Appendix H

Flood Modelling Report
Part 2 of 2

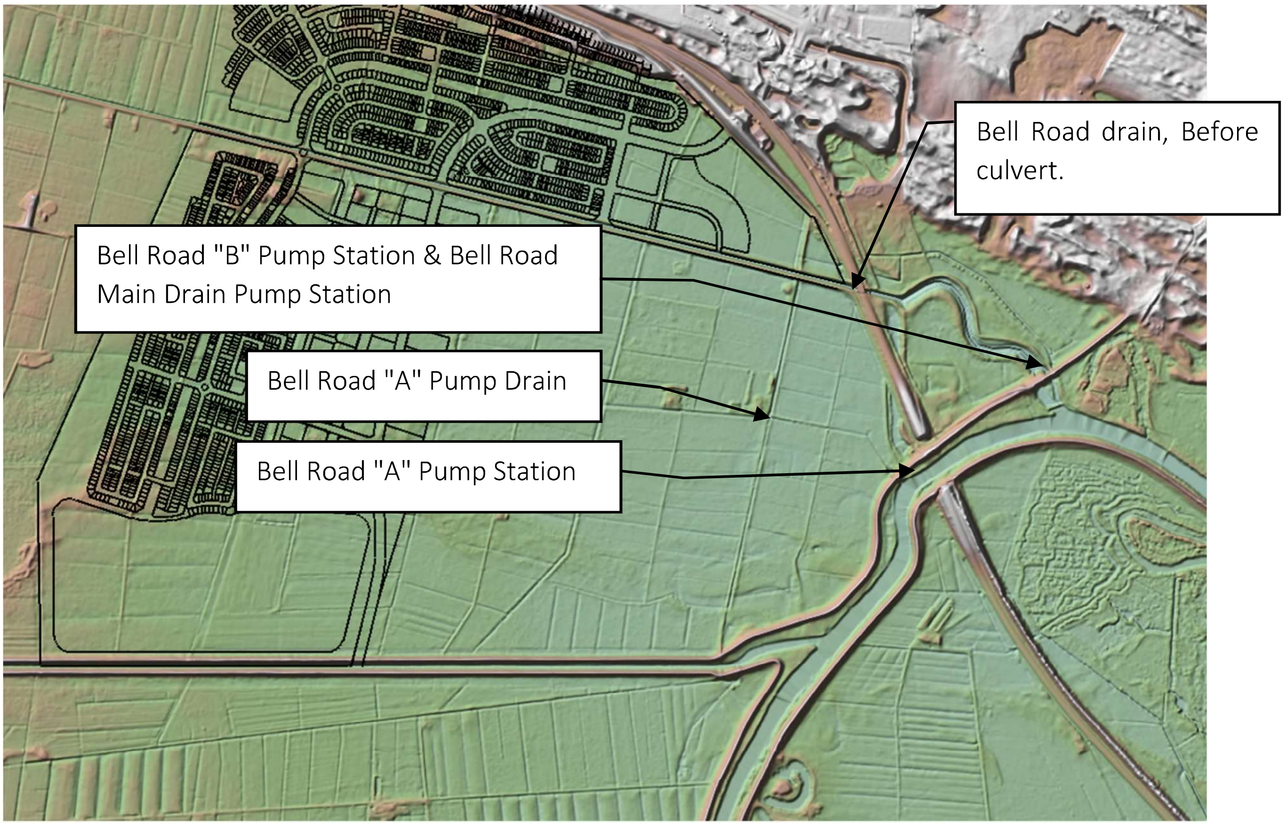


Figure 31 : Water Level Comparison (Source: HEC-RAS)

Below is a series of comparisons of the performance of the BOPRC MIKE+ model with the Wairakei South HEC model across various scenarios.

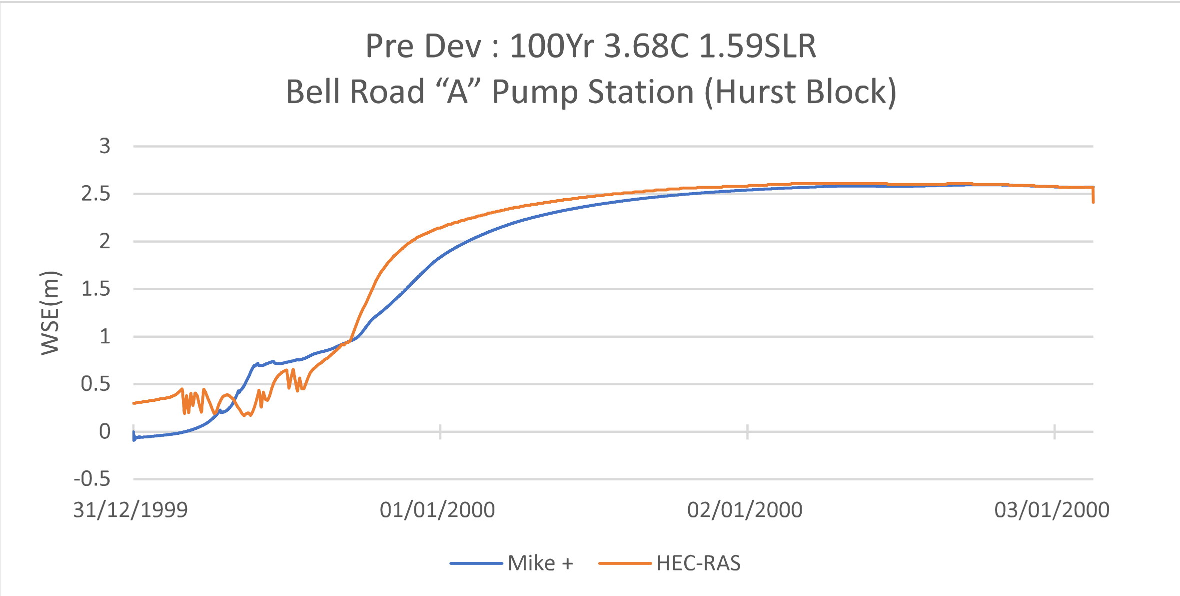


Figure 32 – Bell Road "A" pump station (Source: HEC-RAS)

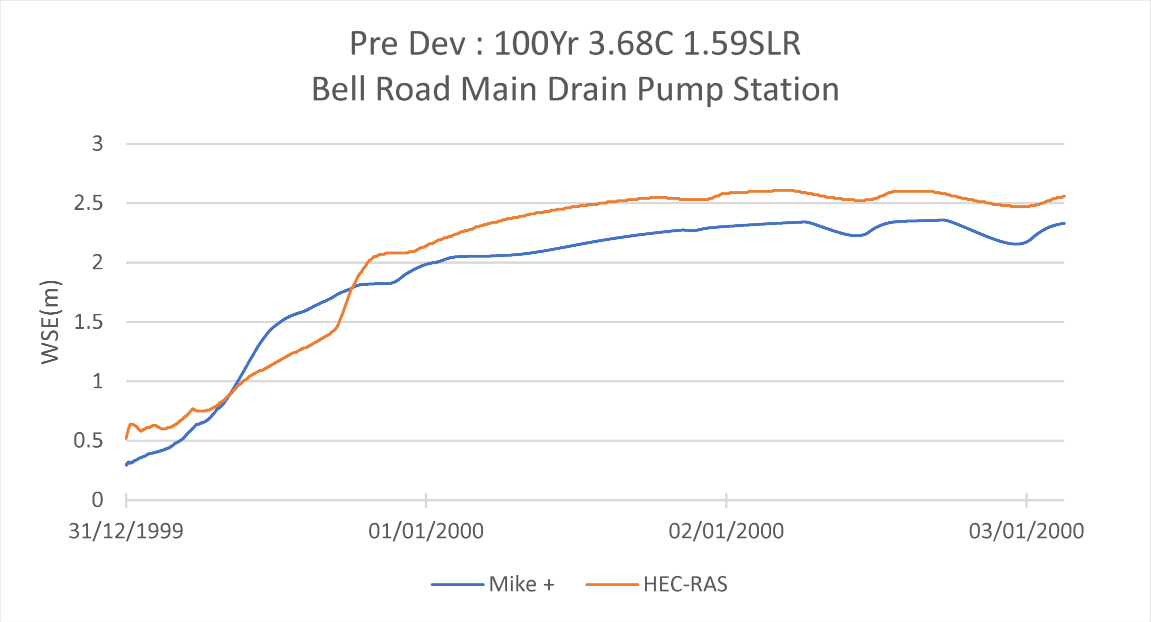


Figure 33 – Bell Road Main Drain Pump Station (Source: HEC-RAS)

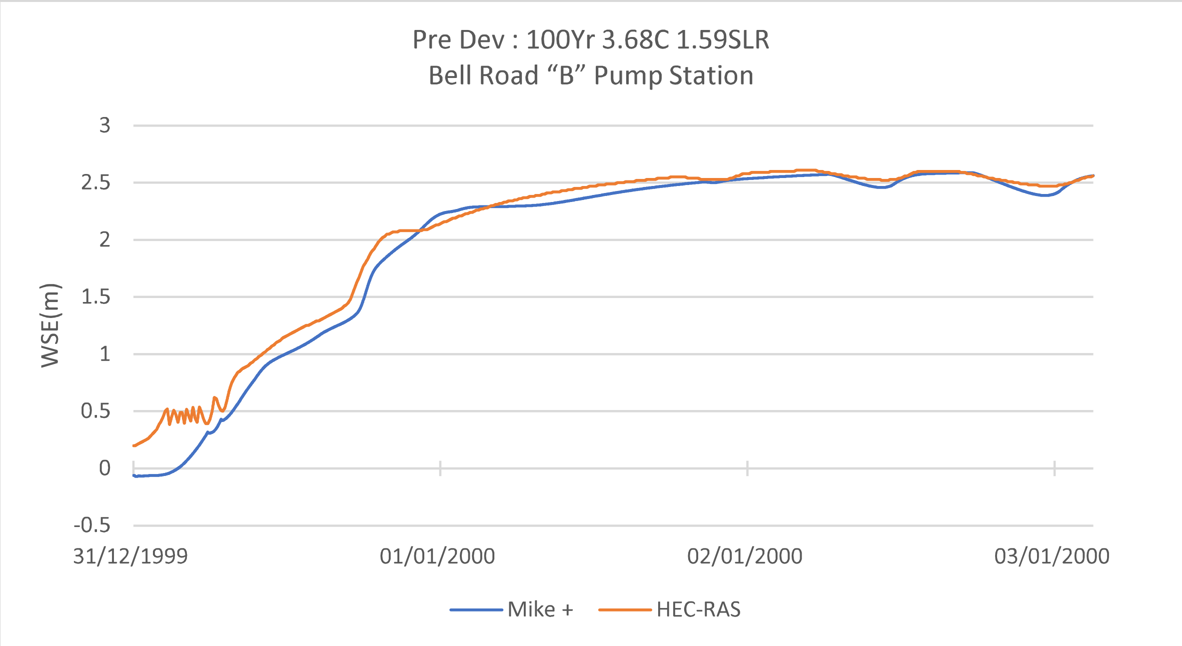


Figure 34 – Bell Road "B" Pump Station (Source: HEC-RAS)

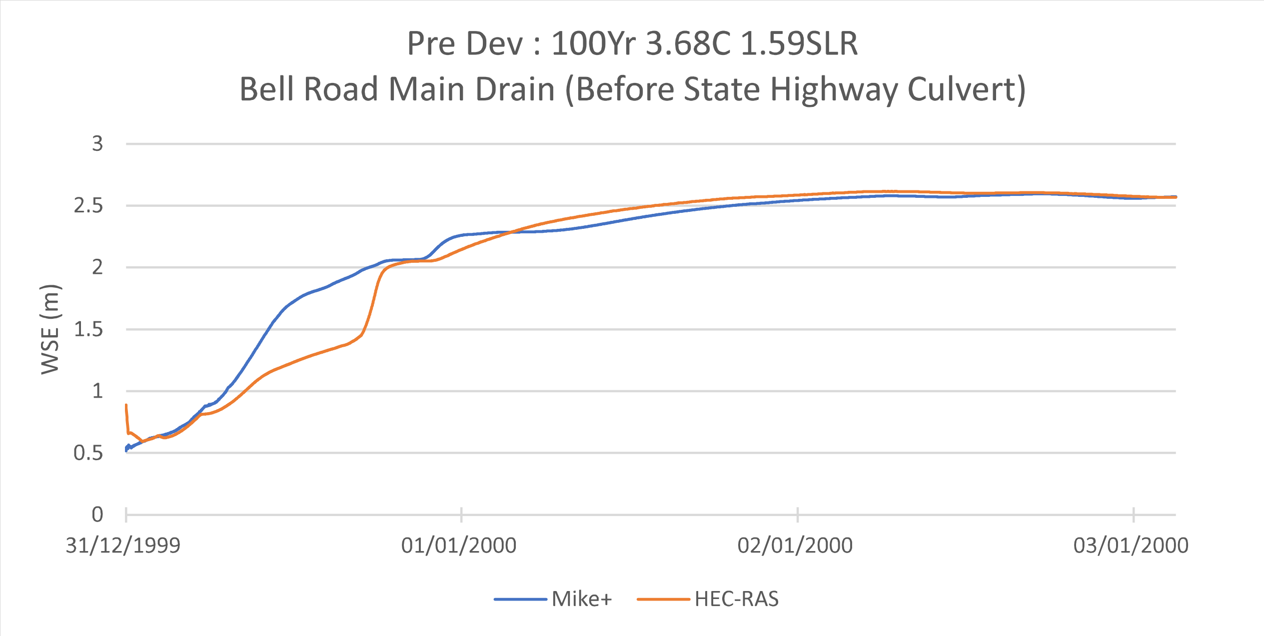


Figure 35 – Bell Road Main Drain (Before State Highway Culvert) (Source: HEC-RAS)

The discharge time series at the three major drains and pump stations, including Bell Road drain, were then reviewed. This assessment allows confirmation that flow behaviour is consistent between the two models, not only in terms of water levels but also in the manner in which runoff is conveyed through the system. Comparison of these discharge patterns further strengthens the model validation and provides assurance that the models are well aligned across the key hydraulic control points.

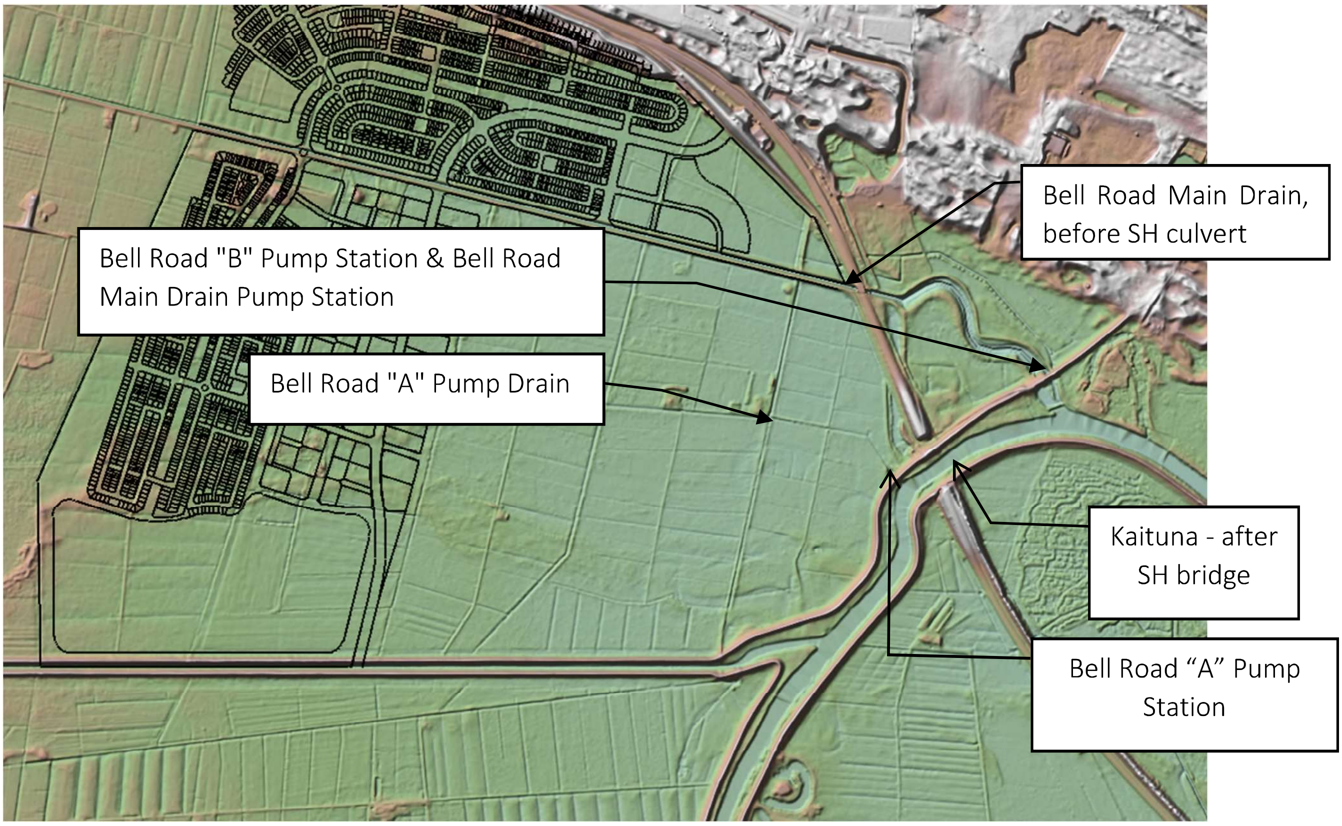


Figure 36 : Discharge Rate Measurement Nodes (Source: HEC-RAS)

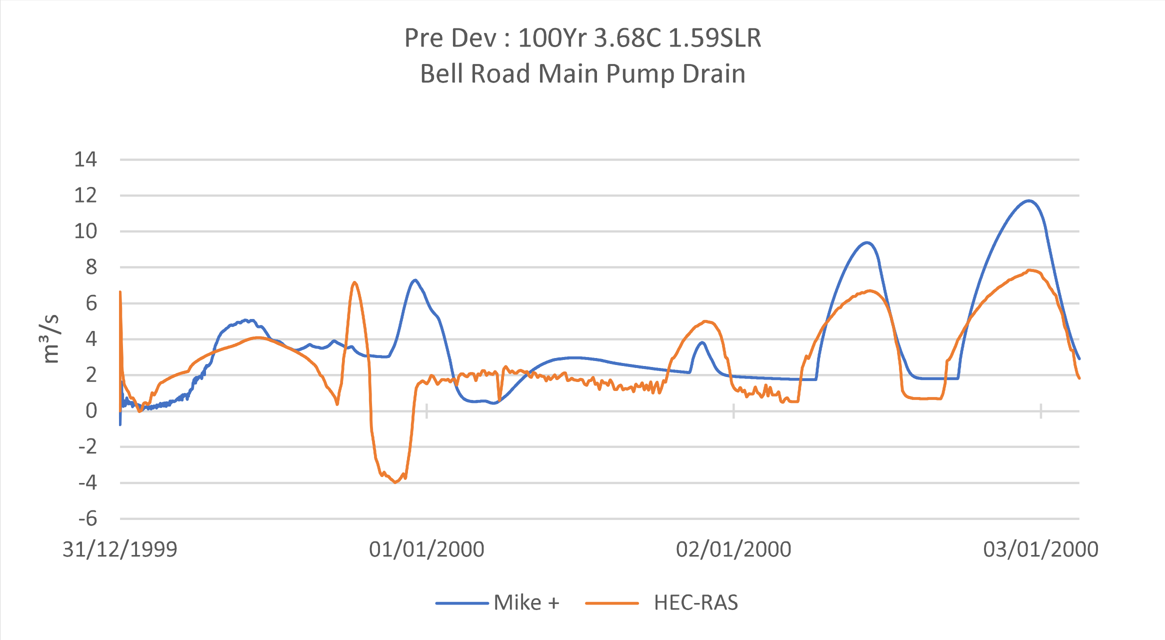


Figure 37 – Bell Road Main Pump Drain (Source: HEC-RAS)

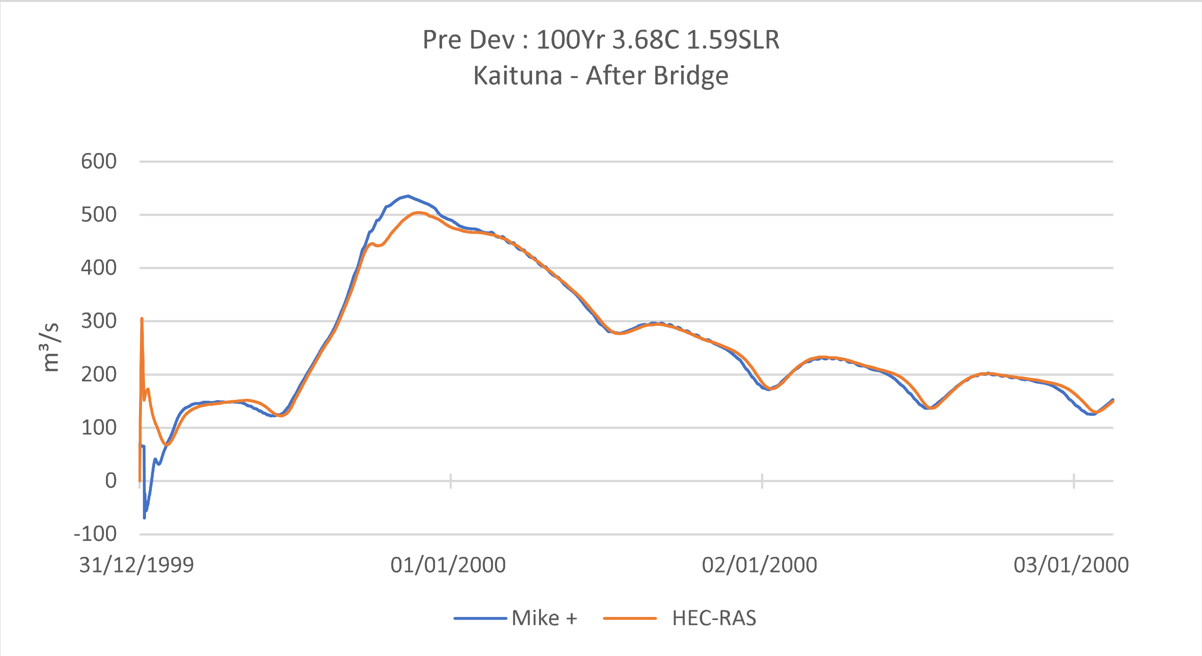


Figure 38 – Kaituna River After State Highway Bridge (Source: HEC-RAS)

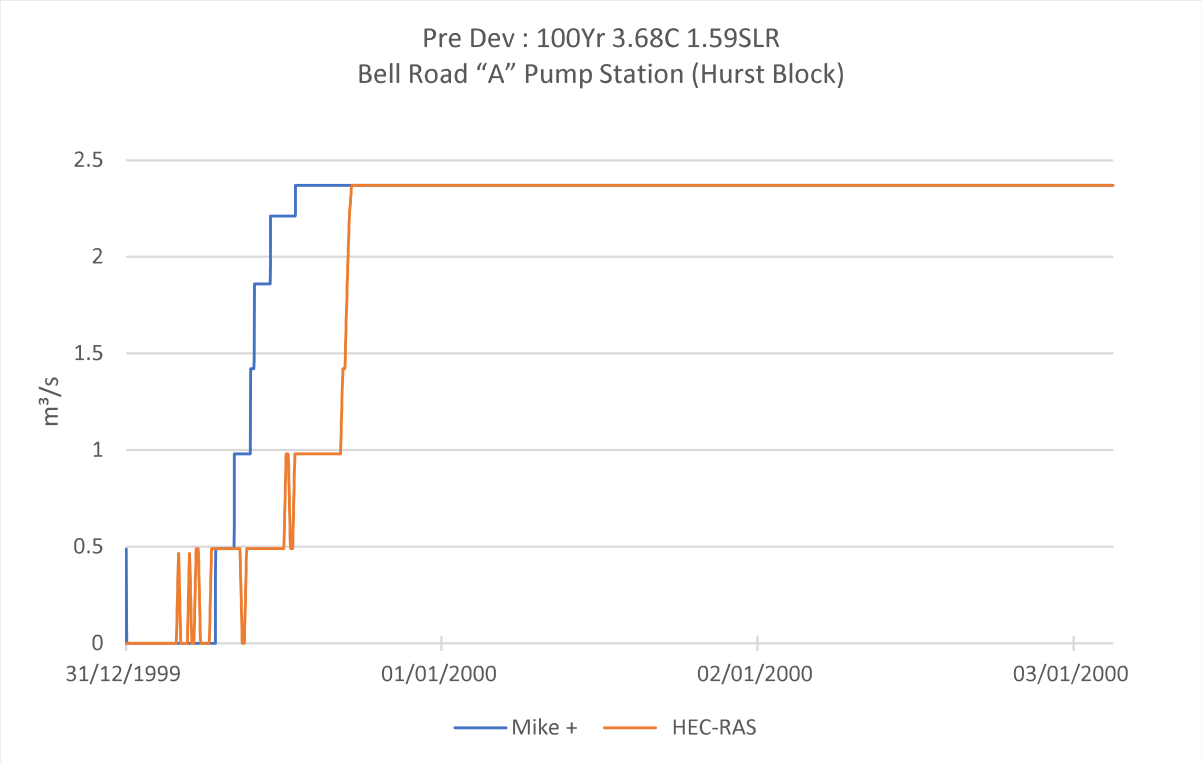


Figure 39 – Bell Road "A" Pump Station (Hurst Block) (Source: HEC-RAS)

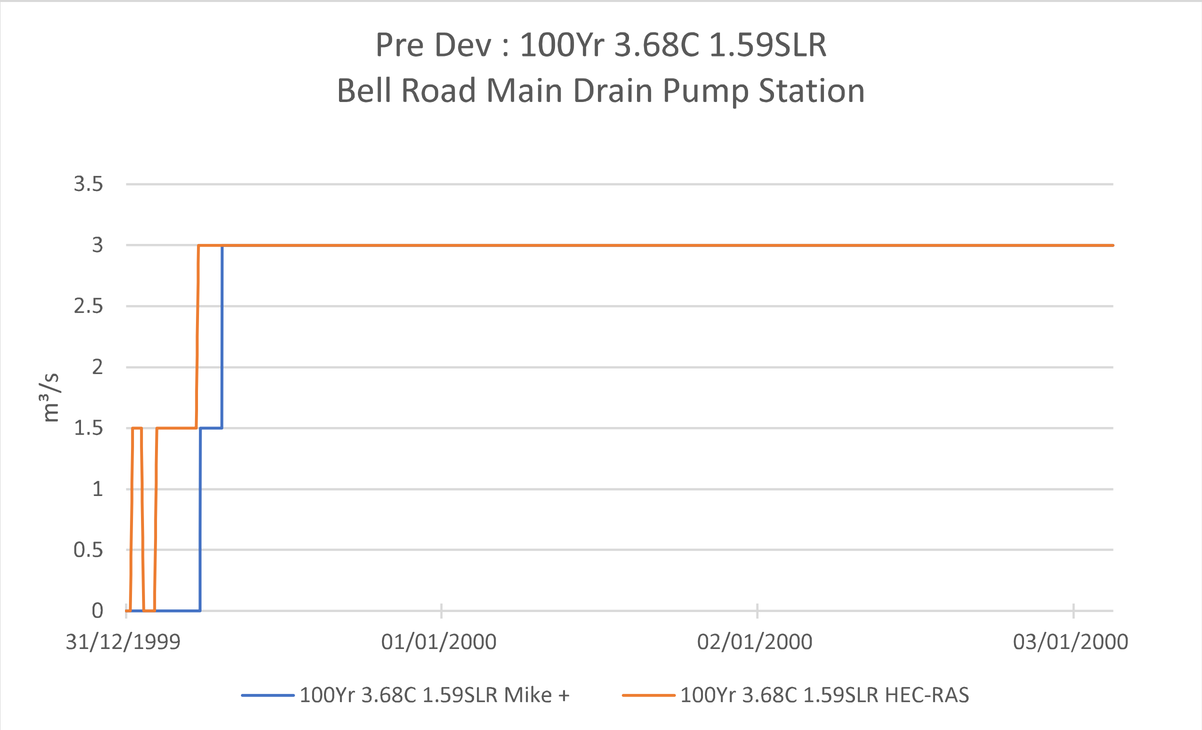


Figure 40 – Bell Road Main Drain Pump Station (Source: HEC-RAS)

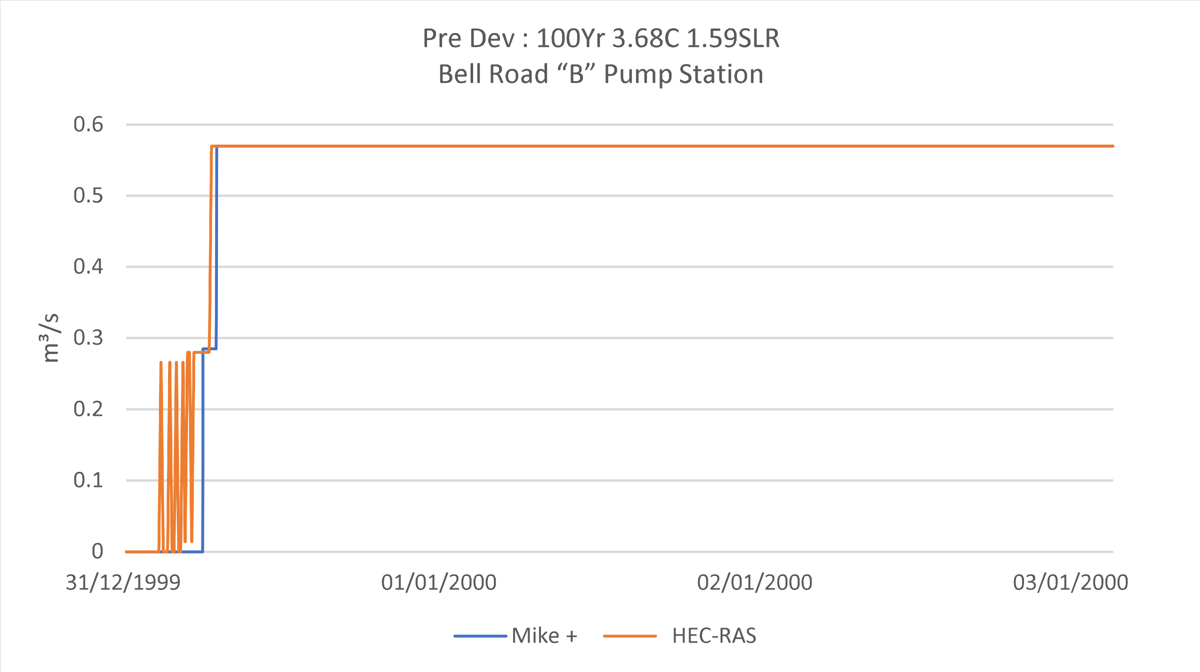


Figure 41 – Bell Road "B" Pump Station (Source: HEC-RAS)

Overall, the MIKE+ and HEC-RAS models demonstrate strong alignment in both flow magnitude and timing. MIKE+ exhibits a slightly longer and smoother peak during the central portion of the storm event, while HEC-RAS produces a shorter, sharper peak with a comparable overall flow volume. These differences are expected and reflect the differing model structures, with MIKE+ routing flow primarily through 1D channel networks and HEC-RAS utilising a 2D grid that distributes and temporarily stores floodplain flows.

Upstream inflows were directly derived from the MIKE+ model, resulting in closely aligned hydrographs between the two models. Pump operations have only a minor influence on overall flow behaviour, with small differences in pump start times attributable to initial upstream water level conditions and the contrast between 1D conveyance and 2D flow routing. In particular, the Bell Road A Pump Station activates slightly later in the HEC-RAS model, reflecting the faster conveyance represented within the 1D network compared to the 2D grid representation. MIKE+ produces a marginally higher peak flow (approximately 30 m^3/s), which occurs where the Raparapahoe channel inflow boundary overtops its banks under the LINZ 2021 terrain. This reflects differences in how each model represents channelised versus floodplain flow. Towards the end of the event, both models show three smaller peaks corresponding to gravity floodgate openings during low tide. Higher outflow peaks in MIKE+ are explained by its representation of two individual floodgates, compared with a single combined gate in HEC-RAS.

The HEC-RAS model aligns reasonably well with the BOPRC model for the 100-year climate change scenario for the purpose of concept level design modelling.

The pre-development extent is shown using the report by River Edge Consulting Limited, dated June 2025. The HEC-RAS model is displayed with a colour configuration matched as closely as possible to MIKE+. The main difference arises from the vertical datum: the MIKE+ model is in MOD53, while HEC-

RAS is in NZVD16. This datum difference causes some areas to appear slightly higher or lower in water level, which may make small differences in the mapped extent.

Additionally, the HEC-RAS model shows extra inundation (highlighted in blue) near Papamoa Hills. This is because the MIKE+ model did not include water inflow from this area, whereas HEC-RAS accounts for it. Despite this, overall flood patterns remain consistent between the two models.

5.4.5. Flood Model Comparison

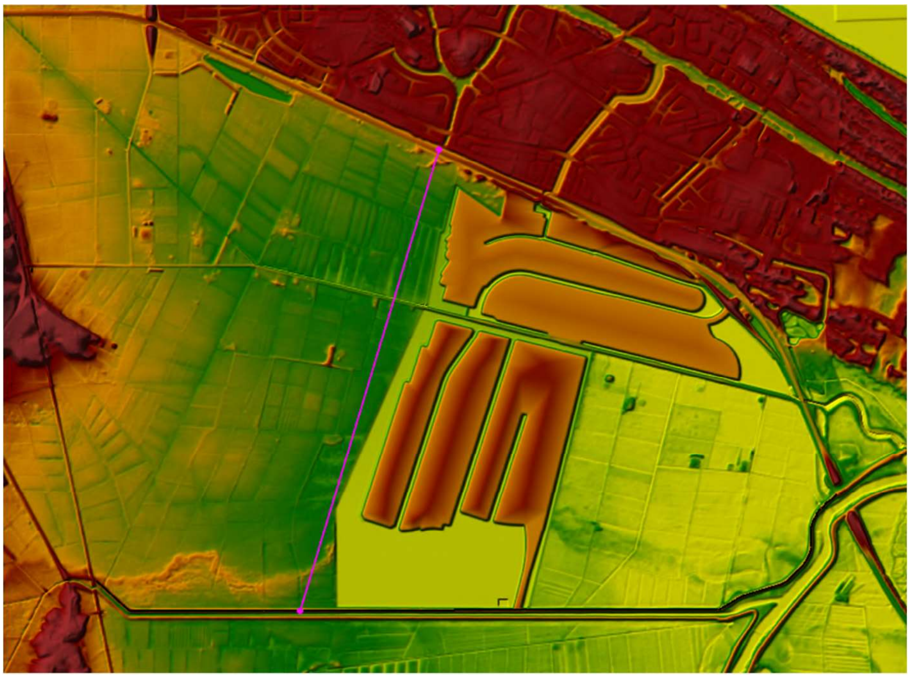


Figure 42 - Section Line for Flow Assessment (Source: HEC-RAS)

The pink line in Figure 42 above was used as the comparison line for inflows.

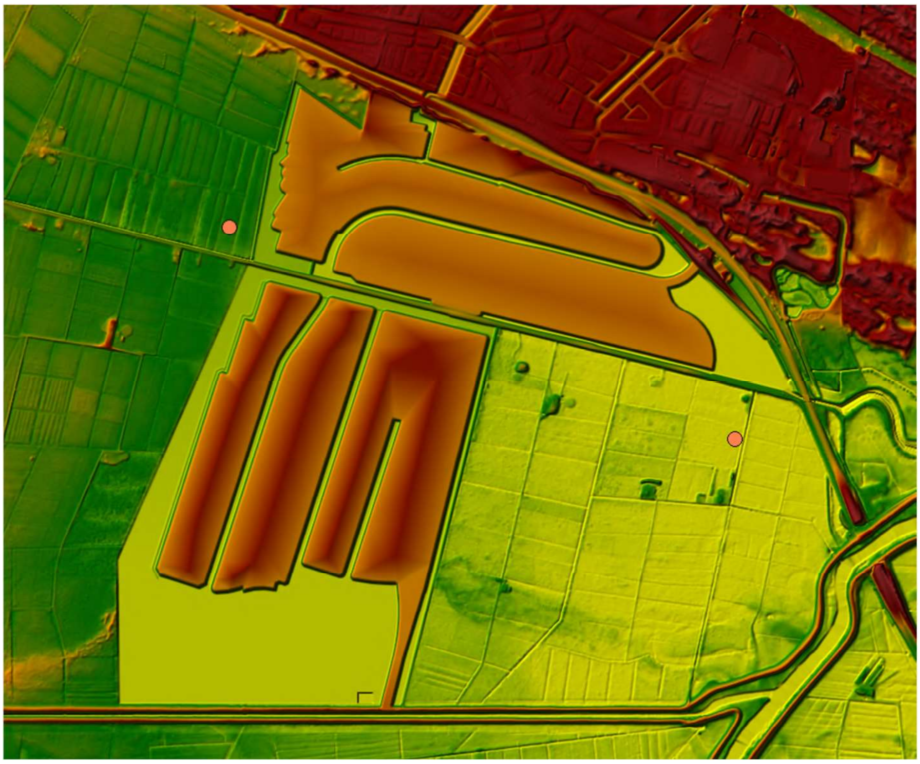


Figure 43: North and South Block Flood Depth *(Source: HEC-RAS)*

Flood depth and water level data were extracted at the two locations marked with orange circles to represent the undeveloped (baseline) condition. This provides a reliable reference for assessing the upstream and downstream effects once the development has been completed.

A summary of the model results is shown below:

Table 10 – Pre-Development inflows for Climate Change scenario 3.68°C with SLR 1.59m

	5-year	10-year	50-year	100-year	500-year	
Site Flow	17.04	49.22	79.536	137.36	222.15	m^3/s
Time of Peak	01/01/2000 0:40	01/01/2000 0:10	01/01/2000 0:30	01/01/2000 0:00	31/12/1999 23:50	hh:mm
Flood Level	1.85 (North) 1.09(South)	2.01 (North) 1.92 (South)	2.46 (North) 2.46 (South)	2.60(North) 2.60(South)	3.30(North) 3.30(South)	m NZVD16
Flood Depth	0.13(North) 0.62(South)	0.29 (North) 1.45 (South)	0.74 (North) 1.99(South)	0.88 (North) 2.13 (South)	1.58 (North) 2.83 (South)	m

*Refer to Figure 42and Figure 43 for reference point and cross section locations

Table 11 – Post-Development inflows for Climate Change scenario 3.68°C with SLR 1.59m

	5-year	10-year	50-year	100-year	500-year	
Site Flow	17.58	52.46	83.57	129.42	193.36	m^3/s
Time of Peak	01/01/2000 0:40	01/01/2000 0:20	31/12/1999 23:50	31/12/1999 23:50	31/12/1999 23:50	hh:mm
Flood Level	1.76 (North) 0.76 (South)	2.05 (North) 1.58(South)	2.26 (North) 2.25(South)	2.49 (North) 2.49 (South)	3.32 (North) 3.32 (South)	m NZVD16
Flood Depth	0.07(North) 0.30(South)	0.35 (North) 1.12(South)	0.55 (North) 1.78(South)	0.78(North) 2.03 (South)	1.61North) 2.86(South)	m

*Refer to Figure 42and Figure 43 for reference point and cross section locations

Table 12 – Difference in inflows (Pre minus Post) for Climate Change scenario 3.68°C with SLR 1.59m

	5-year	10-year	50-year	100-year	500-year	
Site Flow	+0.5	+3.4	+4.0	-8.0	-28.8	m^3/s
Time of Peak	Same time	Same time	Same time	Same time	Same time	hh:mm
Flood Level	-0.09(North) -0.33(South)	+0.04(North) -0.34(South)	-0.20(North) -0.21(South)	-0.11(North) -0.11(South)	+0.02(North) +0.02(South)	m NZVD16
Flood Depth	-0.06(North) -0.32(South)	+0.06(North) -0.33(South)	-0.19(North) -0.21(South)	-0.10(North) -0.10(South)	+0.03(North) +0.02(South)	m

*Refer to Figure 42and Figure 43 for reference point and cross section locations

The results indicate a general decrease in flood levels across all storm frequencies when comparing pre-development and post-development scenarios, primarily due to the additional pump capacity incorporated into the design. No upstream or downstream increases occur during peak events, and no culvert connections have been provided to Papamoa on the eastern side. This approach isolates the system, ensuring that backflow from the wider catchment is not introduced and that flood levels at the catchment boundaries remain unaffected.

5.4.6.Model Sensitivity checks

1. Mannings N Values of Swales and the Bell Road Main Drain.

   A sensitivity assessment was undertaken for the post-development swales and the Bell Road main drain by varying Manning's *n* values from 0.04 to 0.06. The assessment evaluated the resulting effects on pump discharge volumes and water surface levels using the 100-year, 3.68C climate change design event. Pump discharge volumes were assessed on a combined basis, accounting for contributions from the Bell Road Main Drain and Bell Road Pump Stations A and B.
   The post development scenario includes the South Block Pump Station and Bell Road Pump Station A with additional capacity.

Table 13 – Manning's n Value Sensitivity Check - Pre-Development

Mannings' N (Pre Dev)	0.04	0.06
North Block WSE (NZVD16)	2.62	2.62
South Block WSE (NZVD16)	2.62	2.62
Combined Pump Volume	1,439 x 10^3	1,429 x 10^3

Table 14 – Manning's n Value Sensitivity Check - Post-Development

Mannings' N (Post Dev)	0.04	0.06
North Block WSE (NZVD16)	2.50	2.51
South Block WSE (NZVD16)	2.50	2.51
Combined Pump Volume	5,752 x 10^3	5,692 x 10^3

This sensitivity assessment shows that water surface levels remain similar, and the pump stations exhibit only minor differences in their ability to dewater. Therefore, the proposed development is not sensitive to Manning's n values between 0.04 and 0.06.

This demonstrates that the development's hydraulic performance is robust to realistic variations in channel roughness.

