MARLBOROUGH DISTRICT COUNCIL

Peninsula Road Stopbank Repair & Upgrade

Spring Creek Community Meeting

5th June 2024

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

Anne Bruce
Engineering Assistant

marlborough.govt.nz

Welcome

- Lower Wairau Flood Capacity Upgrade Programme
- Spring Creek Project
- Investigation
- Next steps
- Risk mitigation
- **Questions & Answers**

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Lower Wairau Flood Capacity Upgrade Programme

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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Flood Capacity Upgrade

maintain & upgrade stopbank

ready for the future

engaged communities

recover floodway capacity

Project Reaches

- Upper Macdonalds
- Ngāti Rārua
- Lower Macdonalds
- Spring Creek
- Morrins Hollow
- Dicks Road
- Ladies Reach

FY21-22

Upper MacDonalds

- 450m of stopbank upgrade
- Isaac Construction (Simcox)

FY21-22: Upper Macdonalds

FY22-23

Ngāti Rārua

- 612m of stopbank realignment
- Gill Construction

Lower MacDonalds

- 1180m of stopbank upgrade
- Isaac Construction (Simcox)

FY22-23: Ngāti Rārua

FY22-23: Lower Macdonalds

FY23-24

Upper MacDonalds

- 1050m of stopbank upgrade
- Reprioritised in April 2023 to focus on Spring Creek Project

FY24-25

Spring Creek

- Approx. $1.85m Construction Costs
- KiwiRail stormwater outfall works
- Approx. 680m of revetment protection to Wairau River TR.
- Approx. 390m of stopbank upgrade to Spring Creek stopbank

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Spring Creek Project

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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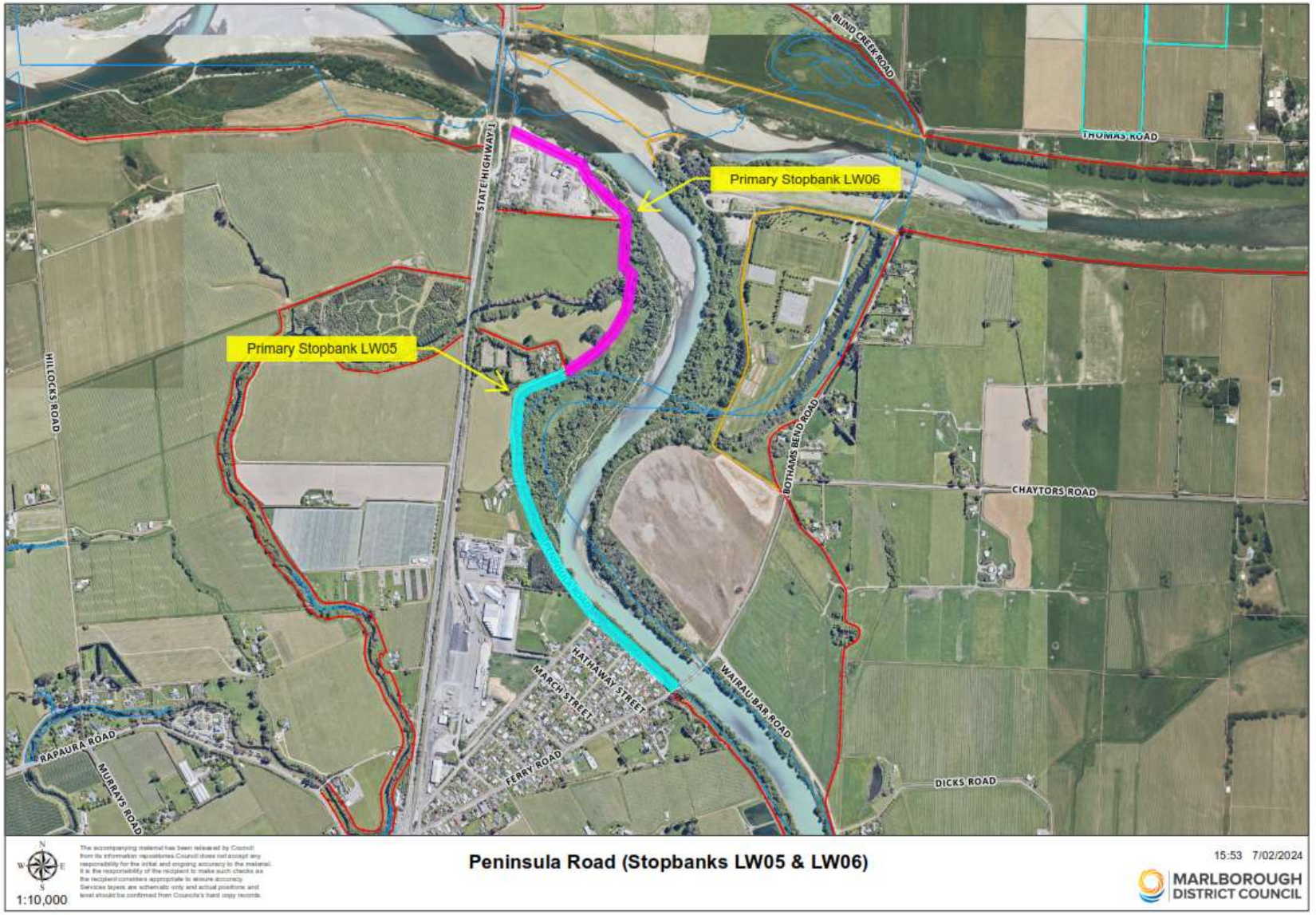
Primary Stopbanks

1. LW05
2. LW06



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Historic imagery

1939 Wairau Flood

100 Men Engaged In Desperate Fight Against Flood

Ten thousand sandbags were filled by river board workmen and farmers on the banks of the Wairau River yesterday morning in efforts to prevent the swollen river topping the stopbanks and flooding the countryside.

Simultaneously, a river board staff, augmented for the occasion, worked till midnight cutting a 500 yards-wide channel through the boulder bank at the Wairau Bar to give the accumulated flood waters a more direct exit to the sea.

Water Rises Swiftly

All told, the board had over 100 men engaged in a desperate fight against the flood last night, in addition to settlers who laboured in their own interests on the stopbanks adjacent to their properties.

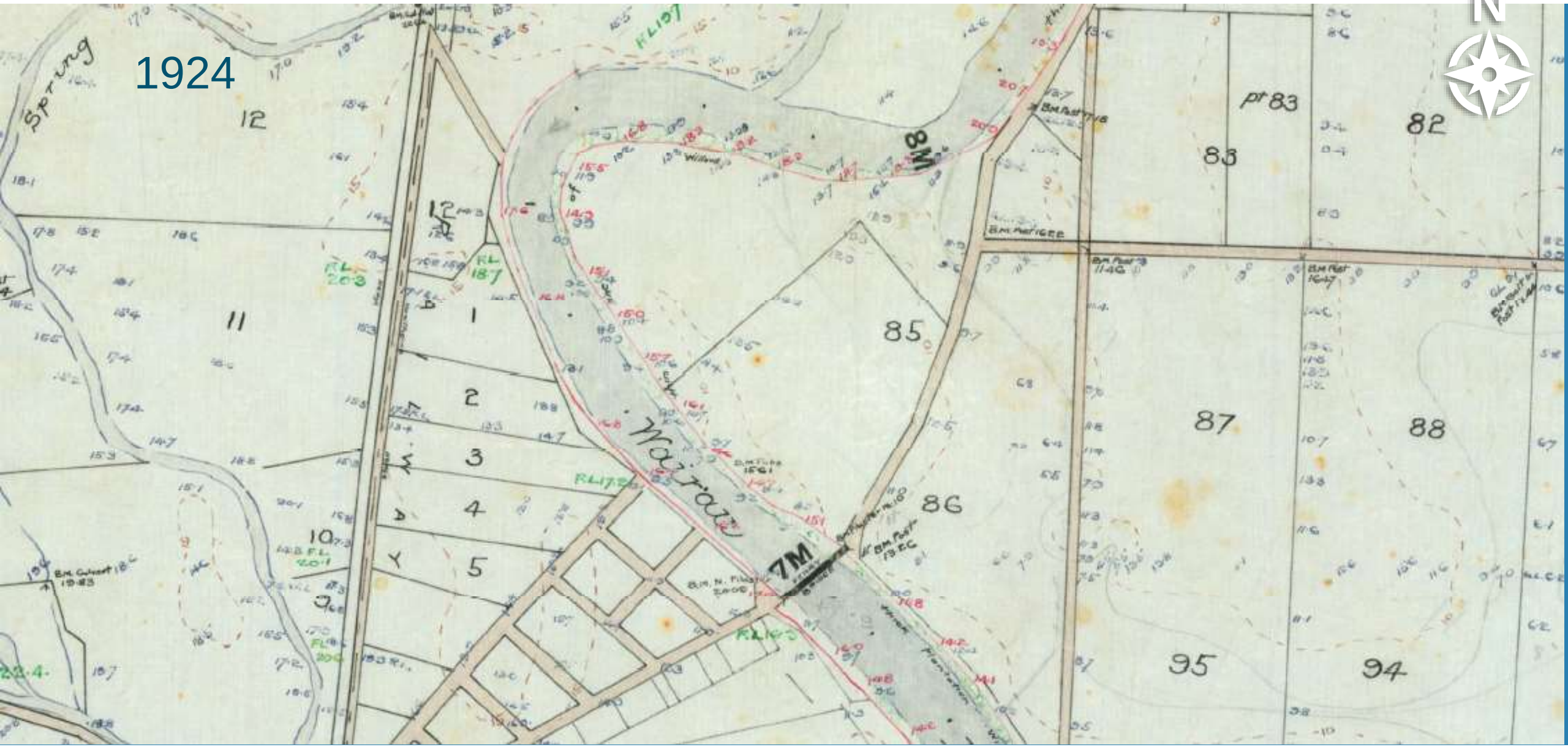
In some cases the water rose so swiftly and to such extraordinary height that it soon poured, a foot or more in depth, over the embankments, which were already raised as much as three feet above normal.

