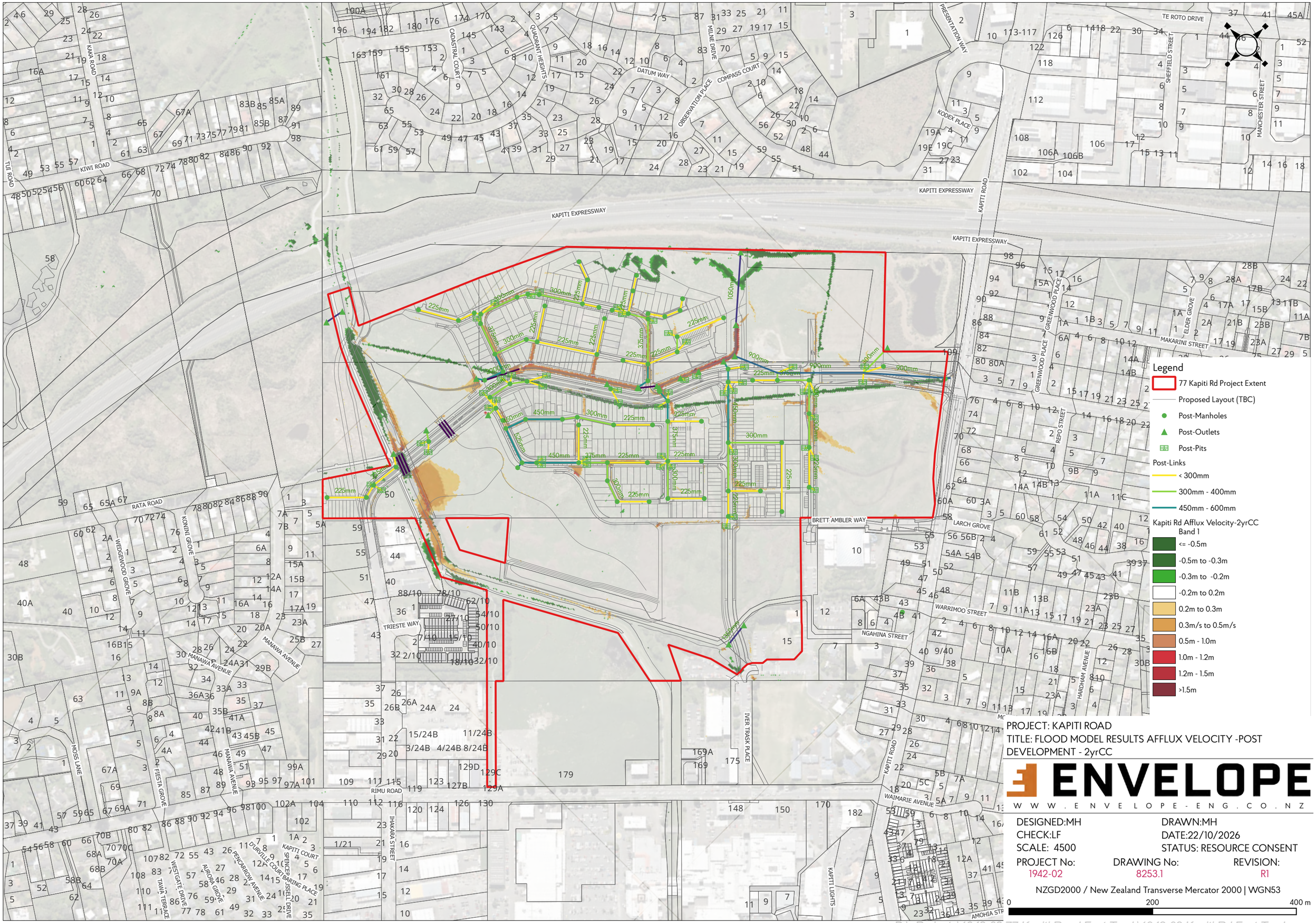
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SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8251.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Afflux Velocity-2yrCC Band 1

- <= -0.5m
- -0.5m to -0.3m
- -0.3m to -0.2m
- -0.2m to 0.2m
- 0.2m to 0.3m
- 0.3m/s to 0.5m/s
- 0.5m - 1.0m
- 1.0m - 1.2m
- 1.2m - 1.5m
- >1.5m