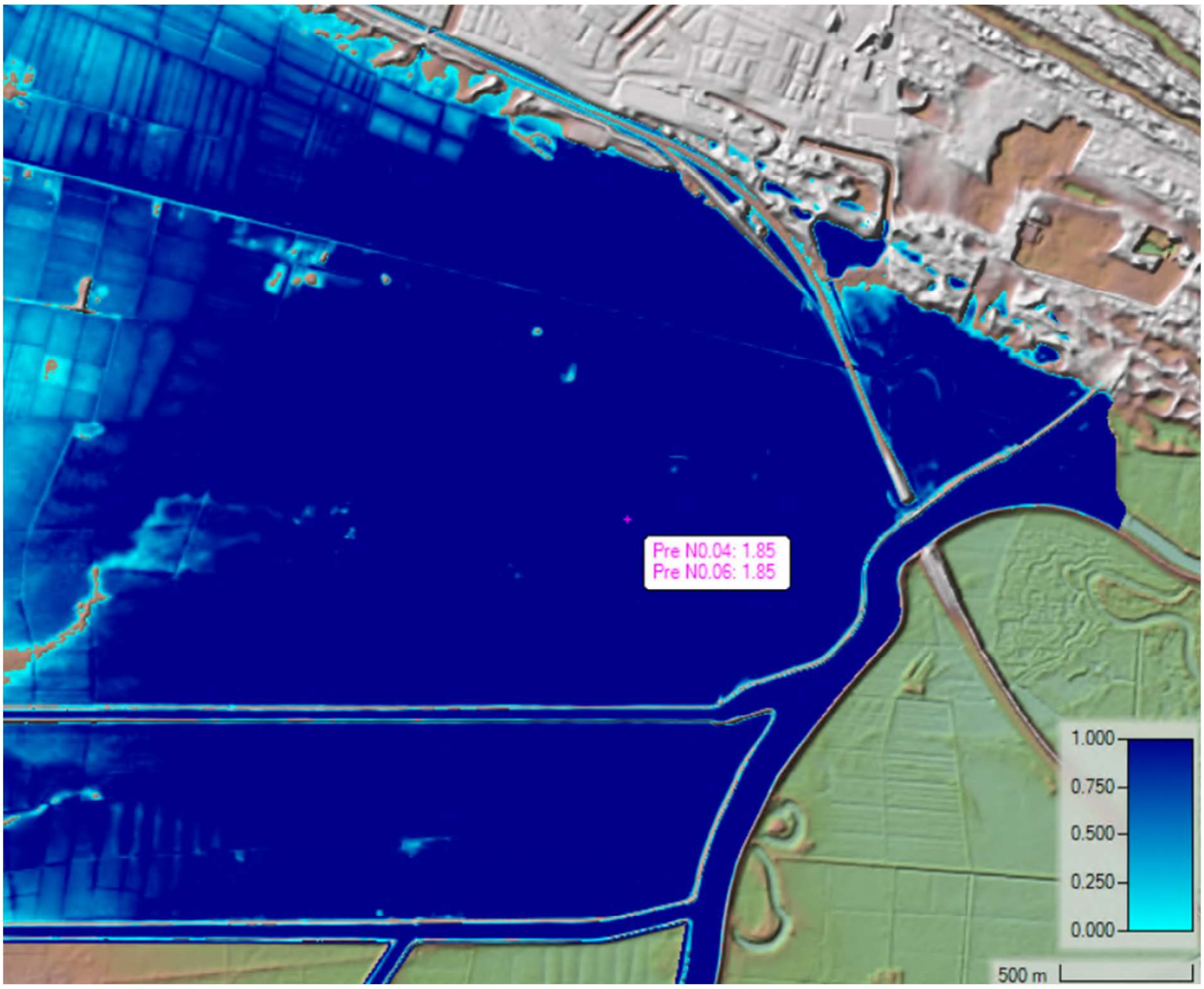


Figure 44: Manning's n Value Sensitivity Check - Pre-Development *Maximum Depth* Comparison (Source: HEC-RAS)

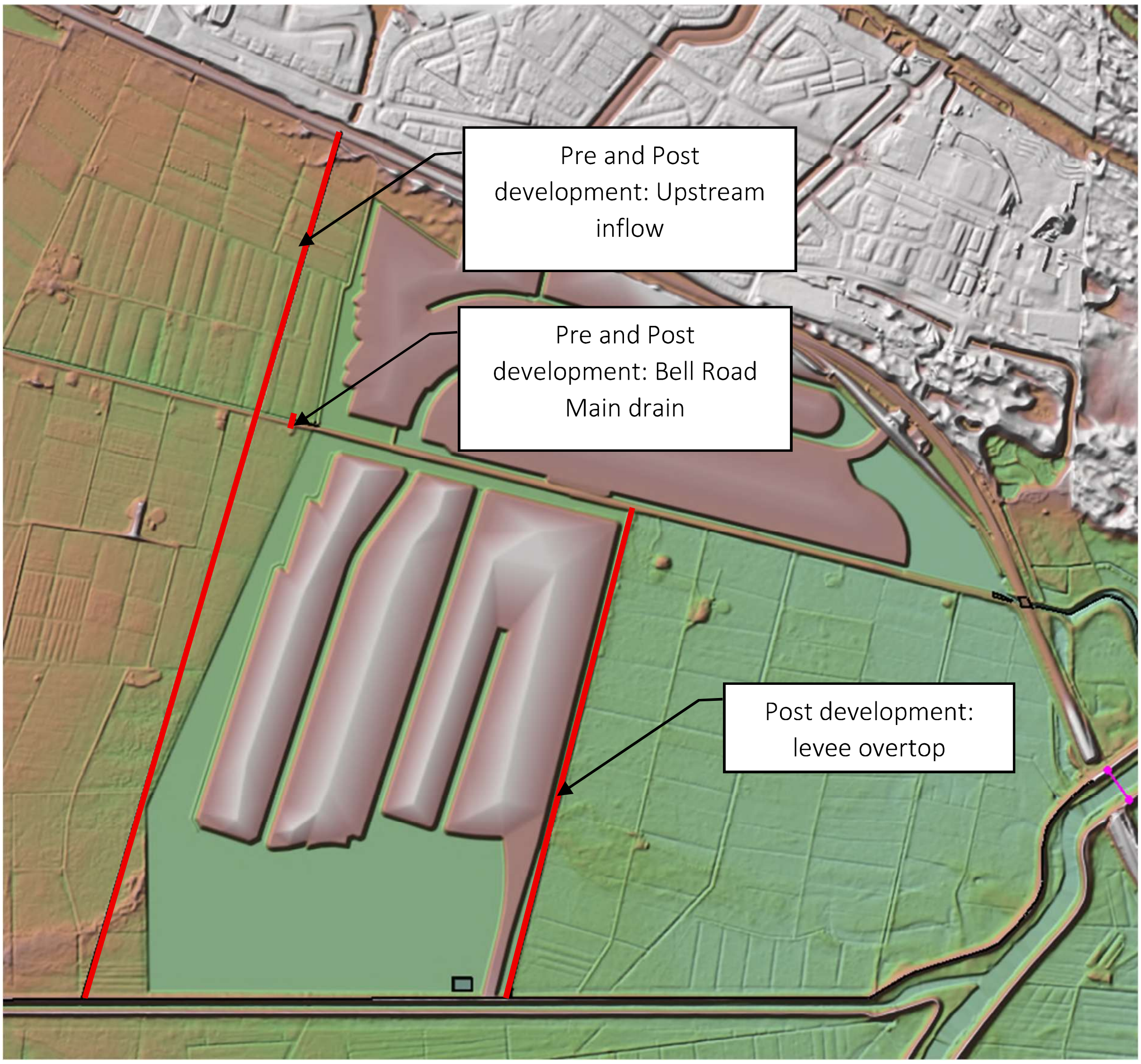


Figure 45: Manning's n Value Sensitivity Check – *Flow Rate Check Locations* (Source: HEC-RAS)

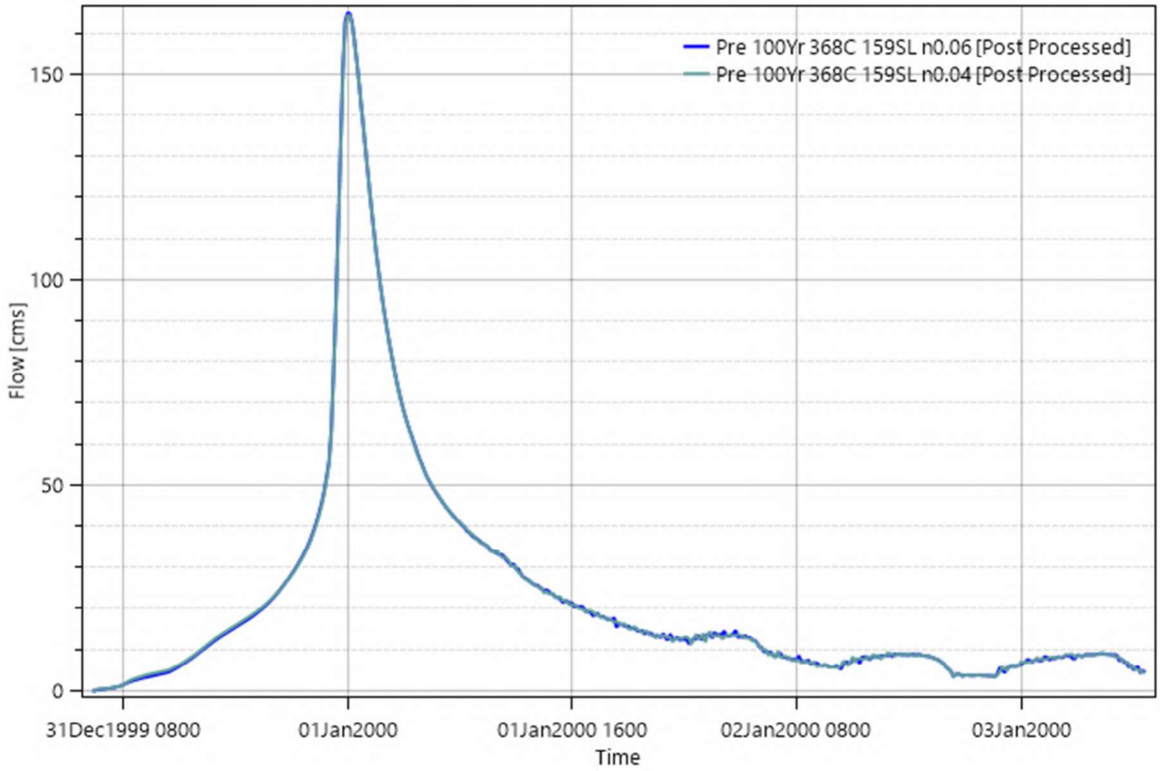


Figure 46: Manning's n Value Sensitivity Check - Pre-development: *Upstream I*nflow (Source: HEC-RAS)

Pre Development 100Yr 3.68C 1.59SML, Manning N 0.06: Peak flow 164.9m³/s at 1 Jan 2000 0:00

Pre Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 164.3m³/s at 1 Jan 2000 00:00

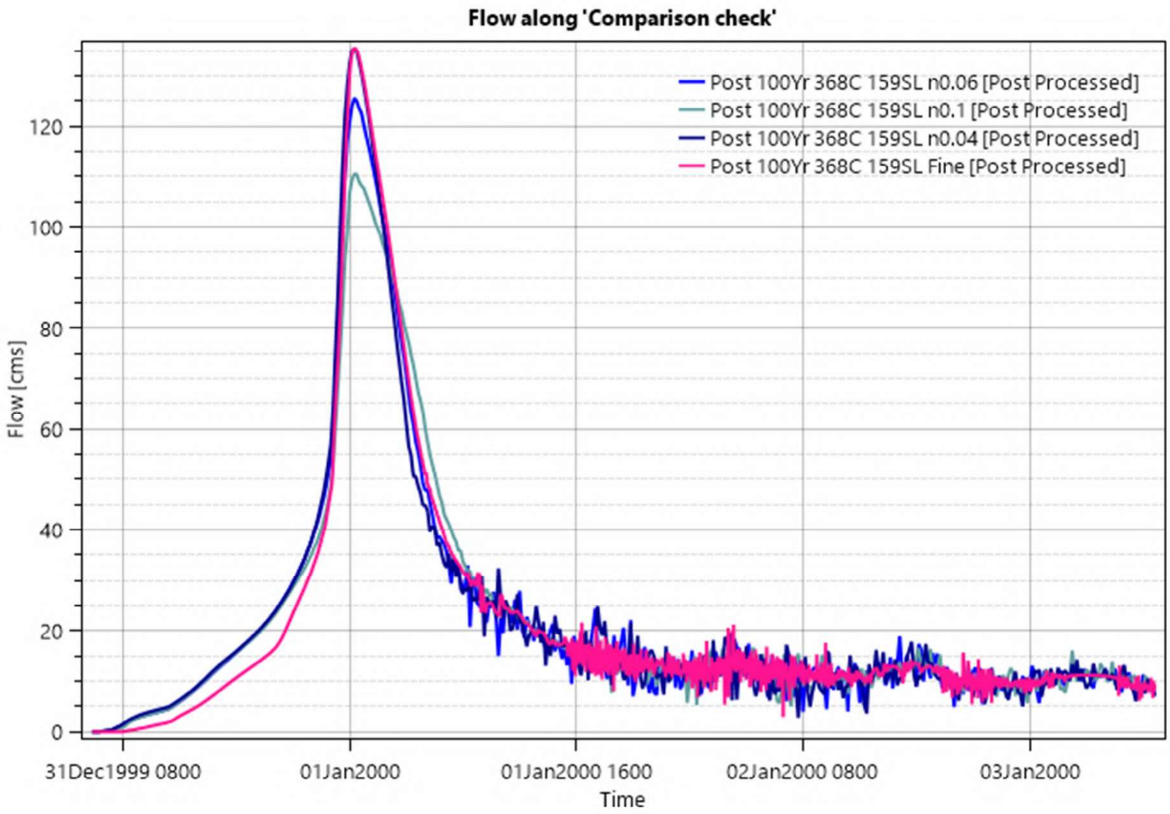


Figure 47: Manning's n Value Sensitivity Check - Post-Development: *Upstream I*nflow (Source: HEC-RAS)

Post Development 100Yr 3.68C 1.59SML, Manning N 0.1: Peak flow 110.5m³/s at 1 Jan 2000 00:20

Post Development 100Yr 3.68C 1.59SML, Manning N 0.06: Peak flow 125.6m³/s at 1 Jan 2000 0:20

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 135.4m³/s at 1 Jan 2000 00:20

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 135.54m³/s at 1 Jan 2000 00:22 – 5m grid

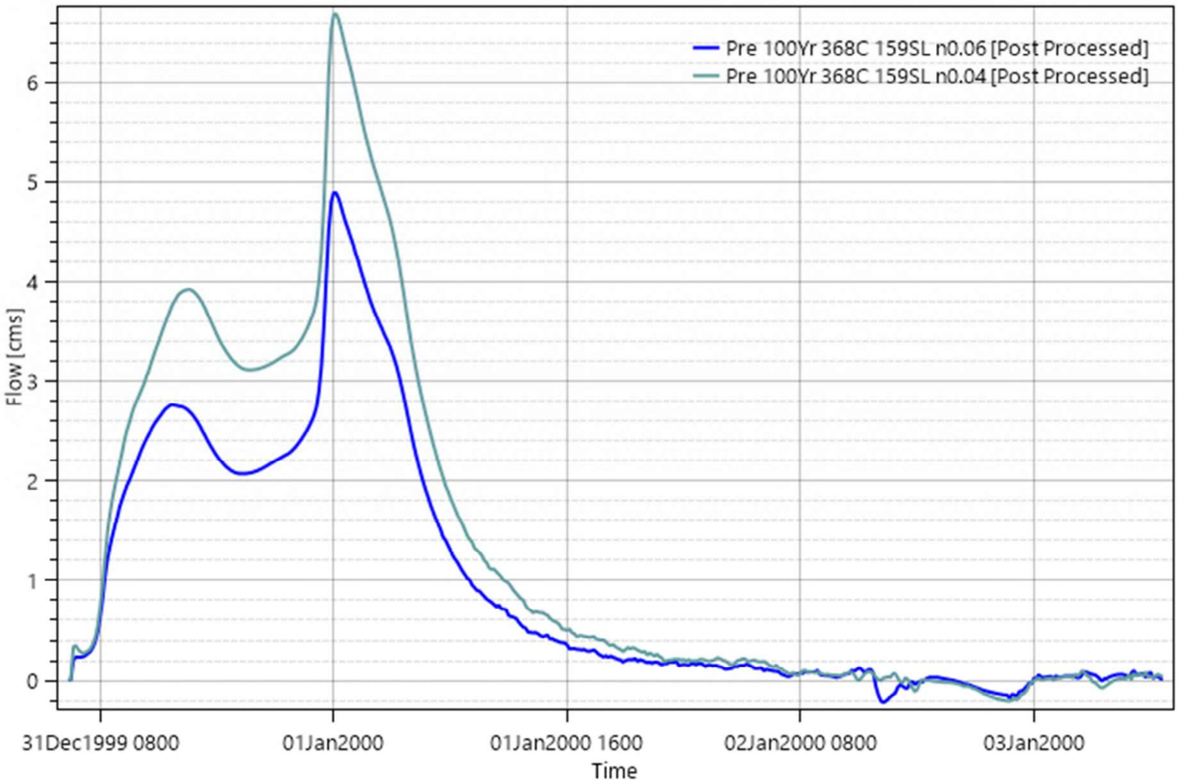


Figure 48: Manning's n Value Sensitivity Check - Pre-development: Bell *R*oad *Main Drain I*nflow (Source: HEC-RAS)

Pre Development 100Yr 3.68C 1.59SML, Manning N 0.06: Peak flow 4.8m³/s at 1 Jan 2000 0:00

Pre Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 6.7m³/s at 1 Jan 2000 00:10

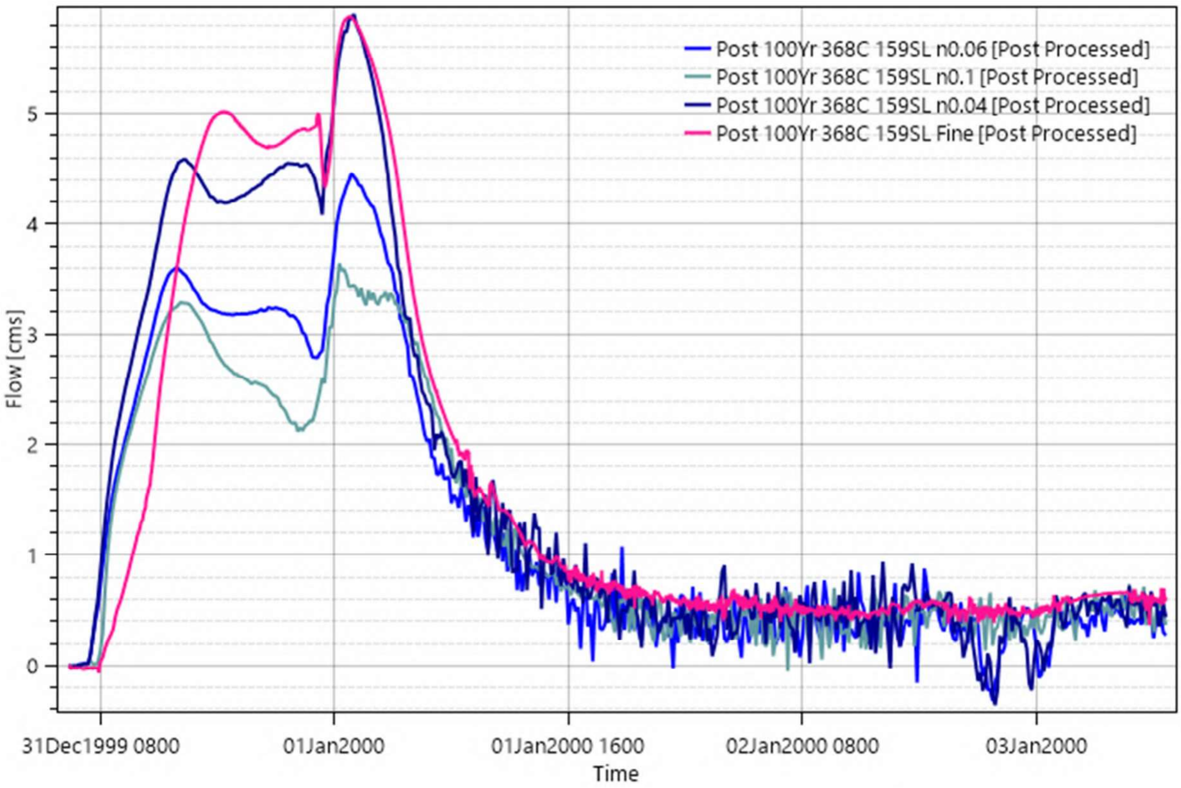


Figure 49: Manning's n Value Sensitivity Check - Post-Development: Bell *R*oad *M*ain *Drain Inflow* (Source: HEC-RAS)

Post Development 100Yr 3.68C 1.59SML, Manning N 0.1: Peak flow 3.6m³/s at 1 Jan 2000 00:20

Post Development 100Yr 3.68C 1.59SML, Manning N 0.06: Peak flow 4.4m³/s at 1 Jan 2000 01:10

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 5.9m³/s at 1 Jan 2000 01:20

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 5.9m³/s at 1 Jan 2000 01:03 – 5m grid

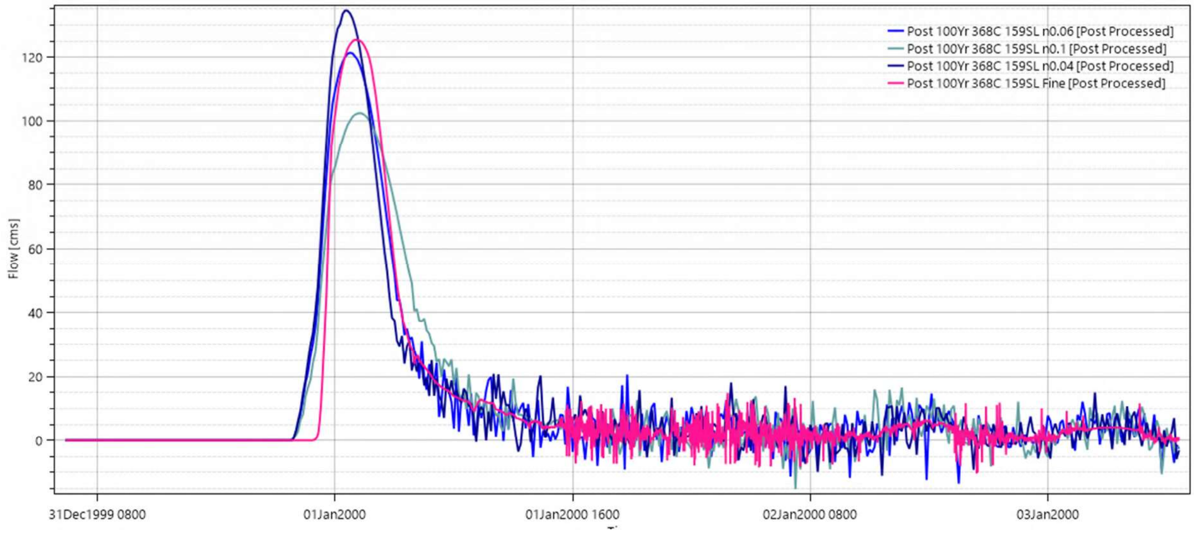


Figure 50: Manning's n Value Sensitivity Check - Post-*D*evelopment: Levee Overtop (Source: HEC-RAS)

Post Development 100Yr 3.68C 1.59SML, Manning N 0.1: Peak flow 102.5m³/s at 1 Jan 2000 01:40

Post Development 100Yr 3.68C 1.59SML, Manning N 0.06: Peak flow 121.4m³/s at 1 Jan 2000 01:00

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 134.5m³/s at 1 Jan 2000 01:00

Post Development 100Yr 3.68C 1.59SML, Manning N 0.04: Peak flow 125.4m³/s at 1 Jan 2000 01:24– 5m grid

The sensitivity analysis for the Bell Road main drain demonstrates that, while variations in channel roughness (Manning's n) and grid resolution produce minor changes in peak inflow, the time to peak remains similar across all scenarios. The differences in inflow magnitude are small relative to the overall catchment response, indicating that the drain's hydraulic behaviour is largely governed by the broader catchment and storage characteristics rather than localised roughness or grid resolution. Finer grid resolution provides a more detailed representation of flow dynamics along the drain but does not materially change the comparative outcomes between pre- and post-development conditions. Overall, the model reliably represents the Bell Road main drain's performance, providing confidence in its use for design and planning purposes.

As the development is constructed, flood depth probes will be installed within the swale to allow calibration of the hydraulic model as vegetation establishes. This monitoring will provide updated data, ensuring that Manning's *n* values used during the design phase remain representative of actual conditions during the construction and early operational phases of the development.

2. Volume Between 72h Event and 7 Day Event

For the purpose of comparing runoff volumes only, the Bell Road catchment extending from State Highway towards the Papamoa Hills was modelled as a single contributing catchment with no lag time and no infiltration applied. The area is approximately 1653.14 ha

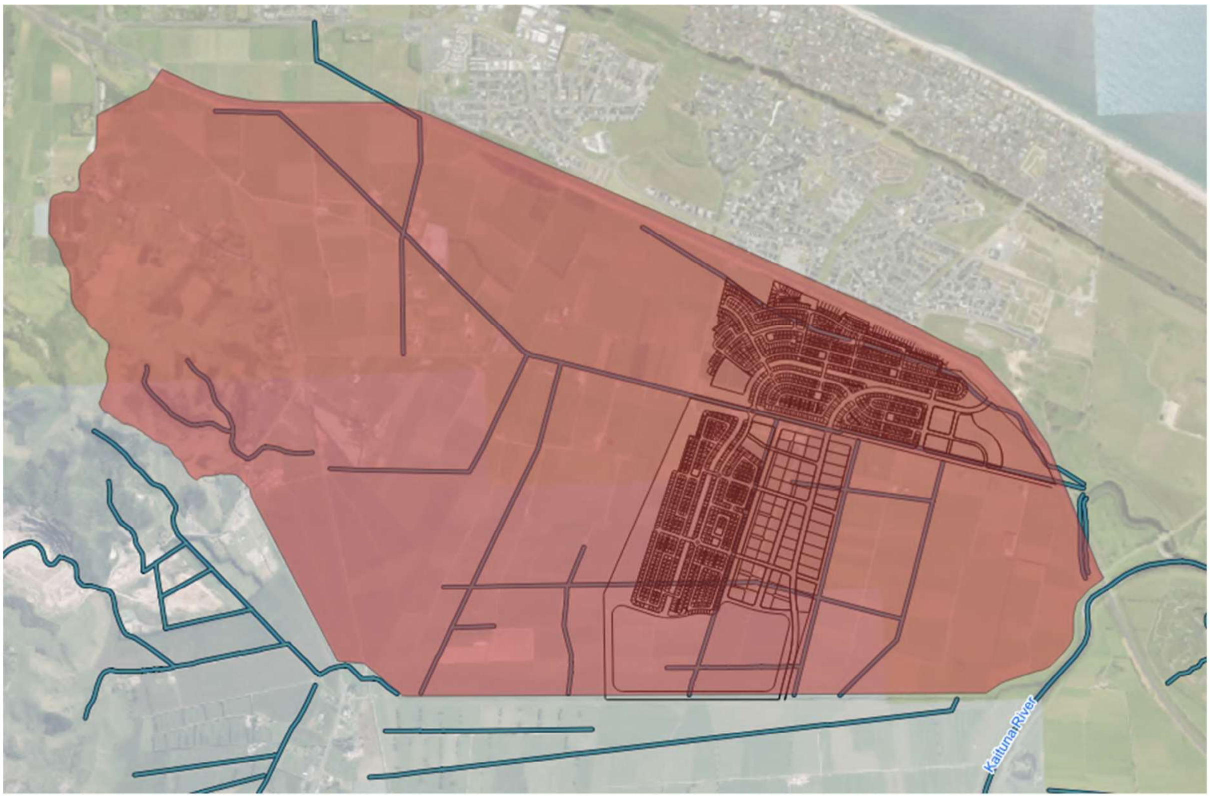


Figure 51: Catchment Area (Source: HEC-RAS)

Hydrologic modelling was undertaken using HEC-HMS version 4.12, and the following total runoff volumes were obtained:

Table 15 – 7 Day vs 72 Hour Sensitivity Check - Volume

Storm Event	Volume (m^3)
BOPRC Model 100Yr 3.68C 7 Days	10,453 x 10^3
BOPRC Model 100Yr 3.68C 72H 75% heavy ended	6,734 x 10^3

The 72-hour event produces approximately 64% less runoff volume than the 7-day event.

The Bell Road South Pump Station, together with the newly upgraded Bell Road Pump Station A, has a combined dewatering capacity of approximately 1,624 × 10^3 m^3 within a 24-hour period. The system has been sized for the BOPRC 100-year, 3.68C, 7-day event; therefore, the reduced runoff volume associated with the 72-hour event will produce lower peak water levels relative to the design scenario.

3. Pump Failure During 100Yr 3.68C Event

Council has advised that the existing pump stations do not have any backup capacity in the event of a power failure. The upgraded Bell Road Pump Station A, however, will be equipped with 24-hour generator capability, similar to the South Block pump station.
As part of the sensitivity assessment, a scenario was considered in which all pumps fail simultaneously, without any operation. The purpose of this assessment is to determine whether the Bell Road development has sufficient freeboard, given that the platform level is at RL 3.5 m.
For this analysis, a Manning's n value of 0.06 was applied to the swales.

Table 16 – Pump Failure Sensitivity Check - WSE

Pump Working	Yes	No
North Block WSE (NZVD16)	2.51	2.88
South Block WSE (NZVD16)	2.51	2.88

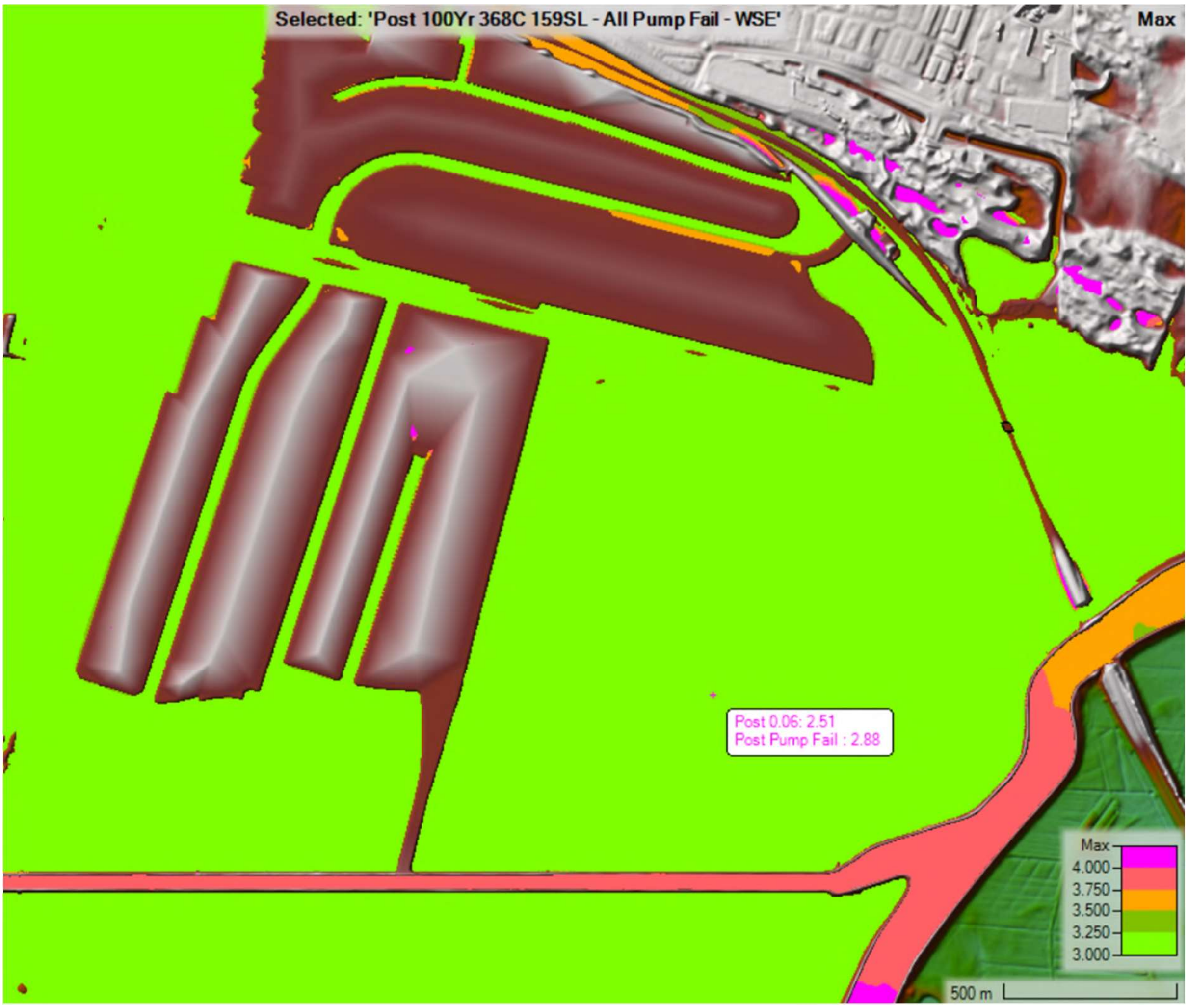


Figure 52: Pump Failure Scenario (Source: HEC-RAS)

Under the sensitivity assessment, water levels reach approximately RL 2.51 m with the pumps operating and rise to RL 2.88 m if the pumps are not operating. Applying 500 mm of freeboard results in a level of RL 3.38 m, which remains below the proposed platform and access road level of RL 3.5 m. Even under this extreme climate change adjusted event scenario, the development is not at risk of flooding. By comparison, the existing conditions expose property owners across the catchment to a greater risk of future flooding.

4. MIKE+ Spatial Moving Rain vs HEC-RAS

The primary difference between the two modelling approaches is that MIKE+ was set up using spatially varying rainfall, whereas HEC-RAS initially applied a uniform rainfall distribution across the entire catchment.

To ensure an appropriate comparison between the two models, the same spatial rainfall dataset used in MIKE+ was subsequently incorporated into the HEC-RAS model. This was done to provide a direct volume and inflow cross-check, and to determine whether rainfall distribution methodology was contributing to the observed differences in results.

Following the update, the HEC-RAS model was found to be relatively not sensitive to the spatial variability of rainfall for this particular event and catchment configuration. The overall runoff response, peak water levels, and storage volumes remained largely unchanged compared to the uniform rainfall scenario.

Table 17 – Mike+ Spatial Moving Rain vs HEC-RAS Sensitivity Check – Total Volume

Model	Total Volume(x1000m³)
HEC-RAS	7639.64
MIKE +	7263.53
DIFF	376.11

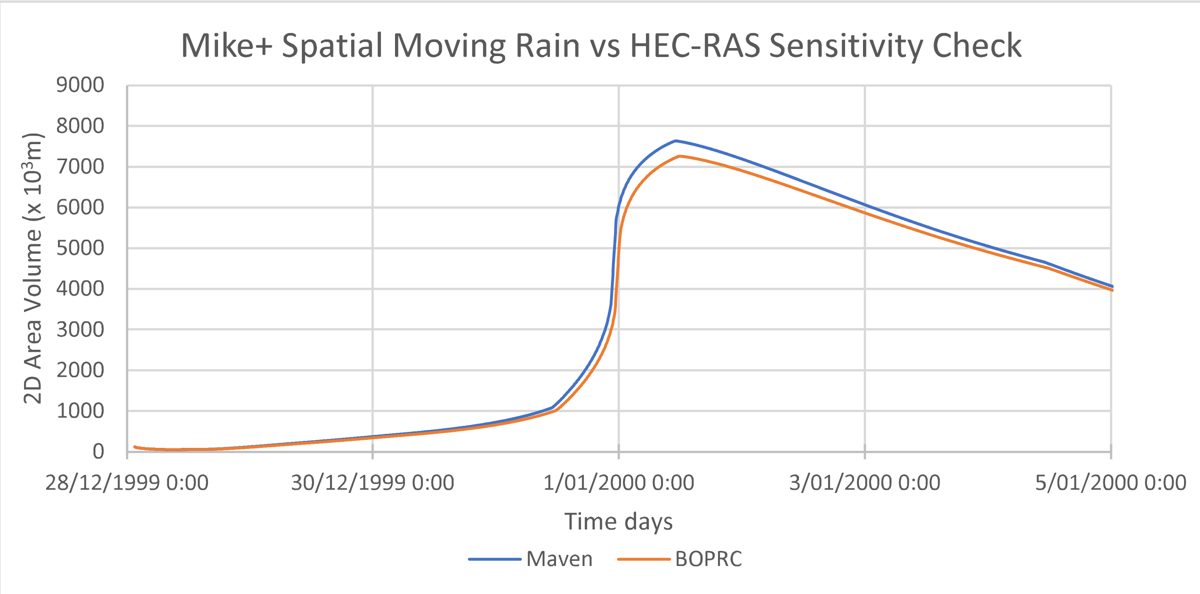


Figure 53: Mike+ Spatial Moving Rain vs HEC-RAS Sensitivity Check – *2D* Area *V*olume (Source: HEC-RAS)

The volume difference of approximately 376,110 m^3 represents a variance of roughly 4.9%, which is considered reasonable given the different hydraulic solvers and computational approaches of the two platforms.

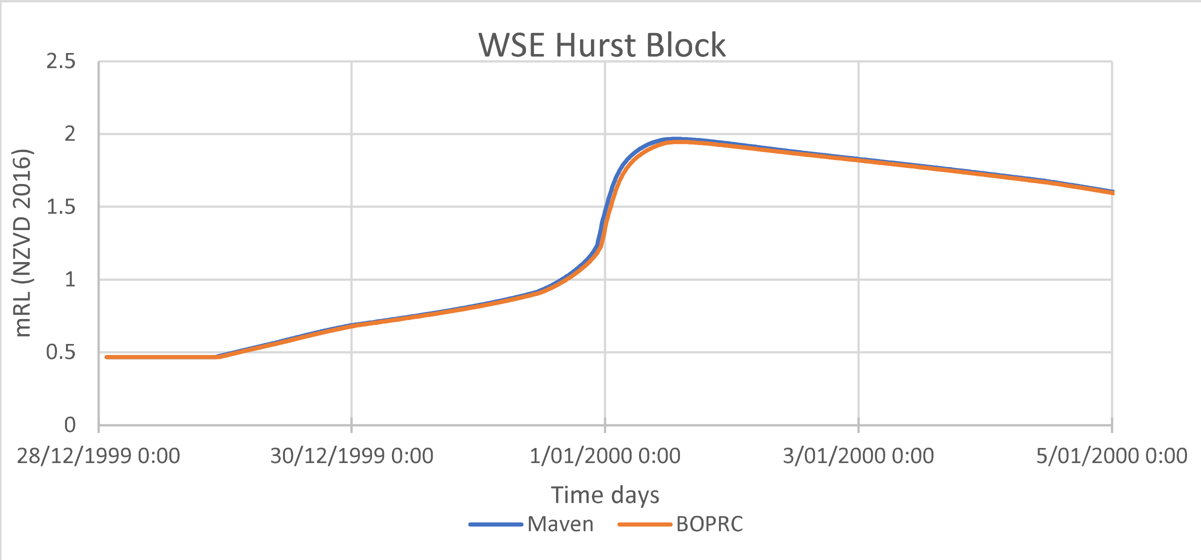


Figure 54: Mike+ Spatial Moving Rain vs HEC-RAS Sensitivity Check – WSE Comparison (Source: HEC-RAS)

The peak water level difference of 19 mm is minor and well within typical modelling tolerance ranges for two independent hydraulic platforms.

The peak inflow predicted by both models is closely aligned, with only minor differences in magnitude and timing.

- HEC-RAS Peak flow of 52.860 m^3/s occurring at 01 Jan 2000 – 00:40
- MIKE+ Peak flow of 51.265 m^3/s occurring at 01 Jan 2000 – 01:20

The difference in peak magnitude is approximately 1.595 m^3/s, equating to roughly 3% variation, which is considered minor and within acceptable modelling tolerance between two independent hydraulic platforms.

Figure 55: Mike+ Spatial Moving Rain vs HEC-RAS Sensitivity Check – *Inflow Comparison Location* (Source: HEC-RAS)

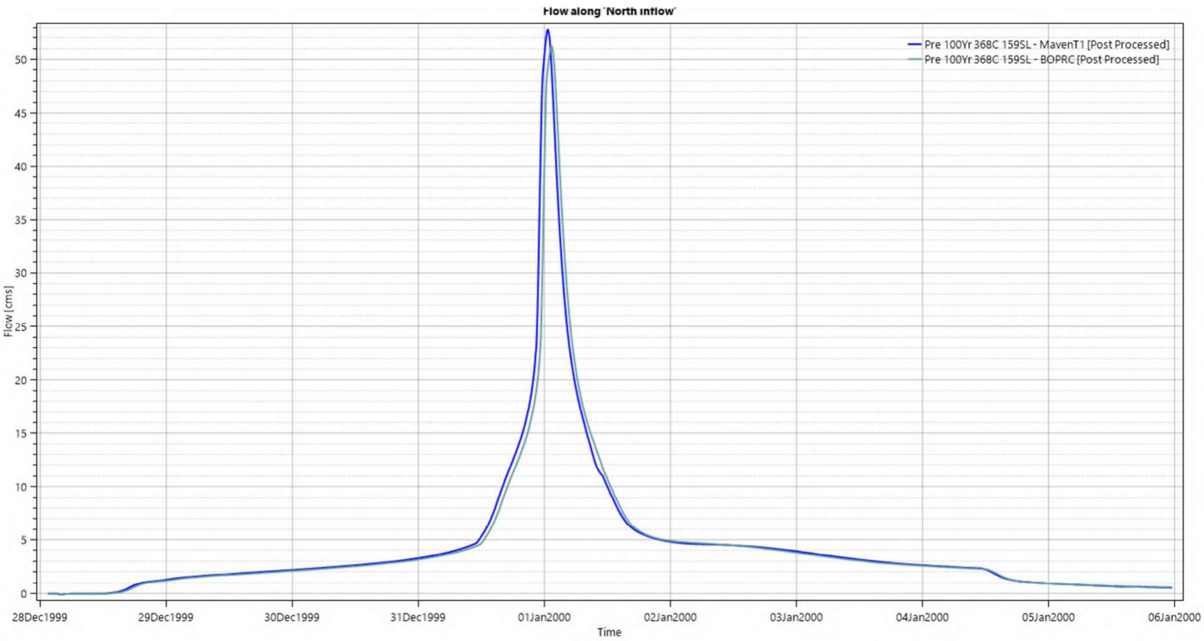


Figure 56: Mike+ Spatial Moving Rain vs HEC-RAS Sensitivity Check – *Inflow Comparison* (Source: HEC-RAS)

6. Flood Risk Assessment

For clarity, the outputs for all assessed events and scenarios are summarised in Table 18 below. Reference Points 1 & 2 are depicted on Figure 43: North and South Block Flood Depth *(Source: HEC-RAS)* elsewhere in this report. Individual pre- and post-development results, including flood levels, velocities, and inundation duration, are presented in Section 6.1 in the form of maps for the for 5-, 10-, 50-, 100-, 500-yr ARI 2130 storm events. Section 6.2 presents point comparisons for the for 10-, 100-, 500-yr ARI 2130 storm events in 4 locations in. Flood extents and flow paths are illustrated on the corresponding figures within these sections.