Extensive Areas Inundated

This water inundated extensive areas at Spring Creek, in the Lower Wairau district, but the worst inundation resulted from the breaching of the stopbanks on the Tuamarina side, where farmhouses were invaded and valuable crops swept by the water.

The Wairau River rose 16ft 6in above normal, one of the highest points ever reached.

1962 Wairau Flood


1924
N
Spring
12
11
10
1
2
3
4
5
83
pt 83
82
85
86
87
88
95
94
8M
7M
Wairau


1948
N


1983
N


1996
N


2002
N


2008
N


2012
N


2016
N


2024
N

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2016 Kaikōura earthquake

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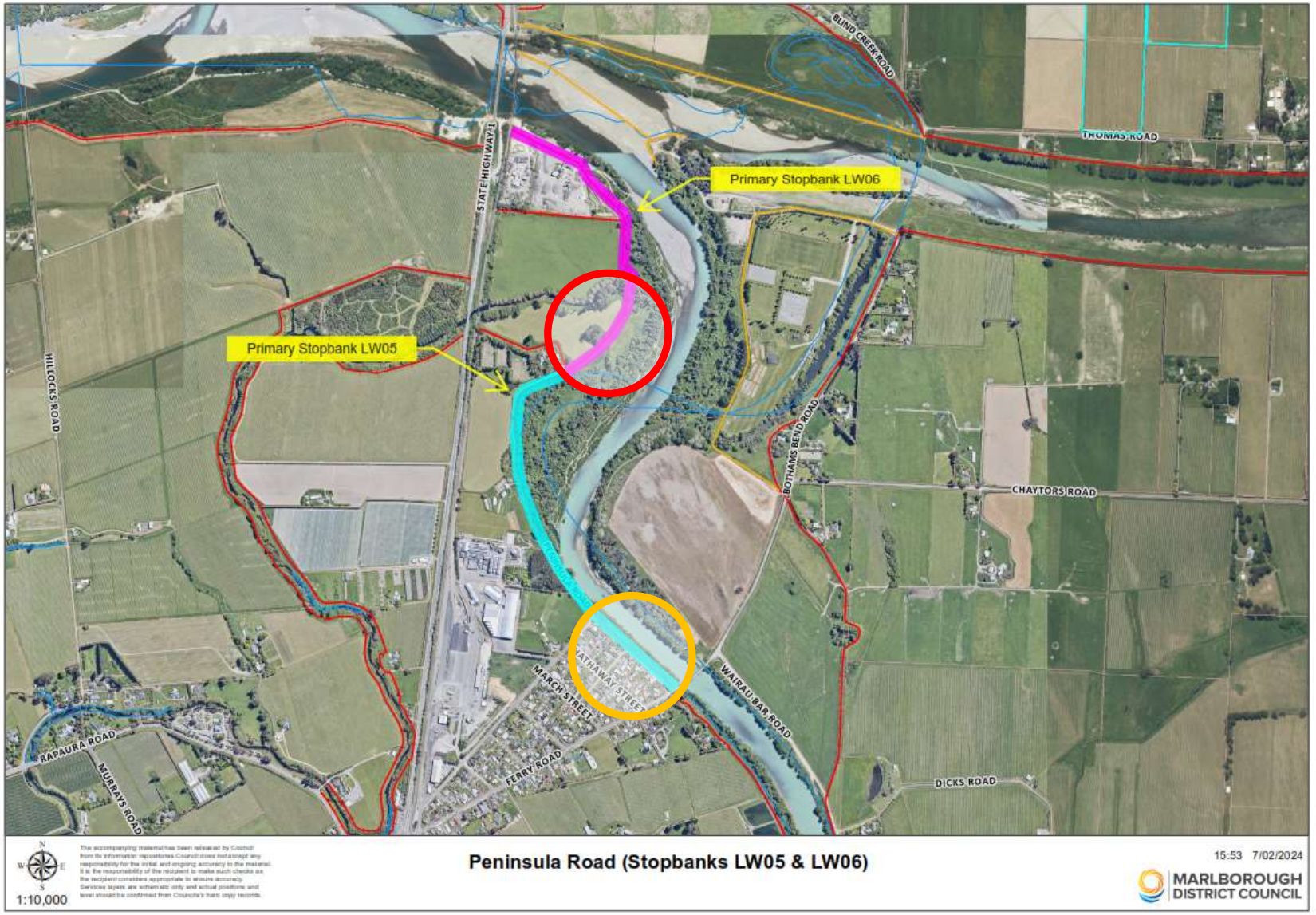
2016 Damage

1. LW06
2. LW05 (*observed 2021*)



LW06 - Lateral Spread

LW06 - Lateral Spread

LW06 - Rebuild

LW06 - Rebuild

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2021 Wairau Flood

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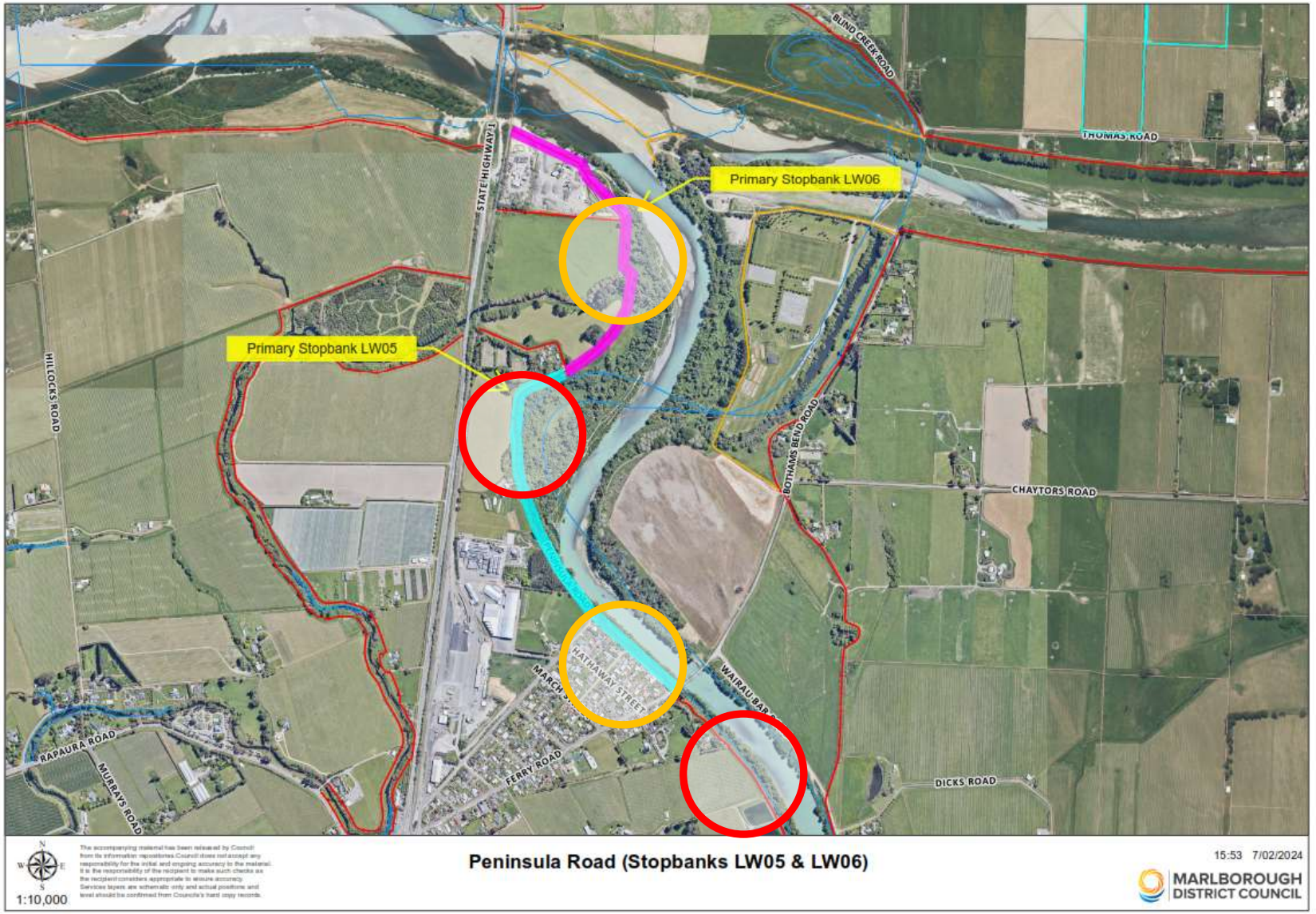
2021 Overtopping