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS AFFLUX VELOCITY -POST DEVELOPMENT - 2yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 4500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8253.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
TRIESTE WAY
IHAKARA STREET
BRETT AMBLER WAY
IVER TRASK PLACE

Legend

- 77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-10yrCC-Velocity Band 1 (Gray)

- <= 0.0 m/s
- 0.2 m/s - 0.5 m/s
- 0.5 m/s - 0.8 m/s
- 0.8 m/s - 1.0 m/s
- 1.0 m/s - 1.2 m/s
- 1.2 m/s - 1.5 m/s
- 1.5 m/s - 3.0 m/s
- 3.0 m/s - 5.0 m/s
- > 6.0 m/s

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -PRE DEVELOPMENT - 10yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8270.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

TRIESTE WAY

IHAKARA STREET

IVER TRASK PLACE

BRETT AMBLER WAY

Future Road

Road 01

Road 02

Road 03 (Ivor Trask Place)

Road 04

Road 05

Road 06

Road 07

Joal A

Joal B

Joal C

Joal D

Joal E

Joal F

Joal G

Joal H

Joal J

Joal K

Joal L

Joal N

Joal O

Joal P

Joal Q

Joal R

Joal S

Joal T

Joal U

Joal V

Legend

- 77 Kapiti Rd Project Extent
- Proposed Layout (TBC)
- Post-Manholes
- Post-Outlets
- Post-Pits

Post-Links

- < 300mm
- 300mm - 400mm
- 450mm - 600mm

Kapiti Rd Post Dev-10yrCC-Velocity Band 1 (Gray)

- <= 0.0 m/s
- 0.2 m/s - 0.5 m/s
- 0.5 m/s - 0.8 m/s
- 0.8 m/s - 1.0 m/s
- 1.0 m/s - 1.2 m/s
- 1.2 m/s - 1.5 m/s
- 1.5 m/s - 3.0 m/s
- 3.0 m/s - 5.0 m/s
- > 6.0 m/s