Table 18: HEC-RAS results at reference points 1 & 2 as shown on Figure 43

Reference Point 1					
Event	**Scenario**	**Max Flood Level mRL (NZVD16)**	**Max Flood Depth (m)**	**Max Velocity (m/s)**	**Remaining Flood Depth 2.4 Days after storm peak (m)**
5-year	**Pre**	1.844	0.137	0.084	0.00
	Post	1.751	0.053	0.119	0.00
10-year	**Pre**	2.006	0.300	0.159	0.218
	Post	2.046	0.341	0.176	0.00
50-year	**Pre**	2.459	0.750	0.205	0.724
	Post	2.26	0.552	0.198	0.349
100-year	**Pre**	2.596	0.886	0.267	0.809
	Post	2.489	0.781	0.220	0.475
500-year	**Pre**	3.299	1.590	0.299	1.492
	Post	3.318	1.610	0.205	1.339
Reference Point 2					
Event	**Scenario**	**Max Flood Level mRL (NZVD16)**	**Max Flood Depth (m)**	**Max Velocity (m/s)**	**Remaining Flood Depth 2.4 Days after storm peak (m)**
5-year	**Pre**	1.087	0.626	0.021	0.593
	Post	0.760	0.311	0.009	0.259
10-year	**Pre**	1.919	1.458	0.070	1.457
	Post	1.580	1.131	0.060	0.659
50-year	**Pre**	2.459	1.998	0.075	1.972
	Post	2.246	1.797	0.091	1.597
100-year	**Pre**	2.595	2.135	0.087	2.057
	Post	2.486	2.037	0.108	1.728
500-year	**Pre**	3.299	2.838	0.091	2.740
	Post	3.317	2.868	0.068	2.595

6.1. Pre and Post-Development Results

Below are pre-development and post-development model results maps for 5-, 10-, 50-, 100-, 500-yr ARI storm events, with the result maps being flood depth, velocity, water surface elevation and inflows and outflows for the western boundary of site, Kopuaroa Canal and Kaituna River.

For the post development scenario It should be noted that the proposed ground level formation is preliminary only and shows a flat surface across the development, which creates minor ponding depths in the model. This will be refined through detailed surface design (above flood levels), with final results expected to show flooding only within designated overland flow paths. A 100 mm depth cut-off has been applied to exclude minor ponding depths.

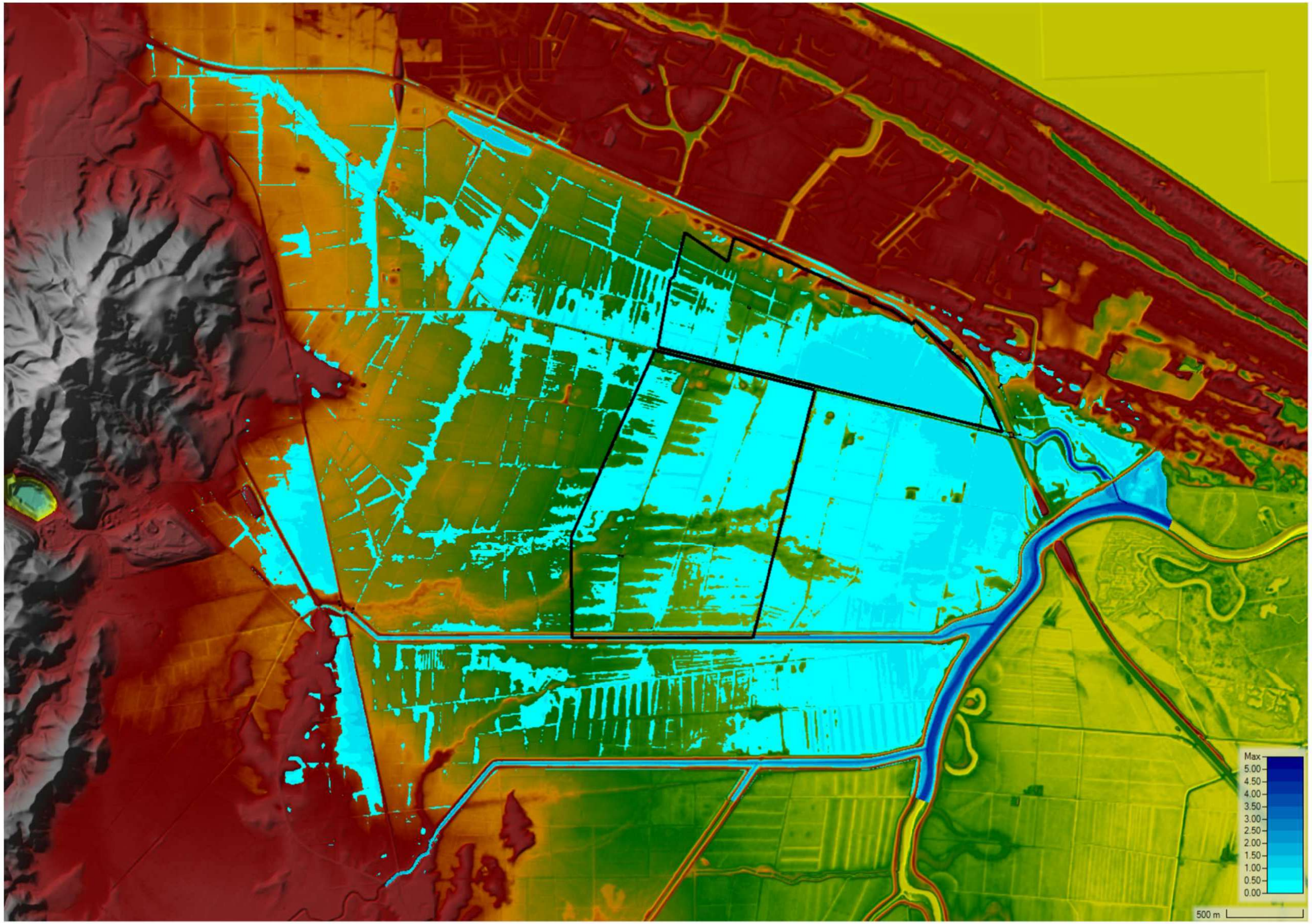


Figure 57 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Depths (m)

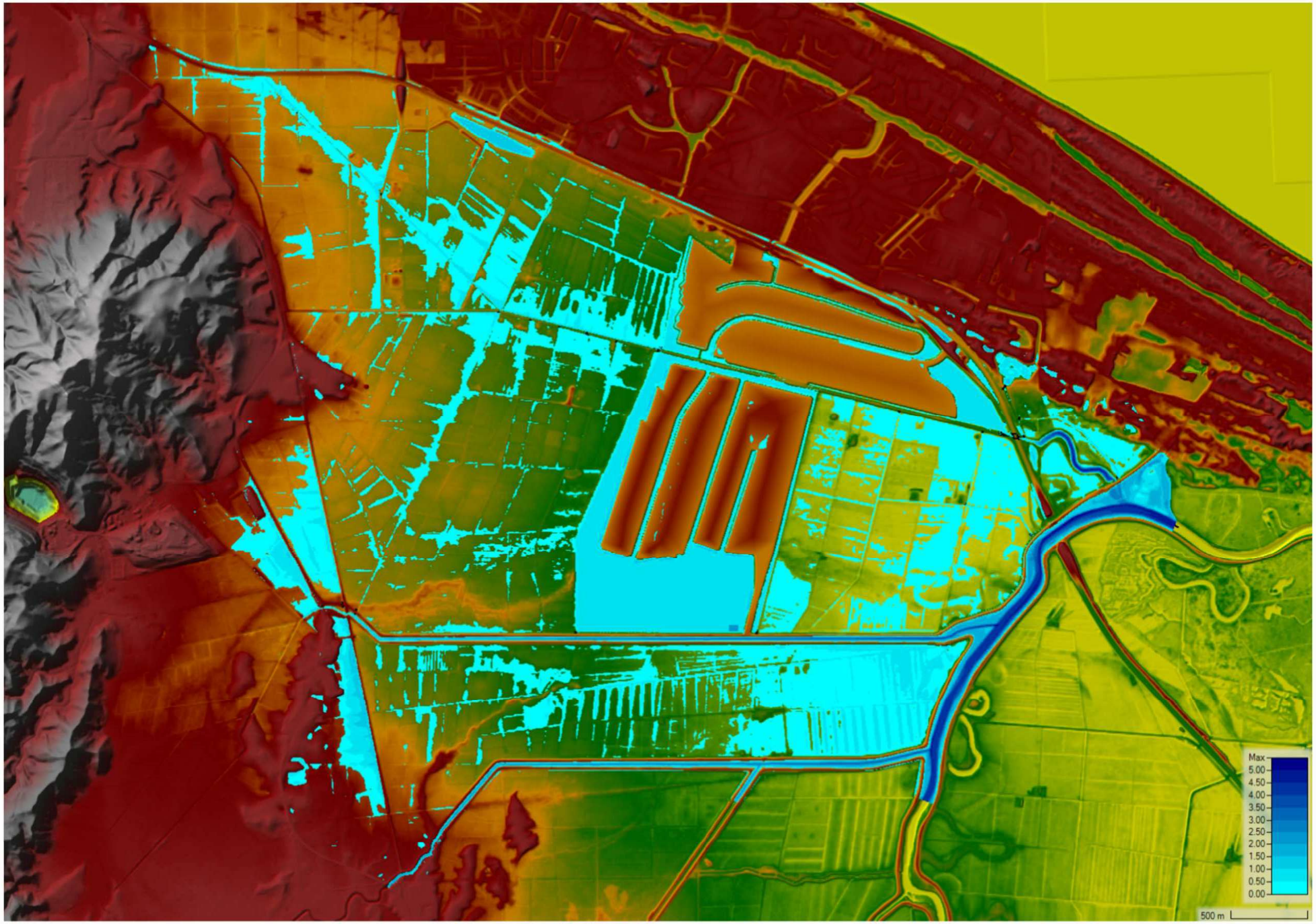


Figure 58 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Flood Depths (m)

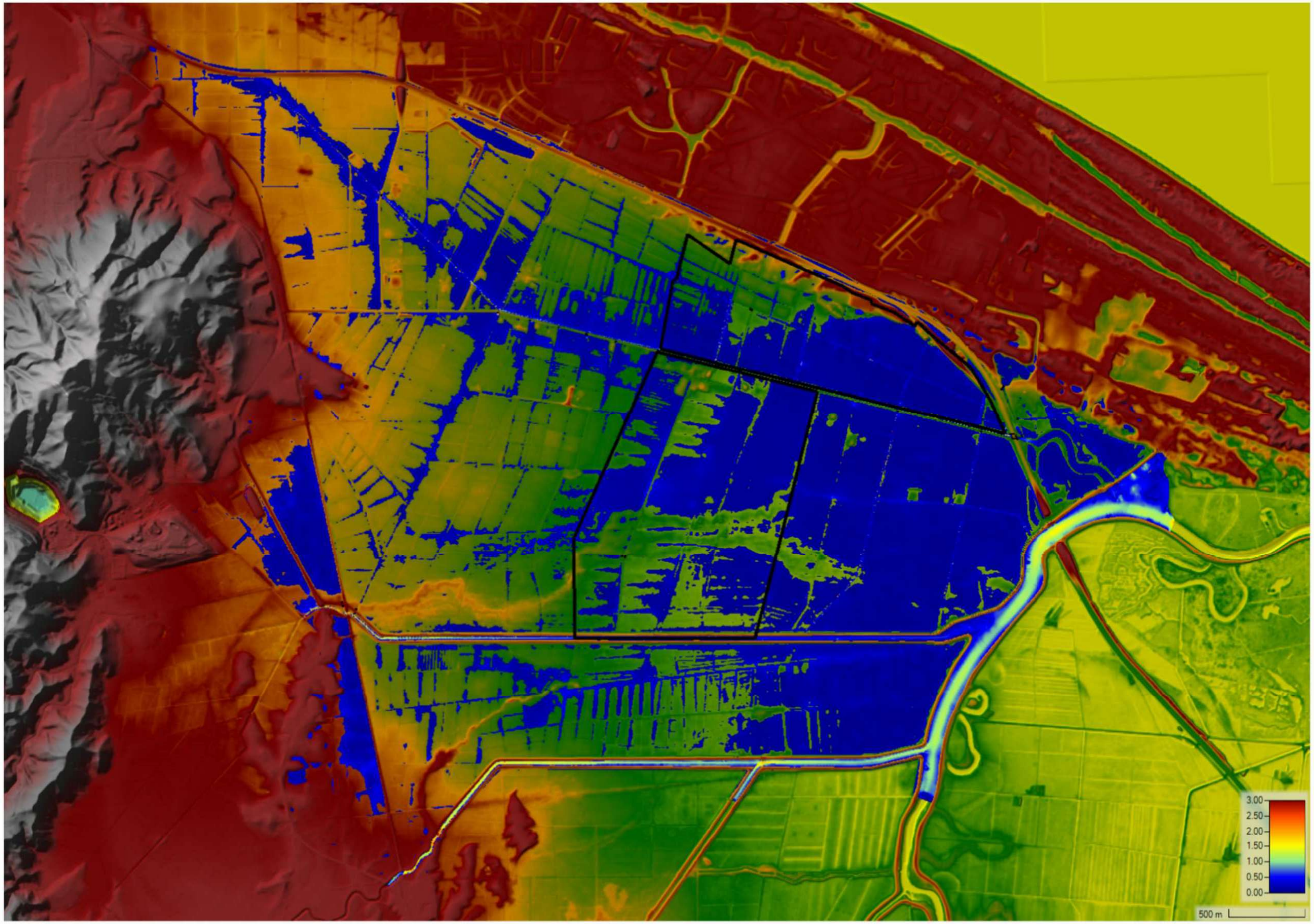


Figure 59 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Velocity(m/s)

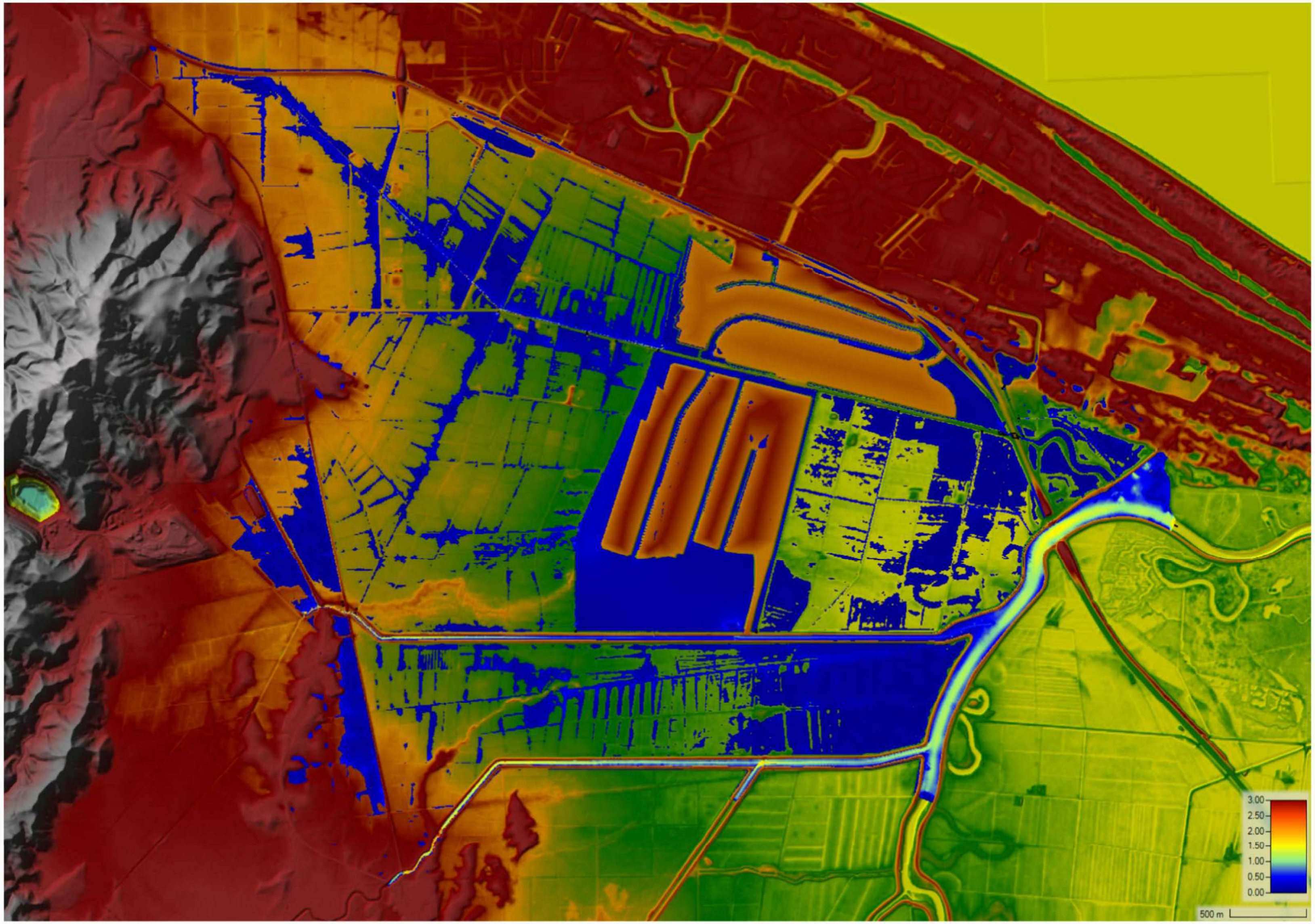


Figure 60 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Velocity(m/s)

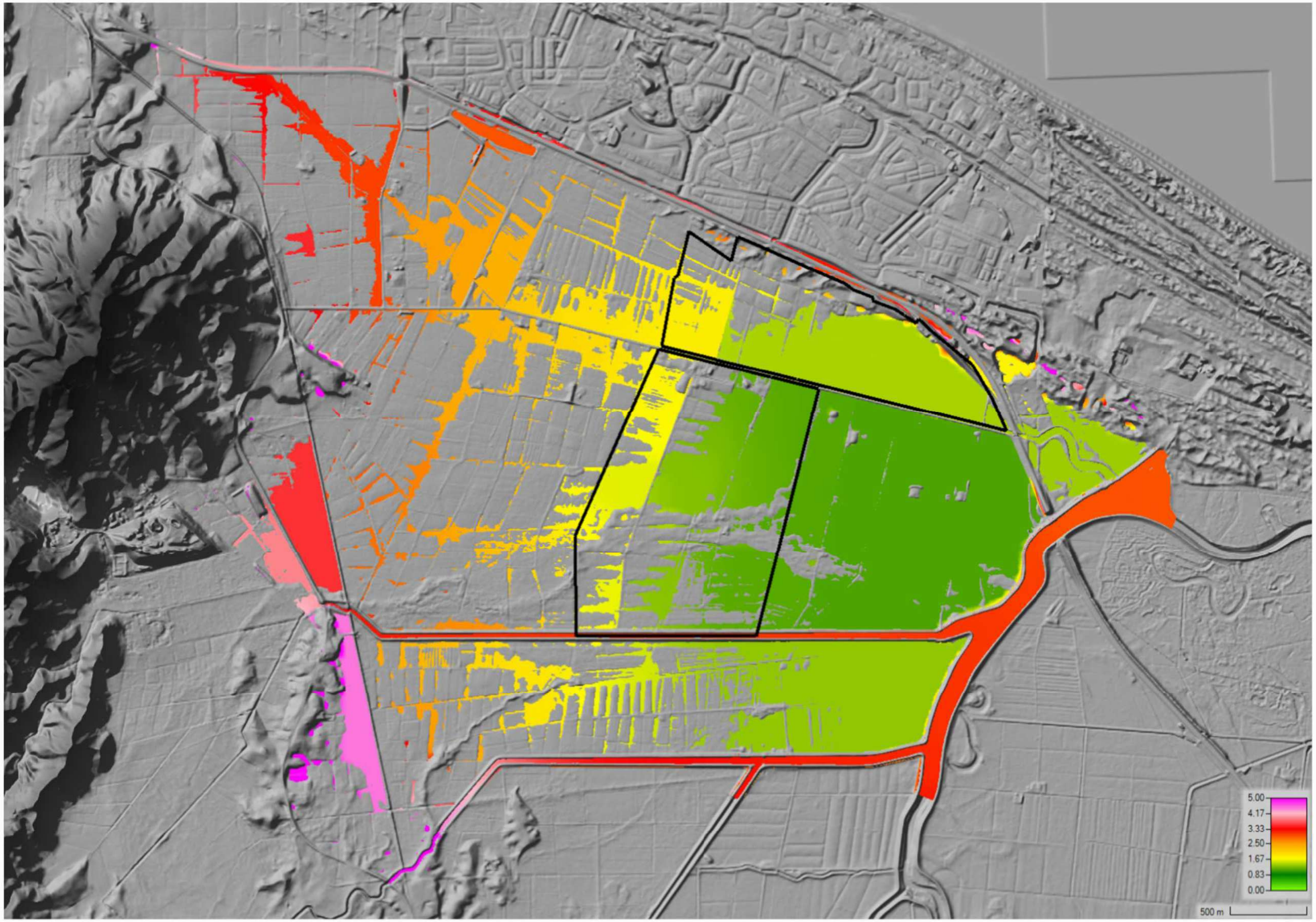


Figure 61 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Water Surface Elevation (m, NZVD16)

Figure 62 - 5yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Water Surface Elevation (m, NZVD16)

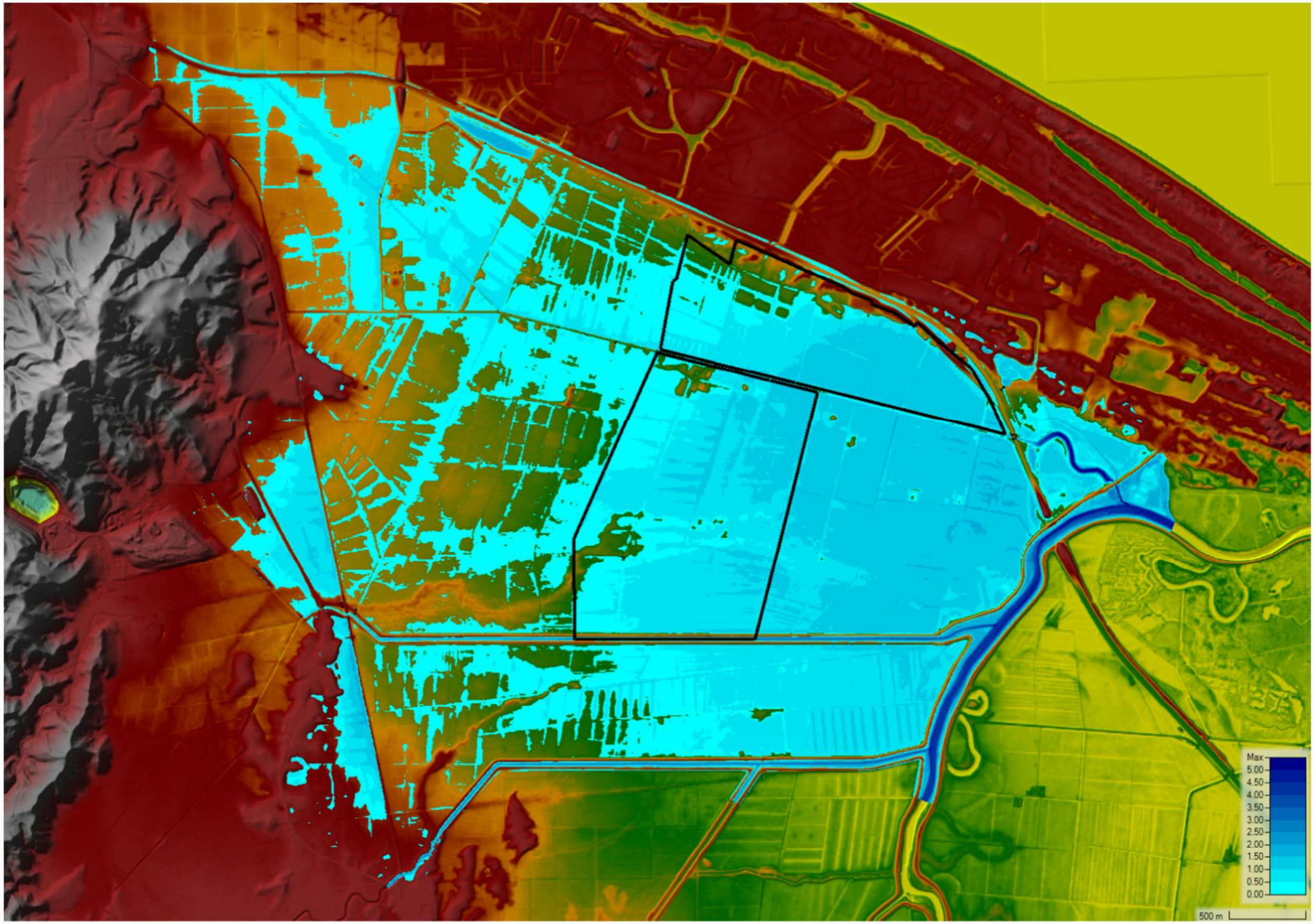


Figure 63 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Depths (m)

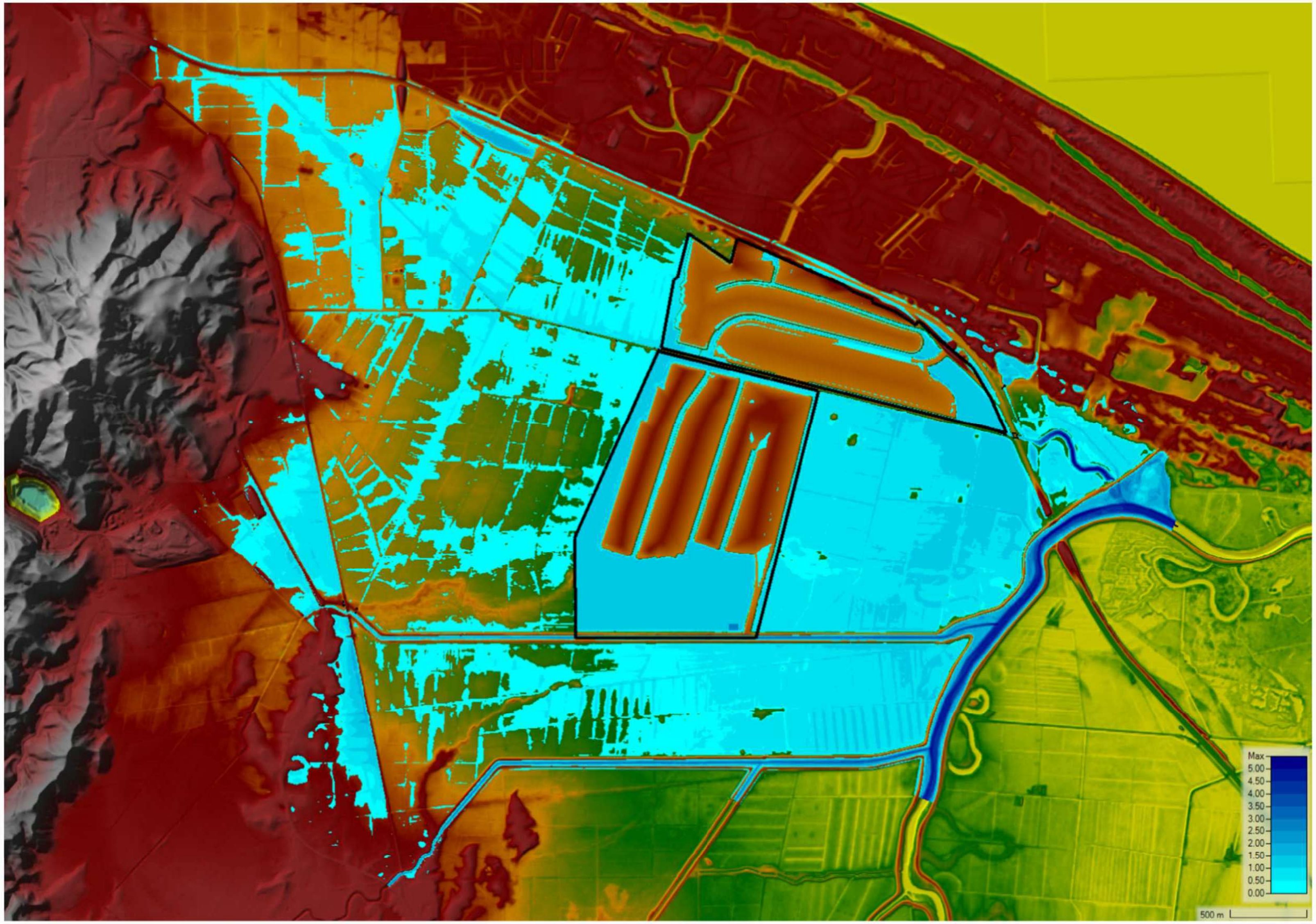


Figure 64 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Flood Depths (m)

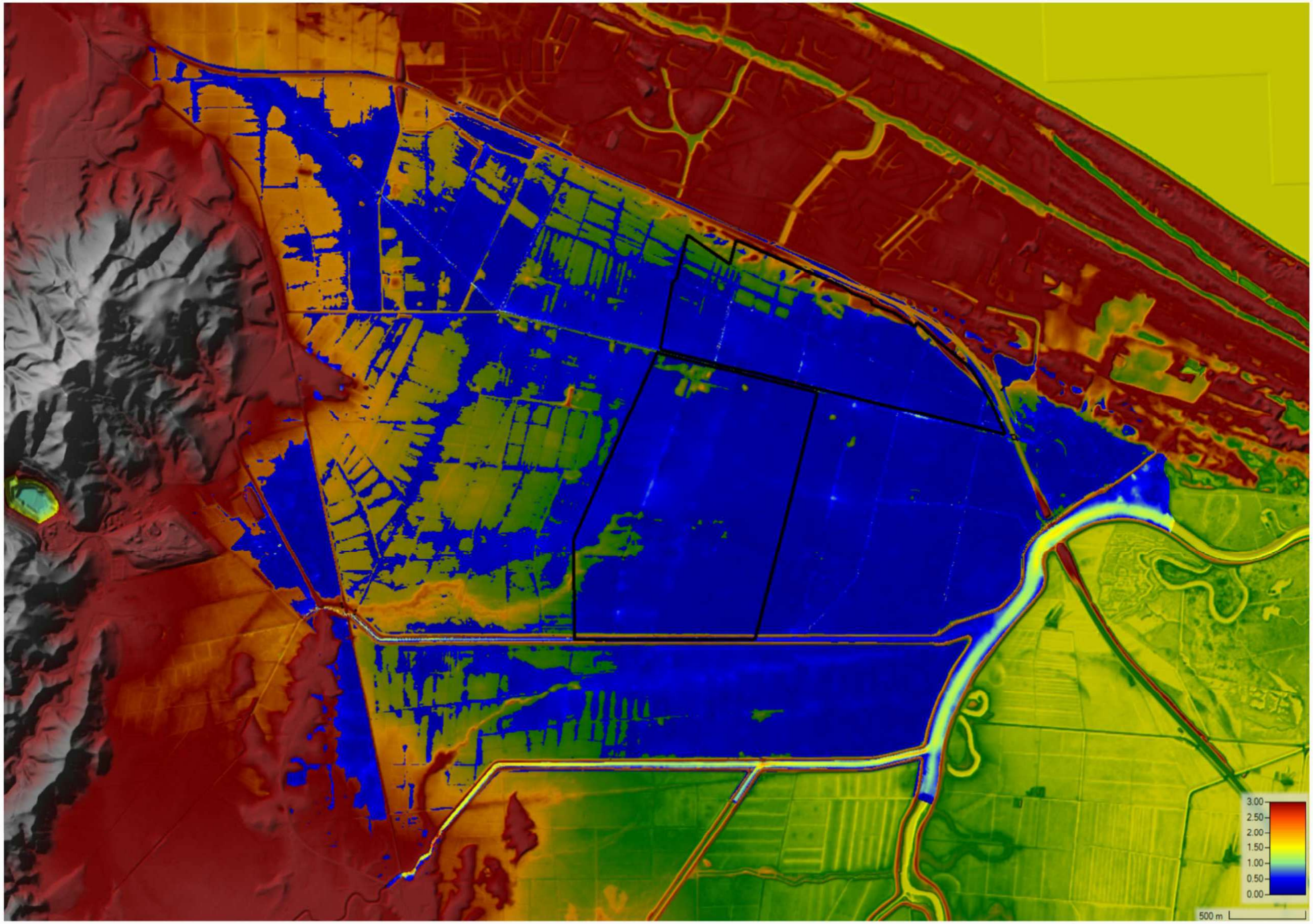


Figure 65 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Velocity(m/s)

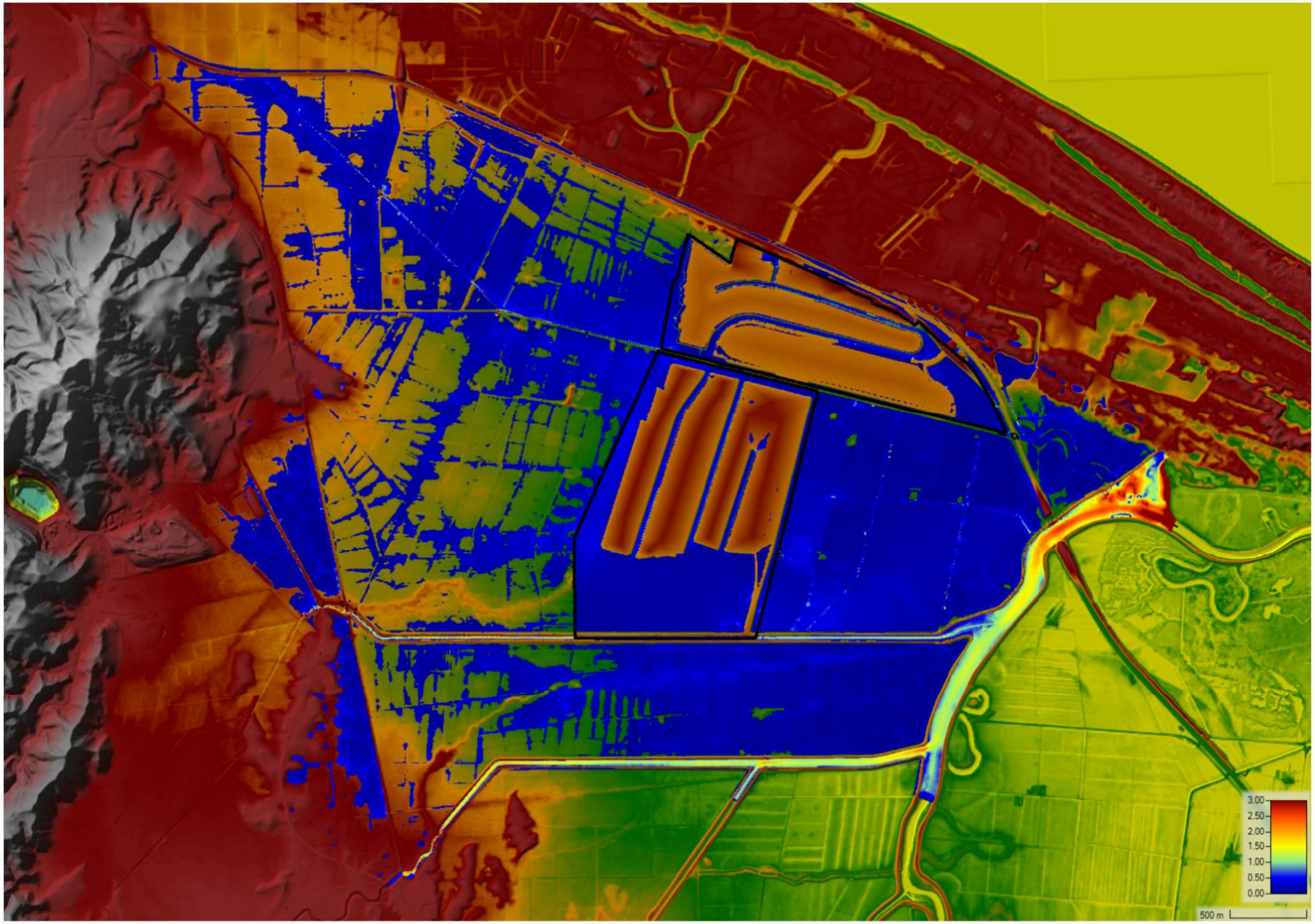


Figure 66 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Velocity(m/s)

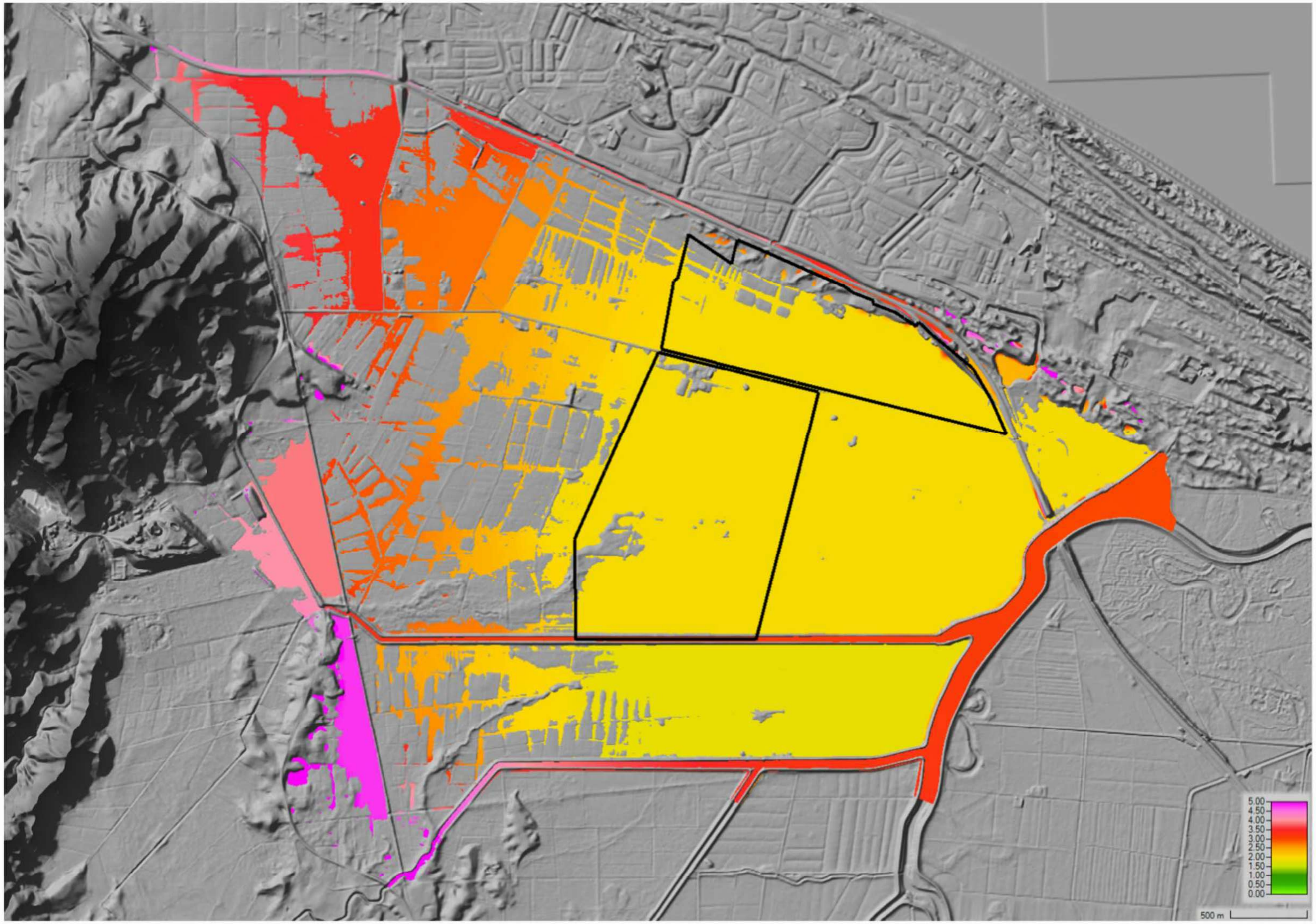


Figure 67 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Water Surface Elevation (m, NZVD16)

Figure 68 - 10yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Water Surface Elevation (m, NZVD16)

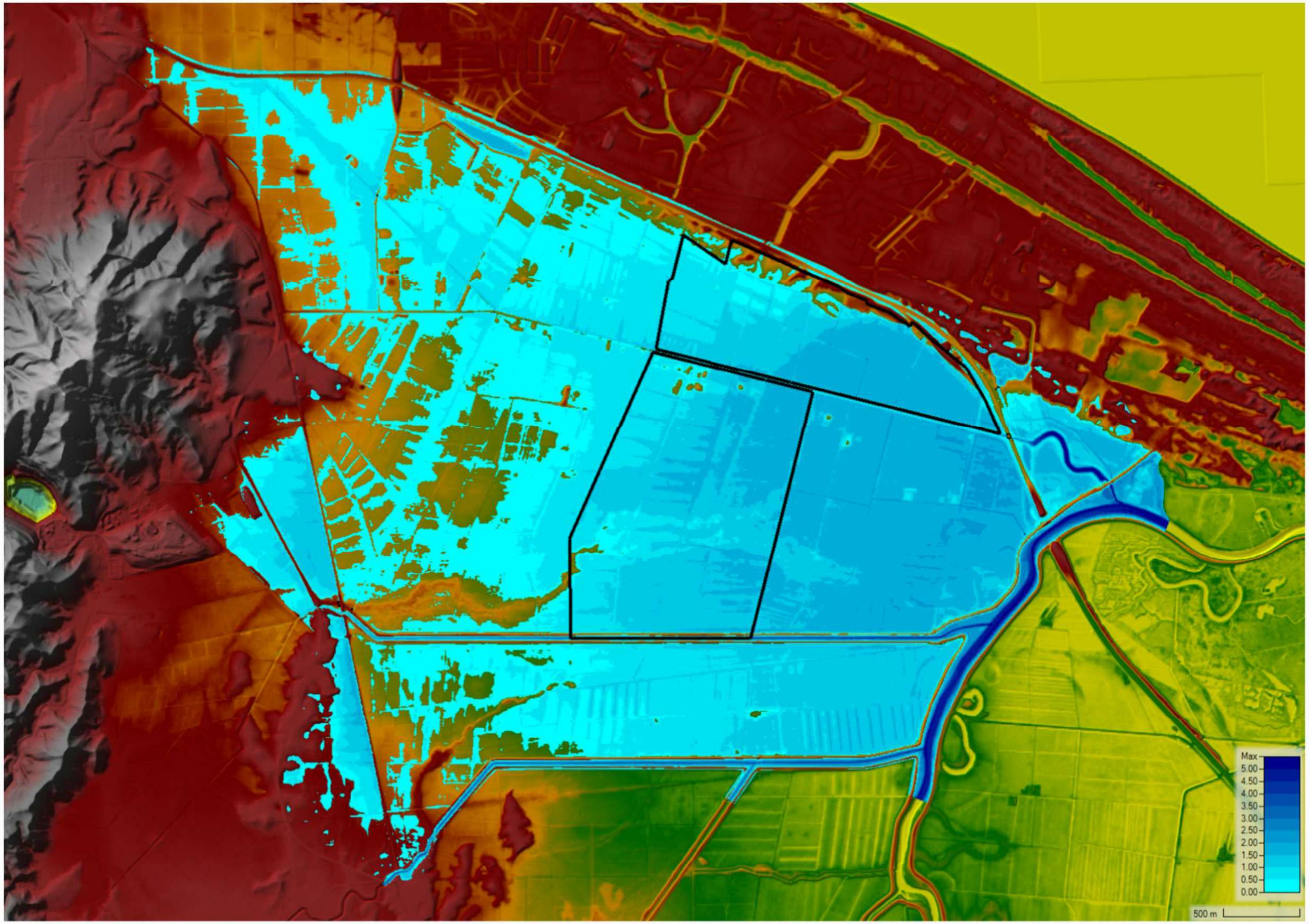


Figure 69 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Depths (m)