1. LW05
2. LW06



2021 Wairau Flood

2021 Wairau Flood

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2022 Wairau Flood

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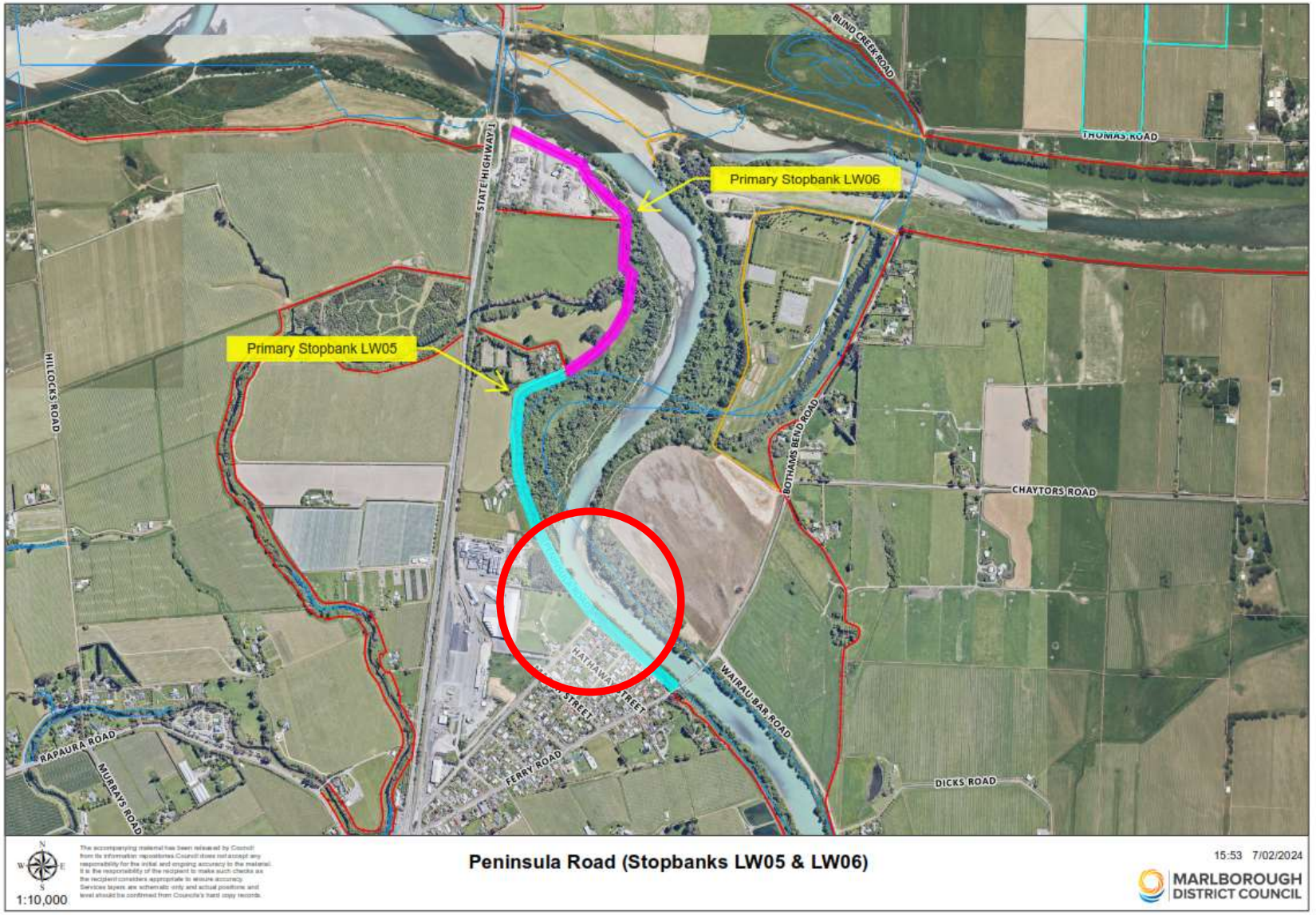
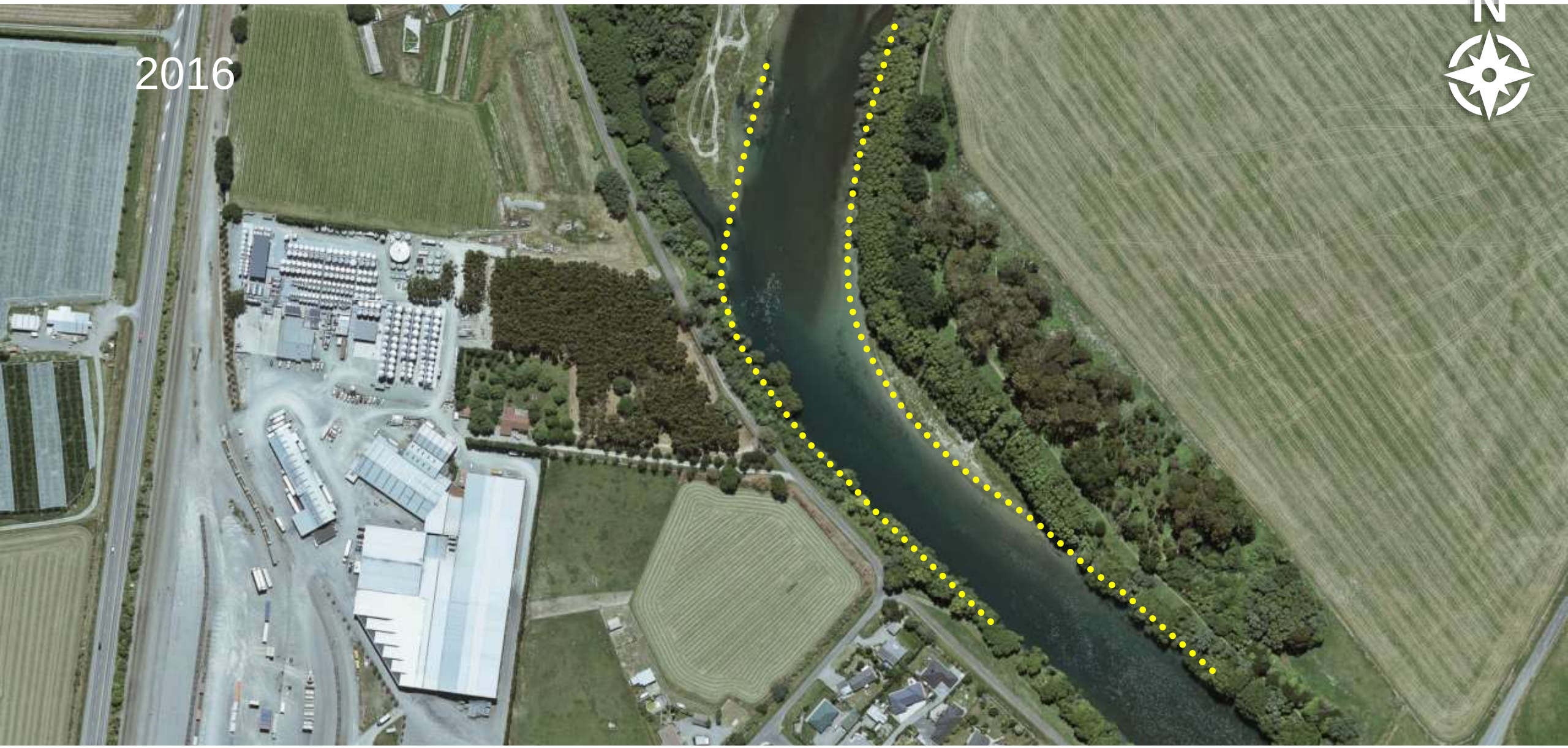
2022 Damage

1. LW05




2016
N


2024
N

2022 Wairau Flood

2022 Wairau Flood

2022 Wairau Flood

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Investigation

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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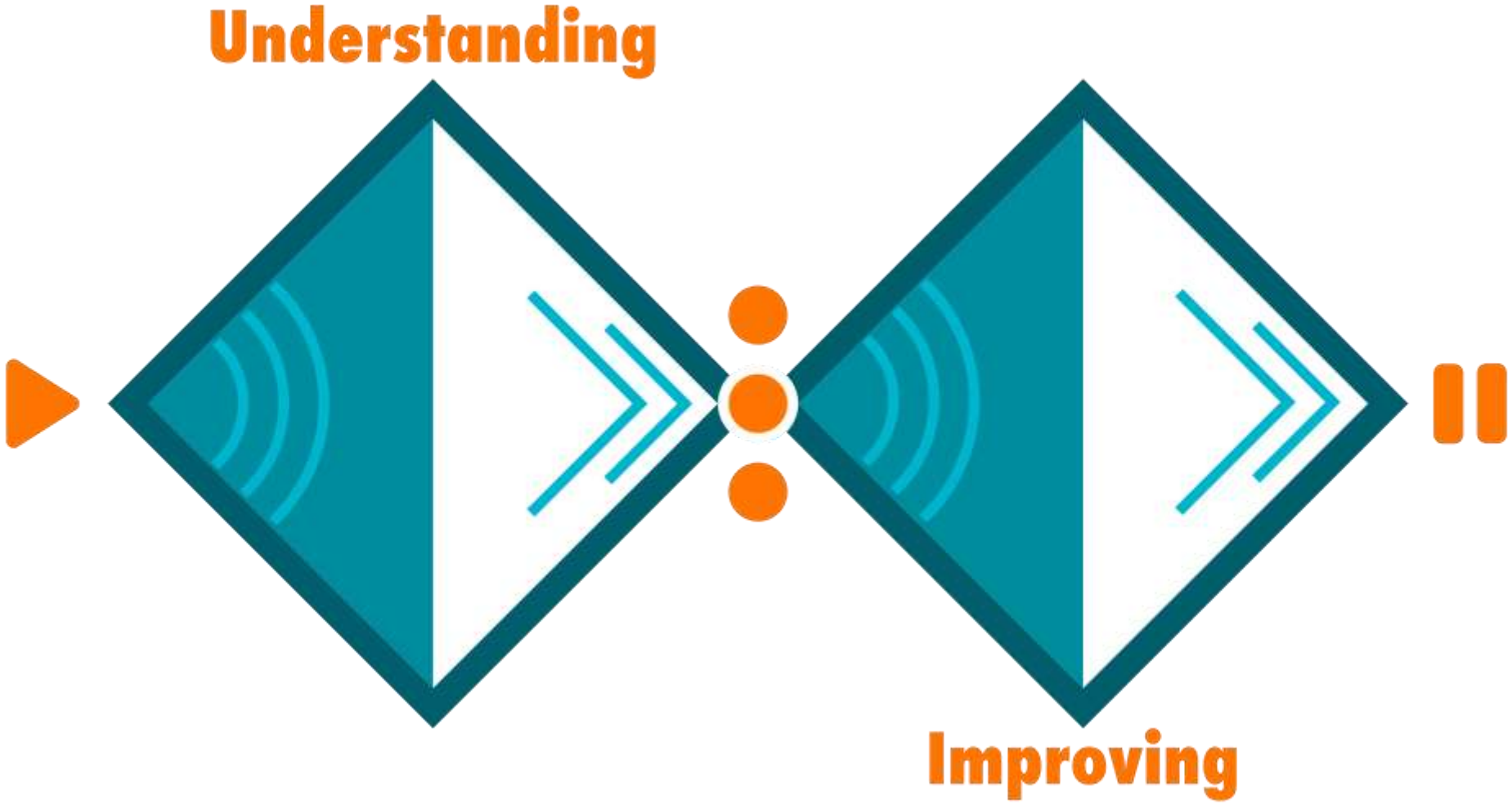
Design approach