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -POST DEVELOPMENT - 10yrCC

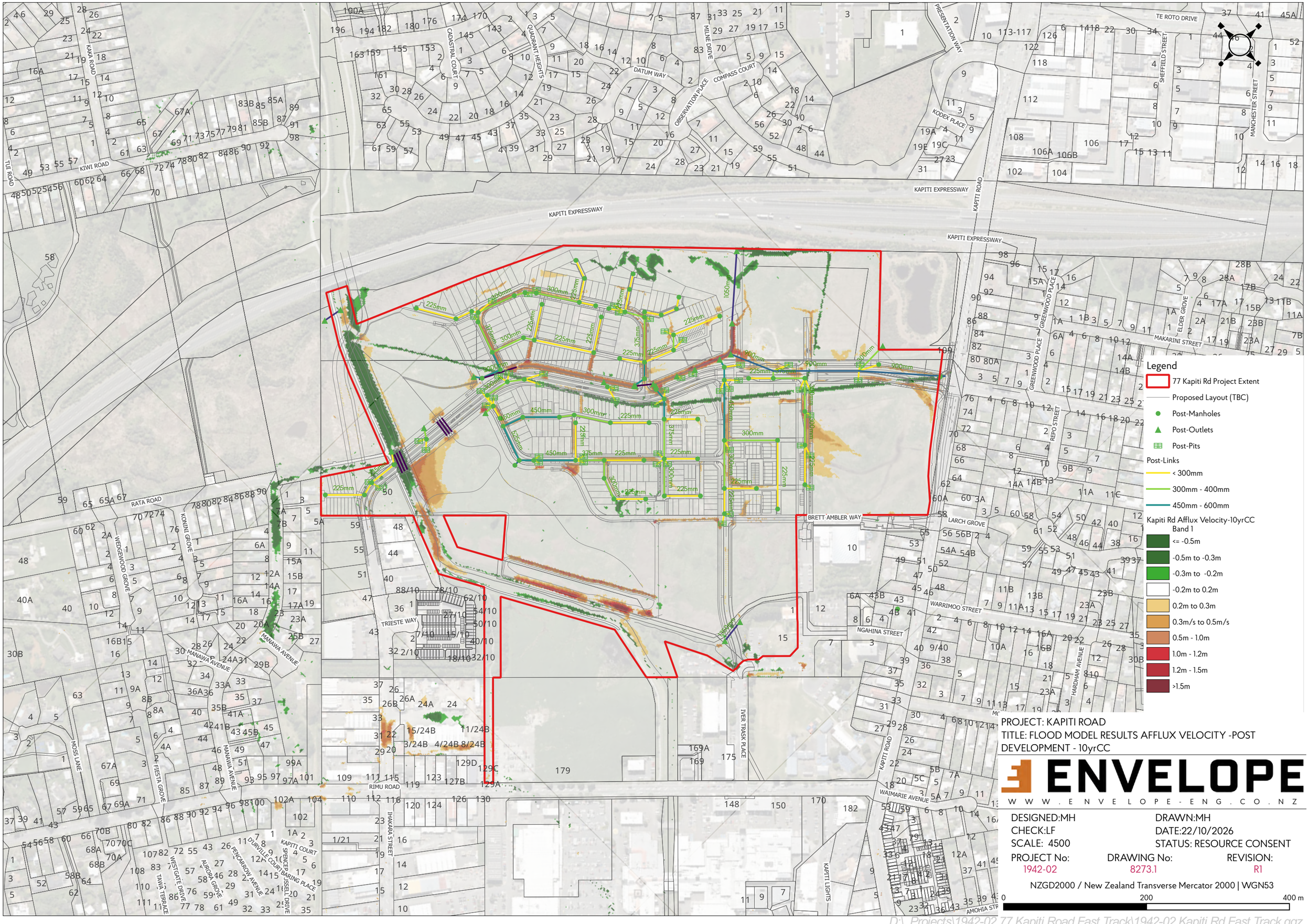
ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH	
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SCALE: 2500	STATUS: RESOURCE CONSENT	
PROJECT No: 1942-02	DRAWING No: 8271.1	REVISION: R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS AFFLUX VELOCITY -POST DEVELOPMENT - 10yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 4500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8273.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI EXPRESSWAY
KAPITI ROAD
ARAWHATA ROAD
TRIESTE WAY
IHAKARA STREET
BRETT AMBLER WAY
IVER TRASK PLACE

Legend

- 77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-100yrCC-Velocity Band 1 (Gray)

- <= 0.0 m/s
- 0.2 m/s - 0.5 m/s
- 0.5 m/s - 0.8 m/s
- 0.8 m/s - 1.0 m/s
- 1.0 m/s - 1.2 m/s
- 1.2 m/s - 1.5 m/s
- 1.5 m/s - 3.0 m/s
- 3.0 m/s - 5.0 m/s
- > 6.0 m/s

PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -PRE DEVELOPMENT - 100yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