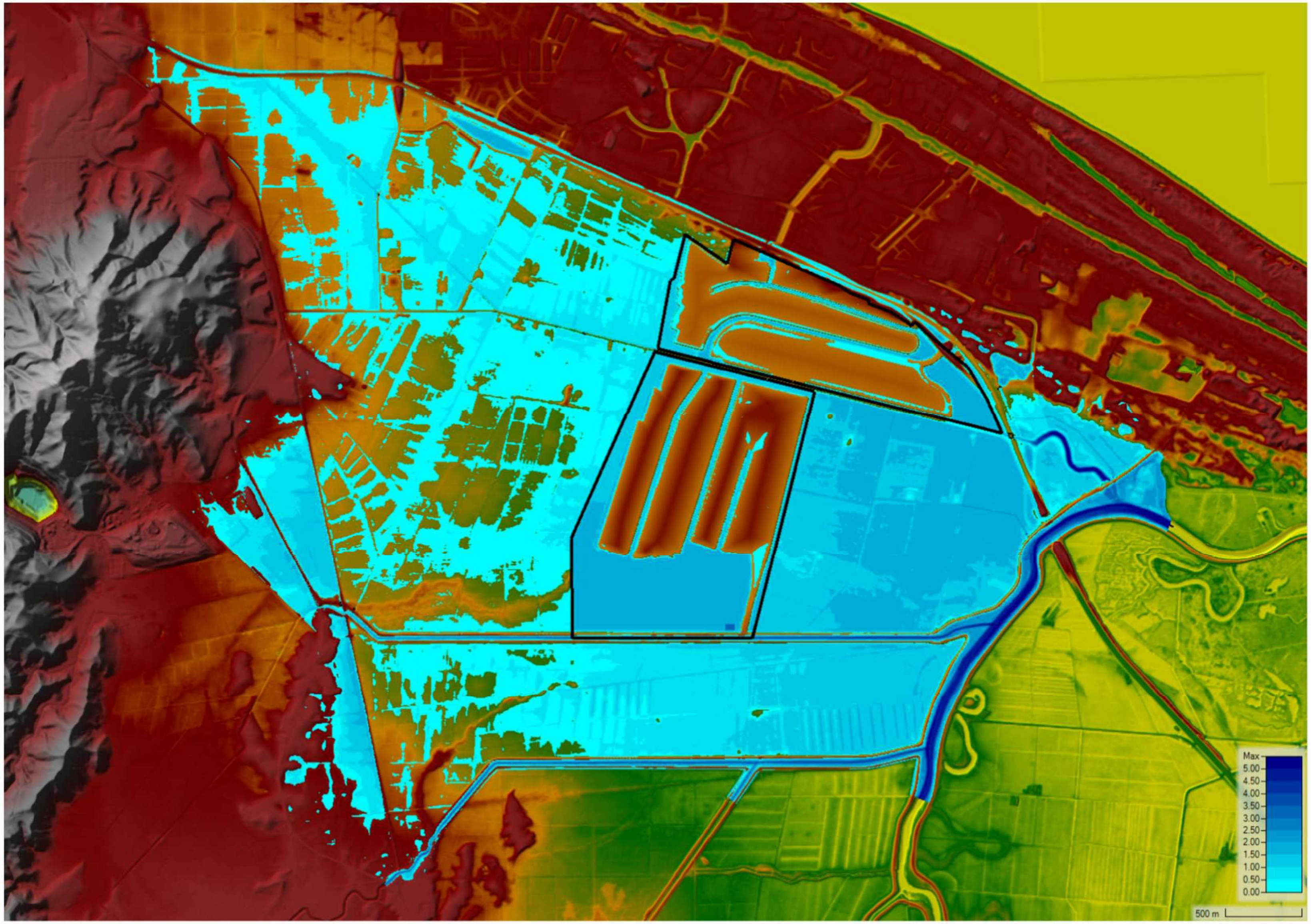


Figure 70 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Flood Depths (m)

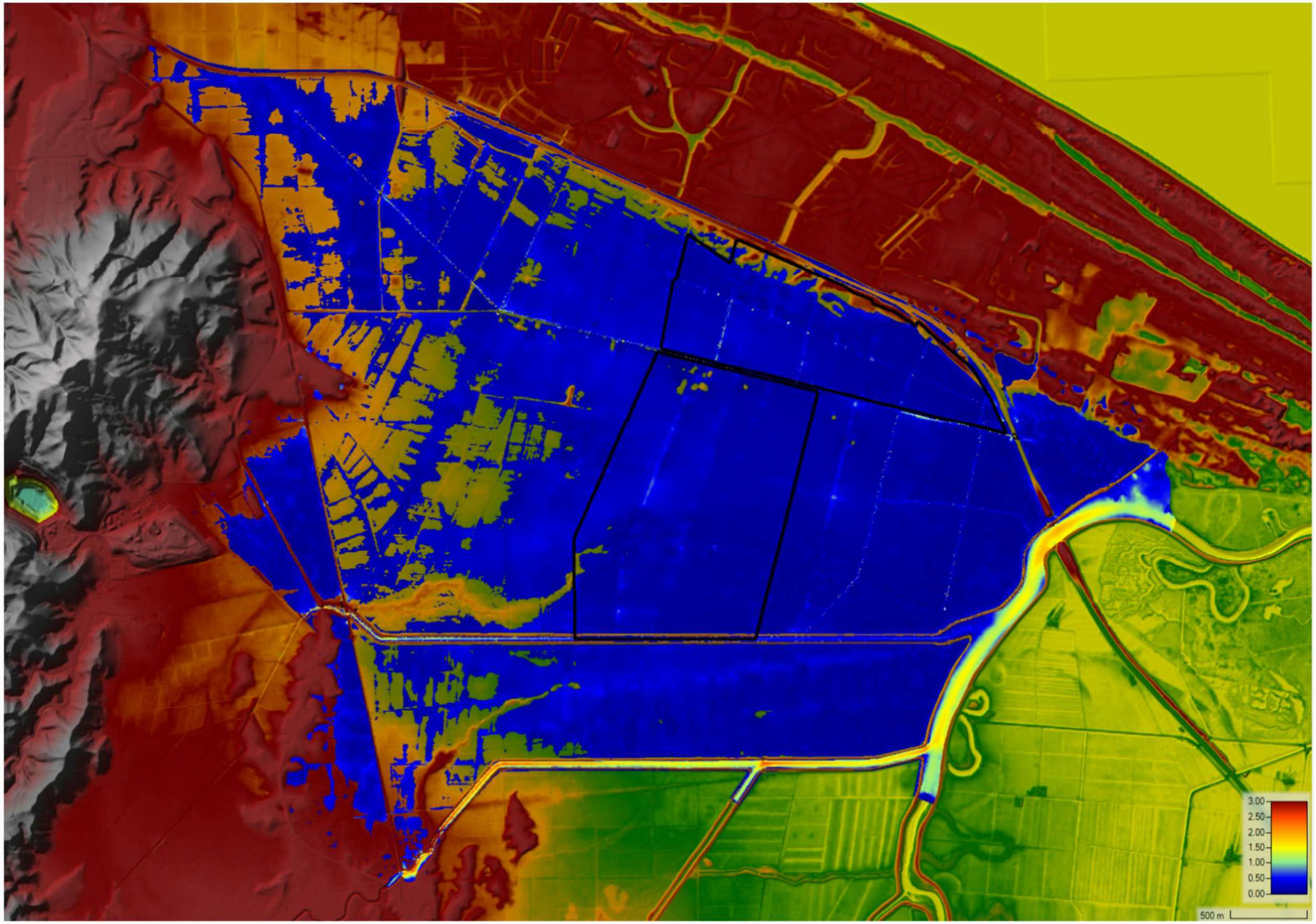


Figure 71 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Velocity(m/s)

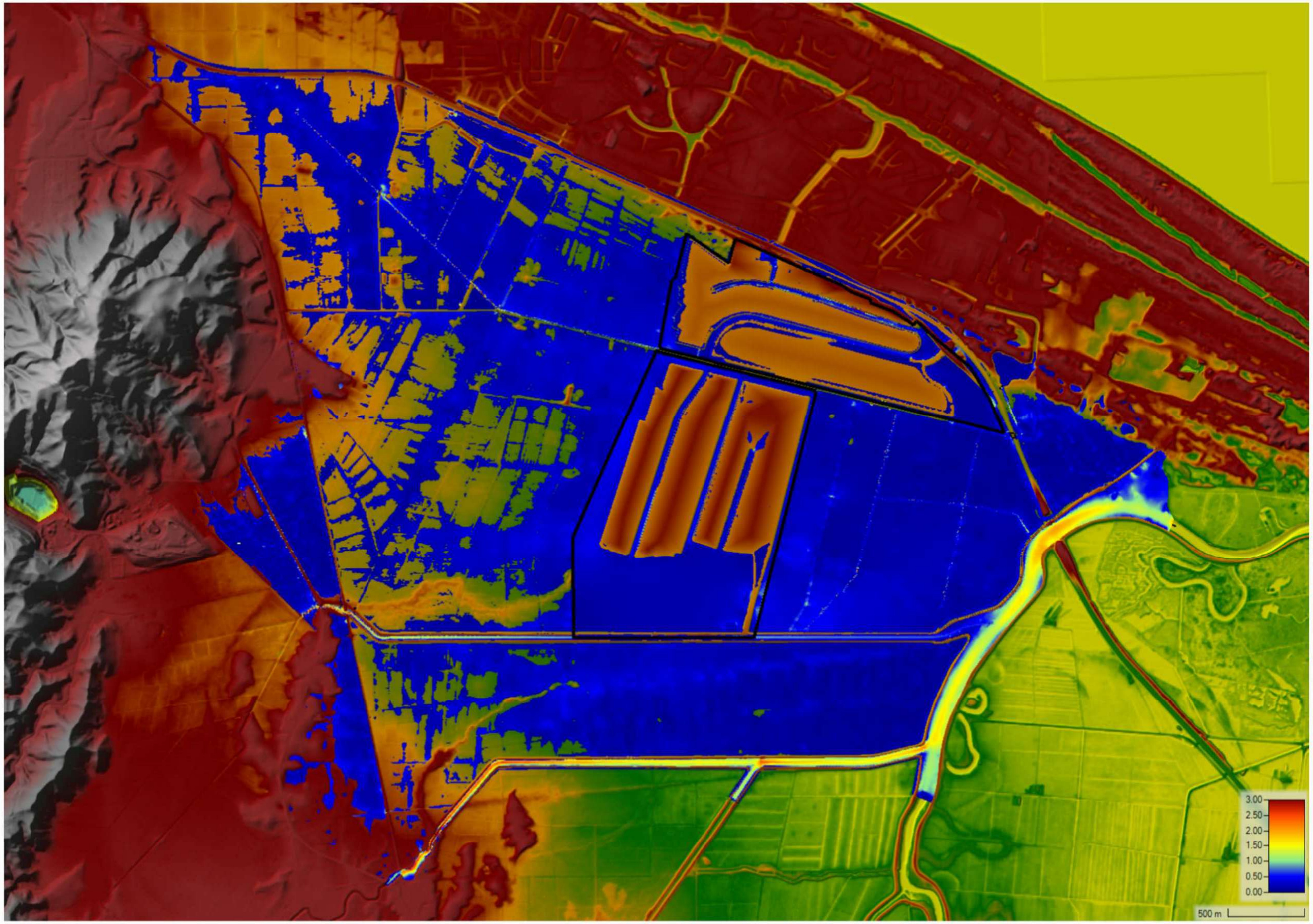


Figure 72 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Velocity(m/s)

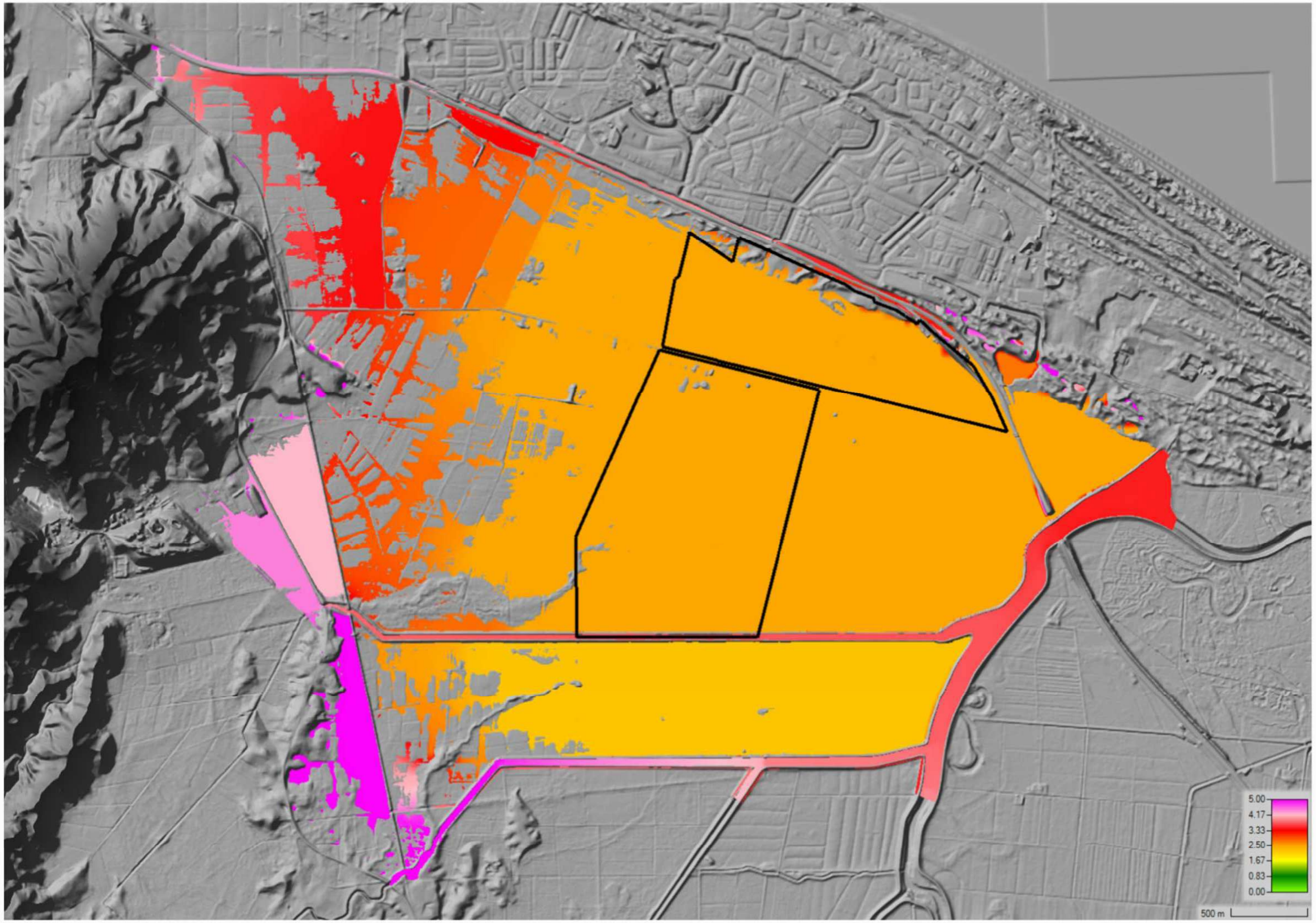


Figure 73 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Water Surface Elevation (m, NZVD16)

Figure 74 - 50yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Water Surface Elevation (m, NZVD16)

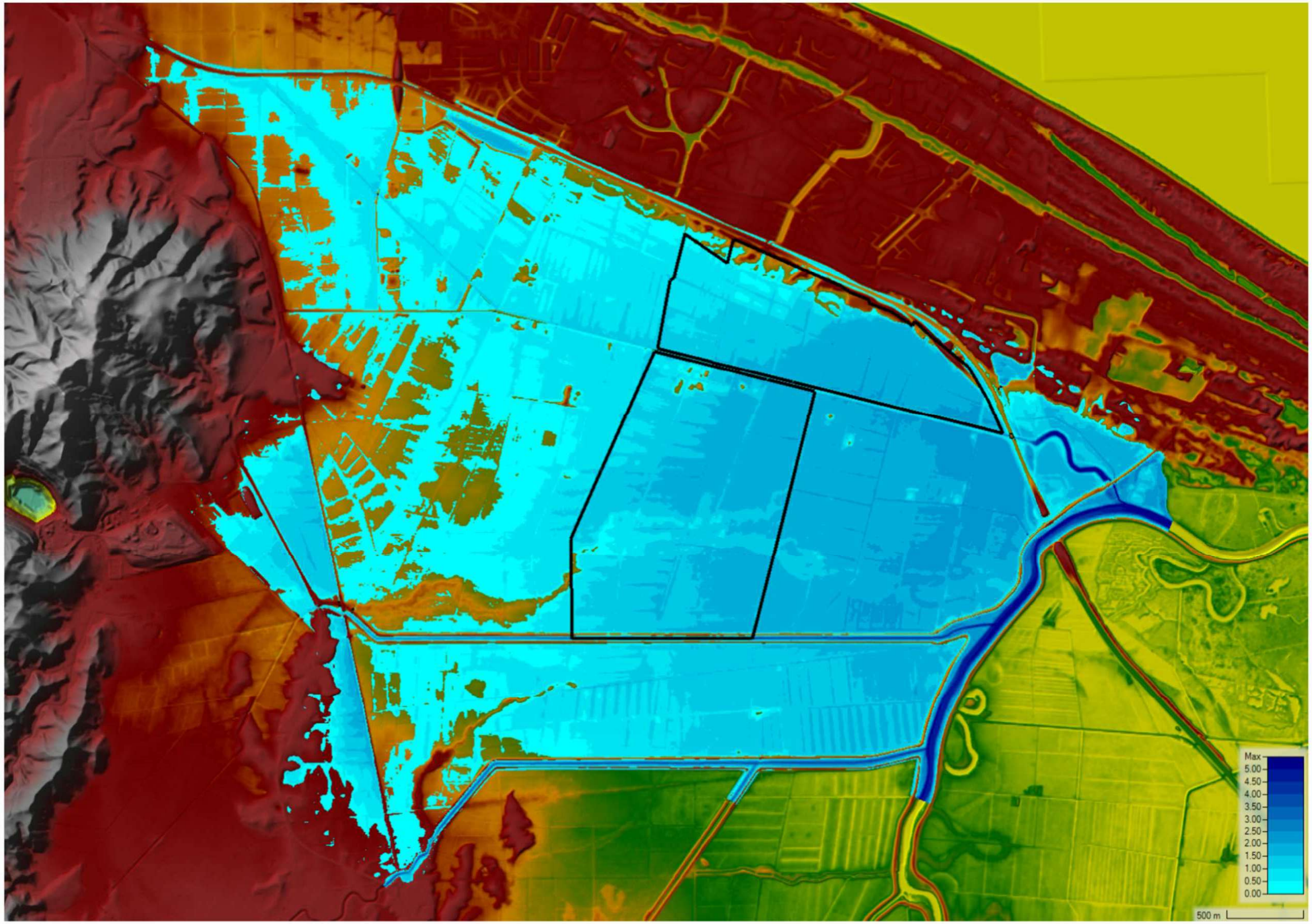


Figure 75 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Depths (m)

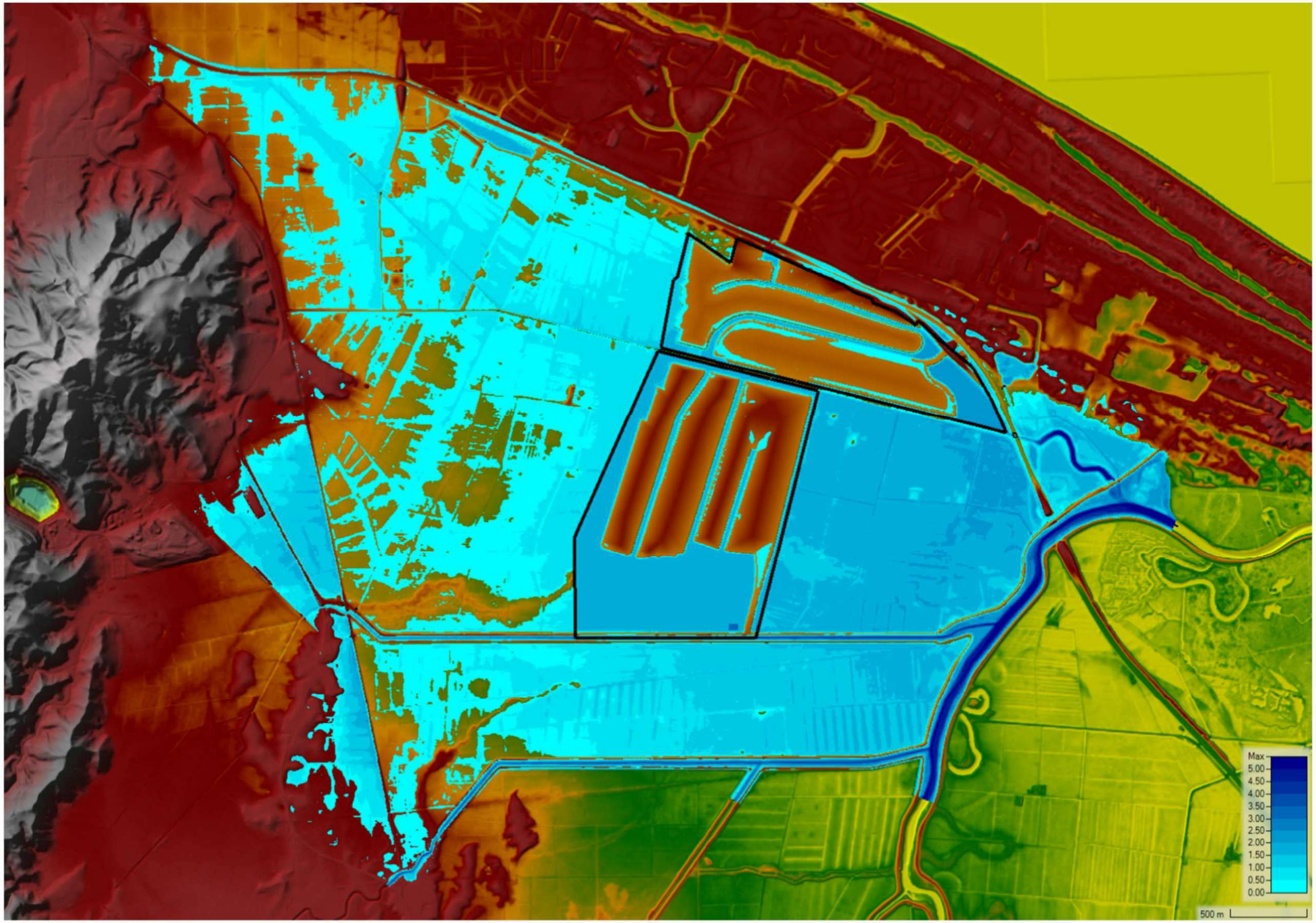


Figure 76 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Flood Depths (m)

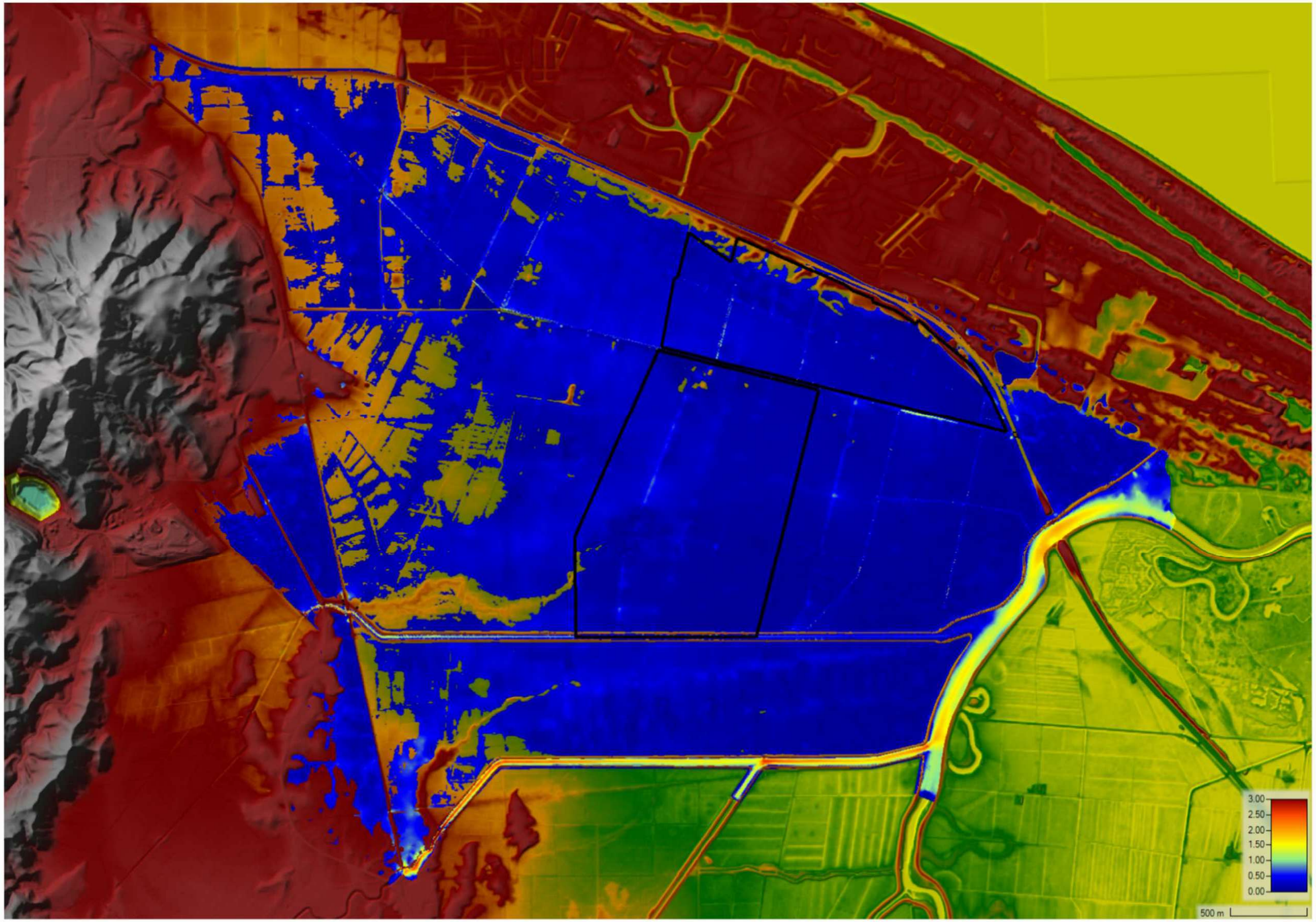


Figure 77 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Velocity(m/s)

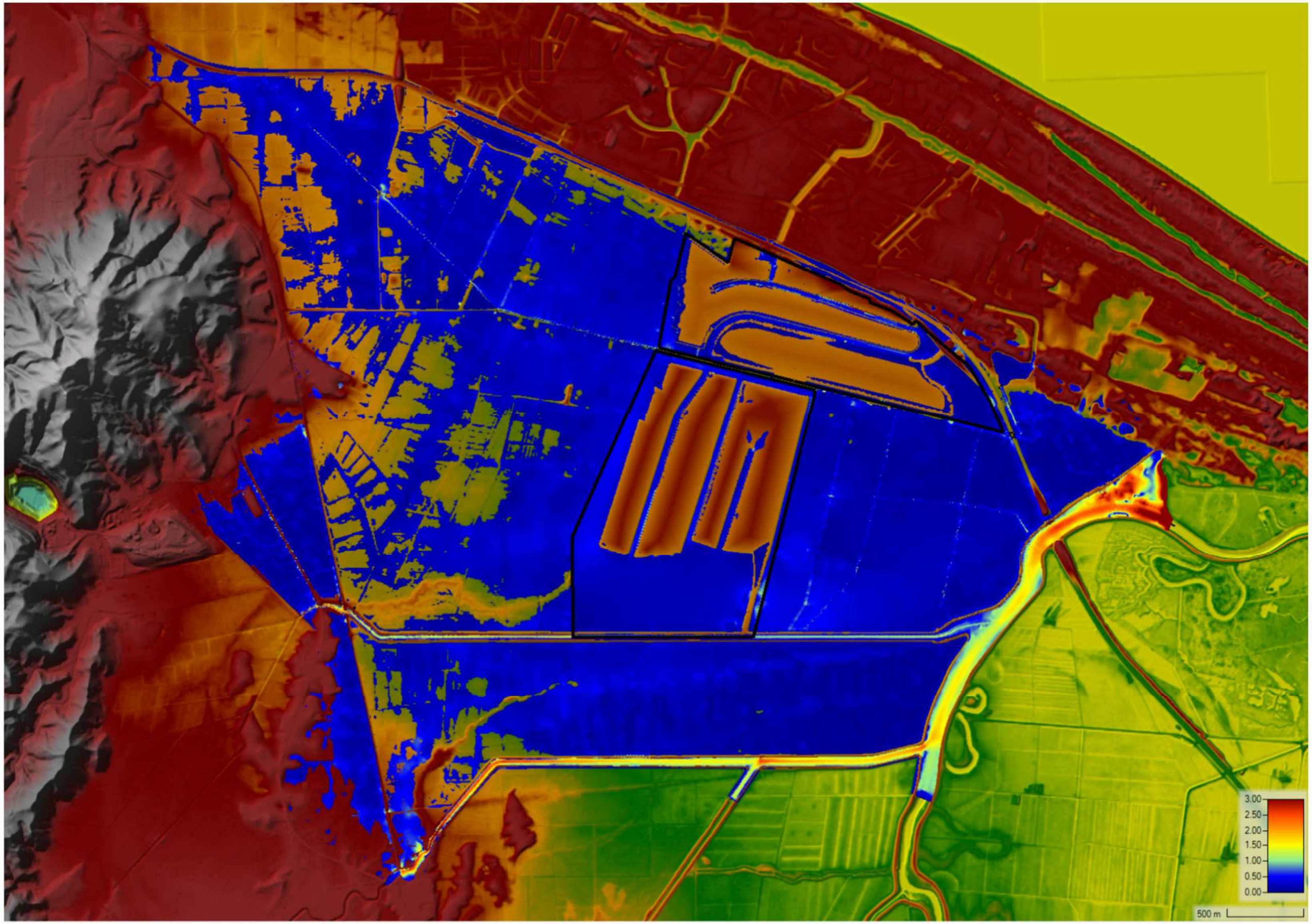


Figure 78 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Velocity(m/s)

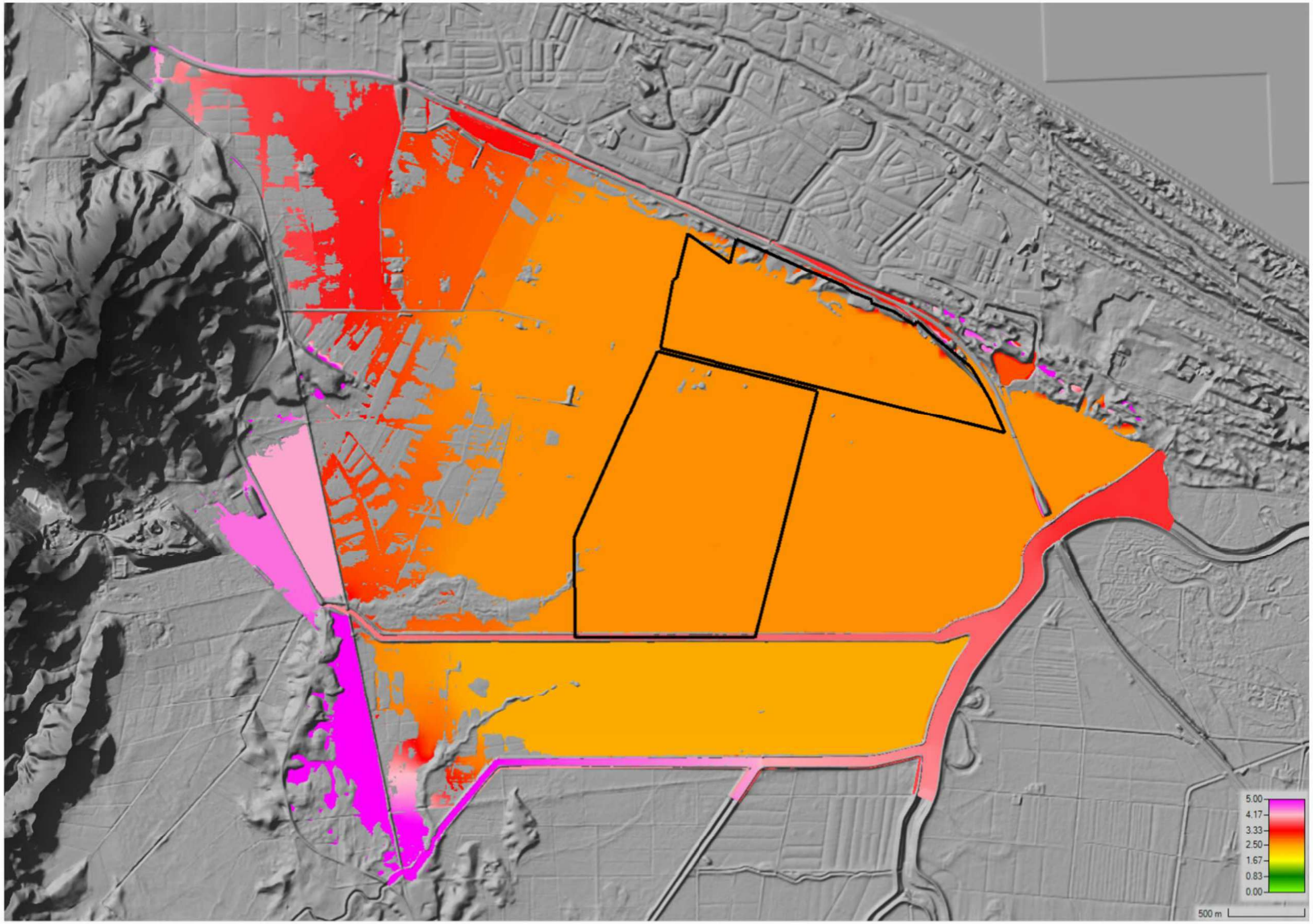


Figure 79 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Water Surface Elevation (m, NZVD16)

Figure 80 - 100yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Water Surface Elevation (m, NZVD16)

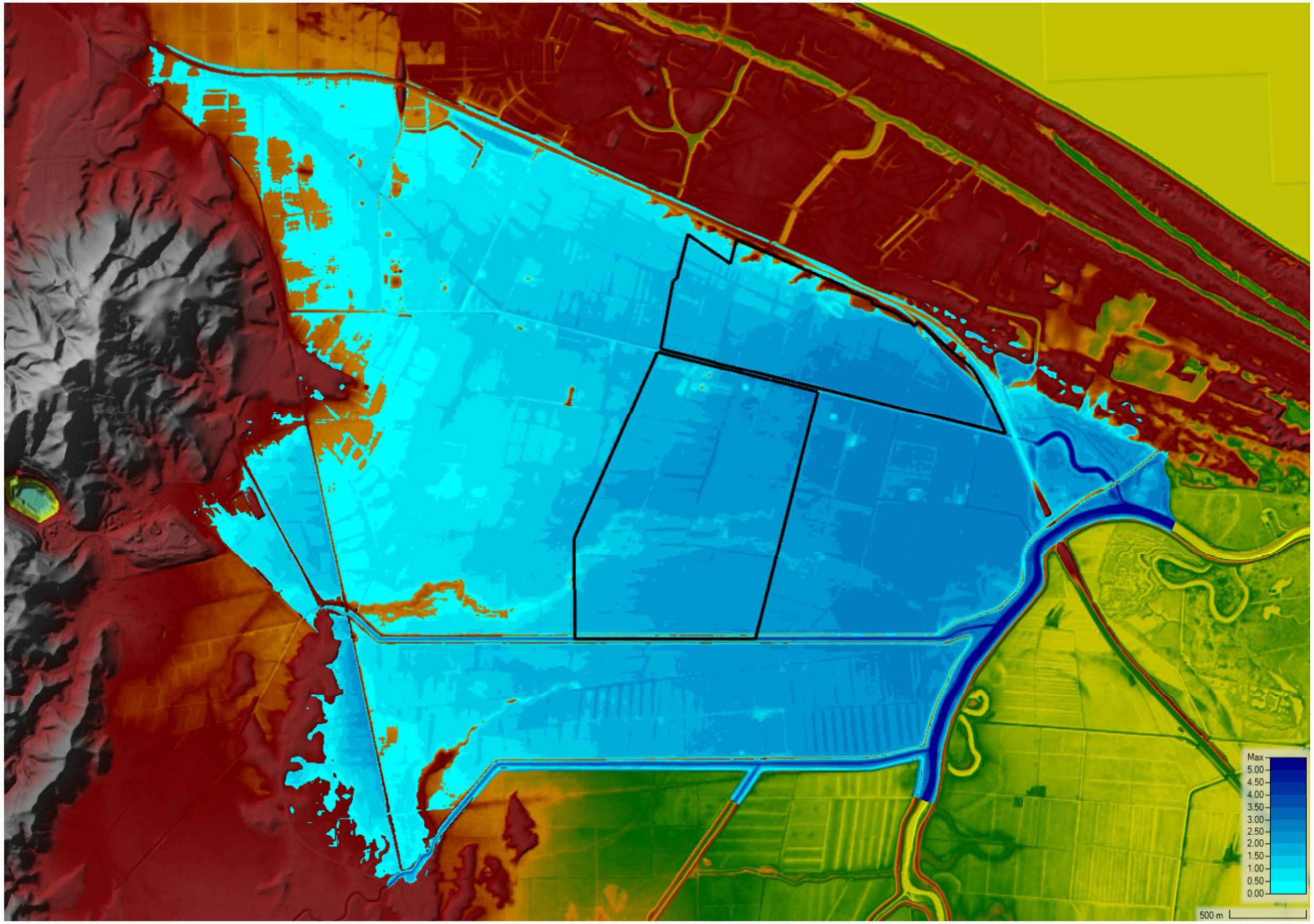


Figure 81 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Flood Depths (m)

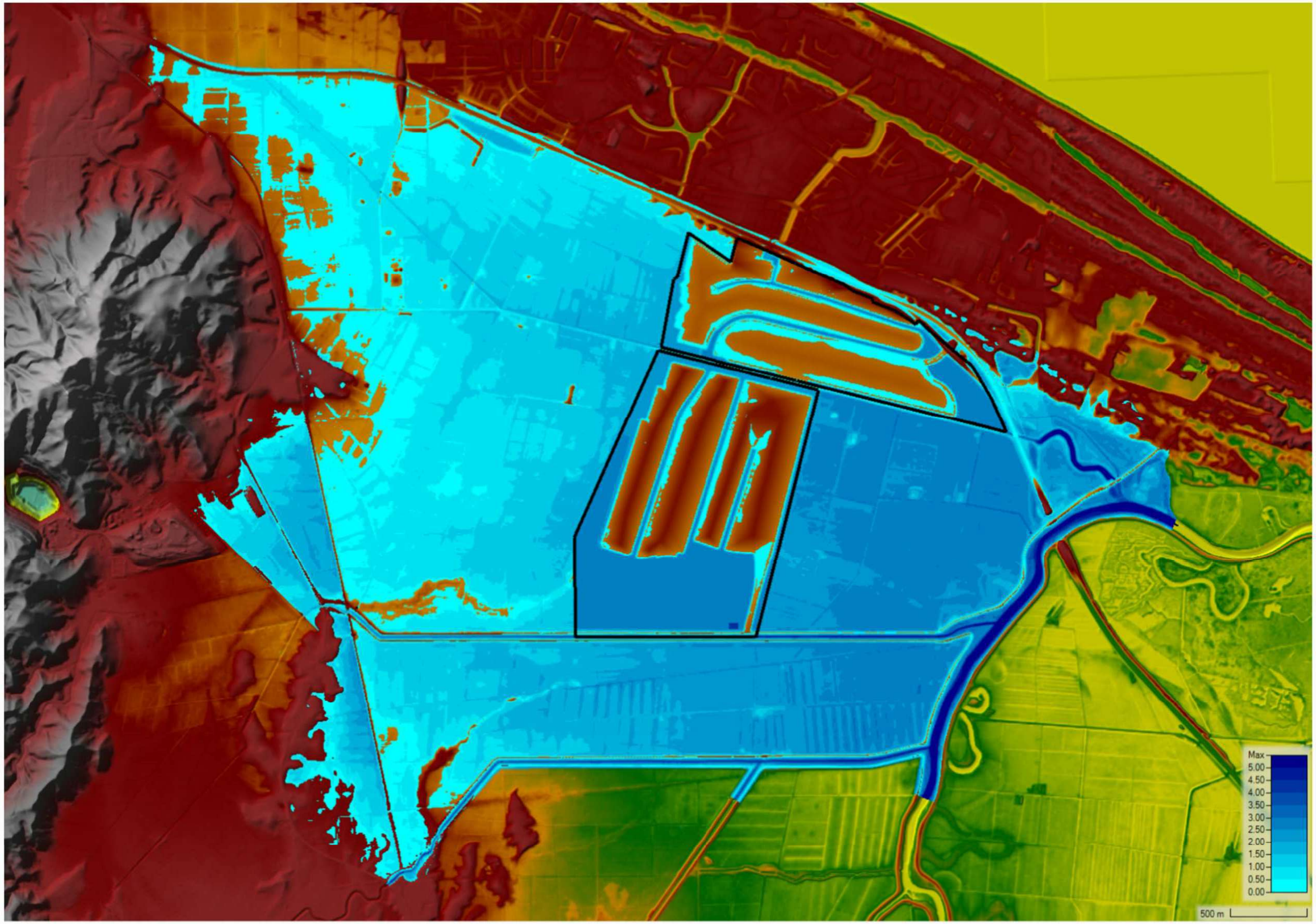


Figure 82 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Flood Depths (m)