Adaption options

Protect

Accommodate

Retreat

Avoid

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Flood investigation

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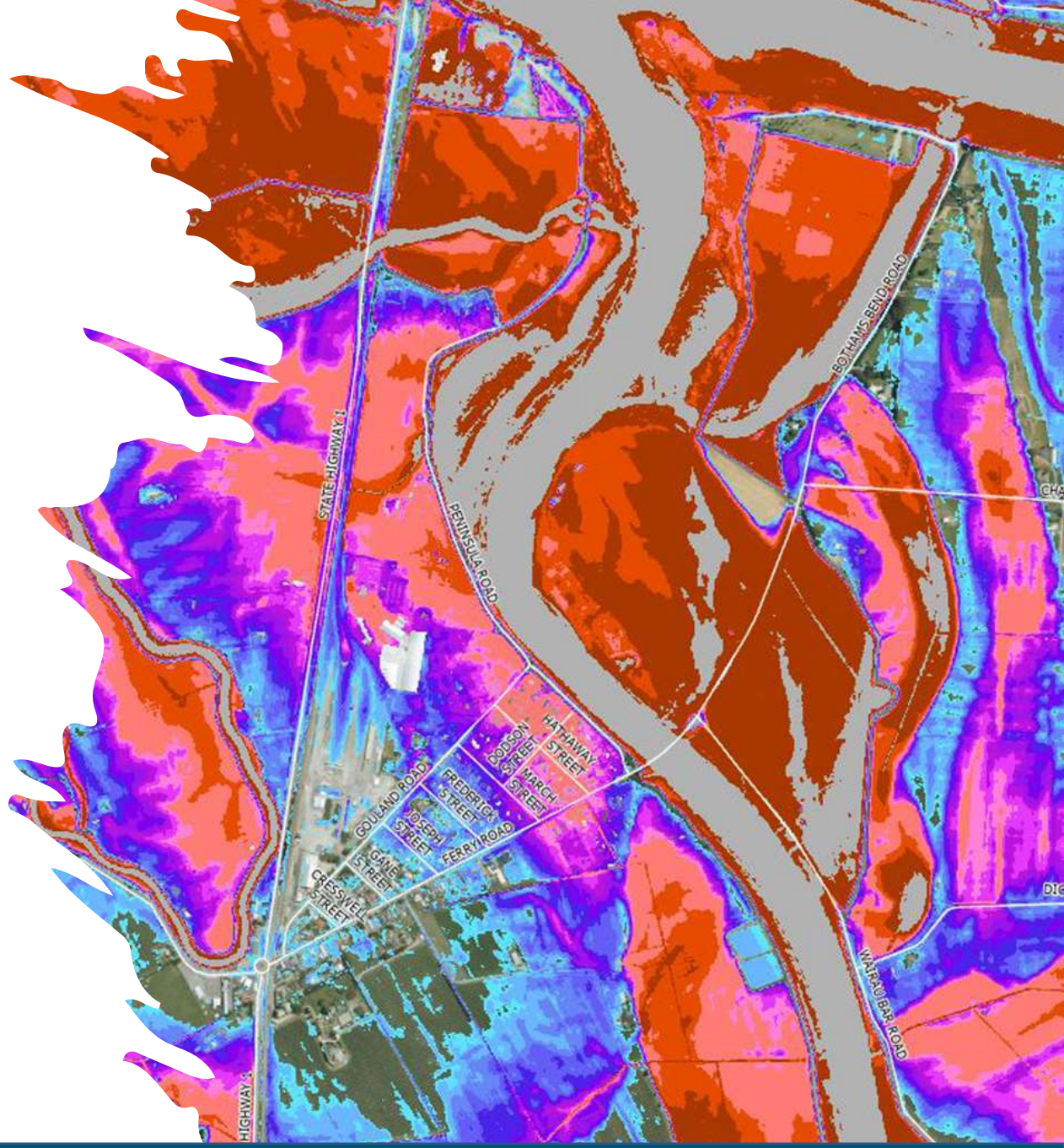
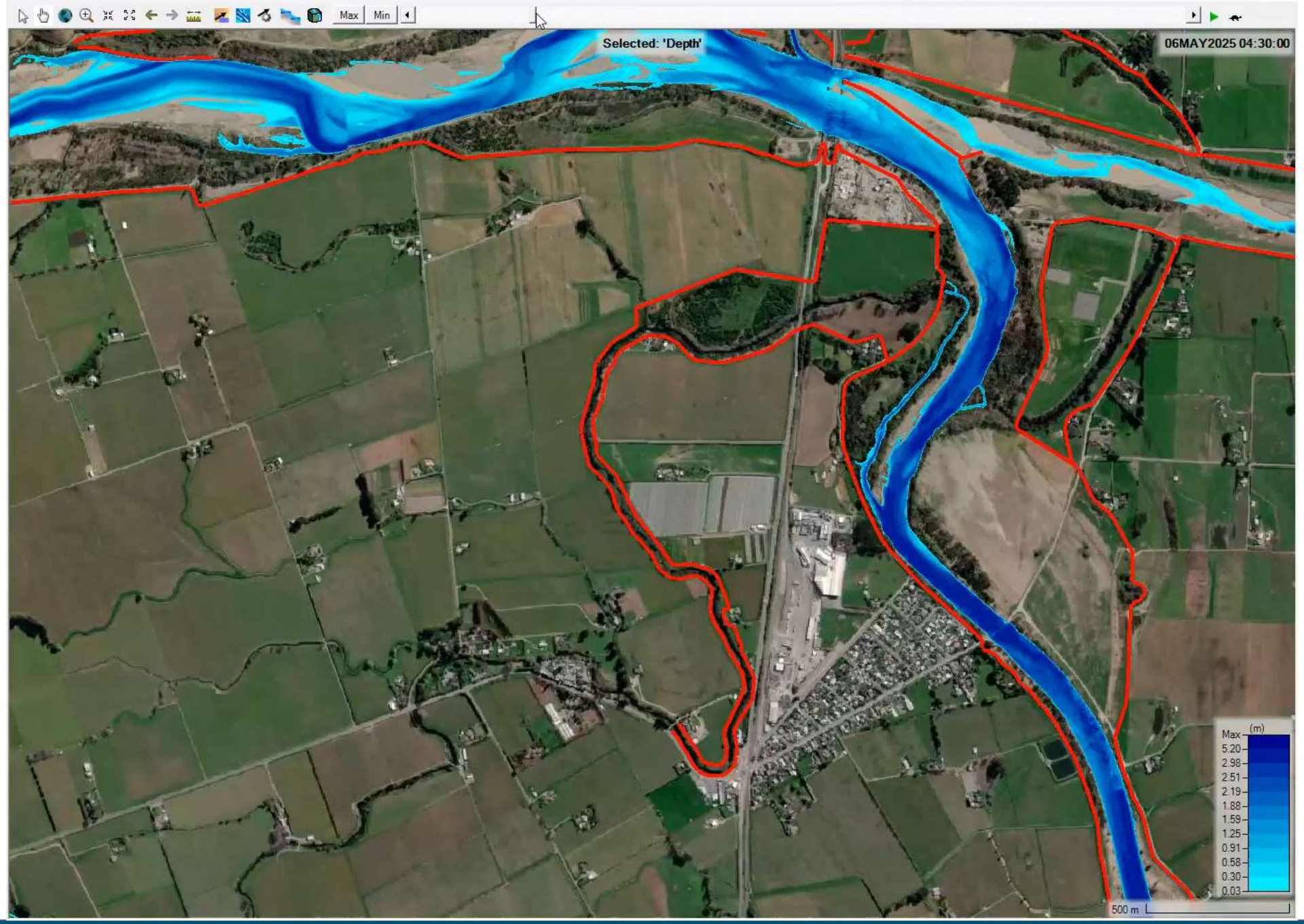
Flood investigation

Combination of:

- Rain-on-grid hydraulic modelling
- Historical flood data
- Hydrology data
- LiDAR survey data
- Aerial photography
- ‘On the ground’ engineering observations
- Stakeholder and first responder photography
- Climate change forecasting




Max
Min
Selected: 'Depth'
06MAY2025 04:30:00
(m)
Max
5.20
2.98
2.51
2.19
1.88
1.59
1.25
0.91
0.58
0.30
0.03
500 m