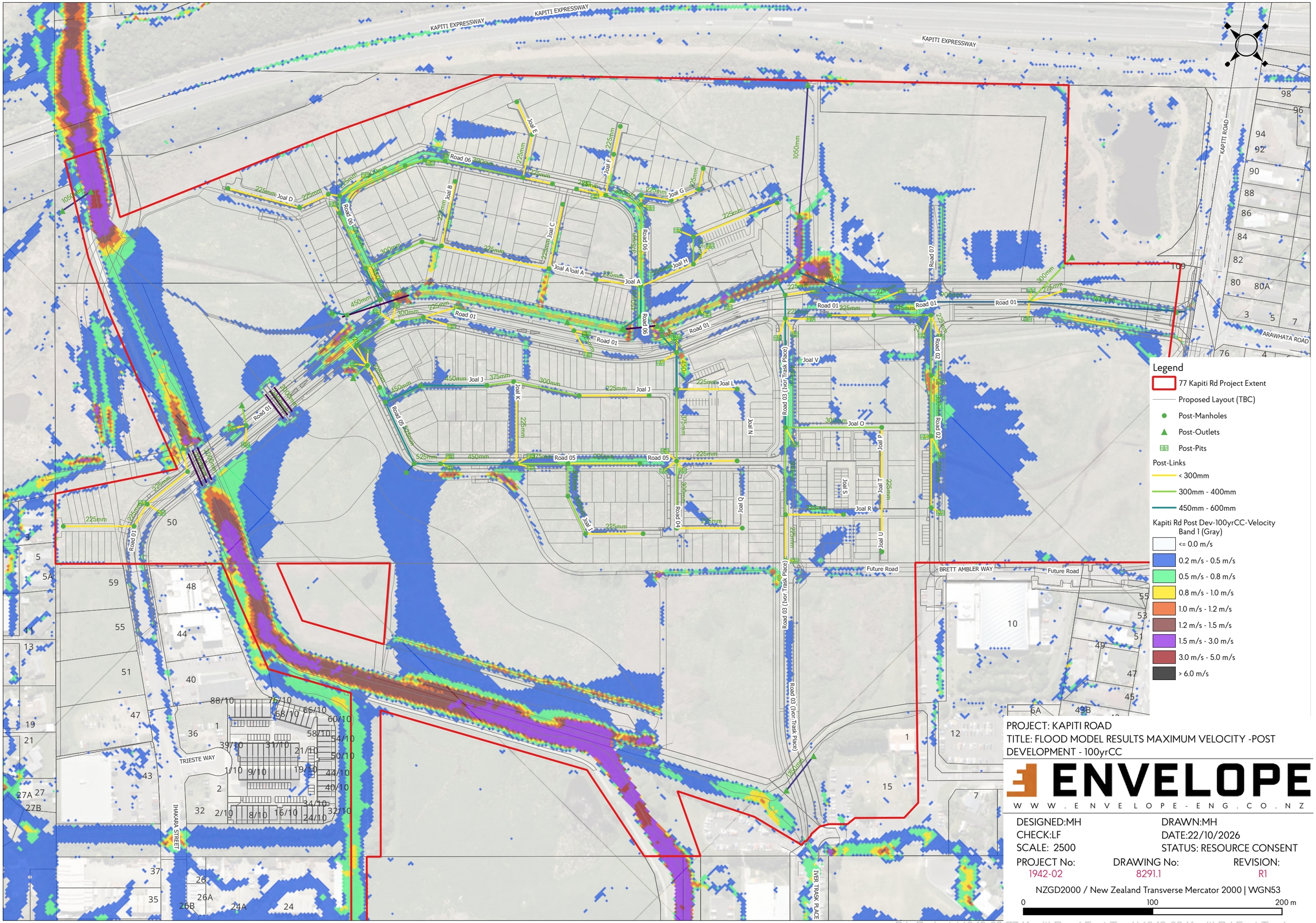
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CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8290.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS MAXIMUM VELOCITY -POST DEVELOPMENT - 100yrCC