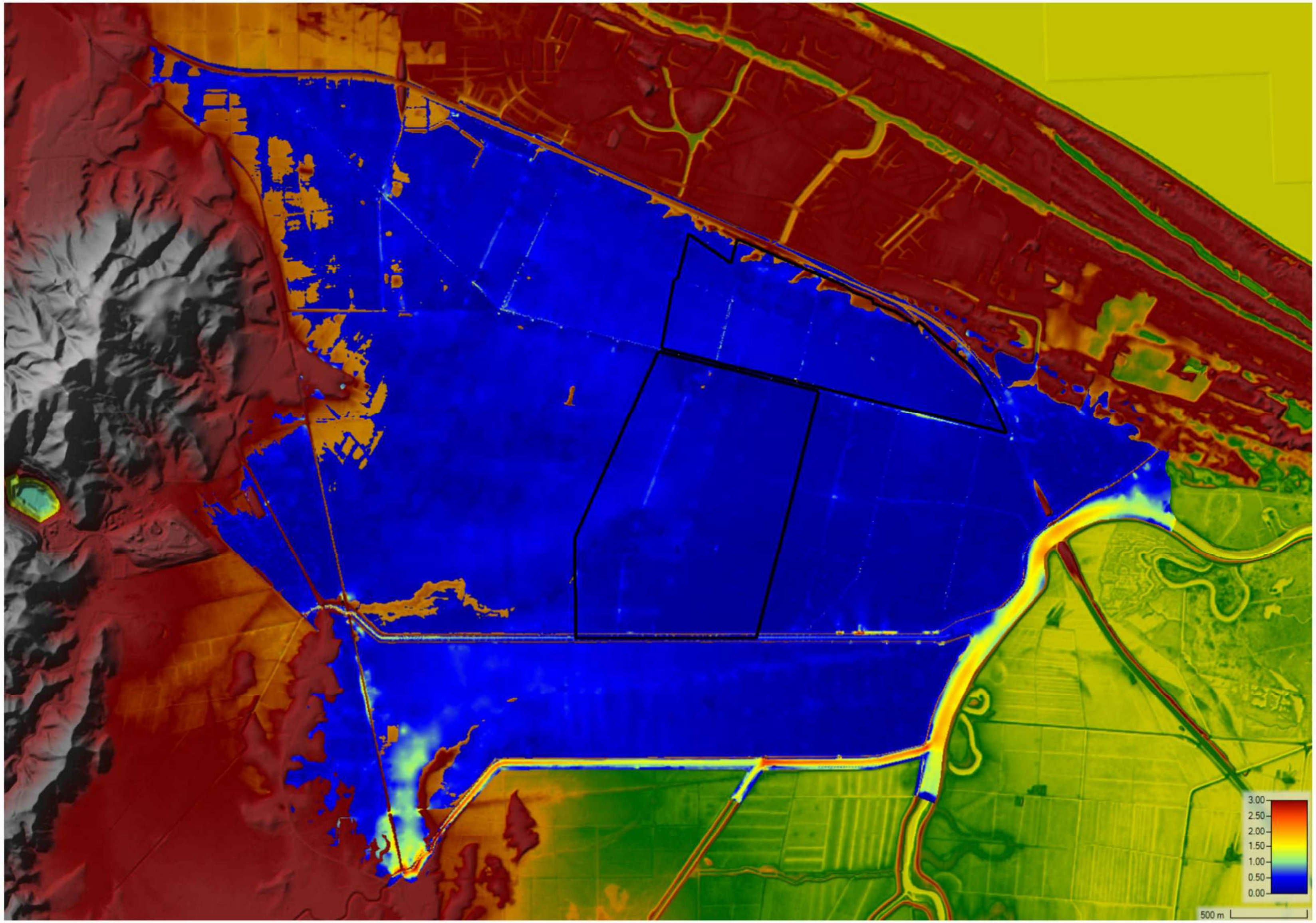


Figure 83 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Velocity(m/s)

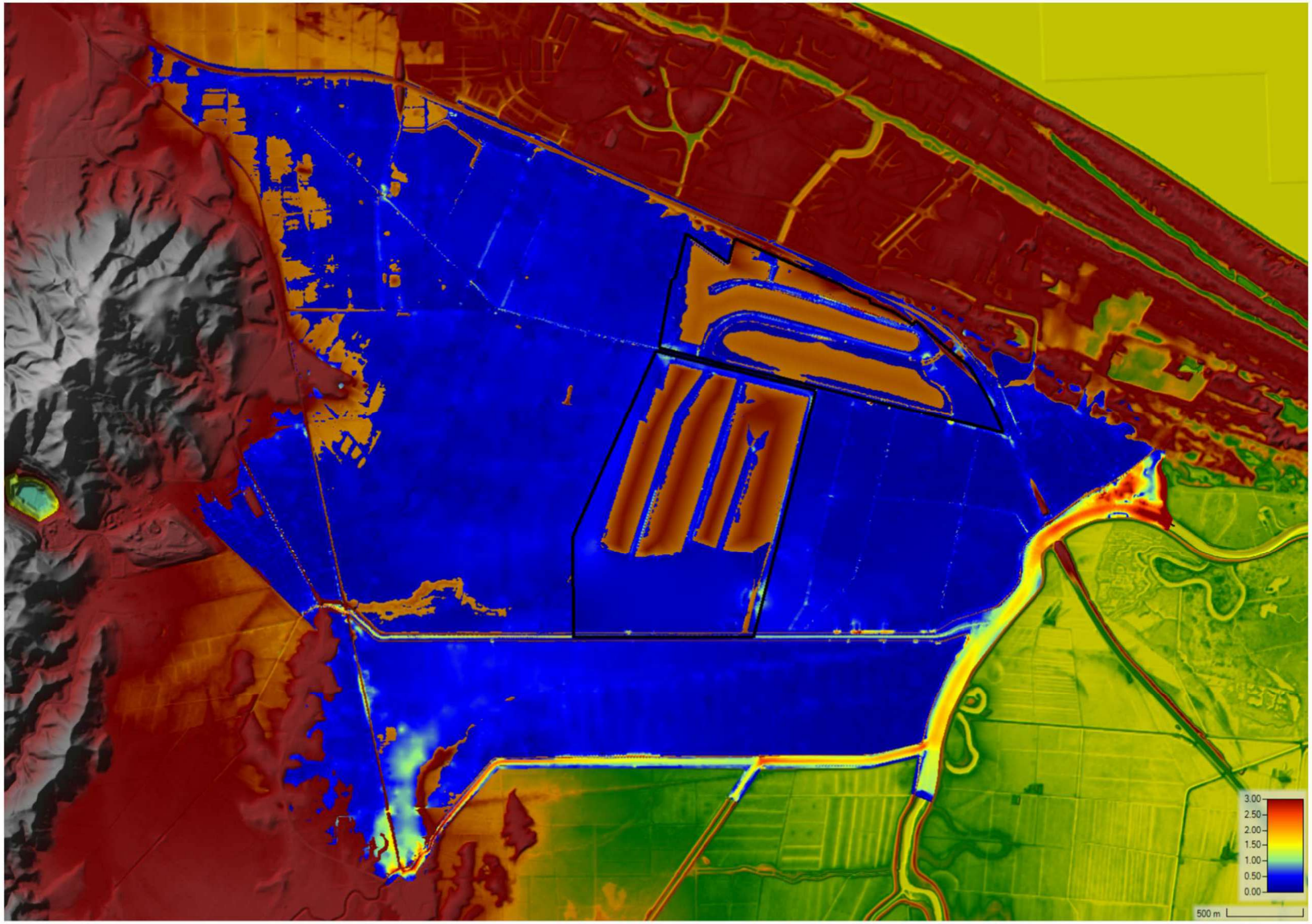


Figure 84 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Velocity(m/s)

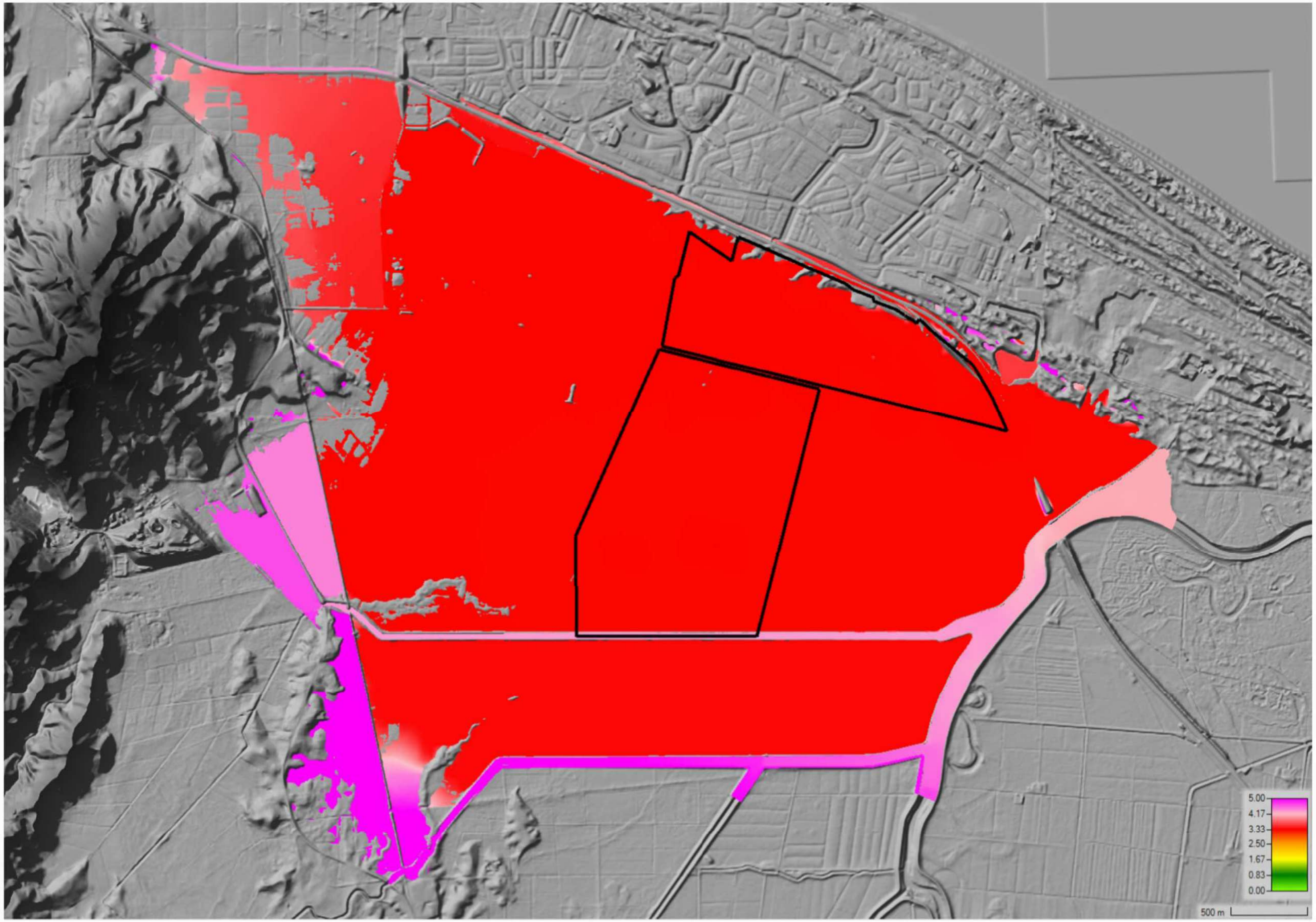


Figure 85 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Pre-Development Water Surface Elevation (m, NZVD16)

Figure 86 - 500yr ARI 3.68°C Climate Change SLR 1.59m, Post-Development Water Surface Elevation (m, NZVD16)

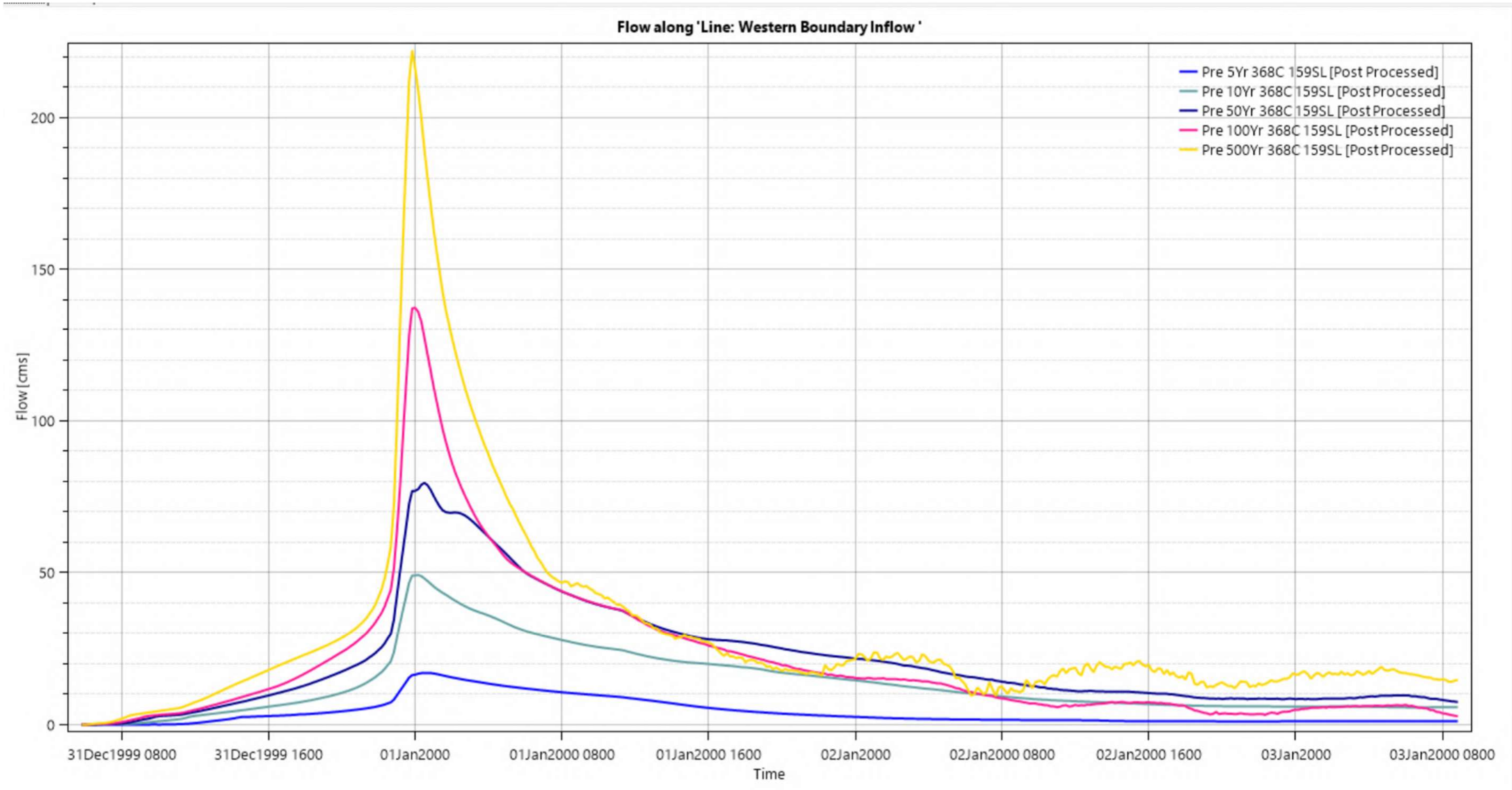


Figure 87 – Pre-Development Inflow(m³/s) from Western boundary of proposed development

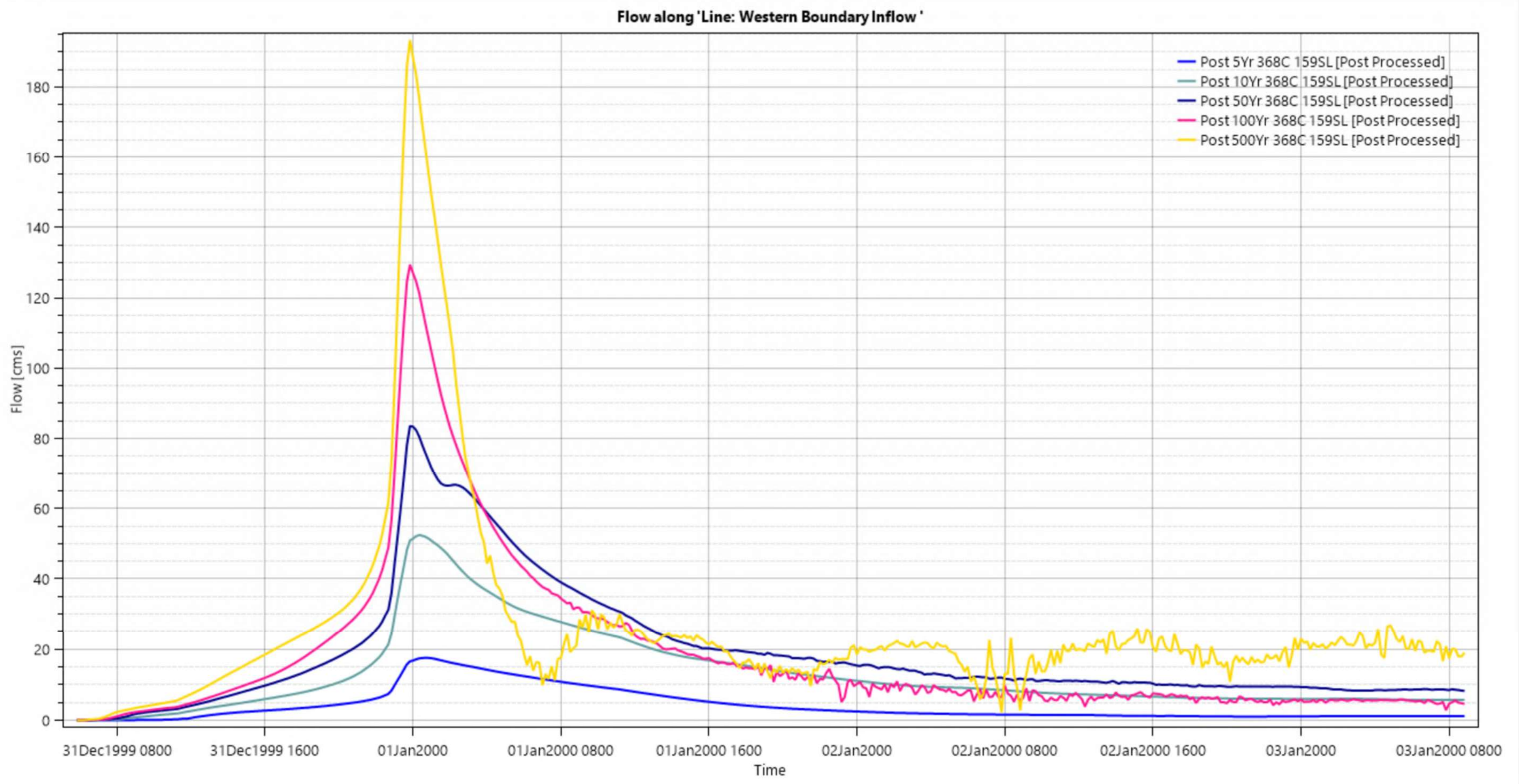


Figure 88 – Post-Development Inflow(m^3/s) from Western Boundary of Proposed Development

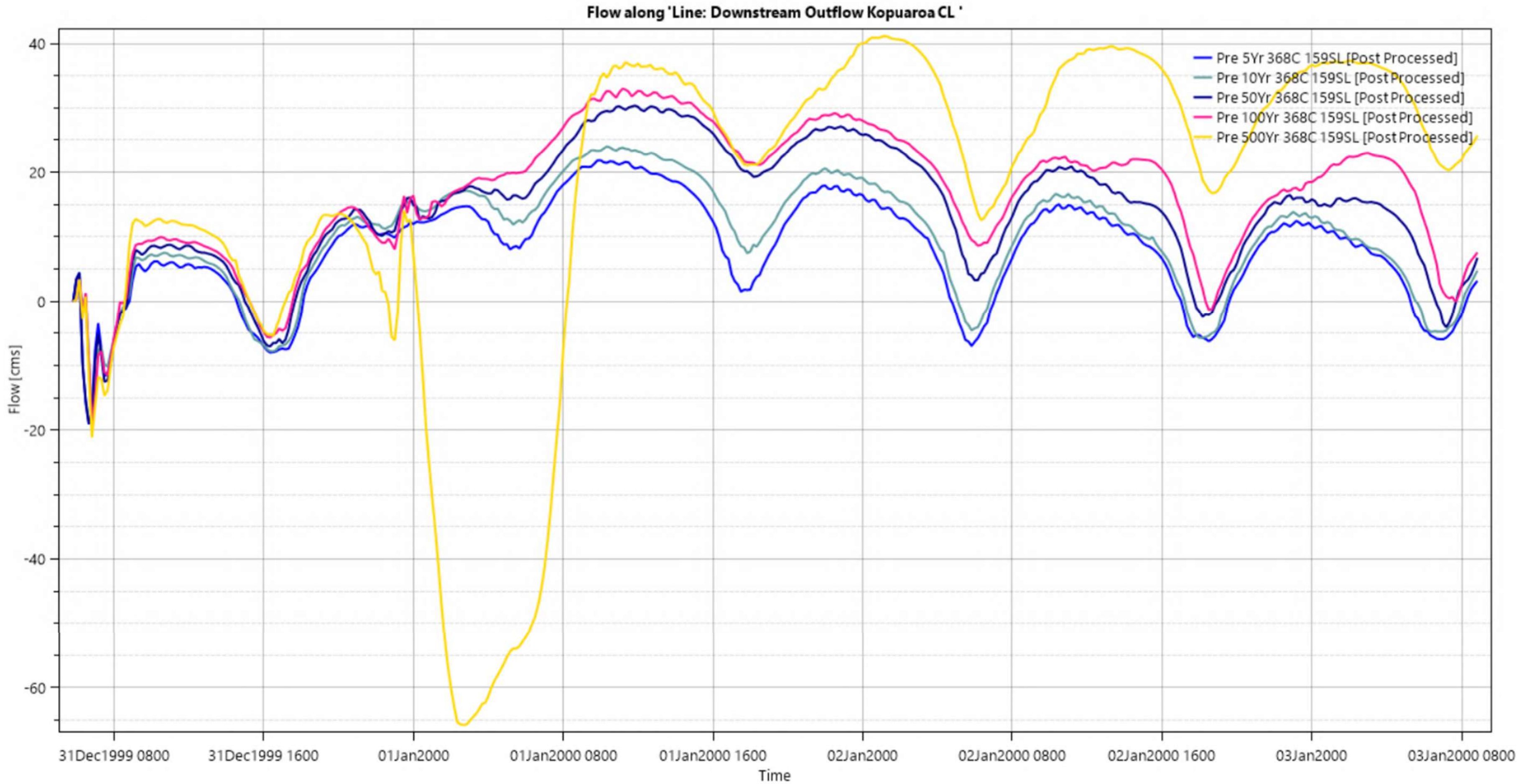


Figure 89 - Pre-Development Outflow (m^3/s) from Kopuaroa Canal east of the proposed development (south block)

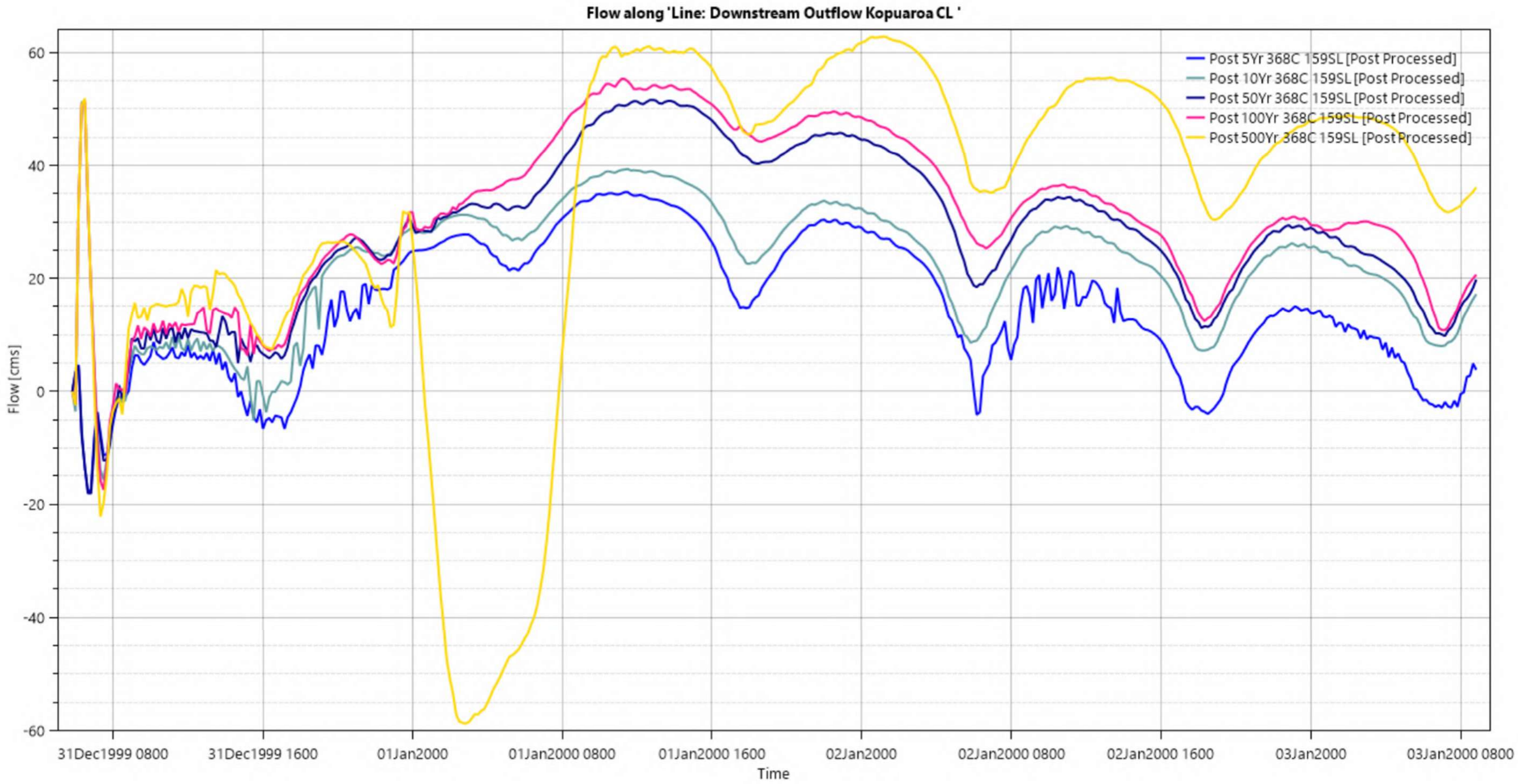


Figure 90 - Post-Development Outflow (m^3/s) from Kopuaroa Canal East of the Proposed Development (South Block)

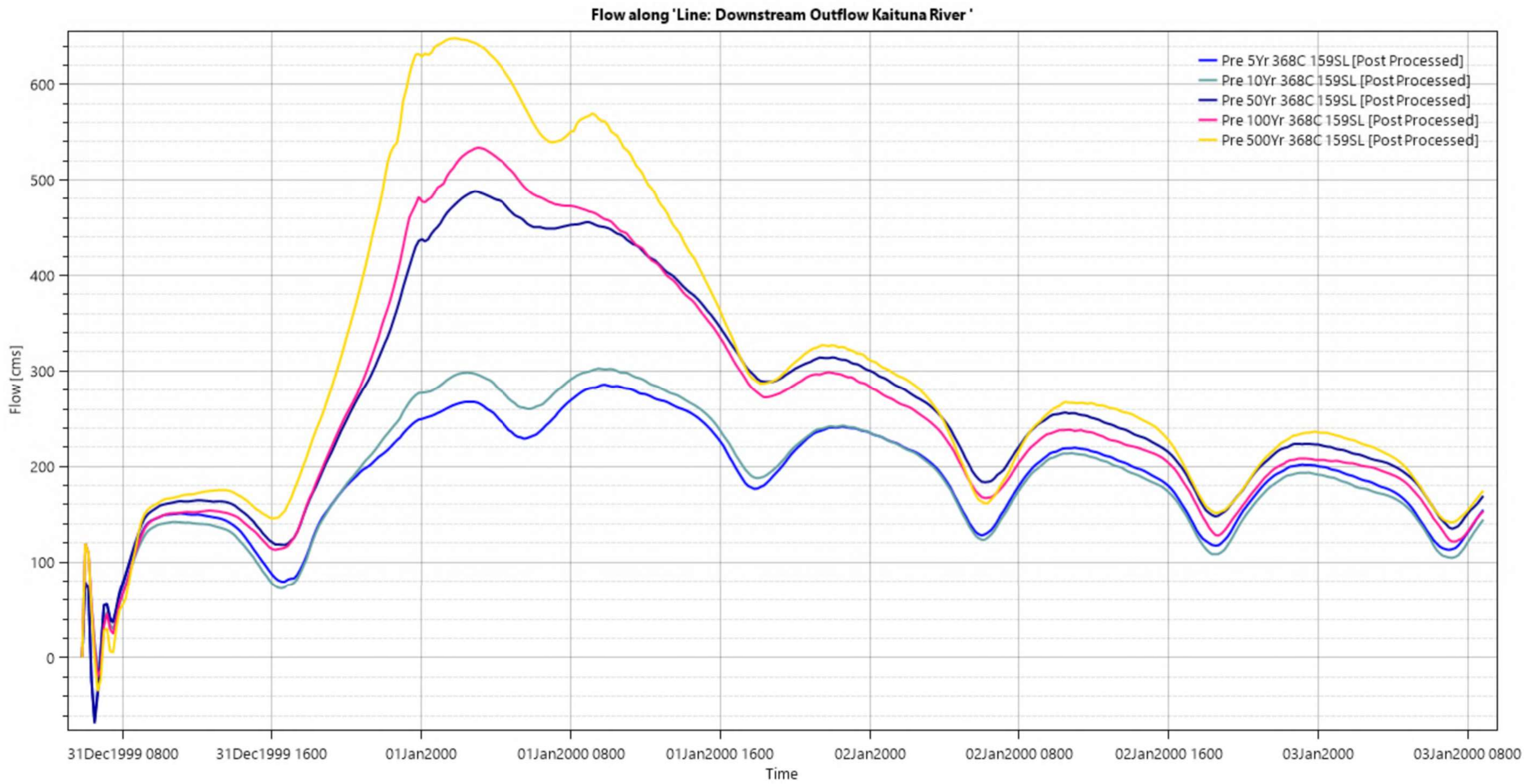


Figure 91 - Pre-Development Outflow(m^3/s) at Downstream Boundary (Kaituna River) of Proposed Development

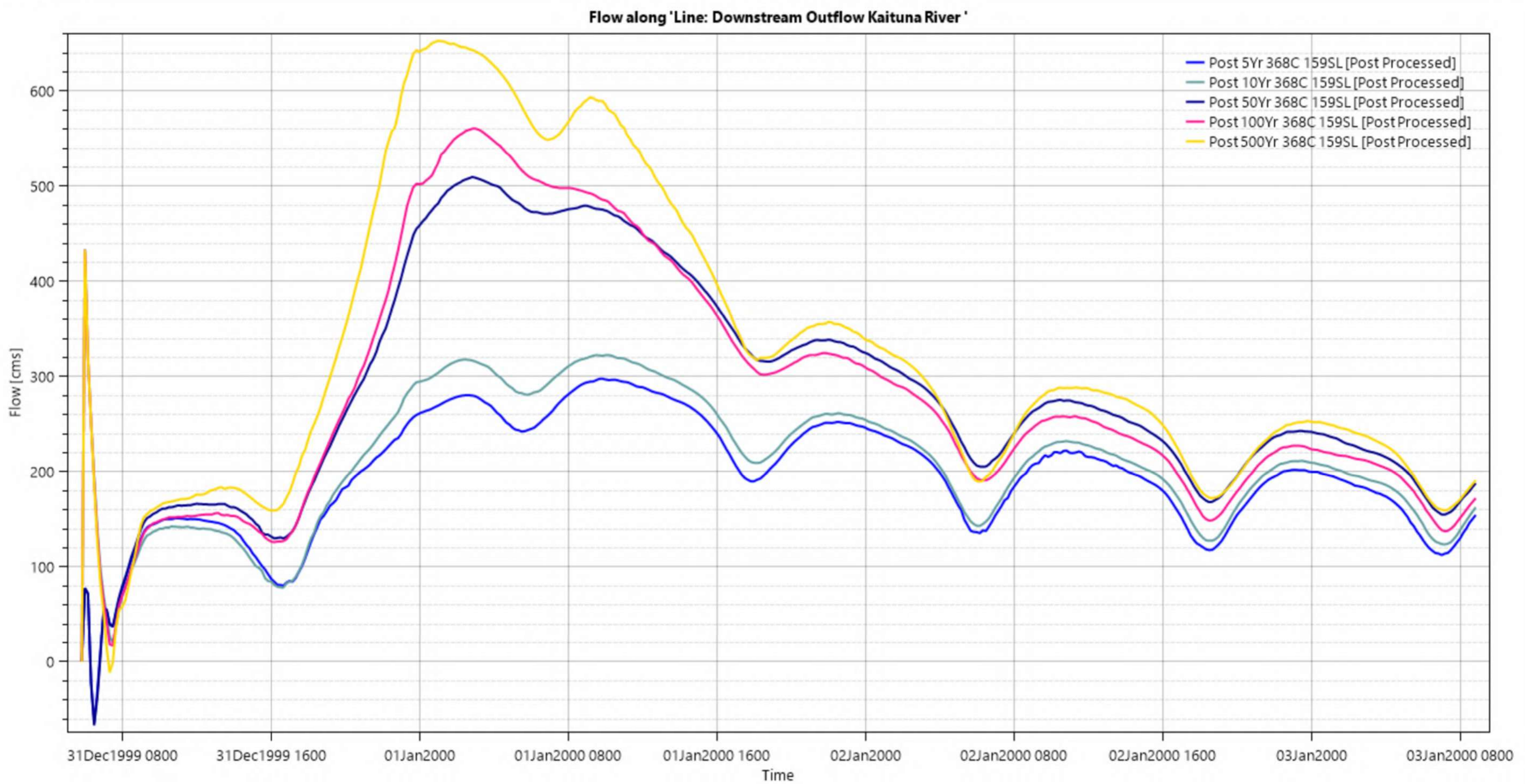


Figure 92 - Post-Development Outflow(m^3/s) at Downstream Boundary (Kaituna River) of Proposed Development

6.2. Flood Level Comparison

The flood model provides an accurate and comprehensive assessment of the changes in flood behaviour, including variations in flood levels, flow paths, and potential impacts on adjacent properties. This approach ensures a detailed understanding of how floodwaters are redistributed in the ultimate scenario and how the development may influence flood risk both on-site and in the surrounding area.

Comparisons between pre-development and post-development conditions were conducted for the 10-year, 100-year, and 500-year future climate-change 3.68°C + 1.59 SML flood events. The difference in flood levels compared to pre-development are summarised below, with a negative value representing a reduction in water surface elevation (WSE) post development and a positive value representing an increase in WSE:

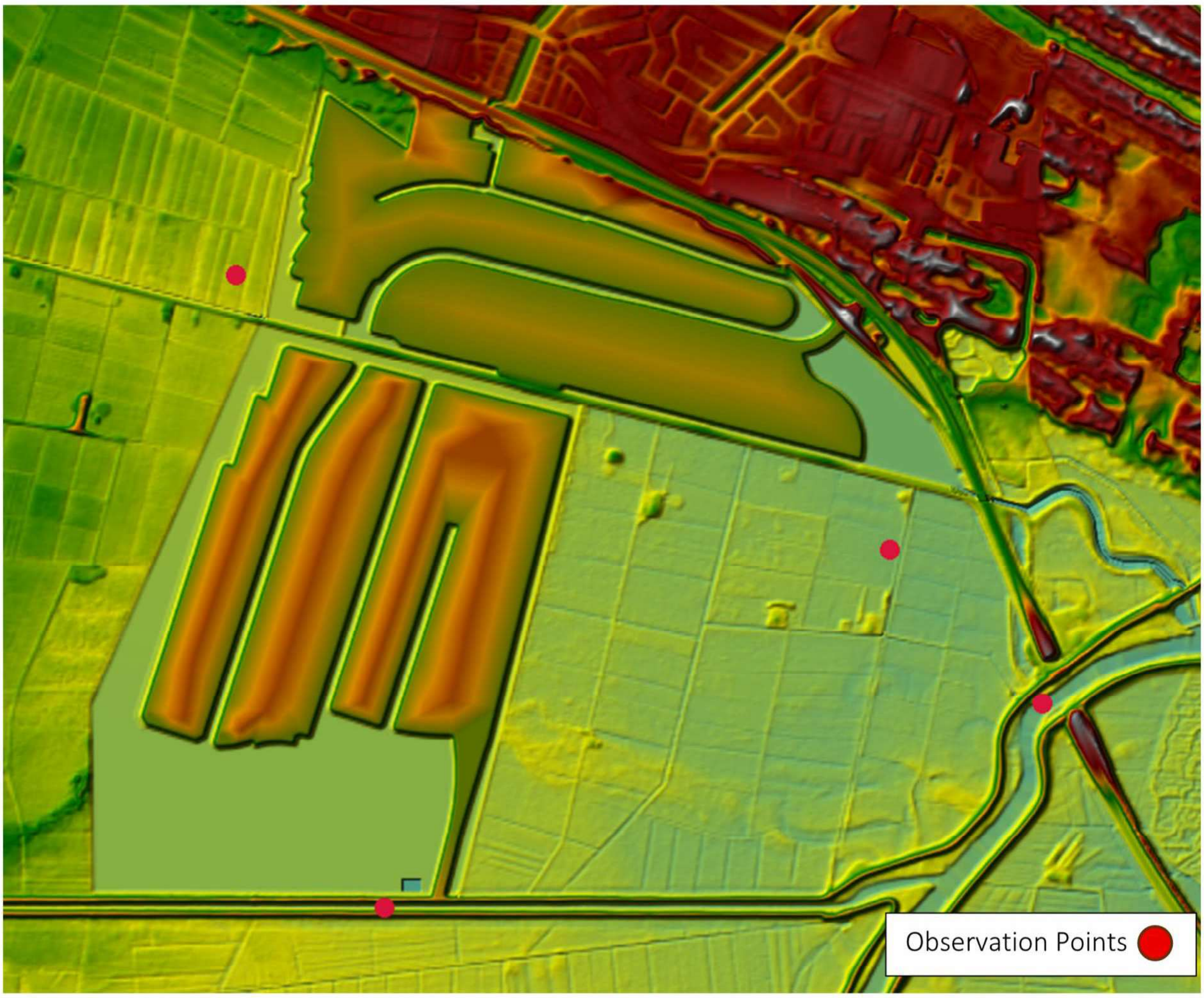


Figure 93: Flood Water Comparison Points (Source: HEC-RAS)

In the 10-year ARI event (peak):

- East of the development site: -340mm Decrease
- Northwest of the development site: +40mm Increase
- Kopuaroa Canal at new pump station: +70mm Increase
- Kaituna River at upgraded pump inflow: +6mm Increase

In the 100-year event:

- East of the development site: -110mm Decrease
- Northwest of the development site: -110mm Decrease
- Kopuaroa Canal at new pump station: +60 mm Increase
- Kaituna River at upgraded pump inflow: +7mm Increase

In the 500-year event:

- East of the development site: +20mm Increase
- Northwest of the development site: +20mm Increase
- Kopuaroa Canal at new pump station: +24mm Increase
- Kaituna River at upgraded pump inflow: +2mm Increase

The proposed new pumping system generally improves water surface levels within the Bell Road catchment during the 10-year event, with small increases in the Kopuaroa Canal and Kaituna River due to slightly higher peak flows.

For the 100-year event, impacts are largely neutral or show minor improvements compared to pre-development levels, with small increases in the Kopuaroa Canal and Kaituna River due to slightly higher peak flows.

During the 500-year event, water surface elevations increase across the Bell Road catchment and both waterways. Despite this, the development site remains above the maximum water levels (approximately 3.32m RL) for the event. By incorporating a 500 mm freeboard above the building platforms (3.5m RL), dwellings shall have a freeboard of 180mm above the 500-year-event max water surface elevation. Some lots may experience minor flooding within their outdoor areas, but the overall risk to property and life remains low.

It is noted that stated increases and decreases are an average, and localised differences will occur due to various approximations required in modelling alongside factors such as ground cover, rainfall intensity fluctuations, terrain survey data accuracy, etc.

Screenshots of the flood level comparisons are shown below. Green indicates decreases in water levels, red indicates increases, and grey represents areas where changes are 0mm, with the colours gradating between increases and reductions.

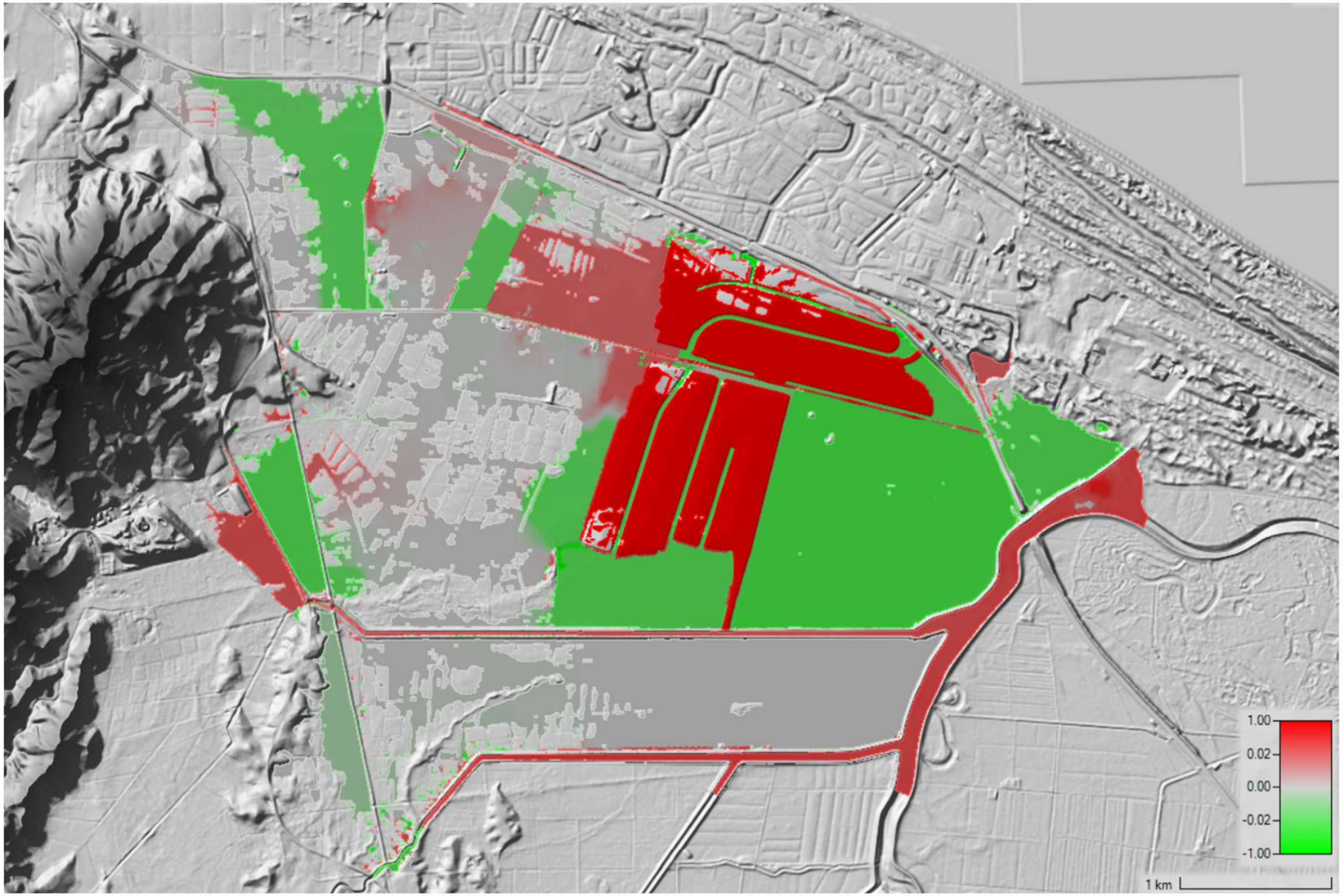


Figure 94 - Comparison between Pre-Development and Post-Development 10-year Event Water Surface Elevation

Figure 95 - Comparison between Pre-Development and Post-Development 100-year Event Water Surface Elevation

Figure 96 - Comparison between Pre-Development and Post-Development 500-year Event Water Surface Elevation

6.3. Hydraulic Structures

Fluctuations in culvert water levels and flow rates were observed in both pre- and post-development models, particularly during the initial and final storm phases. Larger culverts with proportional flow and volume were generally more stable, while smaller or disproportionate culverts showed greater variability. This is mainly due to the coarse model grid, which can be refined in the final RFI review.