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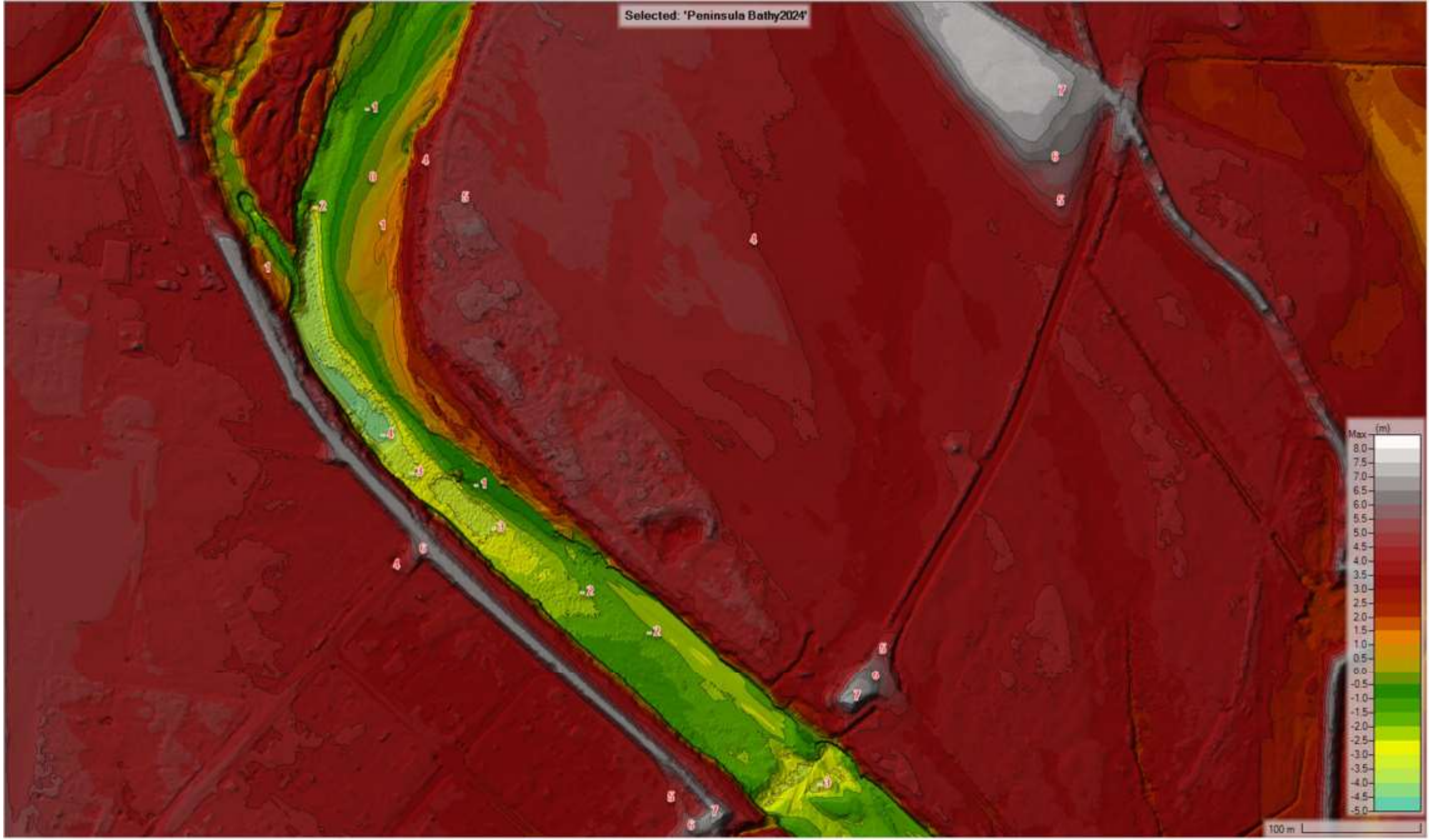
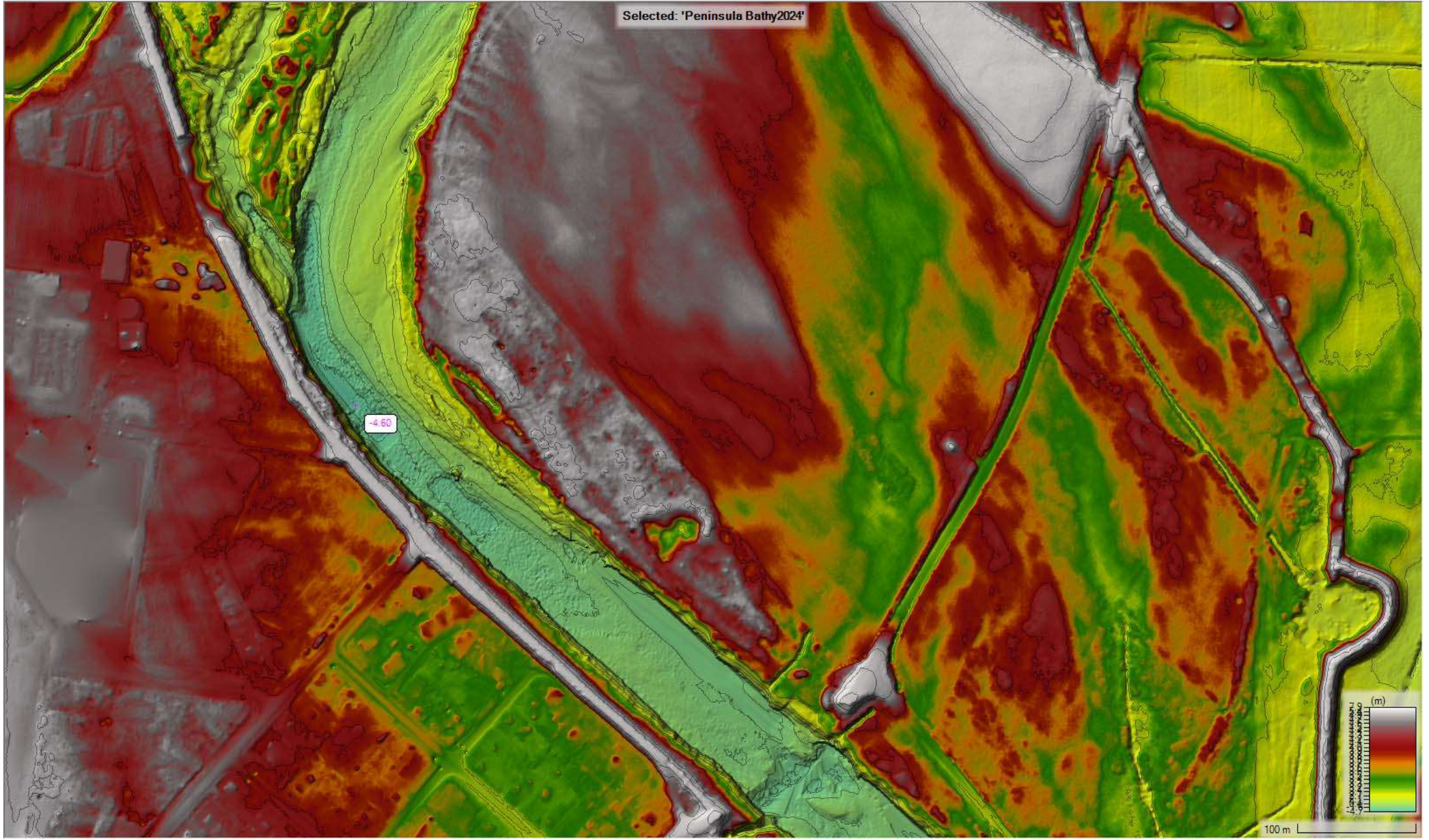
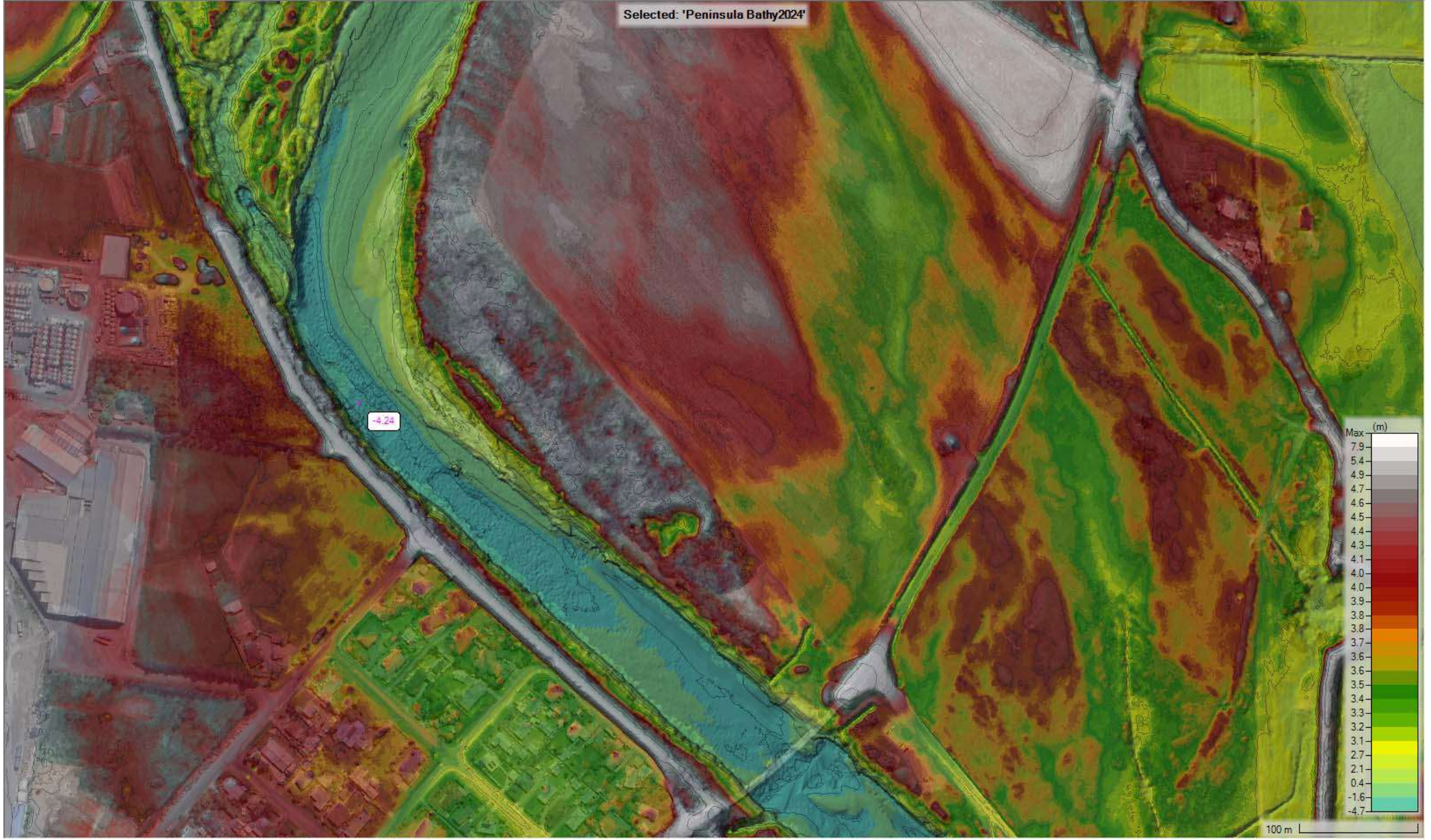
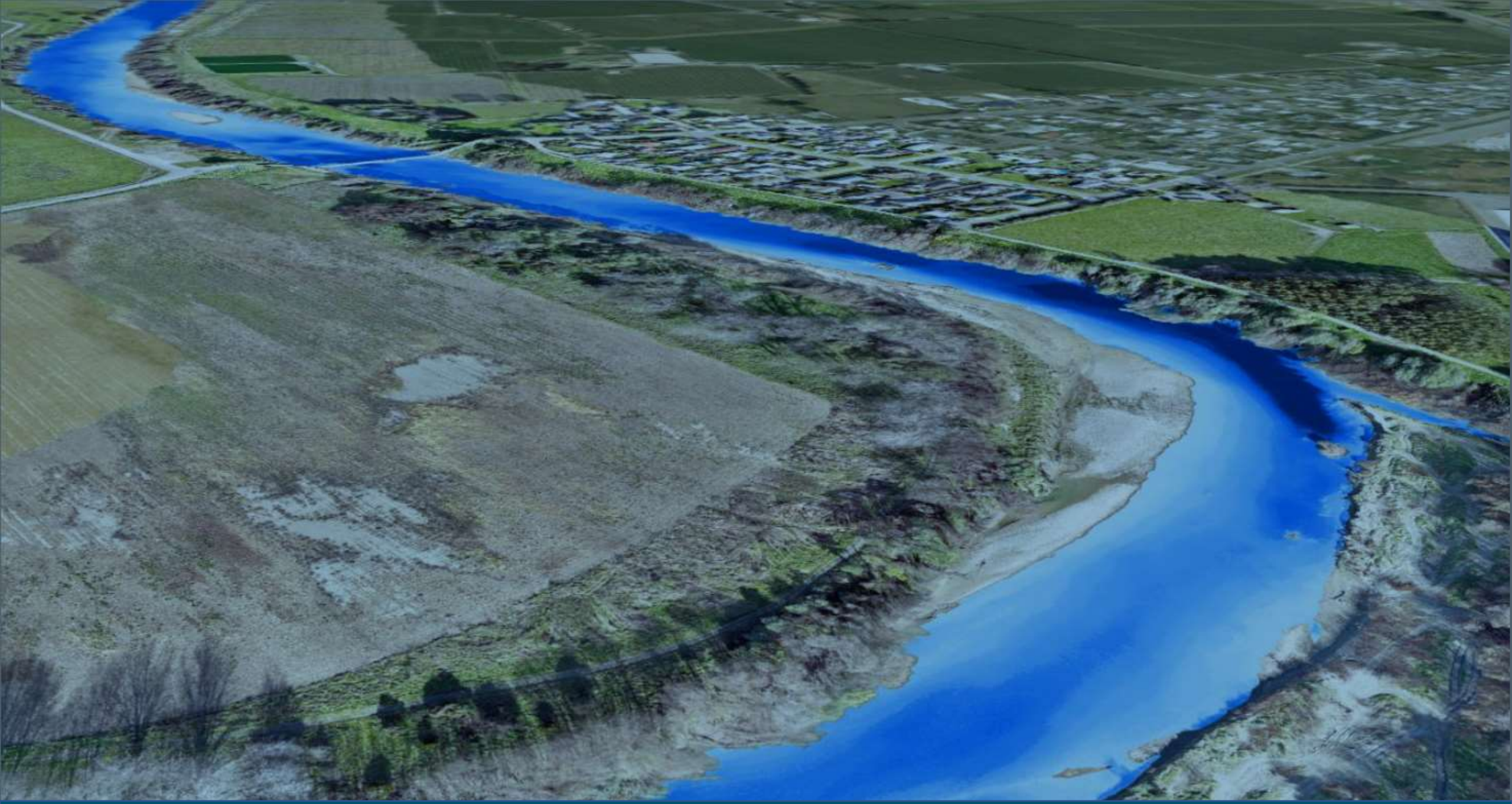
LiDAR and Bathymetry