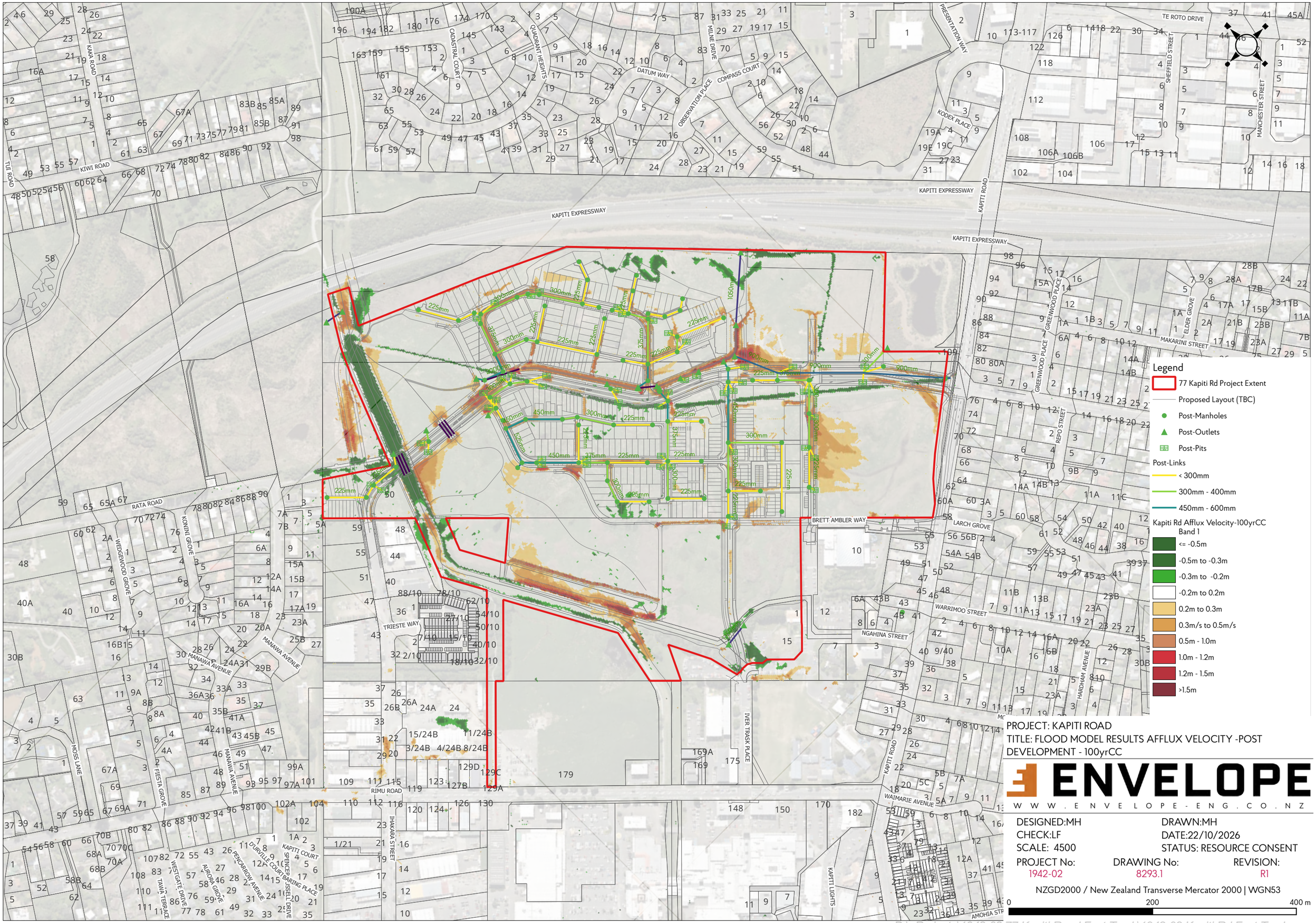
ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH	
CHECK:LF	DATE:22/10/2026	
SCALE: 2500	STATUS: RESOURCE CONSENT	
PROJECT No: 1942-02	DRAWING No: 8291.1	REVISION: R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz



PROJECT: KAPITI ROAD
TITLE: FLOOD MODEL RESULTS AFFLUX VELOCITY -POST DEVELOPMENT - 100yrCC

ENVELOPE
WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 4500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8293.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 200 400 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz

KAPITI EXPRESSWAY

KAPITI EXPRESSWAY

KAPITI EXPRESSWAY

KAPITI ROAD

ARAWHATA ROAD

BRETT AMBLER WAY

TRIESTE WAY

IHAKARA STREET

IVER TRASK PLACE

NOTES:
H1: Generally safe for people, vehicles and buildings.
H2: Unsafe for small vehicles.
H3: Unsafe for vehicles, children and the elderly.
H4: Unsafe for people and vehicles.
H5: Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust building types vulnerable to failure.
H6: Unsafe for vehicles and people. All building types considered vulnerable to failure.

Legend

77 Kapiti Rd Project Extent

Kapiti Rd Pre Dev-10yrCC-Hazard Band 1 (Gray)

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

PROJECT: KAPITI ROAD

TITLE: FLOOD MODEL RESULTS ARR HAZARD -PRE DEVELOPMENT - 10yrCC

ENVELOPE

WWW.ENVELOPE-ENG.CO.NZ

DESIGNED:MH	DRAWN:MH
CHECK:LF	DATE:22/10/2026
SCALE: 2500	STATUS: RESOURCE CONSENT

PROJECT No:	DRAWING No:	REVISION:
1942-02	8550.1	R1

NZGD2000 / New Zealand Transverse Mercator 2000 | WGN53

0 100 200 m

D:_Projects\1942-02 77 Kapiti Road Fast Track\1942-02 Kapiti Rd Fast Track.qgz