The model accounts for both inflow and backflow through culverts. Observed variations are consistent with expected hydraulic behaviour under dynamic storm conditions and reflect model sensitivity rather than operational risk. No significant concerns were identified.

6.4. Design Freeboard

Proposed Development

The proposed development requires all new building platforms to be formed at least 500 mm above the 100-year ARI (3.68°C) flood level. This equates to a minimum compliant building platform level of RL 2.99 m to achieve the required freeboard.

Building platform levels are specified (rather than minimum finished floor levels) to ensure the required finished floor freeboard is achieved once subdivision and final building works are completed. The current ground level design adopts a minimum building platform level of RL 3.50 m, which provides greater than 500 mm freeboard above the 100-year flood level.

Existing Habitable Dwellings

Post-development results indicate a minor increase in peak 10-year ARI flood levels (approximately 40mm) north-west of the site. However, the duration of inundation is significantly reduced.

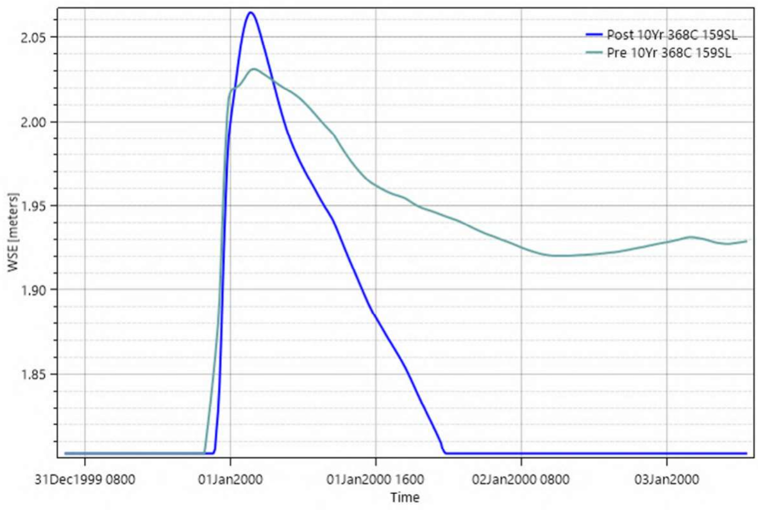


Figure 97 - Pre-Development and Post-Development 10-year Event Inundation Reduction Northwest of Development Site

Flood levels at other neighbouring properties are generally improved; lower flood levels are expected to direct stormwater away from existing habitable dwellings, with flows conveyed toward surrounding pasture areas where ponding can occur without affecting buildings.

For the 100-year, 2130, 3.68 °C climate scenario, the proposed system is expected to perform even better, maintaining safe freeboard and effectively managing peak flows while minimising ponding at critical locations. This provides confidence that both current and future conditions are adequately addressed in the design.

Other Critical Infrastructure

For the 100-year, 2130, 3.68 °C scenario with a sea level rise of 1.59 m, the proposed system maintains similar improvements, providing adequate freeboard and effectively managing peak flows while protecting critical infrastructure and reducing ponding risk.

A review of the Powerco substation located at the north-west corner of the site indicates only minor changes in water surface levels, which are not expected to pose any operational risk.

The underpass to Papamoa is predicted to experience a decrease of approximately 150 mm, reflecting improved drainage and a reduced risk of backflow in this area.

Stopbanks

BOPRC has initiated a capacity review of the Kopuaroa Canal, including the potential need for stopbank upgrades. Minor impacts on stopbank freeboard have been observed, as noted in Section 5.4.7, with a 40 to 100 mm increase in water surface elevation within the Kopuaroa Canal.

Stopbank crest levels along the Kopuaroa Canal and the Kaituna River, bordering the southern boundary of the Bell Road catchment, range from RL 4.00 m to RL 5.76 m. The maximum water surface elevation within the Kopuaroa Canal during the 100-year ARI event reaches RL 3.99 m. A minimum freeboard of 0.11 m is provided along the Kopuaroa Canal, and the minimum freeboard along the Kaituna River is 0.34 m.

BOPRC guidelines recommend a minimum freeboard of 500 mm in urban areas and 300 mm in rural areas. As the only urban area adjacent to the stopbank is the stormwater reserve in the southern block, it is considered reasonable to adopt a minimum freeboard of 300 mm along the northern side of the Kopuaroa Canal and Kaituna River.

Under the BOPRC 2024–2074 asset management plan, stopbank freeboard and capacity will be reassessed as the site progresses, with upgrades or top-ups implemented as required.

The newly formed stopbank along the eastern boundary of the South Block (from the Kopuaroa Canal to Bell Road) has a crest level ranging from approximately RL 2.0 m to RL 1.5 m. Its primary function is to form a basin with the South Block pump station to provide attenuation and dewatering, and to divert flows so stormwater does not discharge freely toward the Hurst Block. In a worst-case overtopping scenario, the stop bank would act as a weir, discharging at its low point located away from the buildings located on the Hurst Block, with the pump station able to regulate basin water levels and limit the rate and duration of any spill.

6.5. Summary

A flood risk assessment has been undertaken to evaluate the potential effects of the proposed development on the surrounding catchment. The modelling assessment focusses primarily on the 100-year ARI future 2130 design storm including 3.68 °C temperature increase and 1.59 m sea level rise. . The results indicate that the proposed development does not increase risk to surrounding land and maintains appropriate flood behaviour within the wider catchment

Additional model runs for smaller storm events, including the 5-, 10- and 50-year events, have been undertaken to provide an understanding of system performance. These results indicate that the proposed drainage strategy is expected to improve the management of frequent storm events; however, the detailed performance of local drainage infrastructure will be refined through future detailed design stages.

Critical infrastructure, including the newly proposed pump stations, has been carefully assessed as part of the design process. These elements form the backbone of the stormwater management strategy, providing both flood mitigation and operational resilience. Groundwater conditions have also been considered in close collaboration with ENGEO, ensuring that subsurface interactions are well understood and incorporated into the overall hydraulic design.

All newly developed areas have been designed to maintain freeboard above the expected water surface elevations for extreme events, including the 100-year, 2130 scenario with a 3.68 °C temperature increase and a sea level rise of 1.59 m. This ensures that habitable dwellings, farm buildings, and other critical assets are adequately protected from flooding, while stormwater is directed safely to designated storage and pasture areas.

Overall, the proposed development demonstrates a robust and resilient approach to flood risk management. By integrating engineered solutions, such as pump stations and strategically placed stopbanks, with careful consideration of existing and future conditions, the design provides a long-term, sustainable outcome. The project not only mitigates risk within the immediate site but also contributes positively to the broader catchment, reinforcing the region’s flood resilience and safeguarding both property and infrastructure for future climate scenarios.

7. Conclusions

The hydraulic assessment demonstrates that the proposed development maintains appropriate flood risk management within the Bell Road catchment and surrounding areas. The primary design assessment has been undertaken for the 100-year, 2130, 3.68 °C scenario with 1.59 m sea level rise scenario. Results show that the development maintains acceptable water levels, adequate freeboard, and controlled flows.

The proposed stormwater management strategy incorporates key infrastructure elements, such as the new pump stations and strategically placed stopbanks and drainage improvements to ensures both operational resilience and effective stormwater management.

Additional simulations of smaller storm events suggest that the proposed drainage strategy is expected to improve the management of frequent rainfall events across the site, which will continue to be refined and integrated in an ongoing, staged manner as the development of the site occurs. The 5-year ARI results should be regarded as preliminary inputs to the design process. They have not yet been fully validated against MIKE+ and currently show routing differences consistent with early-stage model configuration. These limitations do not indicate constraints on the overall stormwater strategy but highlight the need for continued refinement of channel geometry, culvert structures, and grid resolution during detailed design. Draft consent conditions provide an appropriate mechanism for this staged refinement.

Overall, the development integrates robust engineering solutions with careful consideration of future climate scenarios, providing long-term, sustainable flood risk management that benefits both the site and the wider catchment.

8. Future Work

The modelling described in this report has been developed to demonstrate flood effects for pre and post the development conditions, with primary focus on the 100-year ARI 2130 climate change and sea level rise event as the governing design scenario. At this stage, the model is considered appropriately developed to support catchment-scale flood assessment and evaluation of development effects.

Further refinement of the modelling will occur through staged detailed design, consistent with the progression of the development. This will include:

- Refinement of localised flow paths and drainage representation, including improved definition of minor channels, culverts, and overland flow routes as detailed design information becomes available
- Update of model geometry and resolution to reflect finalised landform, roading, and infrastructure layouts, including finished levels and drainage network configuration as these are further defined through detailed design and approval phases.
- Development and optimisation of pump station operation, including staging, trigger levels, and programming for frequent storm events and operational scenarios
- Ongoing comparison and alignment with the BOPRC catchment model and framework, where appropriate, to support consistency of system behaviour and understanding of wider catchment interactions. Work will be carried out to demonstrate compliance with relevant council and regional flood management requirements.
- Assessment of staged development scenarios, including interim landform and infrastructure configurations, to confirm acceptable performance throughout the construction and development lifecycle
- Modelling of stopbank breach scenarios were committed to being completed by BOPRC in 2025 and has not been presented to Maven to date. We assume this workstream is ongoing and at the responsibility of BOPRC.

These refinements primarily relate to local-scale behaviour and frequent storm events, which are inherently sensitive to detailed geometry and operational assumptions.

The above items will be progressed through detailed design and are anticipated to be controlled through appropriate consent conditions and ongoing engagement with authorities.

9. Limitations

The following limitations should be noted for the hydraulic assessment:

- DEM Accuracy: The use of publicly available LiDAR data for the digital elevation model (DEM) limited the ability to accurately capture the bottom levels of key features, including Pond G, Pond H, the Kaituna River, the Kopuaroa Canal stopbanks, the Bell Road Drain, farm drains, and the Raparapahoe and Ohineangaanga watercourses. This may introduce minor uncertainties in localised water depth predictions particularly in smaller events.
- Stopbank Improvements: The assessment assumes potential improvements to the Raparapahoe and Ohineangaanga stopbanks, but exact designs were not incorporated.
- Model Benchmarking: The BOPRC model was used as a benchmark for calibration purposes, providing confidence in overall flow routing and water levels but subject to the assumptions inherent in the original model.
- Hydrologic Inputs: Council-approved hydrographs were used for inflows, providing standardised storm inputs, with HEC-RAS 2D grids of 2m to 50 m (avg of 20m) used to represent the floodplain.
- Model Validation: The validation of the HEC-RAS model against the BOPRC MIKE+ model has been completed at a broad comparative level, confirming general consistency in catchment response and hydraulic behaviour. More detailed, location-specific tabulated comparisons of water levels, flows, peak water levels, peak discharges, and timing between the two models is proposed to be undertaken as part of future development stages or ongoing model updates in line with development staging and detailed design approvals.
- Soil and Infiltration: ENGEO's Hydrogeological Assessment Report (Appendix R of the AEE) assessment indicates that a low infiltration rate exists; however conservatively, the model did not allow for any infiltration for this development.

  Culvert & Bridge Representation: The model does not include potential debris blockage in large culverts, meaning extreme events could be slightly underestimated. Hydraulic structures including culverts and drainage features have been incorporated into the model where they are considered to materially influence floodplain behaviour and catchment-scale flow conveyance. At the scale of modelling adopted for this assessment, not all minor drainage infrastructure has been explicitly represented. The hydraulic model terrain is derived from the available DEM. In some locations the terrain has been modified to remove bridge decks or similar structures to allow floodwaters to pass through the model domain. As a result, bridges and culverts may not be represented with their full hydraulic geometry.
- Data Integration: The modelling combined LiDAR data with targeted site surveys to improve accuracy, but localised uncertainties remain due to gaps in detailed surveyed data for all waterway beds.
- Papamoa Hills: As we did not have any calibration data available, we have undertaken the best possible assessment using the information at hand. A 450 mm culvert has been included to convey the stormwater flows and ensure an appropriate level of service for the catchment.

These limitations should be considered when interpreting the results. While the model provides a robust assessment of flood behaviour and system performance, some localised variations may differ under real-world conditions. Notwithstanding the above, the Panel may rely on the assessments and conclusions in this report for the purposes of assessing and determining the fast-track application.

This report must be read in its entirety and no portion of it should be relied on without regard to the limitations and disclaimers set out.

Maven BOP Ltd makes no assurances with respect to the accuracy of assumptions and exclusions listed within this report and some may vary significantly due to ongoing stakeholder engagement

10. References

- River Edge Consulting Limited, Hydraulic Modelling of the Kaituna River , Jan 2009
- DHI, Bell Road Hydraulic modelling, Jan 2020
- DHI, Bell Road Hydraulic modelling "A" and "B", Oct 2020
- River Edge Consulting Limited, Bell Road Hydraulic Modelling update, June 2022
- Bay of Plenty Regional Council, Rivers and Drainage Asset Management plan 2024-20274, July 2024
- River Edge Consulting Limited, Bell Road Hydraulic Modelling update, June 2025
- ENGEO Limited, Hydrogeological Assessment Report(Appendix R of the AEE)
- ENGEO Limited, Natural Hazards Assessment Report (Appendix Q of the AEE)
- Geotechnical Factual Report (Appendix O of the AEE)
- Geotechnical Interpretive Report (Appendix P of the AEE)

APPENDIX A – AWA PEER REVIEW

PEER REVIEW MEMO

TO:	Rod Bailey (Bell Road Limited Partnership)	**DATE:**	24 March 2026
FROM:	Brad Scarfe	**PROJECT NO.:**	J001051
COPY:	Matthew Kerse (Maven)		
SUBJECT:	Wairakei South Fast Track – Independent Flood Modelling Peer Review (v2.2)		

INTROUDCTION

Bell Road Limited Partnership (BRLP) is proposing to "develop rural land for residential, commercial, and industrial use, including up to approximately 2,700 to 3,000 residential allotments, approximately 50-60 hectares of new industrial land, stormwater corridors and management areas." [1]

Maven has prepared a flood model and flood modelling report. ENGEO has provided geotechnical and groundwater services that support this modelling.

BRLP has engaged Awa Environmental (Awa) to undertake an independent peer review of Maven's flood modelling work as part of concept design level and consent application.

The peer review has been completed by an Awa team of Dr Brad Scarfe (Digital Environments – Group Leader), Dr Chusit Apirumanekul (Senior Water Engineer) and Andrea Pozo Estivariz (Catchment Dynamics Specialist). Principal design and modelling responsibility remains with Maven.

PURPOSE

This memo records Awa's peer review position of flood modelling for BRLP's Wairakei South substantive fast-track application. It has been developed using review material available up to 24 March 2026 including:

- successive Maven draft reports, models and results;
- final Maven report v9 (dated 24-3-2026);
- a comprehensive Excel issue log based on Bay of Plenty Regional Council's (BOPRC) modelling guidelines
- meetings and email communications on technical modelling and reporting matters.

This memo seeks to confirm if the model can be used for the intent as described in the Maven report.

[1] https://www.fasttrack.govt.nz/projects/wairakei-south

SCOPE OF REVIEW

The scope of this review is outlined below.

- Review of Maven's HEC-RAS flood model build including:
    - clarity of model purpose and proposed applications to flood assessments;
    - module assumptions, inputs and outputs;
    - model geometry and structures;
    - boundary conditions;
    - initial conditions;
    - approximation of groundwater in the model;
    - validation against existing information;
    - review of sensitivity tests; and
    - model build reporting.
- Review of design model results for pre- and post- development scenarios including:
    - configuration for different scenarios;
    - verification and spot checking of results; and
    - results reporting;
- Review of flood assessment reporting using model results.

The review excludes the following:

- assessment of all BOPRC simulation requirements relating to service levels, flood duration, breach scenarios and asset performance using Council's MIKE+ base model;
- assessment of groundwater science other than that groundwater assumptions are correctly implemented in the model; and
- assessment of asset management implications of any new assets.

Awa has not undertaken verification of all graphs and maps in Maven's reporting and we expect they have been verified by Maven. Awa's focus was assessing the model schematisation, model set up in comparision to BOPRC's MIKE+ model, validations and quality of reporting.

Awa's review has involved:

1. discovery of broader development proposal and work to date;
2. four rounds of review against Bay of Plenty Regional Council's modelling guideline plan, build use process.
3. logging of findings in Excel issue log and working through resolutions with Maven;
4. comparison of HEC-RAS and MIKE+ model outputs;
5. confirming if reported conclusions are supported by the model; and
6. communications with Maven, BRLP, BOPRC and ENGEO.

OUTCOME OF THE REVIEW

Based on the information provided up to 24 March 2026 and subject to the commentary below, Awa is supportive of the flood modelling work.

100 YEAR EVENT VALIDATION

The HEC-RAS work can support broad macro-scale conclusions for the 100 year ARI 2130 climate design event for the purpose stated in the Maven reporting:

> *"to evaluate flood risks associated with the Wairakei South development in order to determine the impacts of filling in the flood plain and how those effects were able to be avoided, remedied or mitigated effectively".*

The model has been found suitable for concept scale design analysis, in particular, for understanding the impact of the landform change on peak water levels, and if peak water levels can be managed via the new pump station capacity proposed in the design. The model assesses if flood impacts of this event for the development design can be managed via pumping into the Kopuaroa Canal and Kaituna Rivers, based on the assumption that these waterways can absorb this additional volume.

Confidence in the HEC-RAS 100 year modelling work is gained from comparison with MIKE+ pre and post results. It was found that the differences between pre and post development water levels were similar (< 0.10 m across nine sampling locations) for both HEC-RAS and MIKE+ results. It is noted that absolute water levels differ and that the MIKE+ water levels are lower in the flood plain (i.e. Bell Road catchment) and higher in the Kopuaroa Canal and Kaituna Rivers.

Based on this, our acceptance is limited to peak water level analysis, broad flood-pattern comparison, and representation of basin-filling and drainage-system behaviour involving pumps, channels, and gates. It does not extend to detailed flow pathways and localised hazard interpretation.

5 YEAR EVENT VALIDATION

The 5 year ARI (pre-development) 2130 climate design event remains preliminary as there are localised differences to the MIKE+ results. The current evidence continues to indicate a material routing difference, with too much flow directed south toward the downstream farms block and too little north toward the Bell Road Drain / TEL culvert area. With some structures and drainage pathways represented differently in the HEC-RAS model, this indicates that further work will be required on the model for detailed design and effects assessments in smaller events. For more detail, refer to the review issue log.

These comments relate to model verification rather than ability for a smaller event flood management solution to be designed based on the increased pump capacity.

Maven has confirmed in their reporting and to Awa that appropriate draft consent conditions will be included in the substantive application to support ongoing refinement of the modelling scenarios, aligned with the proposed development staging as it progresses.

REPORTING

The report includes a section on future work and outlines additional work to be completed through detailed design, development of consent conditions and engagement with authorities.

APPLICABILITY

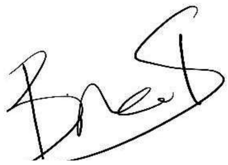
This memo and the supporting services completed by Awa is a review limited to the scope of services set out in the contract between BRLP and Awa. It has been prepared for the exclusive use of BRLP. Awa accepts no liability or responsibility for use by any third party.

Awa understands that this memo may be submitted as part of Bell Road Limited Partnership's application under the Fast-track Approvals Act 2024 and may be considered by the Expert Panel, Western Bay of Plenty District Council, and Bay of Plenty Regional Council in undertaking their respective assessment and consenting functions.

CONCLUSIONS

Awa considers the modelling suitable to support the applicant's current substantive fast-track application based on the assumption that the 100 year climate change event is the key event to evaluate if flood volumes and levels can be managed. This is subject to the qualifications in this memo and comments in the attached Comment Register.

PREPARED BY:



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Dr Brad Scarfe (Digital Environments Group Leader)

ENCLOSED:

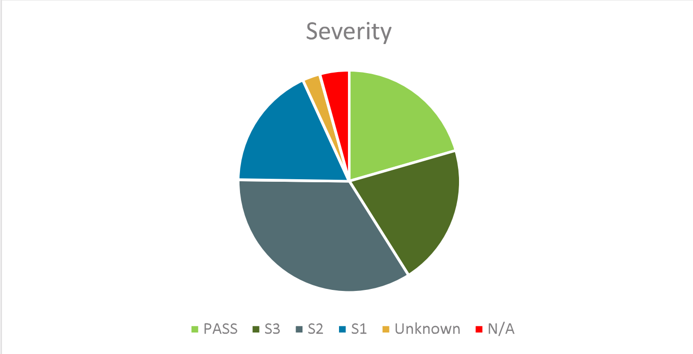
Peer review Comment Register:

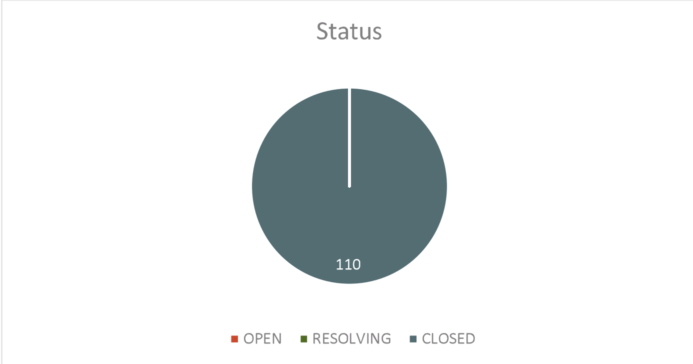
- 260324 Wairakei South SW Modelling Peer Review RFI_HEC HMS and HEC-RAS v4.5.xlsx (as PDF)

260324 WAIRAKEI SOUTH SW MODELLING PEER REVIEW COMMENT REGISTER – SUMMARY SHEET

Severity	Total		Plan	Build	Use	Reporting
PASS	24		9	10	3	2
S3	24		3	7	3	11
S2	40		3	16	8	13
S1	21		1	12	2	6
Unknown	3		0	3	0	0
N/A	5		1	4	0	0

OPEN	0		0	0	0	0
RESOLVING	0		0	0	0	0
CLOSED	*110*		17	49	15	*29*
DEFERRED			0	3	1	*3*





DATE 24/03/2026

Severity	
PASS	NO ISSUE
S3	**MINOR ISSUE** - Likely to have only a minor impact on results and is somewhat subjective - Consider fixing if model is being re-run for other reasons - Minor reporting issue
S2	**MODERATE ISSUE** - Likely to have some impact on results (local or wider) - Strongly recommend fixing (definitely fix if re-running for other reasons) - Major reporting issue
S1	**MAJOR ISSUE** - An error or omission that will noticeably affect results (local or wider) - Must be fixed
Unknown	Not yet tested
N/A	Not Applicable

OPEN
RESOLVING
CLOSED
DEFERRED

Item	Topic	Check	Reviewer comment	Severity	Status	Modeller comment round 1	Reviewer comment round 2	Modeller comment round 2	Reviewer comment round 3	Modeller comment round 3	Review close out comments
1	**Purpose definition**	Is the model clearly framed in terms of its planning, consenting, and hazard management purpose?	28-11-2025 - the model is clearly framed in terms of its planning, consenting, and hazard management purpose.	N/A	CLOSED						
2		Does the scope explicitly link to flood hazard for urban development, structure planning, plan changes or consentable works?	28-11-2025 - scope is explicity linked to flood hazard for urban development.	PASS	CLOSED						
3		Are system failure and freeboard considerations addressed, and do they need to be addressed?	28-11-2025 - freeboard considerations have been addressed, however no commentary on system failure has been provided. Considering 5 new pumps are proposed, the existing Bell Road Pump Station A is proposed to be upgraded, and several culverts are proposed, an investigation and discussion of system failure should be provided.	S2	CLOSED	Council to provide feedback on the number of failures in the pump system	3-12-2025 discussed and awaiting Council feedback to Maven 10-12-2025 Stoffel informed of this approach "Pump failure, we allowed all pumps to fail start of the storm, 100Yr 3.68C 1.59SL, we get RL 2.9m with swale manning of 0.06. we still have the RL 3.5m platform, 500mm freeboard still OK". To be closed out on Council confirmation.	Council confirms that the current pump stations do not have a dedicated generator backup (12/12/2025) "there are no backup generators to record a runtime from. The Bell Rd C pumps operate permanently on a generator, so I don't believe their run hours would be relevant to a backup generator runtime calculation." (15/12/2025) The proposed 12.5m³/s South Blockpump has a 24hour run on diesel gen set Hurst Block with the new 6m³/s we will add a 24hour run on diesel gen set			19/01/2026 pump failure scenario reported in report and item closed
4		Was early engagement with BOPRC undertaken? Are design events aligned with Council agreements?	Engagement with Council has been ongoing but no single documention of argreements has bene provided. Schedule of events has been supplied by Council to applicant and these area a comprehensive range of events. Council requested that the MIKE+ model was used and applicant has opted for HEC-RAS. We understand that this fits better with the applicant's deisgn workflow, but that Council also expects the assumptions and hydraulics broadly match between two models. Awaiting further information to be supplied, or confirmation that this is the extent of agreements and requirements.	S2	CLOSED		3-12-2025 no updates. We understand progress on groundwater assumptions is under discussion with Council.				2-3-2026 ENGEO has provided a memo to support the relevance of their groundwater report (ENGEO 2025.12.02 - Bell Road Draft Hydrogeological Assessment Report Rev 1.pdf) to the HEC-RAS model assumptions. 9-3-2026 Awa has copies of requirements for flood modelling and flood management BORPC communicated to BRHL. These are documented and considered adequate to close this item.

5		Has the base model (MIKE+) been clearly referenced and acknowledged as a benchmark?	28-11-2025 - the base MIKE+ model has been clearly referenced and has been used to validate the model.	S2	CLOSED	It is recommended to consider Pāpāmoa Hills as an additional inflow in the model, as this could influence local flood behaviour and upstream/downstream interactions.	3-12-2025 MIKE+ original of model are in build reporting. Additional comments added in build stage on validation. Closed off.		
6	**Definition of success**	Has the criteria to define success been defined? The success criteria can be evaluated as met, not met, exceeded or in some other appropriate ways for the purpose of the model		S3	CLOSED		28-11-2025 - The second paragraph of the Executive Summary outlines the purpose of this model is flood risk assessment. However, it is assumed that the model also is being used for stormwater framework / analysis / engineering design also. Update purpose for all applications of model	Updated	19-1-2026 Exec summary has "to evaluate flood risks " and ", test the performance of proposed stormwater corridors and attenuation areas, and assist in sizing key stormwater infrastructure " Closed
8	**Defining simulations**	Have gaps in simulation scenarios been defined? For instance, coincidence between rainfall/flow and tidal events might be missing.	Defined by Council	PASS	CLOSED				
9		Has a schedule of model scenario runs been defined and approved by all stakeholders?	Defined by Council and no indication that the applicant is in disagreement. The reviewer is running these events through the MIKE+ model (pre-post development scenarios) to provide all confidence in the stormwater design.	PASS	CLOSED				
10		Have one calibration and 2 validation events been considered in model simulations?	Calibration is completed in the MIKE+ model. So no additinoal calibraiton is required and validation against the MIKE+ model is the requirement	PASS	CLOSED				
11	**Identifying the relevant phenomena**	Have the physical phenomina (such as high groundwater, tidal influence, super elevation, eddies, velocities, scour and etc) relvant to the model outputs been identified?	28-11-2025 - while a specific setion detailing this isn't present in the report, tidal influence and grounwater inflows have been discussed.	PASS	CLOSED	per section 3.2.2 of Bay of Planety Regional Council's hydraulic modelling guidelines (Guideline 2024/03)			
12	**Reviewing previous studies and guidelines**	Have previous documents (such as modelling studies, guidelines, codes and standards, plans and etc) been reviewed?	28-11-2025 - references to previous studies has been provided in the modelling report, with datasets from previous sources being listed in section 3.1. However, a review and discussion/summary of previous studies and relevant guidelines has not been provided.	S3	CLOSED	Yes, refer to the reference	References to modelling studies are correctly included. New work ENGO work on groundwater / geotech to be added to reference.	Updated, kept the date in yellow as this might change, will update on the final report prior to submission	19-1-2026 closed
13	**Analyse data and gaps**	Have available data been analysed to understand gaps and any model updates requirements?	15-10-2025 - awaiting model build reporting. We are aware that additional information such as groundwater measurements, geotech studies and HEC-HMS hill catchment has been completed to provide additional data.	S3	CLOSED	We did mention a small portion of this into the Pre Dev model, as part of the report.	3-12-2025 - no information gap analysis section but new data such as survey is reported		

14	**Define model extent**	Check if model spatial extent considers key topographioc features, impact of key hydraulic phenomena and engineering structures and other natural boundaries.	We have seen that the model extent includes the Bell Road area and extends well beyond the development site. All key pump stations, managed drains and key hydraulic features appear within the model domain.	PASS	CLOSED		
15		Has the model extent responded to the objectives of the model?	15-10-2025 - awaiting model build reporting but gernerally understand the model purpose and the model extent is large and presume the extent has developed based on early conversations with Council.	PASS	CLOSED		
16	**Define model schema**	Check if key catchment features (such as stream, flow constraints, storage and etc) and critical infrastructure (such as stopbank, flow diversion, underpass and etc) are included.	28-11-2025 - modelling report discusses the inclusion of ridgelines, stopbanks, and drains/canals in section 5.3.3.1.	PASS	CLOSED	Yes, all relevant stopbanks and culverts have been incorporated into the model, as they have a significant effect on the flood behaviour and the performance of the proposed development.	
18	**Select model platform**	Has model platform selection considered key factors (such as client preference and capacity, access to software, model runtime performance, requirements of outputs, hardware compatibility and etc)?	15-10-2025 - awaiting model build reporting to confirm full allignment between model purpose and HEC-RAS modelling platform. Initial discussions suggested it was to do with better integration of rapid urban and stormwater design iterations than could be achieved with MIKE.	S1	CLOSED		Discussion on HEC-HMS held. Software is fine for the task but improvements including to grid resolution are reported elsewhere in review. An approach was reported where a lower resolution model was used for intiial runs to speed up simulations. Considering the size of the area and development, a GPU based software where full detailed runs from the start could be completed would have been preferable.
19		Has the selected model platform addressed the modelling objectives at present and in future?	15-10-2025 - awaiting model build reporting	PASS	CLOSED		After disuccsions we are happy with the jusitifcation for the software choice. It is largely driven by available skill set

260324 WAIRAKEI SOUTH SW MODELLING PEER REVIEW COMMENT REGISTER – BUILD STAGE SHEET

Item	Topic	Check	Reviewer comment	Severity	Status	Modeller comment round 1	Reviewer comment round 2	Modeller comment round 2	Reviewer comment round 3	Modeller comment round 3	Review close out comments
1	**Source relevant data**	Have metadata of sourced data been reported? This includes tracking of data requests, supplied dates and	28-11-2025 - metadata has been provided in section 3.1 of the modelling report	PASS	CLOSED						closed in intial review
2	**Define model parameters**	Have preliminary model parameters and configurations been reported? Some model parameters are defined in the model schema during the Plan Stage and will be modifed during the calibration.	15-10-2025 - awaiting model build reporting	PASS	CLOSED		5/12/2025 rainfall, mannings, curve number, abstraction parameters reported				5/12/2025 rainfall, mannings, curve number, abstraction parameters reported
3		Are key parameters alligned to the MIKE+ model?	Infiltration in the MIKE+ model is assumed to be 0 mm/hr due based on Council knowledge of a high groundwater table during major flood events. The applicant has had groundwater monitoring and geotechnical work completed and and we are awaiting reporting to understand their approach. We noting a difference in between the two models and recommend applicant and Council agree on assumption to maintain consistency betewen models.	S1	CLOSED	I would see this as a sensitivity check for, 10Yr, 100yr and 500Yr events. Await feedback from council	Discussion on groundwater modelling showed depth to groundwater very low in many places around development area. This implies little to low infiltration capacity. Potentially more infiltration upstream. Council discussions ongoing on groundwater and highlighting lack of allignment with assumption still between MIKE+ and HEC-RAS models. Senstivity tests will be / are being completed reported. Draft results showed increase in water level of 90mm. 10-12-2025 Stofell informed us that infiltration will be set to 0. Confirm implemented in model to closed. 19-1-2025 Will be checked in next version of model we received that it is implemented as expected and then we will closed out.	Keeping the 0mm infiltration, as we have more data from ENGEO to confirm that the infiltration will be low			30-1-2026 confirmed no infiltration in model
4			Current HEC-RAS pre-development model used the infiltration derived from the 'CN Dev Soil C' which applied 0.05 initial abstraction and curve number value of 74 across the entire model extent. There is another empty infiltration file (CN Pre Soil C) which is unclear if it is for pre-development. Please make file names clear to confirm what is being applied.	S3	CLOSED	We removed the CN Pre Soil C and only CNDevSoil C will be used	Update the report with final approach on infiltration based on groundwater agreements. Note that the report indicates soakage rate of 0.05 while the infiltration layer in HEC-RAS applied abstraction ratio of 0.05. Please recheck and update the report accordingly.	Infiltration was removed from the model the abstraction ratio of has been removed and set to 0 Report has been updated			29-1-2026 report now states "Infiltration parameters were removed from the flood model due to the high groundwater levels across the site. With groundwater already close to the surface, any additional infiltration is minimal, and therefore including it would not significantly affect model results"
5			To confirm impacts of difference in infiltration approach, during a peer review meeting on 30 Sep 2025 the modeller agreed to completed sensitivity test on infiltration for 10-year, 50-year and 100-year events. This senstiivty testing should be on the pre development scenario consider impacts on effects such as depths, levels and discharges (including impacts on pump station capacity).	S1	CLOSED	Email was end on the 17/10/2025 for the diffrence in water level and sensitivey check	Sensitivity test was conducted on different Initial Abstraction (0 and 0.05). I assume that the sensivity tests were carried out by changing abstraction ratio in HEC-RAS while the CN remains unchanged. This means that the tests focused on the intial abstraction (0mm vs 0.176mm : please refer to HEC-RAS manual on how to calculate Ia from CN and abstraction ratio). Suggest to do sensitivity test on without infiltration and include the sensitivity test results in the report. Note that sensitivity test was done (Refer to Stoffel's email on 4 Dec 2025) Include findings in report on depths, levels and discharges (including impacts on pump station capacity).	Initial Abstraction, we kept a 0 for both pre- and post-dev, due to the high groundwater, we will add the results in the report under sensitivity test			19-1-2026 Sensitivity tests not essential now that allignment with MIKE+ infiltration is in place. Report notes "Infiltration parameters were removed from the flood model due to the high groundwater levels across the site. With groundwater already close to the surface, any additional infiltration is minimal, and therefore including it would not significantly affect model results"
6				S1	CLOSED		28-11-25 - section 5.2.1 of the modelling report states that "the storm event was simulated with a 72-hour centrally nested storm profile using the data shown in TP108". Please clarify why the storm profile supplied in Table 11 (p46) of BoPRC's modelling guidelines was not used. The guideline requires heavy ended (75%) storms to be used. 19-01-2026 1) why weren't hydrographs moved 2) was MIKE+ hydrographs and rain timing not sensible? 29-01-2026 Maven is completing a test using raster based rainfall in HEC-RAS to match MIKE+ and confirm rainfall volume allignment if different rain is to be used, or use raster based rain.	The report will be updated to clarify the storm profile approach used. The storm event was simulated using inflow hydrographs derived from the agreed MIKE+ catchment model to maintain consistency across the modelling framework and avoid re-deriving inflows within HEC-RAS. When aligning the rainfall peak timing with the MIKE+ inflow hydrographs, the resulting storm shape effectively corresponds to a 72-hour heavy front-ended storm (approximately 25%). This timing provides better synchronisation between direct rainfall and upstream inflows, resulting in a more realistic combined peak response. Applying a 72-hour heavy-ended (75%) storm directly within HEC-RAS would shift the rainfall peak later than the MIKE+ inflow peak, leading to a temporal mismatch between the two responses. Ref to Bell road, Hydraulic Modelling, BOPC, Report Jan 2000, Fig 5.2 for the hyetographs, similar to what was obtained out of the mike+ 2025 model, and reuse in HEC-RAS and HEC-HMS Diffrent rainfall events has been check (MIKE+) vs Maven model, not significant change in WSE and upstream inflows			9-3-2026 The HEC-RAS 100 yr rainfall has been validated against the MIKE+ rainfall. Other rainfall profiles were not verified and assumed modeller has treated this correctly. Reporting still refers to TP108 in section 5.2.1 and is raised in reporting tab. The explainantions and reporting on rainfall has been more confusing that it needed to be.
				PASS	CLOSED		5-12-2025 HEC-RAS does not support spatially varying rainfall so rainfall is applied globally and this is acceptable considering the software choice.				29-1-2026 raster rainfall supported using https://www.hec.usace.army.mil/confluence/rasdocs/r2dum/6.3/boundary-and-initial-conditions-for-2d-flow-areas/global-boundary-conditions
				S1	CLOSED		5-12-2025 Analysis of HEC rainfall shows that the storm lasts for 7 days (100yr example) but the report says a 72hr storm is used. This reduces total rainfall by approxiately 50 mm for the three days around the peak.	Ref to Bell road, Hydraulic Modelling, BOPC, Report Jan 2000, Fig 5.2 for the hyetographs, similar to what was obtained out of the mike+ 2025 model, and reuse in HEC-RAS and HEC-HMS.			30-1-2026 raster rain test will resolve any issues with rainfall. Closing this off
				S2	CLOSED		5-12-2025 Mannings roughness require updates. The pre development model has different roughness in the development area than the rest of the Bell Road catchment but they landscape is the same. The post development scenario then has inconsistenies in the unchanged areas of the post development model, and seemingly low values for the development area. 10-12-2025 information on mannings values and approach supplied. Need to review assumption on low mannings for flood prone areas as may be too low.	Given that the site is flood-prone, the use of depth-varying Manning's roughness was considered. Guidance on depth-varying roughness is available from Catchments & Creeks (Field Guide – Stormwater). However, HEC-RAS does not natively support depth-varying Manning's n values and instead allows only spatially or flow-varying roughness. As the site hydraulically behaves like a "bathtub" during large events, with extensive inundation and relatively uniform flow conditions, a fixed Manning's approach was adopted as a practical and conservative representation of flood behaviour. The following Manning's values were applied: Global floodplain: n = 0.04 (MIKE+ and ref to Bell road design report) Bell Road channel: n = 0.04, reflecting the presence of ponds, dense vegetation, and deep weeds (n = 0.06 was applied and not sensitive with WSE) Major channel and river: n = 0.02, calibrated against HEC-RAS 1D hydraulic calculations Internal swales - Post Dev: n = 0.10 for water quality design under low-flow conditions For flood events exceeding minor flows, Manning's was reduced to n = 0.04 to reflect vegetation flattening and deep flow conditions This approach provides a balanced representation of both water quality and flood conveyance while remaining consistent with the modelling capabilities of HEC-RAS and industry guidance. Refer to https://www.boprc.govt.nz/media/520746/guidelines-2012-01-stormwater-management-guidelines-for-the-bay-of-plenty-region2.pdf Table 4.2 Guidance on depth-varying roughness is available from Catchments & Creeks (Field Guide – Stormwater).			20-1-2026 meeting disucussion on mannings tests concluded that flood levels are not sensitive to mannings. Accepted that if sensitivity tests are minor and reported then proposed manning approach is fine for 100 yr. Caution still to be taken for smaller events in case it impacts profiles through structures. The caveat for this is that the model can be used for high level design and effects assessment, but manings may be an issue for more detailed or location specific analysis.
				S2	CLOSED		12-12-2025 Citations for sources of roughness values are not provide BOPRC guidelines provides values and a range of sources. For swales recommended values between 0.05 and 0.15 depending on vegation. We reviewed also TCC, CCC and GWRC values for comparision.	n = 0.10 for water quality design under low-flow conditions For flood events exceeding minor flows, Manning's was reduced to n = 0.04 to reflect vegetation flattening and deep flow conditions Refer to https://www.boprc.govt.nz/media/520746/guidelines-2012-01-stormwater-management-guidelines-for-the-bay-of-plenty-region2.pdf Table 4.2			20-1-2026 meeting disucussion on mannings tests concluded that flood levels are not sensitive to mannings. Accepted that if sensitivity tests are minor and reported then proposed manning approach is fine.