Selected: 'Peninsula Bathy2024'
Max
(m)
8.0
7.5
7.0
6.5
6.0
5.5
5.0
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
-0.5
-1.0
-1.5
-2.0
-2.5
-3.0
-3.5
-4.0
-4.5
-5.0
100 m


Selected: 'Peninsula Bathy2024'
-4.60
(m)
100 m


Selected: 'Peninsula Bathy2024'
-4.24
Max (m)
7.9
5.4
4.9
4.7
4.6
4.5
4.4
4.3
4.1
4.0
4.0
3.9
3.8
3.8
3.7
3.6
3.6
3.5
3.4
3.3
3.2
3.1
2.7
2.1
0.4
-1.6
-4.7
100 m



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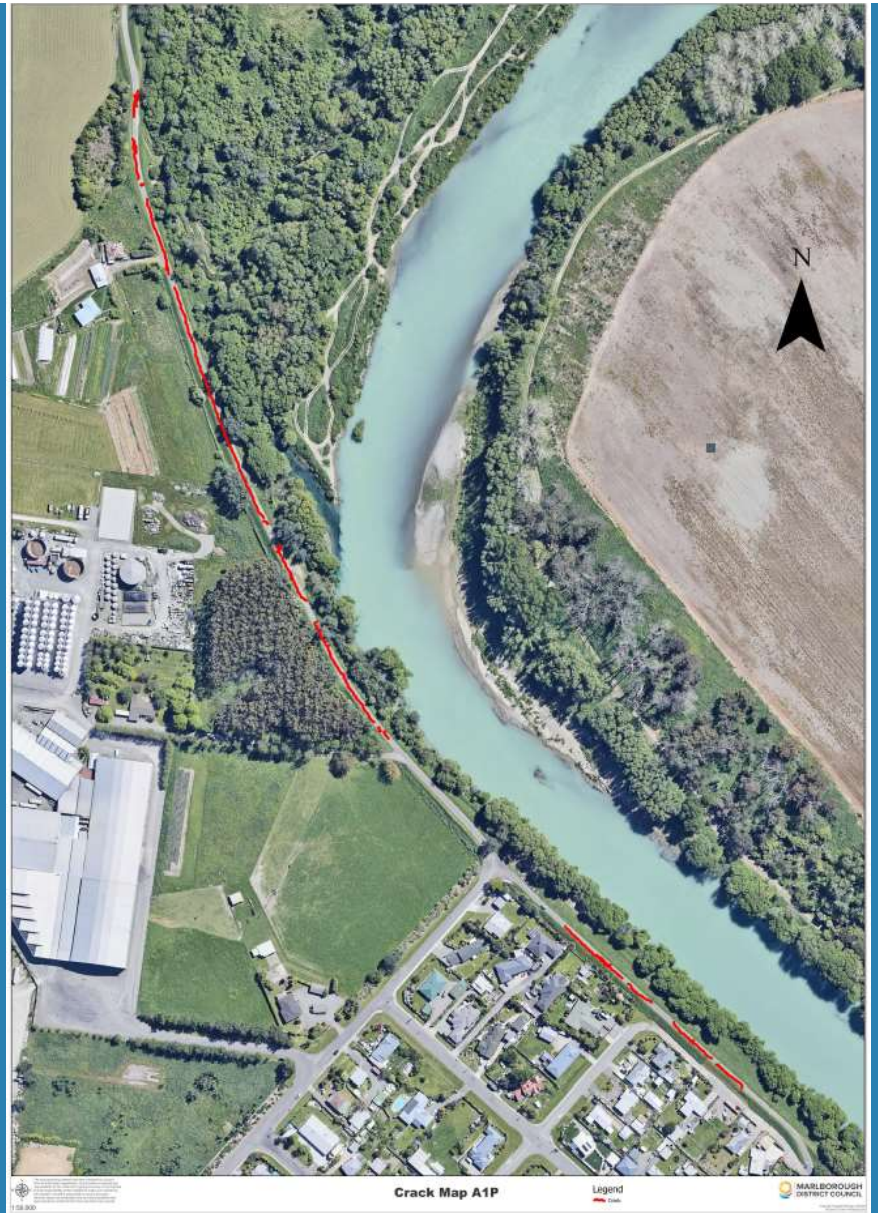
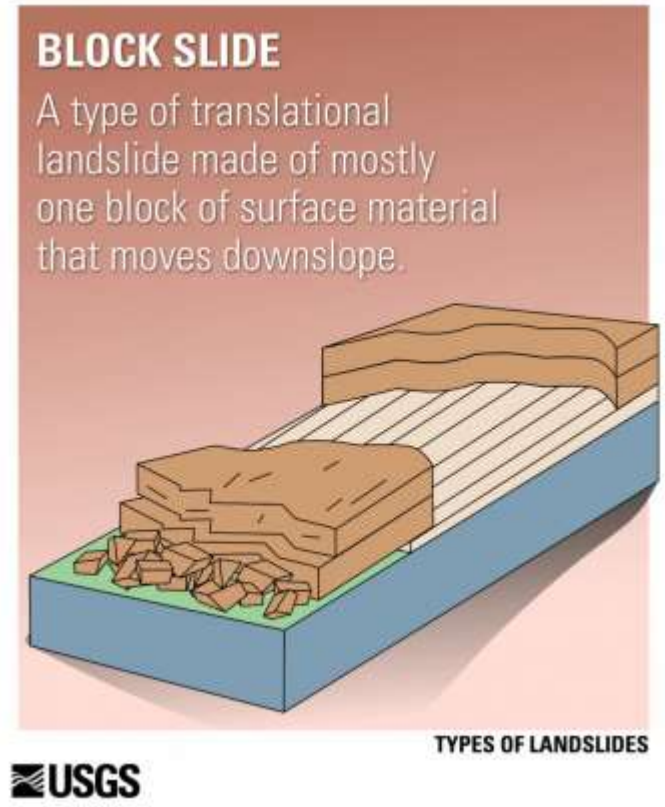
Geotechnical investigation

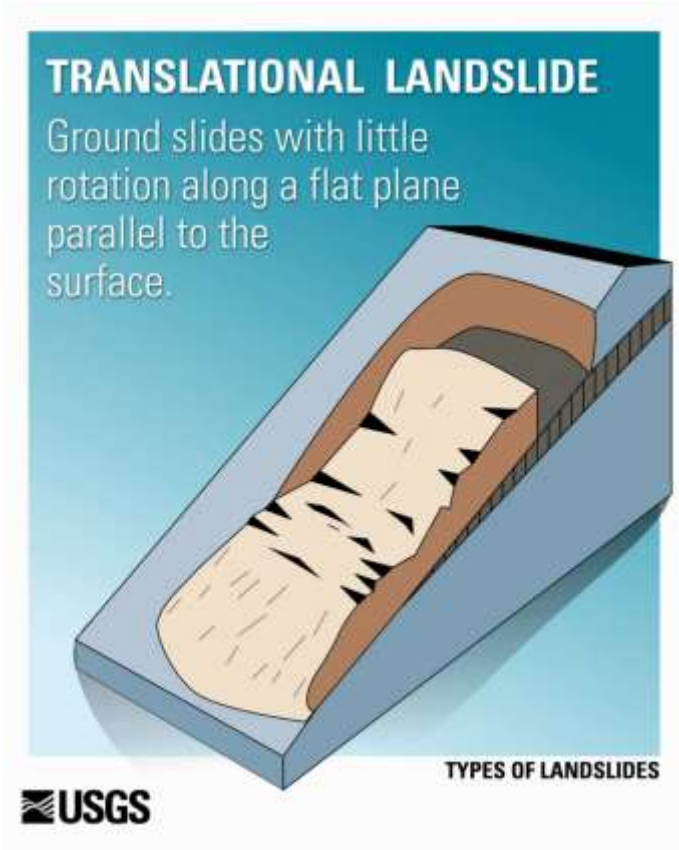
Deformation Survey

Deformation Survey



Geotechnical failure





Mississippi River, Darrow, Ascension Parish, Louisiana - August 23, 1983

Waihopai – 17th July 2021

Geotechnical investigation

Commenced 20th May 2024 with:

- 13no. Boreholes (including 5no. piezometers)
- 6no. Test-pits
- 6no. Cone Penetration Tests (CPT's)

Will inform the ongoing design work, helping to ascertain the extent and cause of deformation.

Geotechnical investigation

Geotechnical investigation

Geotechnical investigation

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Concept design

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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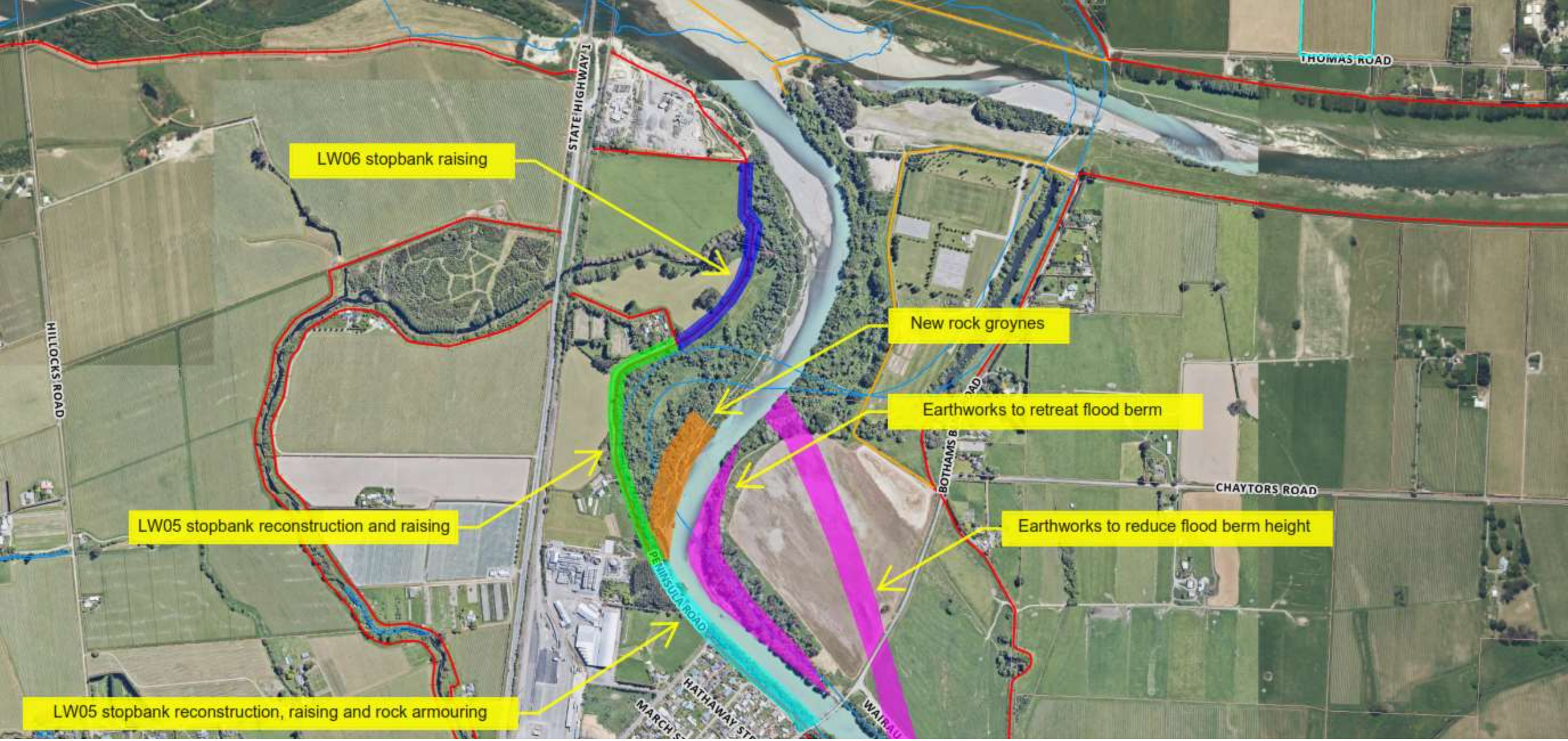
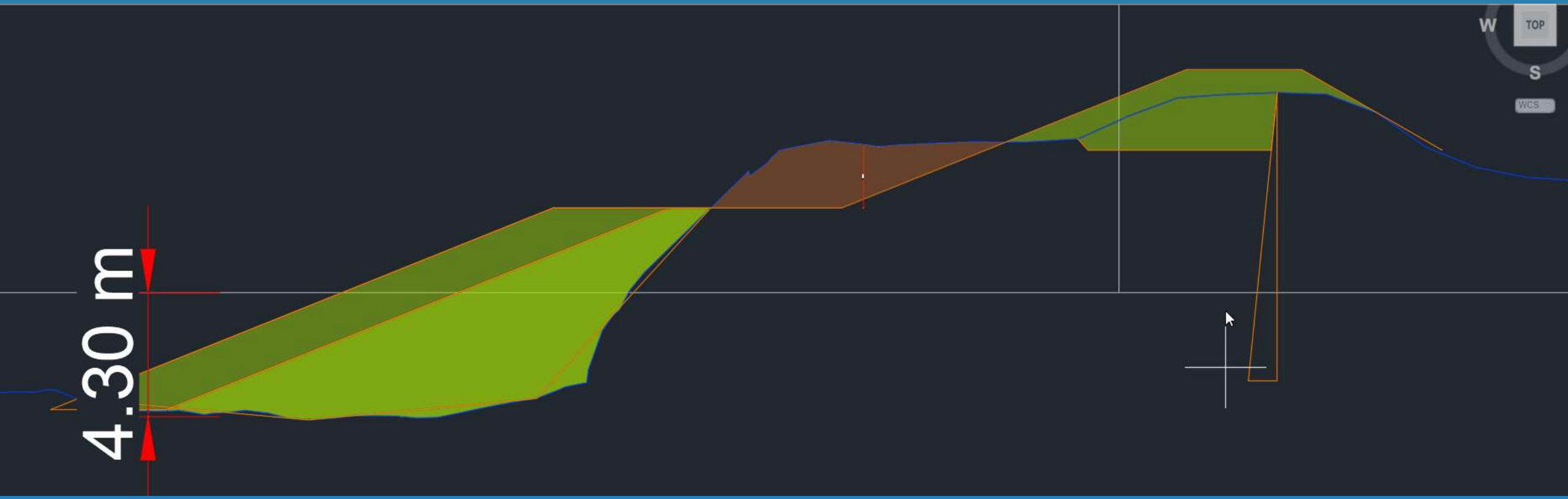


Peninsula Road Concept

Typical cross-section

Typical cross-section



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Next steps

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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Funding

MDC Funding

Your Rates

Description of Rate	Type of Rate and Activities Funded	Rate Calculation		Amount
Geo. Area General Rate - Blenheim Vicinity - Residential/Rural	works and services rate that pays for activities that aren't funded by other targeted rates, user pays charges, general revenue or reserves.	LV	255,000 0.00248056	632.54
Geo. Area General Charge - Blenheim Vicinity Area	A fixed dollar charge that pays for activities that aren't funded by other targeted rates, user pays charges, general revenue or reserves.	SUIP*	1 754.00	754.00
Wairau River Rate - Other Urban 1	A rate to cover the costs of river planning, control & flood protection in the Wairau catchment.	CV	415,000 0.00041241	171.15
Blenheim Group Sewer Cap Works Rate -	A rate on every unit in the combined sewerage special rating area that covers the capital & debt servicing costs of collection, treatment & disposal of wastewater.	LV	255,000 0.00048298	123.16
Blenheim Group Sewer User Charge -	A fixed dollar charge per SUIP* in the combined sewerage special rating area that covers the cost of treatment, reticulation and other costs of the combined sewerage scheme improvements (where the service is supplied).	SUIP*	1 430.00	430.00
Total rates assessed (GST inclusive) for 2021/2022				$2,110.85

Levels of Service Increases

Agenda Item 4.21

"To request Capital Expenditure (CapEx) budget of $8.7m for the design, repair, and upgrade of Primary stopbanks LW05 and LW06, along and under Peninsula Road, Spring Creek."