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				S3	CLOSED		12-12-2025 An extremely low roughness in build up areas of 0.005 has been used to represent a 10 min time of concerntration of an urban area. Pleas provide addition workngs for this assumption	Test was done using a Manning's N - 0.1, 0.05 ,0.005 Manning's N = 0.005, No Lag Time from peak storm Manning's N = 0.05, 18min Lag Time from peak storm Manning's N = 0.1, 28min Lag Time from peak storm Storm peak hyetograph 31Dec 23:15 Upstream peak inflow 65min Lag Time from peak storm Use Manning's N = 0.05, 18min Lag Time from peak storm, as the stormwater pumps will have a delay start of 8min, around 6144m³ difference			20-1-2026 meeting disucussion on mannings tests concluded that flood levels are not sensitive to mannings. Accepted that if sensitivity tests are minor and reported then proposed manning approach is fine for 100 yr. Caution still to be taken for smaller events in case it impacts profiles through structures. The caveat for this is that the model can be used for high level design and effects assessment, but manings may be an issue for more detailed or location specific analysis.
				S2	CLOSED		12-12-2025 BOPRC guidelines suggest a +/-20% roughness sensitivitiy test. Please complete this for the post development sceanrio. The roughness assumption will effect the ability of water to get to the pumps and time to drain.	Roughness test was done using 100Yr 3.68C + 1.59SM Post dev, we allow the internal swales from Mannings n = 0.04 to n 0.1 Based on 10min time steps South Block pump station Mannings n = 0.04,Peak flow 31 Dec 1999 1410, vol 3134x10³m³ , 2.50m WSE Mannings n = 0.06, Peak flow 31 Dec 1999 1510, vol 3081x10³m³ , 2.51m WSE Mannings n = 0.1, Peak flow 31 Dec 1999 1610, vol 3016x10³m³ , 2.51m WSE Minor effect on the WSE, the volume on the scale of the projects also minor effect on the overall development			20-1-2026 meeting disucussion on mannings tests concluded that flood levels are not sensitive to mannings. Accepted that if sensitivity tests are minor and reported then proposed manning approach is fine.
7	**Create boundary conditions**	Confirm discharges extracted from MIKE+ have been applied correctly	15-10-2025 - awaiting model build reporting Spot checks to be completed after reporting review	S3	CLOSED		Some minor differences (refer to row 1 in Image_V2 spreadsheet for a sample of discrepancy). Please recheck if flows from MIKE+ match with HEC-RAS boundary flows.	Has been updated accordingly, spot checks were done on the other input data			30-1-2026 spot checks of culverts show same disharges betwee models
				S3	DEFERRED		Flow at 'PondG_Inlet' is located inside Pond G. Suggest to move the flow connection to the inlet of PondG. Refer to row 2 on Image_V2 30-1-2026 inflow has moved to the channel but is not at the model edge. This is causing backflow out of the model and should be moved to the model boudnary.	Has been updated accordingly	10-3-2026 The boundary was moved but not to the required place. It will need to be moved for future analysis as per Image #2 in Image_v2.	The location of the boundary condition will have negligible impact on the model results. The pond outflow hydraulics is dictated by the inflow volume and water surface elevation in the pond, which is uniform across the pond. Whether the inflow enters at the north or south end, the WSE rises identically. Since the outflow (culvert/pump) is determined solely by the WSE at the outlet, the discharge timing and peak remain unchanged.	10-3-2026 The boundary was moved but not to the required place. It will need to be moved for future analysis as per Image #2 in Image_v2. This indicates either a lack of understanding of how this should be set up, or unwillness to respond to the review. We have set to defferred as it will need to be updated for more detailed modeling work in the future.
8		Confirm HEC-RAS tidal boundaries against MIKE+ boundaries to confirm they allign	MIKE+ model applied T20 1.59m SLR tidal level at the open coast. HEC-RAS model for 100-year event used a water level timeseries as boundary condition near the Bell Road Boat ramp. This time series showes some impact of tide level, which is expected at this location. Result from MIKE+ 1D (res1d) was compared with HEC-RAS water level timeseries and there are slight differences (see green circles in image in row 8) but they are expected to be the same. Please recheck which res1d file to be used for boundary condition and confirm in reporting that this is set up to match the MIKE+ results at this location, for all scenarios.	S3	CLOSED	Diffrence will be between MOD53 and NZVD We use a global factor of NZVD + 0.231 MOD53 Will always be higher Refer to Build Stage RFI 9.xlsx					
9		Confirm inflow HEC-RAS flow boundaries against MIKE+ boundaries to confirm they allign	Multple boundary flows into the Raparapahoe canal are lumped and discharged into the Kaituna rivers. To represent better the actual hydraulic phenomena the should be separated as shown by orange lines in image 5. Uncesseary errors in timing also may occur. Any locations where discharges are lump should be highlighted and justified in reporting.	S2	CLOSED	All inflows have been made separate	Boundaries have been separated as expected				
			It would be good to include verification against MIKE+ boundary conditions by including plots comparing HEC-RAS outputs with MIKE+ Boundaries (water levels, flows and pump discharges at some locations).	S2	CLOSED		5-12-2025 Stoffel has began on reporting	The model results has been updated using the 5 m DEM grid. Initial water levels were applied, and the model was initiated with a higher peak flow. These changes do not affect the overall flood extents or results of the assessment.			29-1-2026 improved verification reporting is in the report
10		Confirm rain HEC-RAS initial conditions against MIKE+ boundaries to confirm they allign	A nested rainfall profile consistent across the HEC-RAS domain is applied. The MIKE+ model has spatial varying profile across the model. Please explain in reporting and justify any impacts.	S1	CLOSED	We have added the discussion part of the pre-development model. Summary, A nested rainfall profile consistent across the HEC-RAS 2D domain was applied, producing slightly higher local peaks and longer durations without significantly affecting overall water levels, and allowing sensitivity checks independent of spatial rainfall variability.	Refer to comment on row 9 on spatial distributed rainfall in HEC-RAS. 10-12-2025 Information on inflow and rainfall allignment has been supplied. To be reviewed.	Refer to the rainfall section to see the vol diff for the development			30-1-2026 closing to focus on item 6 only for rainfall justification
11		Review other related boundary conditions considerations are set up e.g. - rainfall (gridded / observed rainfall) - upstream catchment flows (discharge / locations) - downstream boundaries : tide, water level, slope - point source inflows/outflows - groundwater - initial conditions	Inflows from Pond H have large 100-year flows than the 500-year ARI event. The TEL14370 location has 500 yr only slightly higher than 100 year. Please check the inflows (refer to images in row 2).	S2	CLOSED	All inflows have been rechecked and separated. In areas where the 500-year event results are slightly lower than the 100-year event, this is due to computational error within the MIKE+ model.	Flow at Culvert_H2_(TEL12) contains a spike flow which seems to be an issue from MIKE+ result. Suggest to recheck and modify the output from MIKE+ before applying these flows to HEC-RAS model. Refer to row 3 in Image_V2. Please check other boundaries as well.	This high spike is in the mike + data files as well, only in the 500Yr Current not in the 500Yr 3.68C + 1.59SL Have adjusted H2, not to spike to 7, but reduce to in line with the following data, only 5min of data was adjusted. Refer to Row 3 for the comparison of all data Ther Kopuaro channel has early high inflow of, but will not have any effect. this is due to the inital water level in the Raparapahoe, which creates a wave of water in the first 1.5hours in the model before returning to normal, see the graphs below in the model validation			30-1-2026 not checked in model but modeller confirmed resolved
12			A 10-year ARI inflow at Pond G had negative flows. Refer to image in row 2. This issue was raised via email on 23 Sep. The 10-year ARI inflow for Pond G was updated by modeller (refer to image in row 3). Plesae check that there are no other negative flows.	S2	CLOSED	All inflows have now been updated, Pond G has now 3 inflows similar to the mike + model Using HEC-DSSVue to keep track of all inflow boundary conditions	No further comment..				
13			Boundary flow at Kapuaroa canal is not attached at the upstream catchment outlet (refer to **row 4 and 5**). In high flow event, the boundary flow might overtop the canal to the north and south and backflow and unjustified storage may occur upstream from the current discharge location. Suggested in meeting to move the flow connection location to the catchment outlet and modeller said it initially caused instabilities but these have been resolved and it is intended to move discharge to the correct location.	S2	CLOSED	Kapuaroa canal has been moved, with a smaller grid size(10m) in that area compared the the 50m grid size	No further comment..				
14			The HEC-HMS generated boundary into the Kauaroa canal has a tidal ossocialtion but the MIKE+ version doesn't. Please explain the difference.	S2	CLOSED	It is assumed that the reference to HEC-HMS is a typographical error and should read HEC-RAS. The HEC-RAS model uses water level data from MIKE+ at KAITUNA 16638.9, which forms the Kauaroa Canal boundary. This represents conditions prior to the flood peak, so any early tidal oscillations or minor negative flows observed as the model starts are part of the model "warm-up" and are expected to have a small to minor effect on the overall simulation results. Special care was taken to extract water levels at KAITUNA 16638.9 to ensure consistency with the MIKE+ dataset. I have added a screenshot of all events, Tab - Image row 8		No action			30-1-2026 confirmed fixed in latest model

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15			Boundary flows used in the northern part of the HEC-RAS model (e.g. BellRoadMainDrain1, PondH) are different from the discharges extracted from the MIKE+1d results. Flow at TEL130005 62.25 used discharge extracted from the branch while there are flows from other significant nearby branches that contribute flows. Please include in the report how these boundaries in the northern part of the model are set up.	S1	CLOSED	All new inflows were applied directly to the node structure to prevent any additional inflows from being introduced by the MIKE+ model. Using HEC-DSSVue to keep track of all inflow boundary conditions		No action			30-1-2026 spot checks of culverts show same disharges betwee models
16			The series of large culverts west of Pond H (image 9) are known to have significant discharges and they are lumped into a single location (TEL13005 62.25). Justify the lumping approach as this may impact timing and flood mapping impacts in the area.	S2	CLOSED	Inflow has now been separated in pond H Using HEC-DSSVue to keep track of all inflow boundary conditions		No action Pond H has initial water level provided by council data on site			30-1-2026 confirmed discharges are not lumped in latest model
			Initial conditions of the model	S3	CLOSED		Please include initial conditions or assumptions used to define initial conditions in the report.	Please see the report under initial conditions			30-1-2026 intial conditions set up in model and Pond G and H have initial conditions above DEM level.
17	**Create model geometry**	Has the model geometry considered key elements? See samples below. - terrains : DEM, modifiction of terrains (e.g. stopbank, kerb lines, ponds, retention storage, overland flow path and etc) - open channel : check if latest information has been used (DEM/suirveyed cross sections) - Proper cell sizes / variable cell sizes to fit the 'defined purpose' in the Plan stage - Estuary, river mouth, ponds : check shape and bottom level - Building footprints : terrain modification for building level - Land cover and imperviousness - 1D components (such as pipes, manholes, inlets, culverts and etc)?	15-10-2025 - awaiting model build reporting Please report on DEM used in HEC-RAS vs survey vs MIKE+ geometry if different.	S1	DEFERRED	Maven was able to open the Mike+ geometry Refer to 4.1 Terrain Data for the Topo and DEM detail	There are differences of culvert levels in MIKE+ and HEC-RAS. Here are some culverts in MIKE+ which have different culvert invert levels (TEL4 BellRdBPump). Please rheck all culverts if the levels are correct (after vertical datum conversion). 30-1-2026 Invert levels of some culverts in MIKE+ model do not match with culvert levels in HEC-RAS after vertical datum conversion (such as SA2D Bellroad-B and SwallBellRdDrain). Please recheck the culvert levels in HEC-RAS models by comparing with levels in MIKE+ (after datum conversion). Email sent to Stoffel which includes significant downstream discharge differences (which may or may not be related to inverts). The model inlcudes new terrain data with quntified accuracy. The reporting does not comment how this is different to the MIKE+ DEM and if this will make any difference to results. 2-2-2026 Pumps around Bell Rd have start / stop levels different to MIKE+. eg. Bell Road A Duty pump in MIKE+ (MOT53) is 0.23 and it is 0.46 in HEC (NZVD2016), but we expected this to be closer to 0.0 (NZVD2016). The impact is that the pumping will start later and more water will be in the system.	All culvert is now of a similar size and invert level as MIKE+ model MIKE+ DEM has been updated for the pre and post-terrain All pumps it level of the MIKE+ model; the new pumps have set as reasonable levels. The detailed design will optimise all the pump levels	10-3-2026 Not all identifed geometry issues from round 2 comments have been resolved despite modeller comment 2 stating they have been. Increased to S1 due to findings from MIKE+ comparisions for 5 year event not verifying likely due minor geometry issues but perhaps also calibration to 100yr for roughness. Also many channels are still poorly define and this will be having impacts on 5 year event results and validation against MIKE. Comments from 2 Mar 2026: Total pump capacities at Nuzuma in HEC-RAS model are set to 1.05 m^3/s while the pump set up in MIKE+ has only one pump with 0.525 m^3/s capacity at Nuzuma. There is another pump located nearby with capacity of 0.525 m^3/s in MIKE+. The impact should be minimal. Here are lists of culverts which have invert levels inconsistency with MIKE+ model : SwaleBellRdDrain, Bell6, Bell culv3 There are some culverts excluded in HEC which might have impacts during low flow simulation and/or flood occurence mechanisms. Some culverts along Bell Road drain include Bell_Road_No2_796 (1.5m dia), Culv Bell30, Culv Bell 32 and etc. Some culverts crossing/along TEL are missing and this could lead to less flow to Pond G and more flow to development area (north). Refer to images, with a snapshot of culverts included in MIKE+ model, in line 9 in Image_v4. In MIKE+ model, there are weir, culverts and bridge set up at the downstream of Bell Road B Pump station. In HEC model, there is no structure set up with the channel burn to allow flow. This model set up is likely to have impact for low flow simulation. It is a noticeable issue that there are differences in geometry (DEMs and infrastructure) between MIKE and HEC models. The report outlined inaccuracies with publically avaialble LiDAR. However, the current model version uses a Digital Surface Model (DSM) which include the in HEC model while DEM is used in MIKE model (refer to images in line 1 and 9 in Image_v4). Flood models typically use DEM.	14-03-2026 The reviewer comments primarily relate to minor geometry differences between the HEC-RAS model and the regional MIKE+ model. Nuzums Pump Capacity Correspondence dated 19&23-02-2026 between Maven and Awa confirms the MIKE+ model includes two pumps at Nuzums (each 0.525 m³/s), giving a total capacity of 1.05 m³/s, which is consistent with the capacity represented in the HEC-RAS model. Awa stated that this could be in error within the MIKE+ model however without confirmation, Maven have kept both within their model. In addition, this pump station drains a separate catchment south of the Kopuaroa Canal and does not materially influence flows within the Bell Road drainage network or the development area. Minor Culverts and Local Structures Some minor culverts represented in the MIKE+ model have not been explicitly included in the HEC-RAS model. Given the catchment scale and modelling purpose, the HEC-RAS model focuses on primary channels and controlling infrastructure relevant to major flood events. These smaller culverts convey relatively minor flows and typically operate under drowned conditions during large storm events. Their omission is therefore not expected to materially influence predicted flood levels within the study area. this is confirmed by sound alignment of the 100-year future scenario being well aligned between the HEC-RAS and MIKE+ model results. Geometry and Terrain Data The HEC-RAS model uses DEM LiDAR data, consistent with standard flood modelling practice and as confirmed in both the original and revised reports. Model Purpose and Event Focus The Flooding Technical Assessment is focused on assessment of major flood events (100-year + climate change + sea level rise) to confirm development safety and flood effects. Model development has therefore prioritised accurate representation of primary flow paths and floodplain storage controlling these events. Minor infrastructure differences do not materially affect these outcomes.	17-3-2026 DEM vs DEM issue resolved and DEM is being used. Missing culverts/channels or incorrected inverts has been discussed on mulitple occassions and this limits applications to smaller events. The reporting now more clearly states that the focus is the 100yr CC events and while progress on smaller event modelling has been made, validation is not strong and it will be part of ongoing work in detailed design stages. Setting remaining culvert/channel geometry improvements to deffered
18		Is grid cell size approriate	Verbal updates noted that site specific survey has been completed to improve the model	PASS	CLOSED						
19			The grid cell size is considered large, especially for the open channels. This may cause difference in hydraulic flow compared to a 1D model such as included in MIKE+, or a Sub Grid Sampling approach in TUFLOW. There is also a concern around post flood recession in smaller farm drains that might not be represented. Report information on convergance testing (e.g testing of the cell size to show where futher refinement does not impact results) and/or validation against MIKE+ results.	S1	CLOSED	A convergence check has already been undertaken by running the 100-year 2130 event using a 10 m grid, which produced a stable water surface and showed no significant change in overall flood behaviour compared with the coarser base model. This provides confidence that the model is not highly sensitive to moderate grid refinement. Given the substantially longer computational time required for finer grids in HEC-RAS, we propose completing a final refinement run for the post-development 5-year (LOS), 10-year (internal culvert outlet), and 100-year (freeboard) – 2130 events using a maximum 5 m grid size once all RFIs are resolved and model inputs are fully finalised. Only minor differences are expected, and this final check will confirm convergence and address the concerns regarding channel representation and post-flood recession in smaller farm drains.	3/12/2025 Good practice for critical channels is 3-4 cells for each channel. Convergance testing only on water level has been be completed but discharges need to be compared for convergance as more critical for channels than level. Suggest 3-4 cells wide for all channels included as 1D in the MIKE+ model which include side drains. See image in row 4 for a sample of too large grid along side drains that needs refinement. 10-12-2025 Stoffel sent images of refined channels. To be checked in model to close out.	3 - 4 cells has been added part of the 50m Grid as a refinement on all critical channels For the 5m grid, we have also refined the area even more 1m grid that allows up to 8 cells			29-1-2026 sentivitiy tests to grid size are reported as a single discharge, which shows it is not sensitive. Not other difference maps, or discharge or level information was provided. Importance of correct resolution has been discussed and modeller is happy with geometry.
20			Boundary flows at Kopuaroa Canal are different between HEC-RAS boundary and MIKE+ 1D result. Please recheck which res1d file is used for HEC-RAS boundary file and include in reporting how this boundary is set up.	S2	CLOSED	All new inflows were applied directly to the node structure to prevent any additional inflows from being introduced by the MIKE+ model. Using HEC-DSSVue to keep track of all inflow boundary conditions		No action			
21		Have the 1D components coupled with 2D components? Check if the coupling approaches are appropriate.	Numerous culverts are included throughout the model. Can you confirm that all MIKE+ culverts have been implemented in HEC-RAS model as many seem to be missing. This will cause ponding.	S1	CLOSED	Culverts have been added to represent the MIKE+ Model, these culvertsrom 300 - 750mm in the pre-dev, post dev model most of them have been	There are many culverts missing (farmland and along Bell Road channel). Please refer to culverts in MIKE+ model. 30-1-2026 many small culverts that will be important for smaller events are missing. Requires discussion	Critical culverts within the Bell Road development have been included in the HEC-RAS model. The Pond H culvert has also been added to convey flows appropriately. Upstream culverts were not explicitly modelled due to the coarse grid size used, with their hydraulic effect represented through the 2D flow routing. All culverts outside the 50 m grid extent have been modelled explicitly. Within the 50 m grid area, culverts are not individually represented, as the coarse grid resolution allows flow to pass through without introducing artificial blockage effects.	10-3-2026 Increased to S1 due to findings from MIKE+ comparisions for 5 year event not verifying likely due minor geometry issues but perhaps also calibration to 100yr for roughness. It is clear that the flood extent for 5y CC is very different to the MIKE results, and the in channel discharges are also not verifying. It is likely to do with poor channel representation.	Addressed in Build Stage RFI 17 response	17-3-2026 reporting related to 100 vs 5 year quality is being improved and closing this off as it duplicates other reporting issues.
			There are numerous bridges crossing channels along Bell Road. These bridges seem to be overtopped.	S2	CLOSED		Suggest to include these bridges along the Bell Road channel.	A major convenience culvert/bridge was part of the model Bell38 & Bell22 Other bridge and cuvlert in the was part of the 1D mike + model and don't have any information around this. The public lidar opening was used for the openings			30-1-2026 major structure in place but some minor bridges (e.g. a Bell Road driveway) is excluded which will have minor impacts on losses, not signifcant to the purpose of the model.
22		Check if kerb lines are included in the model.	Kerb lines are not included and not required for this scale of mdoel.	PASS	CLOSED						
23	**Build structures into the model**	Check if the structures are properly included in the model. See samples below. - Pipe, manhole, pit, pump, gate and etc - Bridge, culvert, weir and etc - Soakhole, soakage trenches - dam, barrage, water diversion and etc	There is no stormwate network (pipe, manhole and pits) incorporated in the mode. Pumps and culverts are included in the model. Random checks on operation of pumps and culvert at at Bell Road 427 were performed. Pumps and culvert with flap gate at Bell Road 427 were performed as defined in the operational rules.	PASS	CLOSED						

24			Some culverts at the northern part of the model were included while the boundary flows, collecting flows from culvert upstream, were attached at the downstream of the culverts (image in row 7). It seems that the upstream culvert flows were assumed to fully flow pass through the culverts. Some flows were lumped into one flow hydrograph (see green circle). It is observed that there are flow fluctuations through these culverts (see a sample of flow through culvert 16 in image in row 7). This is due to the flow connection at the downstream of the culvert. This also causes backwater flows through culverts, resulting in flooding at the upstream of culverts. Suggest to reconsider model boundary by extending the model extent cover culvert upstream or removing the flood depth results at the edge of model extents.	PASS	CLOSED	The culverts were removed, and the inflow conditions were configured to simulate the inflow and outflow that would normally occur through them, part of the MIKE+ model. The 2D area was retained to capture any potential overtopping of the road.					
25		Has the model included building footprints? Check the modelling approaches for building footprints (roughness, infiltration, roofslope, stormwater drainage system and grid cell size)	Not applicable.	PASS	CLOSED						
26	**Review limitations and assumptions**	Have the limitations been defined? Definition of limiation is an acknowledgement of the inability for a model to meet all objectives by way of stating situations that should be avoided when using the model.	15-10-2025 - awaiting model build reporting	PASS	CLOSED		12-12-25 limitations in report now				
27		Have the assumptions been defined? Definition of assumption is what was taken to be true, often due to lack of information, in order to proceed with the modelling process.	15-10-2025 - awaiting model build reporting	PASS	CLOSED		12-12-25 assumptions in report now				
28			Section 5.2.2 states that "Hydrologic soil group (HSG) C was confirmed by ENGEO over the entire catchment area based on site geology", however section 7 states that "Soil and Infiltration: Hydrologi Soil Type B was assumed". Please confirm which soil type is appropriate for this model.	S2	CLOSED			Infiltration was removed, soil type was also removed to ensure no other water loss will occur			30-1-2026 no infiltration so can be closed
29	**Calibrate model**	Has the model been calibrated to one event?	Not applicable. MIKE+ was the calibrated model.	N/A	CLOSED						
30		Is the appropriate information used for calibration? Check level of available data in Table 5 of guidelines (No data, very limited data, some data and extensive data).	Not applicable. MIKE+ was the calibrated model.	N/A	CLOSED						
31		Are the calibrated paramters within realistic ranges?	Not applicable. MIKE+ was the calibrated model.	N/A	CLOSED						
32		Is the model calibration acceptable?	Not applicable. MIKE+ was the calibrated model.	N/A	CLOSED						
33	**Validate model**	Has the model been validated against the MIKE+ model (level, discharge, depths, extent, velocities)?	Basic validation of two sites only. Time series levels required and discharges in key channels	S1	CLOSED			Refer to the model validation section for the diff between the Mike + and HEC-RAS model			30-1-26 reporting now provides level and discharge time series. Evalaution by review completed elsewhere but information is now reported.
34		Is the validation result acceptable?	15-10-2025 - awaiting model build reporting	S1	CLOSED		5-12-2025 only basic validaton reported and Stoffel is working on additionl analysis.	Refer to the model validation section for the diff between the Mike + and HEC-RAS model	10-3-2026 5.4.3. MODEL VALIDATION explaintion and evidence is not adequate and includes potentially incorrect information. For example, there are POST development MIKE+ results at Hurst Block but Maven will not have these results. While the 100yr CC MIKE vs HEC results Awa has provided to Maven (9-3-2026) show good agreement, our checking of the 5 year PRE model MIKE vs HEC results show a variance of ~0.3m between the models. This is sigificant for a low flow event. Section 5.4.3. MODEL VALIDATION has a ~0.5m difference for the 10yr CC event, which is in conflict with the statement "validation its was generally found that there was good agreement between the Maven model and BOPRC model"	Modelling purpose and peer review scope has been clarified with Awa recently. Revised reporting and clarifications address this.	17-3-2026 reporting related to 100 vs 5 year quality is being improved and closing this off as it duplicates other reporting issues.
		Confirm pump discharge match with MIKE+ for boundary conditions		S2	DEFERRED		Boundary condition at Wairakei pump line applies a constant discharge of 0.001 m^3/s. Please validate the pump discharges with MIKE+ model. 2-2-2026 Check the pump capacity (Pump Group #3) at Bell Road 427 and it has capacity of 0.001 m^3/s. Please recheck.	All the 0.001m³/s has been updated to 0.18m³/s inflow Ref to Bell road, Hydraulic modelling, Bay of Plenty Regional Council Report, Jan 2020, By DHI, mention the pump has a capacity of 200l/s (0.2m³/s) Ref to Bell road, Hydraulic modelling Update, Bay of Plenty Regional Council Report, June 2025, By River Edge Consulting Limited, capacity of 180l/s (0.18m³/s)	9-3-2026 Check flows between HEC and MIKE models at different locations. Some have good agreements and some have some discrepancies. Refer to images from line 2 to line 8 of Image_V4 for comparison of flows at different locations. Kopuaroa boundary is the worst and there is an error in model boundary set up	To be discussed with Awa	17-3-2026 improvement to allignemnt of flood extent, flood level, depths and discharge between MIKE and HEC are required for 5 year but can be deferred now the scope of the assessment has been updated.
				S2	CLOSED		28-11-2025 - section 5.4.3 of the modelling report provides flood level differences between the BoPRC model and Maven model. However, this is the only comparison. A more rigerous comparison is recommended; for example, a comparison of flows that enter the Bell Road Pumpstation. Addtionally, a water level difference map between the Maven and BoPRC model would be beneficial in visually demonstrating the model validation. Validation of the post-development model is yet to be completed. 12-12-2025 validation section has been extended and has discharges, levels and more locations. Flood extent provided by usinged different maps and sympobology so like for like comparision isn't possible. Remake consistent maps for comparison.	Refer to the model validation section for the diff between the Mike + and HEC-RAS model			30-1-2026 additioanl reporting has been supplied
35	**Verify model**	Is there additional verification completed of the model performance, independent of the MIKE+ model	15-10-2025 - awaiting model build reporting	Unknown	CLOSED						30-1-2026 no additional verification against measurements or other data sources was made. Accepting that if MIKE+ verifies that is sutible for the stage of the development design
36		Is the verification result acceptable?	15-10-2025 - awaiting model build reporting	Unknown	CLOSED		12-12-25. Initial scan of levels and discharges look promising but awaiting final version before making conclusions. 2-2-26 still under review as substantive changes to model (eg. Culvert / pump inverts and rainfall) is still under review	Refer to the model validation section for the diff between the Mike + and HEC-RAS model		Focusing on validation not	10-3-2023 Focusing on validation not verification. Closed off.

32	**Groundwater**	Implementation apporach	0.7 m³/s across 7 discharge points is used to represent groundwater flows. Due to the limitations of HEC-RAS for inflow (ie no ability to do regional inflows), an approach like this seem pragmatic. Lines would be better than points.	S2	CLOSED	10-12-2025 For the 7 inflow lines, as groundwater, we can add it as length along the swales. This will allow avoiding a central groundwater inflow and instead have a spread low flow. Also allowed for 100mm water, before the storm event started.	10-10-2025 will check in model that implementation makes sense. 12-12-2025 met with ENGO and additional drains will have small GW inflow added. Inflows limited only to development area curently but that is not what will happen in the catchment. 30-1-2025 inflow only in development area which doesn't seem correct. Awaiting Council/developer agreement on magnitude of groundwater inflow. Approach that has been applied for representing groundwater is correct.	ENGEO's report identifies a groundwater inflow rate of approximately 3,700 m³/day, equivalent to around 0.04 m³/s. For the purposes of the flood modelling, a more conservative allowance of 7x groundwater inflow points at 0.1 m³/s each has been adopted across the site. This higher inflow provision is intended to account for potential uncertainties, spatial variability, and future conditions, thereby providing a robust and future-proof approach to the assessment. Pond H serves as a practical example of why allowing for unforeseen groundwater influences is prudent in the overall site design and modelling.	9-3-2026 The model is configured correctly to impement ENGEO's groundwater advice. Awa has not commented on the scientific basis for these assumptions, and the inflows are small in relation to flood volumes. The applicant will be assuming that the initial groundwater levels are achievable via pumping. Any current / future climate groundwater impacted are assumed to impact the pump operations (e.g. the time the run for) rather than the model configuration
33		Groundwater inflow coverage	Should groundwater inflows be added to channels as base flow outside of the development areas. The seven locations are all in the development area but groundwater inflows occur elsewhere as well. Raised with Roydon Nustsford 12-12-2025.	S3	CLOSED		12-12-2025 being added	Initial water levels have been applied within the channel and existing ponded areas. The allowance of seven groundwater inflow locations at 0.1 m³/s each also enables upstream channel inflows to be represented appropriately within the model. At present, Pond H and the Bell Road Main Drain exhibit groundwater levels and areas of stagnant water, which is a reflection of the existing system conditions, where there is no gravity outlet and the existing pumps are primarily designed to operate during flood events. Under the proposed development, the stormwater strategy includes the provision for dedicated groundwater pumping to maintain water movement and manage groundwater levels, along with flood pumps to proactively manage additional water volumes during significant rainfall events.	30-1-2026 close as other items address groundwater.
34		Groundwater pump	Confirm 0.3m³/s groundwater pump in south block is implemented in model	Unknown	CLOSED			yes, prev south block capacity was 12.5m³/s we have now increased it to 12.8m³/s	2-2-2026 12.8m3/s pumps in place and opertating at different start levels as expected
35	**Initial conditions**	Confirm correct initial confition implemented	What is the intiial water level assumption. Is it different for current and future climate as impacts volumes. Raised with Roydon Nustsford 12-12-2025.	S1	CLOSED	10-12-2025 Stoffel said 100mm of water in the south and north basin has been implemented. Check set up in model and any sensitivity reported and/or agreement with Council on geotech recommendations.	30-1-2026 intial water level outside of ponds to be agreed with Council 2-2-2026 Initial water levels for South and North basins are set to be 100mm above the ground levels for post development with and without climate change. For pre development, the initial water levels applied is the same levels as post development, which is likely incorrect as the post development has lower elevations and ponds. However, base model set up for implementing intial water levels is in place subject to Coucnil acceptance of initial condition.	With the inclusion of proactive pumping, the initial 100 mm water levels in the north and south blocks have been established to provide a starting point for early activation of the dewatering pumps. The South Block dewatering pump is expected to operate for approximately six hours to lower the initial 100 mm water level and maintain it during rainfall, prior to the activation of additional pumps. In the North Block, the existing pump station will start earlier in response to the combined effects of increased groundwater inflows and runoff from the new development.	9-3-2026 The model is configured correctly to impement ENGEO's groundwater advice. Awa has not commented on the scientific basis for these assumptions, and the inflows are small in relation to flood volumes. The applicant will be assuming that the initial groundwater levels are achievable via pumping. Any current / future climate groundwater impacted are assumed to impact the pump operations (e.g. the time the run for) rather than the model configuration

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Item	Topic	Check	Reviewer comment	Severity	Status	Modeller comment round 1	Reviewer comment round 2	Modeller comment round 2	Reviewer comment round 3	Modeller comment round 3	Modeller comment round 4	Review close out comments
1	**Configure the required model scenarios**	Have there been any changes in model scenarios since the plan stage? Have those changes been included in the scenarios?		PASS	CLOSED	Not from Maven side	12-12-2025 closing. Additional check that all required sims have been run is below.					
2		Have all scenarios been configured?		S3	CLOSED	Yes, but not the 20Yr event	2-2-2026 A signficant number of scenarios are configured and more scenarios than required are in the model plan. Sceanrios such as the Kaituna breach pump fail and pump fail sceanrios are included However, the two required 20 yr year events are missing - see Image_v3 #2. Counci was expecting a 20 yr current and future climate run. Report quote "The 20-year event was not modelled as BORPC did not provide data in the form of the Mike + Model. " Concil to confirm not require to close (likely)					11-3-2026 all scenarios are configured except 20yr which Council did not supply
3	**Create boundary conditions for scenarios**	Have the boundary conditions for the design events been included?		S2	CLOSED	Yes, let me know if I missed any other boundary condition that AWA would like us to add	2-2-2026 not all boundaries are in the model we have but thye may not have been supplied so just needing confirmation that they are in the model	All boundary conditions have been made separate with the use of HEC-DSSVue to keep track of all hydrographs				11-3-2026 all boundary conditions are included except 20yr which Council did not supply
4	**Run simulations**	Have all model scenarios been set up correctly? Check boundary and geometry for model scenario.		S2	DEFERRED	We spot check inflow boundaries and within the margin as expected	2-2-2026 we don't have all boundaries to can't confirm - s	Yes. All infiltration has been removed, and surface roughness is applied solely using Manning's n values. Using managed layer associations, it is straightforward to verify that all terrains, Manning's n assignments, infiltration settings, and cross-sections have been correctly applied across the model.		Previous Modeller comment stands.		17-3-2026 as 100yr CC is fine but 5 year has boundary condition issues to resolve. Due to scope now primarily 100yr, this can be deferred
5		Have all model scenarios required by Regional Council been run?		S2	CLOSED	Yes, a fine 10m run and 5m run will need to be re-run on the final RFI stage.	2-2-2026 see item 1 - missing 20yr	A comparison between the 5 m and 50 m DEM grid models shows that inflows into the site are similar, with the 5 m grid producing slightly lower water levels of approximately 20 mm. This demonstrates that the 50 m grid model provides a reasonable representation of site conditions. Additionally, the 50 m grid model has been refined in critical flow areas to ensure accurate assessment of flooding and hydraulic behaviour where it matters most.	6-3-2026 All HEC-RAS models and their results were run and provided for 10, 50, 100 and 500-year under current climate and with climate change allowances, both pre and post development (only 50m grid with refined resolutions in necessary areas).	As recently addressed with Awa and justified in the revised report, the relevant model scenarios have been completed and justified by Maven.		11-3-2026 all results have been run and supplied except 20yr which Council did not supply
6	**Process results**	Check if the processed results follow the requirements (e.g. showing depth greather than 0.05m and etc).		S3	CLOSED	Part of the BOPRC and H&H guidelines max 15mm increase for a 1% AEP, as this catchment rely on pumping.	2-2-2026 Depth reporting and figure captions (e.g. Figure 23, 26, 29) do not note the approach to filtering of small depths. Please add clarity to reporting. Water levels can also be filtered by the same depth filter, but this is not mandatory. Make reporting clear on if water levels are filtered.	A cutoff of up to 100 mm has been applied to the processed results. This ensures that minor, artificial water levels over the development are not displayed, while maintaining compliance with the assessment requirements.	to discuss with Maven. Reporting does not show post proceed results, just screen snaps from HEC	Discussed and justified in revised reporting.		17-3-2026 reporting tab has actions for improvement to cartography. Closing this item.
7		Are the processed results in the format that can be used/accepted by the clients?		PASS	CLOSED			Screenshot will be update end of the review process				2-2-2026 Results will be avaialble in whatever format the designers required and Maven and easily convert formats as requried. Reporting of results (maps) is needing improvements and that is covered elsewhere.
8		Are there any errors in the processed results (e.g. uncommonly high velocity and water level and etc)?		PASS	CLOSED	The only area showing elevated velocities is along the edge of the proposed development platform, where the sharp change in ground level creates a localised waterfall effect. This is a modelling artefact resulting from the abrupt elevation drop rather than an error in the processed results. No unreasonably high velocities or anomalous water levels were observed elsewhere in the model domain. Minor water level increases at culvert entrances are expected and are typical of 2D–1D interaction calculations, rather than being indicative of any modelling error.		No Action				2-2-2026 only 100 yr CC results have been looked at to date but no observed issues

9	**Verify results**	Have the results been verified? See some suggestions below. - comparison of flood depth/extent between 10-year and 100-year events. The results from 100-year event are expected to be greater than 10-year event. - comparios of results between pre and post development. Check if the results are as expected.	S2	CLOSED	Yes, this was checked for both the 10-year and 100-year events, as it was a critical verification for upstream and downstream conditions. Due to the large computational area, minor calculation errors are expected in all models, but these do not materially affect the overall results or conclusions.	2-2-2026 MIKE+ verification reporting is significantly improved. Time series verification reported now show reasonable alligned. However, one location near Bell Road pump stations has been raised (30-2-2026) has having signficant difference, which may be related to implementation of structures. There is an issue with the reporting of flood depths and reporting of maps with different scales, and colours. See Image_V3 #1 for a mock up we made, which makes it hard to verify. We would have expect a GIS raster from MIKE+ and HEC to be compared in like for like with a narrative around any differences.	Yes. The 100-year event (3.68C + 1.59 SML) has been compared with MIKE+ model results. Verification was carried out for both the 50 m and 5 m grid models, with results found to be within reasonable agreement with the MIKE+ outputs. The model performs as intended, demonstrating that the site can be developed, provided that the proposed stormwater pump station is installed and upgraded as part of the development.	6-3-2026 There is an instability issue at the beginning of model run which can be observed from the uncommon peak flow at downstream of Kaituna bridge at early stage. Same peak is observed at the Kopuaroa canal near the Kaituna confluence as well. Thes uncommon peak flows in Kaituna happen at early stage of model run and it is likely not to have impact in the proposed development area. However, it would be good to address this instability issue, especially for 10-year event as the peak discharge from instability is higher than the normal peak (refer to image in line8 of Image_v4). The instability can be deferred 11-3-2026 spot checks of results to be done still to make not gross errors in boundaries.	Maven notes the reviewer's observation regarding the initial peak flow at the start of the model run near the Kaituna Bridge / Kopuaroa Canal confluence. As noted by the reviewer, this occurs at the early stage of the simulation and is not expected to influence results within the proposed development area. Maven therefore considers this to be a model comment only, and it does not affect the outcomes of the Flooding Technical Assessment.	17-3-2026 fixing of instabiltiy can be deffered.
10	**Present results**	Have the agreed deliverables been produced?	S1	CLOSED		2-2-2026 draft results in report.	c	11-3-2026 Need to have Maven confirm what is being delivered. A GAP analysis between reporting and Council requirements was supplied 9-3-2026	Maven have clarified the intended scope and outcome of the modelling and peer review and have subsequently revised and addressed this in the reporting.	17-3-2026 closing has this is coverred by other reporting items
11		Check if the results follow the required filenaming and conventions, or at least clear and understandable if not conventions exist.	S3	CLOSED		2-2-2026 filename and folder tidiness only needs to achive quality of a development assessment model. This is not a council base model requiring adherance to the standard and use by multiple parties. However, some improvements would help with usability and reduce change of errors Suggest a model log file to help with tracking of runs, scenarios and metadata of model	Yes. All results have been named clearly and consistently to ensure ease of use for future reference. For example: Post-Development 100-year (3.68C + 1.59 SLR): Indicates post-development scenario, 100-year return period, climate change allowance of 3.68°C, and 1.59 m sea level rise. Pre-Development 100-year Current: Indicates pre-development scenario, 100-year return period under current climate conditions. This approach ensures that all files are intuitive, self-explanatory, and can be easily interpreted in the absence of formal naming conventions.			11-3-2026 files and folders are clear and organised
12		Is cartography well presented?	S2	CLOSED		2-2-2026 see item 6 on this sheet about different scales and extents for depth results	Yes. All cartographic outputs are clearly presented, with consistent symbology, colour scales, and annotations. Flood extents, depths, and infrastructure features are clearly distinguishable, ensuring that the results are easily interpreted by reviewers and suitable for reporting and stakeholder communication., update on all screenshot will be done end of the RFI process	11-3-2026 Need to have Maven confirm what is being delivered. A GAP analysis between reporting and Council requirements was supplied 9-3-2026 This relates to comments on model report purpose in reporting tab	Maven have clarified the intended scope and outcome of the modelling and peer review and have subsequently revised and addressed this in the reporting.	17-3-2026 improvements have been made but still open cartography items in report tab. Closing this.

13	**Evaluate scenarios**	Have the results been evaluated in relation to the model objectives and criteria? Evaluation of results can be used for options analysis.		S2	CLOSED	2-2-2026 Section 5.4.6 and 5.4.7 present results, and 5.4.8 short disucssion and difference inforamtion between the pre and post for 10, 100 and 500 yr events. The climate is presumed to be future climate, but should be explicity noted. Flood displacement volume has not been assessed but flood levels have. It would be good to tie this back to what is actually required by the AEE. It also says the model can be used to understand risk but flood risk is not assess (ie likely hood and consequence), and risk may not require assessment. However, it is only flood levels that are compared. Depending on the objectives in relation to the AEE, more may be required. If asset performance and ownership needings consideration (eg. pumping impact, post flood service levels for agricultural land), additional inforamtion may be required. This is all dependent making it more clear about the purpose of the analysis, and therefore what is requried to be analysed. This is somewhat addressed in section 5.4.9 hydraulic structures which outlines some effects assessment. The model clearly provides a strong assessment capability, linkage to what it is to be used for could be improved. Ideally a section on downstrean effects to help with consent processing.			Addressed in the reviest report and results.		17-3-2026 significant improvements to reporting underway so this can be closed. Report tab has outstanding reporting items
14	**Create final model report**	Has the final model report been supplied for review? Check required contents in the guideline (p.35)		S2	CLOSED	2-2-2026 near final report after significant updates has been supplied. Changes to final results will be added once model is signed off, plus other reporting changes.		11-3-2026 Need to have Maven confirm what is being delivered. A GAP analysis between reporting and Council requirements was supplied 9-3-2026 This relates to comments on model report purpose in reporting tab	Addressed in the reviest report and results.	Closed	17-3-2026 still reviewing draft reporting - leaving open 24-3-2026 v9 of the report is the final version reviewed
15		Has the final model report been reviewed by peer revie		S1	CLOSED	2-2-2026 multiple review rounds have been completed and good progress on implemenation of improvements			Final modelling report has been provided	Closed	17-3-2026 still reviewing draft reporting - leaving open 24-3-2026 v9 of the report is the final version reviewed
16	**System performance**	Pump failure scenario	10-12-2025 Stoffel informed of this approach "Pump failure, we allowed all pumps to fail start of the storm, 100Yr 3.68C 1.59SL, we get RL 2.9m with swale manning of 0.06. we still have the RL 3.5m platform, 500mm freeboard still OK". Check model results	S2	CLOSED		No Action as the swale mannigs's n of 0.06 has been used, all of this has been conservatively used to increase the flood depth with the manning N, see sensitivity check				2-2-206 Section 5.4.5 sensitivity test reports impact of pump failure in relation to building platform and including freeboard. Assessment states that levels will below platform.

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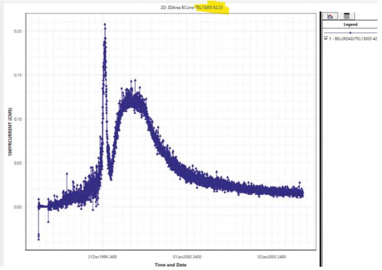
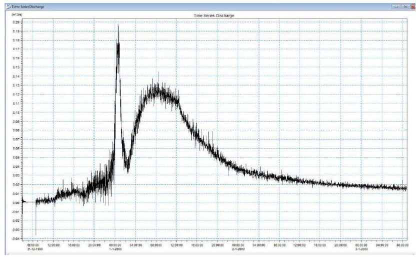
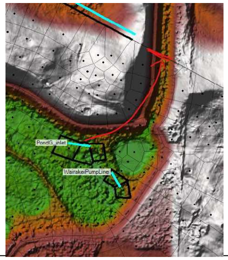
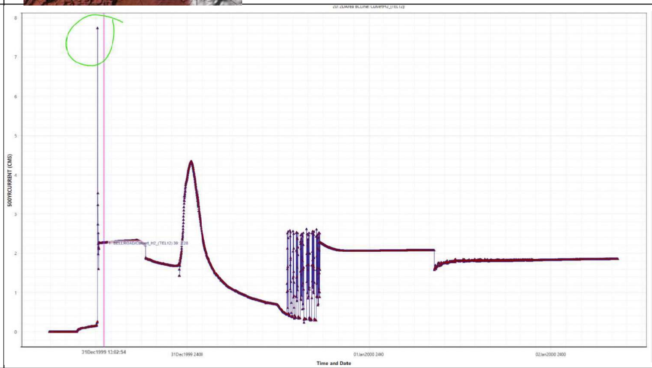
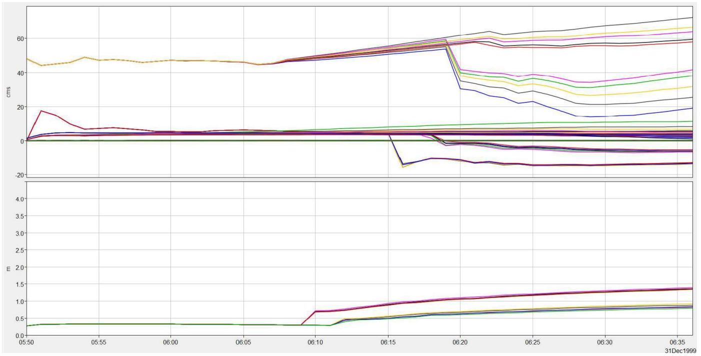
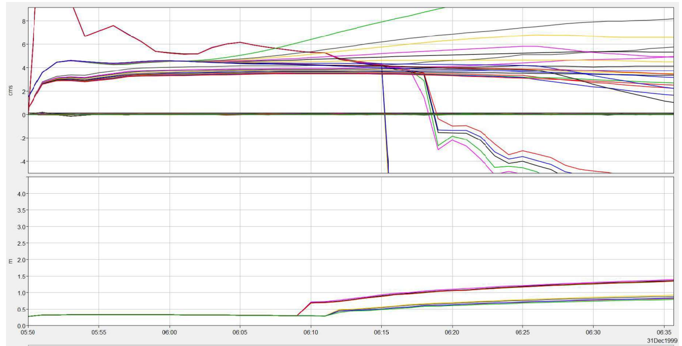
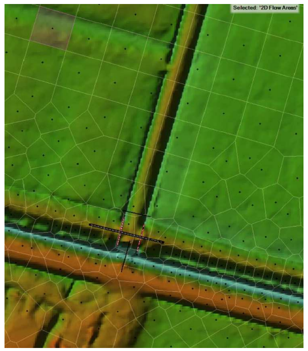
Item	Section	Reviewer comment	Severity	Status	Modeller comment round 1	Reviewer comment round 2	Modeller comment round 2	Reviewer comment round 3	Modeller comment round 3	Modeller comment round 4	Review close out comments
1	**5.2**	Figures 9 and 10 are comparative maps but have different colour scales making interpretation hard. Suggest classfied Mannings values or other alternative representation	S2	CLOSED	Noted, updated.	2-2-2026 Some maps still seem to be generated in different software and different colours		10-3-2026 no repsonse and maps not consitent presentation to difficult to evalulate	Updated in revised report		17-3-2026 Mannings maps updated as required
2	**Mulitple**	"Mannings" term is used but should be "Mannings N" or m"Mannings M" consistently depending on approach used in project.	S3	CLOSED	Noted, updated Mannings N	2-2-2026 some refernces still to just Mannings					10-3-2026 all references now correct
3	**Groundwater**	Can you qualify/comment on this in the reporting in terms of: - current vs future climate sea level impacts - current vs future climate rainfall conditions, commenting on antecedent moisture conditions (AMC) - if the elevated landforms change this at all - for example, currently it is all low lying and in the future only part of the area is low lying, do these values change?	S2	CLOSED	This will be a question for ENGEO, outside Maven scope of work. The Engeo report indicates no difference to the current and future climate	2-2-2026 Still needing statement on climate		10-3-2026 The ENGEO report states "In combination with the proposed civil and stormwater design, the project effectively mitigates potential groundwater impacts and supports long-term flood resilience. The hydrogeological response remains stable under current and projected climate conditions, with off-site or downstream effects considered to be less than minor." However there is no comment in the ENGEO repor, memo or Maven report that asserts if groundwater is expected to be stable or increasing due to climate change. This position needs to be made. If the groundwater changes in a future climate is considered an increase in pumping rates and associated opeations rather than a blocker for flood model approval. A simple sentense in Maven report on position is all that is requried. 23-3-2026 Reference is not included but exec summary now includes a clearer statement about the ENGEO report "it has been reviewed to understand potential implications for surface water behaviour, such as infiltration assumptions, groundwater inflow locations or rates, or initial pond water levels that could be directly adopted within the HEC-RAS model."	Groundwater response under current and future climate conditions has been assessed within the ENGEO hydrogeological modelling and associated reporting. Section 8.2.3 of the hydrogeological report states that while sea level rise results in changes to groundwater elevation and gradients near coastal boundaries, no significant change in groundwater levels was observed within the vicinity of the site. This is attributed to the presence of multiple drainage layers between the coast and the site which buffer groundwater responses. The modelling also concludes that, assuming ongoing operation and maintenance of the surrounding drainage network and local pump stations, the effects of sea level rise on the site are likely to be less than minor. In addition, the proposed stormwater design incorporates a 0.3 m³/s pump to manage low flows and groundwater control within the development area. Maven therefore considers that groundwater effects under current and future climate conditions have been appropriately addressed within the hydrogeological assessment and stormwater design, and these matters do not affect the flood modelling outcomes presented in the Flooding Technical Assessment.	Done - added to reference list and reported on in Section 4.4.2	17-3-2026 This is ready to close once the ENGEO memo is added to referenced and cited. Only the full ENGEO report is referenced. 24-3-2026 Reference has been added and can be closed.
4	**Groundwater**	Please consider how any agreement/disagreement with Council on groundwater inflows and associated initial water level assumptions is reported.	S2	DEFERRED	The P50 and P95 groundwater is what council has seen on site pre dev, We have requested more pond H and pond G levels to confirm Pond H level max 2.3m, min 1.81, avg 1.87. minor peak in the data, data set 2022-05-23 to 2025-12-14 every 5min's						10-3-2026 pumping rates is considered a mitigation for differences in groundwater assupmtion. Due to the potential size of groundwater inflows compared to flood flows, this is not considered a blocker for flood model approval based on ENGEO findings.
5		The ENGO report is focused on effects assessment relating to groundwater. It is a comprehenisvie piece of work that has developed signficant understanding of soils and groundater characteristics (pre and post development). However, it does not include in it's purpose, exec summary or sections any synthesis of how this work will be able to be used to inform the HEC-RAS modelling or simple summaries of recommendtations for infiltration, groundwater inflow locations/rates or initial water conditions in ponds. Raised with Roydon Nustsford 12-12-2025.	S3	CLOSED	ENGEO completed comprehensive field data collection and groundwater modelling to understand groundwater conditions and responses to development, with the outcomes presented in a detailed hydrogeological assessment report. ENGEO's report is focused on groundwater effects assessment rather than hydraulic flood modelling. While it provides a comprehensive understanding of subsurface conditions, groundwater behaviour, and relative changes between pre- and post-development states. Overall, the new development will not have a worse effect on the development or neighbour lots.	2-2-2026 requires council feedback			The modelling also concludes that, assuming ongoing operation and maintenance of the surrounding drainage network and local pump stations, **the effects of sea level rise on the site are likely to be less than minor**.		10-3-2026 An additional ENGEO memo (27 Feb 2026) has been received that connects the groundwater study to the flood study.
6		Report on logic behind initial water level assumption for current and future climate. This has immediate volume impacts to the model and the intial water levels are likely groundwater feed. Pond H has level monitoring so suggest any experience from Pond H and G are used also.	S2	CLOSED	Pond H and Pond G water levels has been requested, currently working on the MIKE+ water levels. For the South block, as long as the 0.3m³/s is on a VSD it will be able to dewater the 3700m³/day inflow For the North Block, the water will return to equilibrium and will be approximately 100mm water in the winter months	2-2-2026 good to add these comments to report					10-3-2026 pumping rates is considered a mitigation for differences in groundwater assupmtion. Due to the potential size of groundwater inflows compared to flood flows, this is not considered a blocker for flood model approval based on ENGEO findings.

7		Reference BOPRC hydrogeological modelling and sea level rise report as well as TCC groundwater study. Contentualise this work in line with ENGO reporting. This can be included in the ENGO work or the modelling reporting. State allignment or differences in approaches and purposes.	S2	CLOSED	This will be a question for ENGEO, outside Maven scope of work.	2-2-2026 needs discussion as basis for initial water conditions and groundwater inflows for future climate	10-3-2026 Awaiting feedback from Maven on if any BOPRC groundwater reporting will be considered in either the Maven or ENGEO work in relation to flood modelling.	Groundwater behaviour and hydrogeological response for the site have been assessed by ENGEO through dedicated hydrogeological modelling and reporting. BOPRC have also engaged groundwater specialists (PDP), who, during consultation, have verbally confirmed agreement with ENGEO's hydrogeological modelling and assumptions. As such, groundwater considerations and potential climate change influences have been reviewed by the relevant subject matter experts. ENGEO have confirmed that the appropriate groundwater assumptions and controls have been incorporated into the stormwater modelling inputs. Accordingly, this matter sits outside the scope of the stormwater modelling peer review and is considered addressed through the hydrogeological assessment process.	17-3-2026 Groundwater has been disucssed at length. The ENGEO assumptions are implemented in the model and it is not Awa's role to decide on the hydrogeological science.
8	**Exec summary**	The purpose of the reporting in the summary is assessment to evaluldate flood risk. However it should be broader as outlined in section 2.3. It is a model build, validation against MIKE+ model in order to have a model to support stormwater design and assessment of effects.	S2	CLOSED	Updated	2-2-2026 the section 2.2 now is called proposal but would be better focused on objectives / purpose of the report.	10-3-206 Nathan York (BRHL) recently confirmed that the flood modelling review is part of a substantive application to enabel BRHL to do that activities they require under the Act. The purpose of the Maven report is" *to understand existing flood behaviour, assess future development impacts, and confirm that the site and surrounding land are not adversely affected by flooding.* " which is considered a narrower focus. Coucnil also has other requriements. Confirm that this narrow focus is the purpose of the report or expand the report focus to other matters such as asset management and service level assessments as part of the BOPRC drainage scheme.	Scope clarity has been further addressed with Awa and the revised reporting is provided to further address this item.	23-3-2026 improvements to the reporting scope have been made and the exec summary states "The purpose of this assessment was to evaluate flood risks associated with the Wairakei South development in order to determine the impacts of filling in the flood plain and how those effects were able to be avoided, remedied or mitigated effectively. " with a focus on 100yr climate change storm
9	**Exec summary**	Specifically note verification against MIKE+ results and summarise verification	S1	CLOSED	Noted added into the report				2-2-2026 now included - other items focus on feeback on validation
10	**Exec summary**	Pump station capacities are stated. Would be useful to reader to sumarise total capacity and proposed future capacity	S3	CLOSED	Noted, added to report, ref in the Mike+ model and DHI Jan 2020 report				2-2-2026 noted BOPRC model as source in table 2
11	**Exec summary**	Include summary of pump failure test	S2	CLOSED	Noted, Pump failure based on n0.06, from the start of event all pumps failed, WSE 3.44, platform RL3.5				2-2-2026 included
12	**Typo**	P6 "error reference not found"	S3	CLOSED					2-2-2026 fixed
13	**Roughness**	3.3.8 section on calibration missing calibration resutls. p41 comment "The Kopuaroa Canal and Kaituna River have been calibrated using the BOPRC model to derive appropriate Manning's n values for the 2D domain." Where is this calibration information?	S2	CLOSED	Noted added into the report				
14	**Limitations**	Limiations are sensible and complete	PASS	CLOSED					
15	**Assumptions**	Assumptions section could have a few more entries. Briefly outline assumptions about groundwater. I would also state something about it is assumed the tidal levels do not flow from Papamoa to the site, and that there is not a fast response from the hills into the site. Wether or not this is true is different question, but this is what is being assumed. Any assumptiosn around roughness and flood convenance to make sure water gets to pumps in a timely manner Assumptions around ponds and swales considering final design / planting etc is not know.	S3	CLOSED	Noted added into the report				2-2-2026 more groundwater information is included but additional items open on the topic
16	**Data sources**	They are listed	PASS	CLOSED					
17	**Reglatory context**	Fast track legislation is missing. Is there anything relating to drainage scheme, BOPRC RPS, targeted rates policy or vesting assets with 2x Council worth noting?	S3	CLOSED	Both WBOPDC and BOPRC and their SME's have and are being consulted with through the substantive application process where these matters are being discussed and addressed in a partnered approach. this falls outside of what is scoped through this SW model review process and is being addressed through the other consultation streams with BOPRC and WBOPDC.				2-2-2026 reviewing reporting as to the purpose outlined in the reporting. Council to raise if additional scope is required otherwise closing off

18	**Simulation schedule**	Include schedule of simulations (perhaps sec 5.3.5) as a table that reflect all the different boundary conditions applied for each sim.	S3	CLOSED	Noted, added to report					2-2-2026 resolved
19	**Rainfall reporting**	Due to MIKE having a spatially varying rain, changes to the rain were required for HEC-RAS. Prevoius comments about heavy ended (75%) storm requirements by the guidelines need to be implemented and section 5.3.3.2.1 needs to be updated. Quantify the impacts of the rain change from MIKE to HEC in terms of total volume.	S1	CLOSED	Please refer to rainfall data and under sensitivity	2-2-2026 work underway to resolve				
20	**Post development model**	Drafts in section 5.3.3.4 to be updated including with changes relating Awa / ENGO meeting	S3	CLOSED	Upated					2-2-2026 exact changes weren't logged but improvements made
21	**Cell size**	Section 5.4.1 has a disucssion in first paragraph on cell size and performance which is reduntant. Cell size and performance relate to software and hardware choises and should not impact the method required for the analysis. The model even if it takes a few days to run needs to be fit for purpose.	S3	CLOSED	Noted, Updated					2-2-2026 sensitivity testing and mesh refinement completed
22	**Final state review comments**	Validation information against MIKE+ to be updated where relevant based on final HEC-RAS model version	S2	CLOSED			10-3-2026 unsure of what Maven proposes to report so requires discussion before close out.	Maven request that Awa address the strong MIKE+/HEC 100 year future results that have been completed to date. Recent SW modelling and peer review scope clarification has confirmed what is being addressed and reported on accordingly		23-3-2026 Assessment of validation quality is a combination of what is reported, model checks and comparisions of MIKE+ and HEC-RAS results. 100yr climate change is the key validation event and 5 year validation is preliminary only. Validation of 100yr pre-post water level differences shows agreement with MIKE+, but absolute water levels and discharges show disprepencies. Closing of at limitations are noted in close out memo.
23		Flood mapping to be updated where relevant based on final HEC-RAS model version	S2	CLOSED		2-2-2026 to be done once review complete	10-3-2026 cartogrpahy not clear enough and Maven to confirm which version of the model produced the flood maps. Due to the number of maps in the updated report, they could be optionally moved to appendices	Updated in the revised report and results		17-3-2026 Maven confirm report has latest results. Closing off.
24		Flood maps to follow more consistent and standard mapping format for final HEC-RAS model version. For example, 0-3m/s scale hides much of the velocity inforamtion, and typically flood depths are filtered to only show >0.1m.	S2	DEFERRED			10-3-2062 flood map cartography has not been updatd	Updated in the revised report and results	Done	17-3-2026 Figures like 40 and 41 still have different scales and colours. Raised against yesteday and awaiting updated maps before closing. 24-3-2026 Depsite multiple requests the colours are not alligned between the 100yr depth maps. However, the scale bars were improved and it is somewhat understandable but the reader needs to translate colours when comparing the maps. The depth extent maps are not disucssed as part of validation but readers can draw conclusions on validation quality.
27		Section 5.5 summarises the flood asssment and the 6. conclusions seems to have a similar approach. Suggest that section 5.5 should focus on the model build and results. Perhaps even take the asssessment of effects work and promote that to a section 6 header for easier scanning during processing. The model build/validation is just providing confidence, but the assessment is what is being processed.	S2	CLOSED			10-3-2026 no response from modeller	Reporting structure has been revised accordingly	Now titled "Flood Model Build and Validation"	17-3-2026 raised again in meeting on 13th, and yesterday. Alternative table of contents supplied and awaiting review of updated report. 23-3-2026 Model build section now called "5. Flood Assessment" which is too close the "6. Flood Risk Assessment" - should be something like "5. Model Build" 23-3-2026 title fixed and closed out

28	Section 5.5. says "the level of service for the 5-year event will be greatly improved" but evidence in the reporting.	S1	CLOSED	10-3-2026 Section 5.4.8 provides flood level comparision for a number of events but not the 5 year. There are graphs of pre and post development discharges but they are in different sections of the document and not compared or discussed. This claim is unsubstantiated.	tables and results updated in the revised reporting to avoid ambiguity		17-3-2026 the sentiment of 5.5 summary and conclusions is "The level of service for the 5-year event will be significantly improved, reducing ponding and improving drainage reliability for frequent storm events." This needs to be caveated as it is not demonstrated in the report. I would change this to more like "due to the significant planned instructure and drainage pathways proposed by this development, level of service for the 5-year event will be significantly improved and demonstrated during detailed design. The increase in pump station capacity to manage the 100 year events will also have substantial benefits for small events and service levels. 23-3-2026 Section 5.5 is now 6.5 and reads much clearer without statements on 5 year. Considering that MIKE+ results are 0.2m lower (pre-dev) and 0.13 lower (post-dev) in the flood plain, this provides additional freeboard over the levels from the HEC-RAS model.
29	Reporting still refers to TP108 in section 5.2.1. From our understanding the rainfall was not created using TP108 so it needs to be clearly outline how the rain was made (e.g. from BOPRC MIKE model or other method)	S3	CLOSED	10-3-2026 this was raised previously and discussed in meeting but has not been resolved	Updated in the revised report		17-3-2026 TP108 is not mentioned now and can be closed.
30	Analysis of impact of manning decisions on pumping is not covered. It may not have impact on 100 yr event but will likely impact smaller events.	S2	DEFERRED	10-3-2026 This new information added to the report needs analysis otherwise it is not clear to the reader what is being concluded.			Closing as can be considered as part of more detailed design in the future.
31	Numerous maps and graphs are presented with not analysis or discussion.	S1	CLOSED		Updated in the revised report and results	Paragraph added to section 2.2 to justify the figures not referenced in the report text	17-3-2026 raised again in meeting on 13th, and yesterday. Awaiting latest report before closing. 23-3-2026 figures still without discussion. If they are not to be dicussed, suggest adding framing statement "that some figures included for future reference and are not discussed" 24-3-2026 overall statement that all figures are not discussed has been made in the scope section. This should have been in the results but it is still in the document now.
32	A number of close out comments on reporting listed and provided in emails on 16/17 March. These will significantly improve abilty for reader to process the report.	S1	CLOSED			Resolved	23-3-2026 A number of the comments from 16-3 have been resolved but the outstand items is being supplied 23-3-2026. 24-4-2026 The detailed report review comments shared via email have been addressed. There are inconsistencies in structure and where information is reported, but the information is provided so closing off. Maven belives some of these comments are reviewer prefernce but they are readability. For example, in a 5 year time series section, there are 100 yr maps not relating to tmie series information.

260324 WAIRAKEI SOUTH SW MODELLING PEER REVIEW COMMENT REGISTER – IMAGE_V2 SHEET

1	 
2	
3	  
4	

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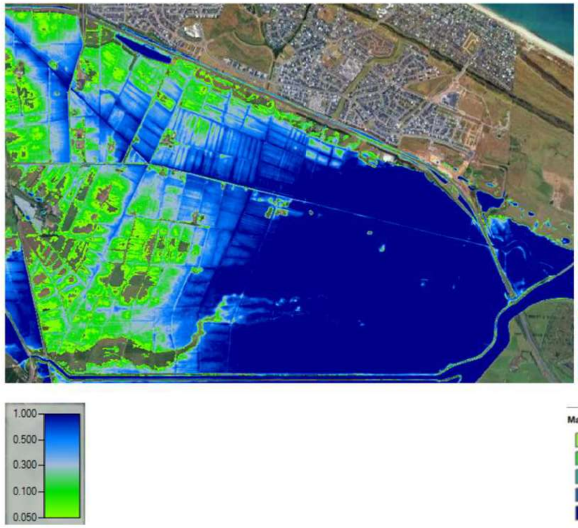

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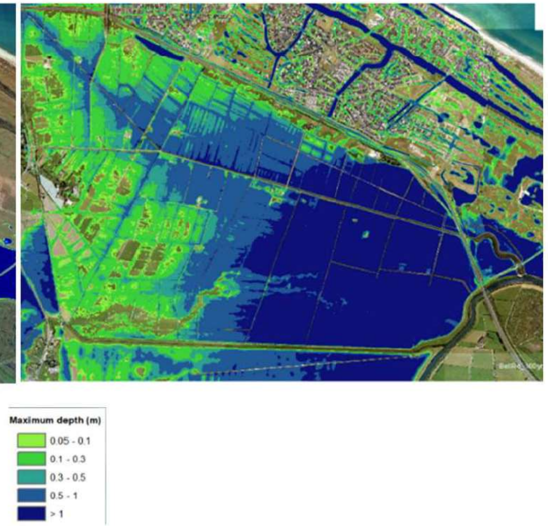

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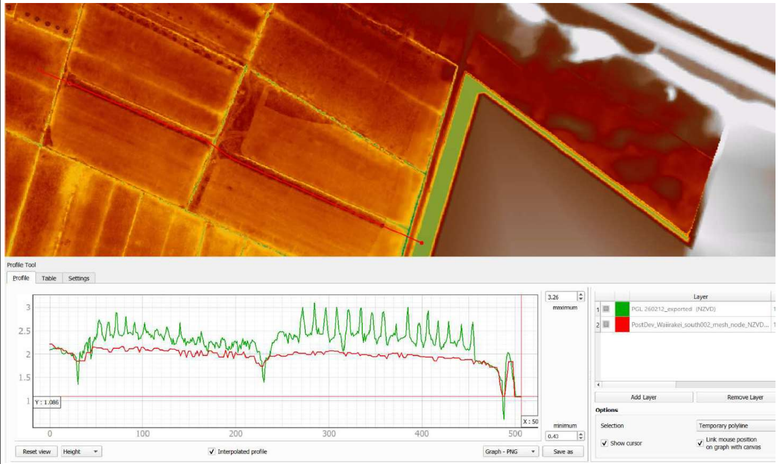
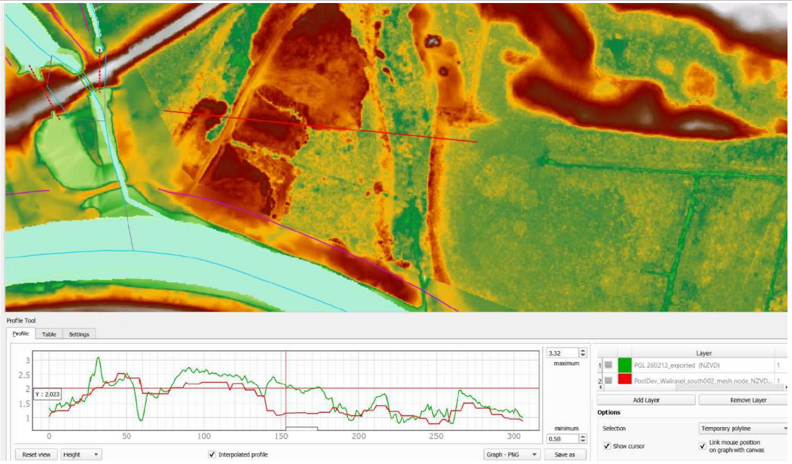
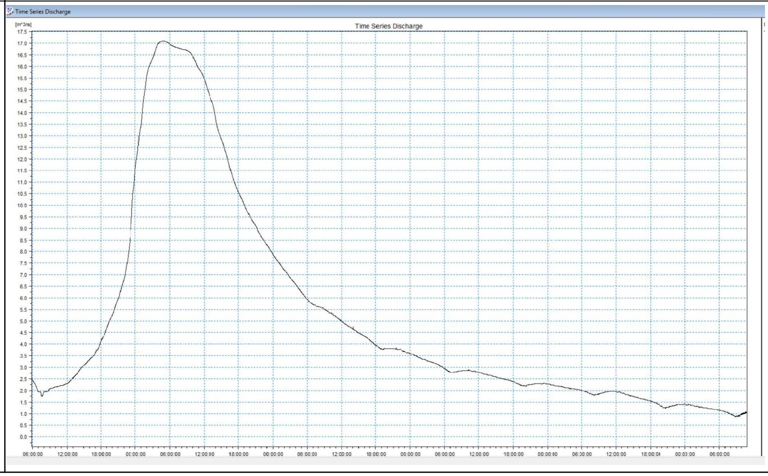
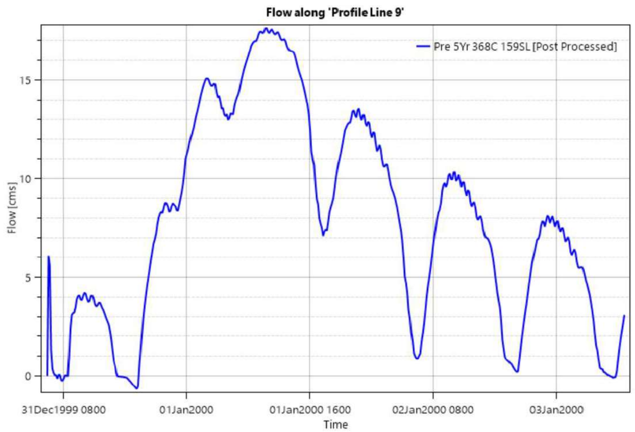
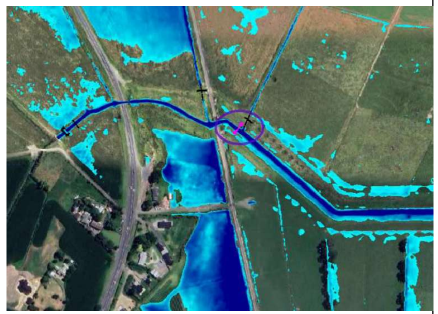
5	20-year return period - current climate (0.13 m SLR #) with and without development	As the long-term mitigation is unknown it cannot be determined whether the long-term mitigation will have an adverse effect under the present climate condition. Assessment of effects of the mitigation (including volume, level, extent, and duration etc) on private property and infrastructure in rural and urban area to show no increase of flooding due to the flows generated by the proposed development (determining if between a 10yr and a 50yr there may be adverse effects).
6	20-year return period - 3.68°C climate change (1.6 m SLR) with and without development	Assessment effects of the mitigation (including volume, level, extent, and duration etc) on private property and infrastructure in rural and urban area to show no increase of flooding due to the flows generated by the proposed development (determining if between a 10yr and a 50yr there may be adverse effects).

1	 	
2	 	US Kopuaroa : (17.1 m3/s in MIKE vs 17.6 m3/s in HEC) 

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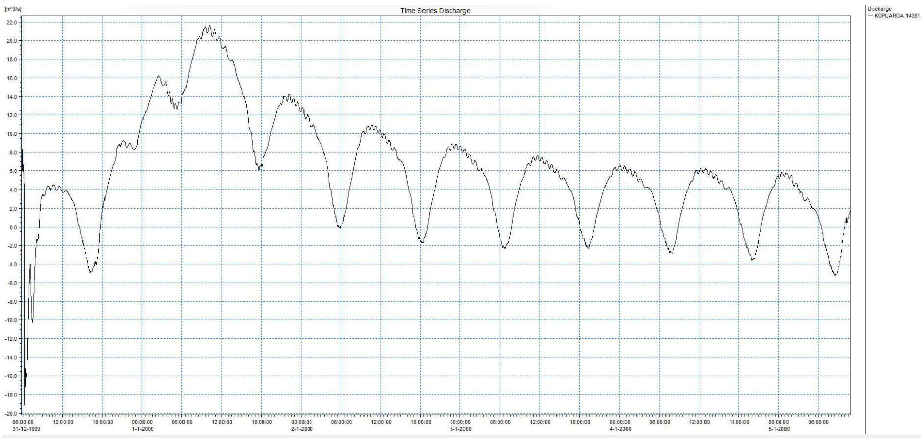
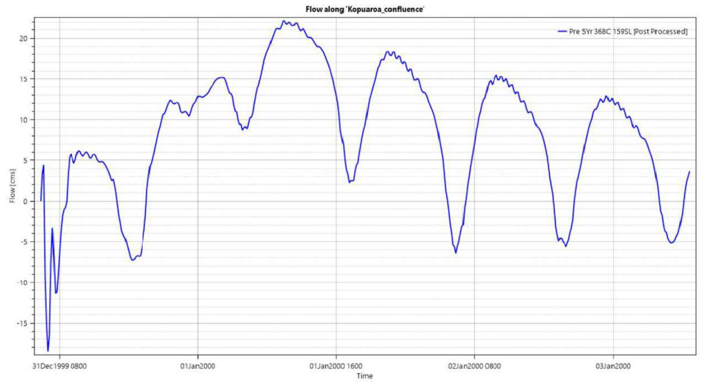
<td>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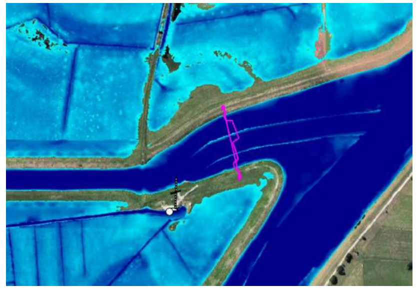</td>
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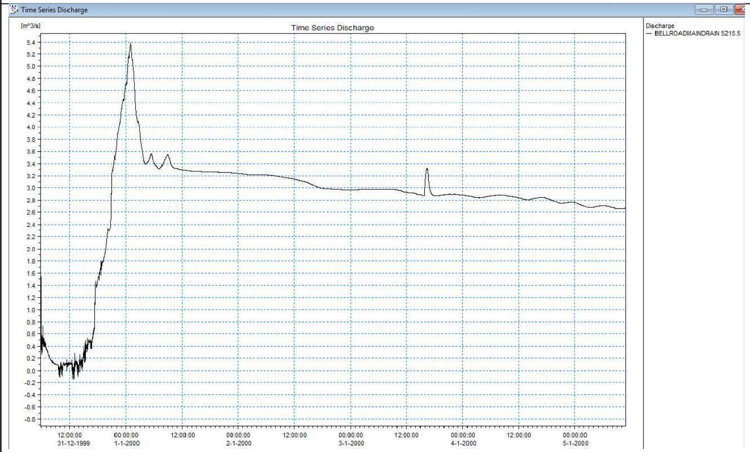
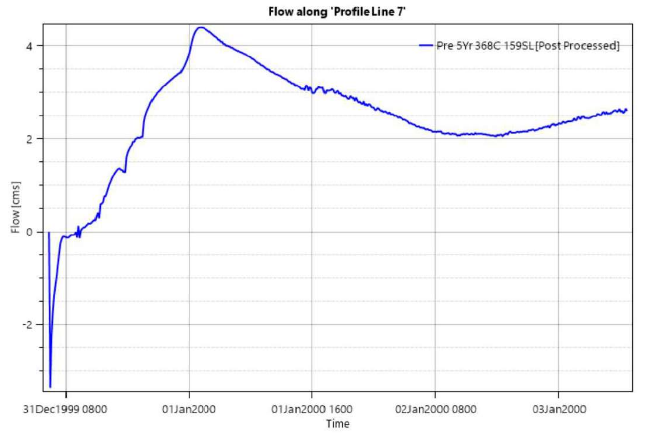
<td>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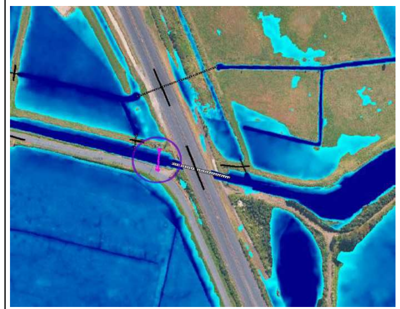
<td>TEL Bell RD (5.4 m3/s in MIKE vs 4.4 m3/s in HEC)
</td>
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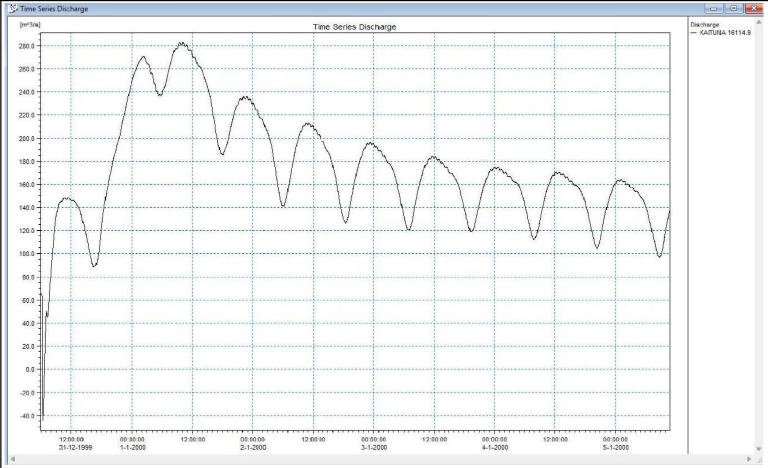
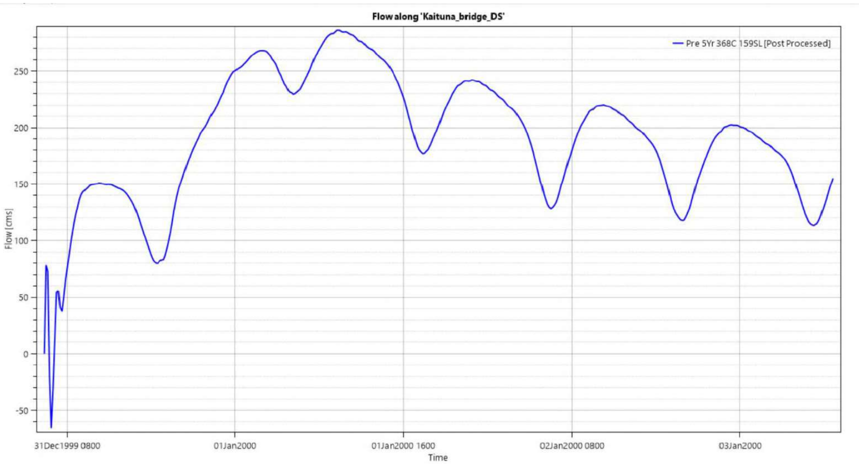
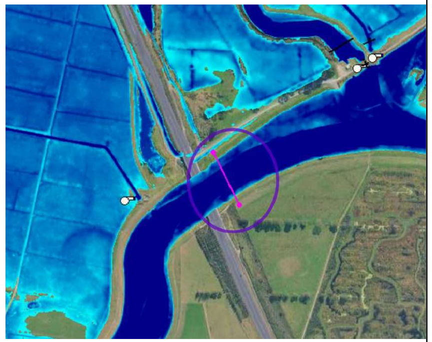
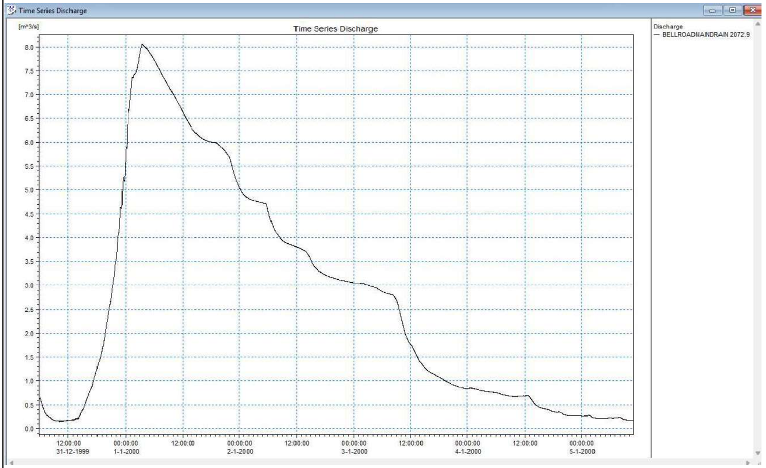
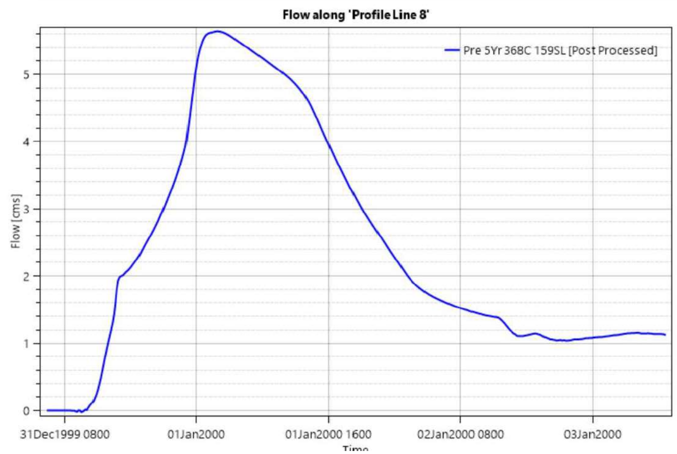
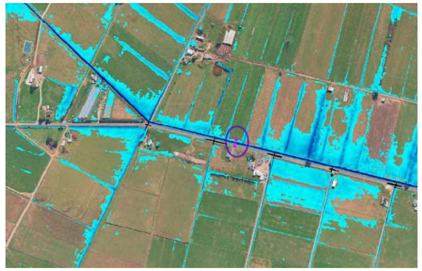
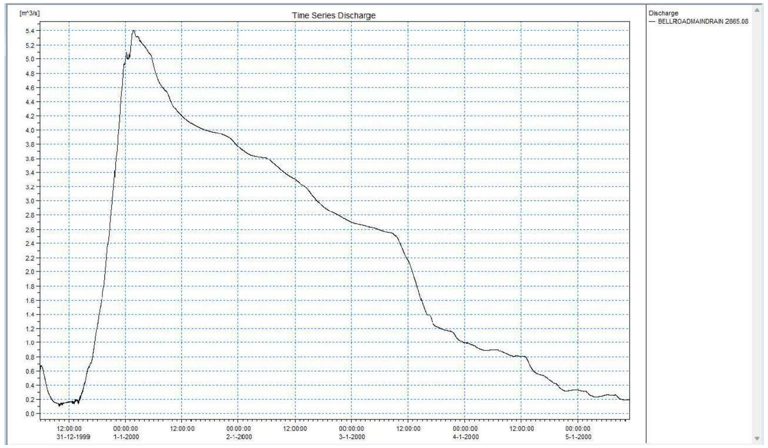
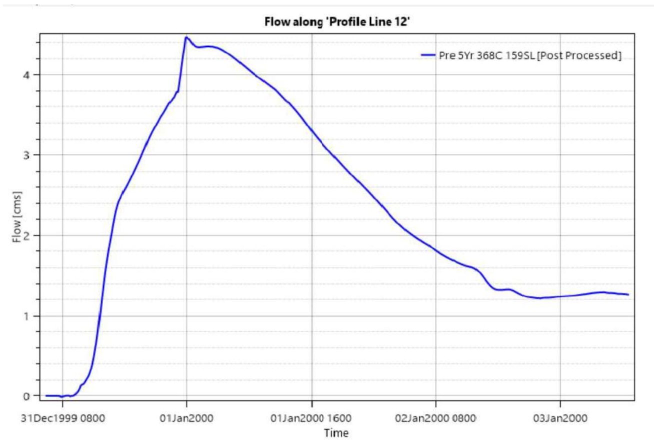
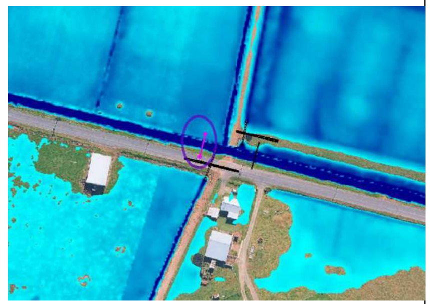
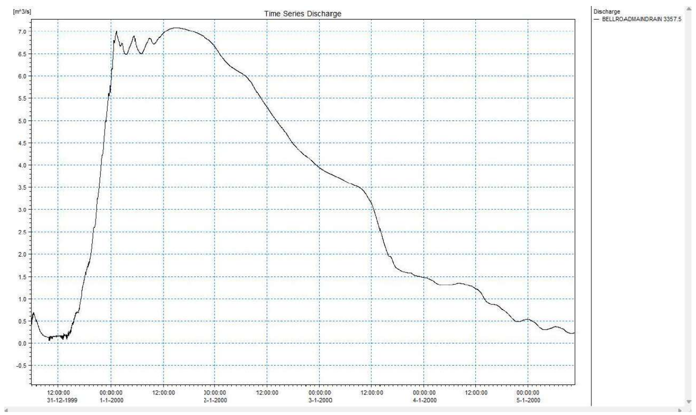
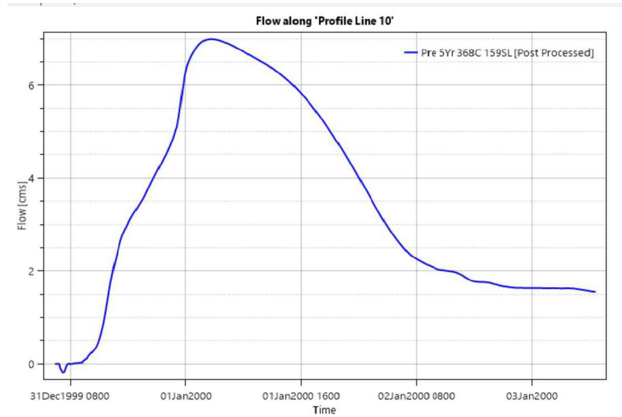
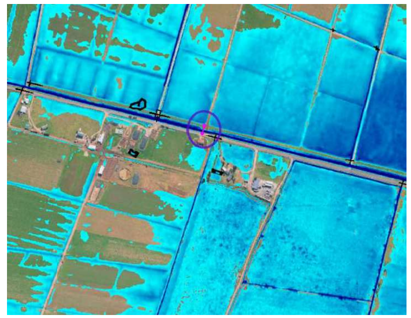
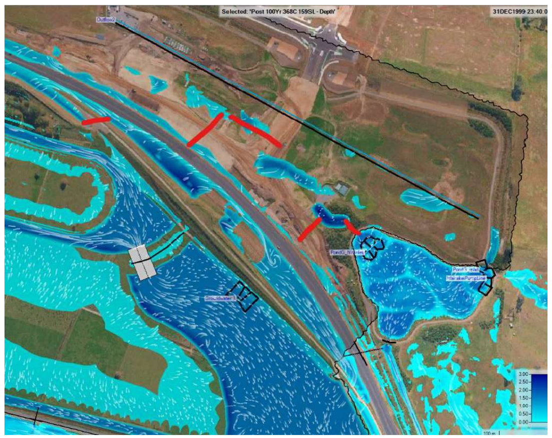
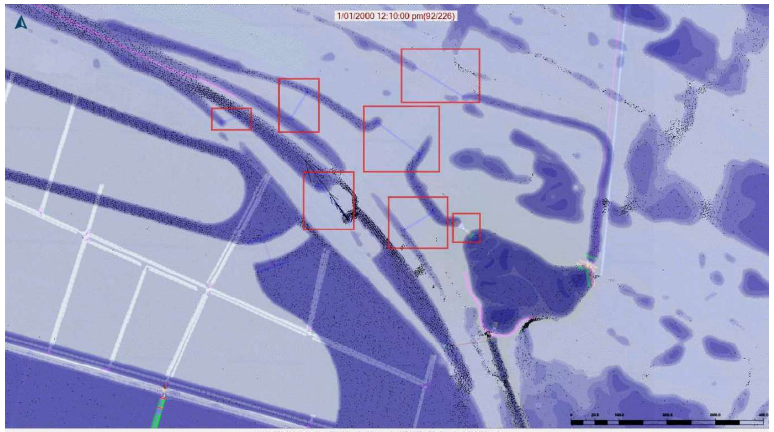
4			DS of bridge - Kaituna river : (283 m3/s in MIKE vs 286 m3/s in HEC). 
5			Bell Rd Main Drain 2072.9 : 8.1 m3/s in MIKE vs 5.6 m3/s in HEC. 

	 	Bell Rd Main Drain US development area: 5.4 m3/s in MIKE vs 4.5 m3/s in HEC. 
6	 	Bell Rd Main Drain inside development area: 7.1 m3/s in MIKE vs 7 m3/s in HEC. 
7	 	

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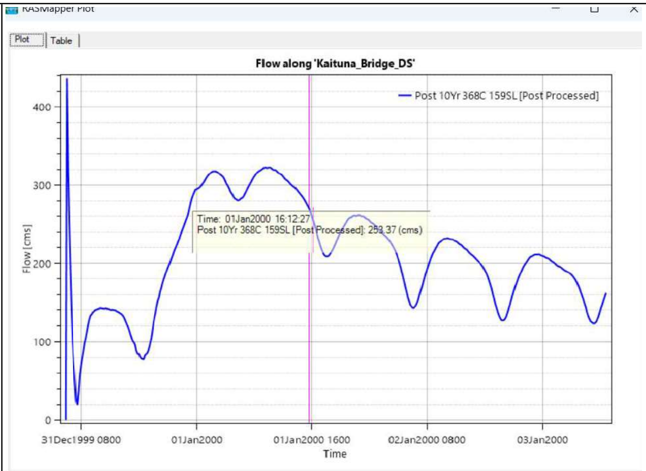
<td>
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