4.21 Levels of Service Increases
Capital Expenditure Increase – Peninsula Road Stopbank Repair & Upgrade

(Report prepared by Andy White/Richard Coningham) R710-03-002

Purpose of report

1. To request Capital Expenditure (CapEx) budget of $8.7m for the design, repair, and upgrade of Primary stopbanks LW05 and LW06, along and under Peninsula Road, Spring Creek.

Executive Summary

2. Primary stopbanks LW05 & LW06 are two critical pieces of flood protection infrastructure that prevent deep-fast moving water from flooding the township of Spring Creek, SH1, and KiwiRail's Main North Line.

3. In recent years, LW05 has become compromised in several locations due to internal instability following the 2016 Kaikōura earthquake, and erosion of its unprotected foundations during the July 2021 and August 2022 flood events. Where faults in these discrete locations have been revealed they have been repaired, however a picture is emerging that the stopbank is vulnerable along its entire length.

4. Post-event analysis of the July 2021 flood event has also highlighted a need to increase the flood capacity safety margin of both LW05 and LW06 to ensure that the assets are able to function as intended and provide the level of service required of them during a future 1% AEP (1 in 100yr ARI) event.

5. In summary, action is required with some urgency to repair and upgrade sections of LW05 and LW06. Until the work is undertaken the stopbanks will remain at an elevated risk of failing before reaching their design limits, comprising the safety of Spring Creek township and key transport links during a flood event.

RECOMMENDATION

That Council approve CapEx budget of $8.7m for the design, repair, and upgrade of Primary stopbanks LW05 and LW06 and associated works, under and adjacent to Peninsula Road, Spring Creek.

Background/Context

6. The true-right of the Wairau River between SH1 and Ferry Road, is protected by two Primary stopbanks LW05 & LW06. These two critical pieces of flood protection infrastructure prevent deep-fast moving water from flooding the township of Spring Creek, SH1, and KiwiRail's Main North Line.

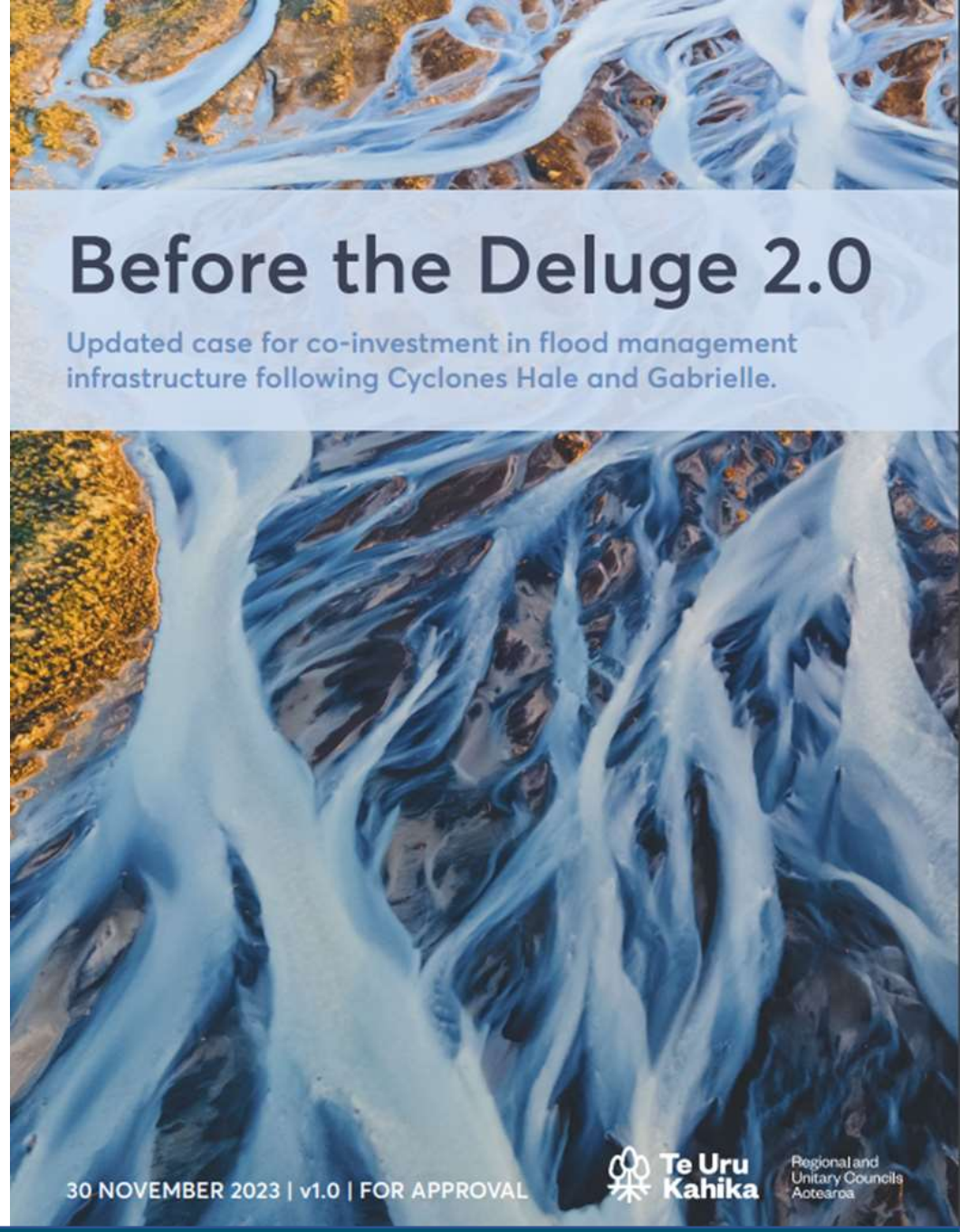
7. The 2016 Kaikōura earthquake resulted in lateral spread along much of LW06, requiring the full reconstruction of a large section of bank in 2017 (Figures 1-4 below). Whilst both LW05 and LW06 were assessed post-earthquake, lateral spread was only identified along the grassed sections of bank (LW06) where surface cracking was clearly visible on the bare ground. LW05 differs from LW06, in that Peninsula Road runs along much of its length and the flexible chipseal surfacing can mask the visual identification of lateral spread.

8. During the July 2021 flood event, surface cracking became evident in LW05 opposite 18 Dodson Street (Figure 5 below). At the peak of the flood, Rivers Engineers reported feeling a swelling movement in the bank, suggesting an internal loss of stability. It is most likely that a latent failure has lain dormant since the 2016 earthquake and not materialised until the bank was fully loaded. This is not to suggest any wrongdoing during the post-earthquake inspection, it is simply a limitation of any visual assessment.

Kanoa/IRG

Central Government Co-investment Scheme

- Co-investment previously sought through *'Before the Deluge'* in Budget 2023
- Re-submitted for 60% contribution from Central Government in *'Before the Deluge 2.0'*
- Decision to be announced in Budget 2024



Kānoa
Regional Economic Development & Investment Unit

Resilient River Communities

Central Government support

Kānoa
Regional Economic Development
& Investment Unit

Resilient River
Communities

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Rock resources

2024 Pukaka Quarry Development

2024 Pukaka Quarry Development

2024 Pukaka Quarry Development

2024 Pukaka Quarry Development

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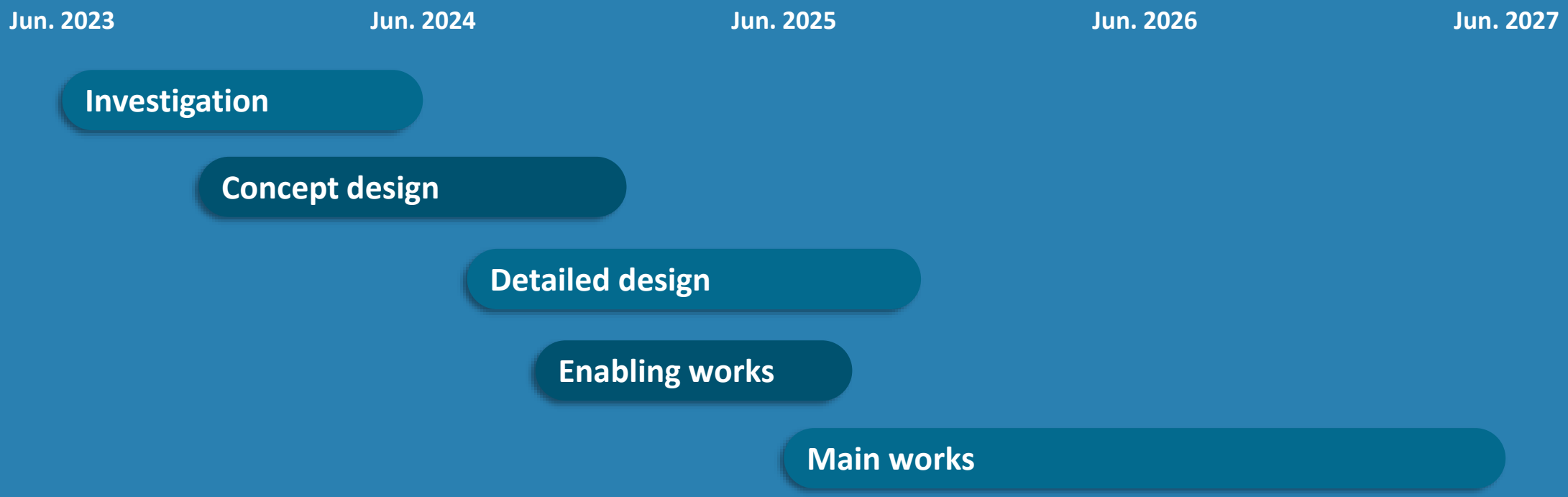
Timeline



Proposed Timeline


5th June 2024
N


5th June 2024
N

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Risk mitigation

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

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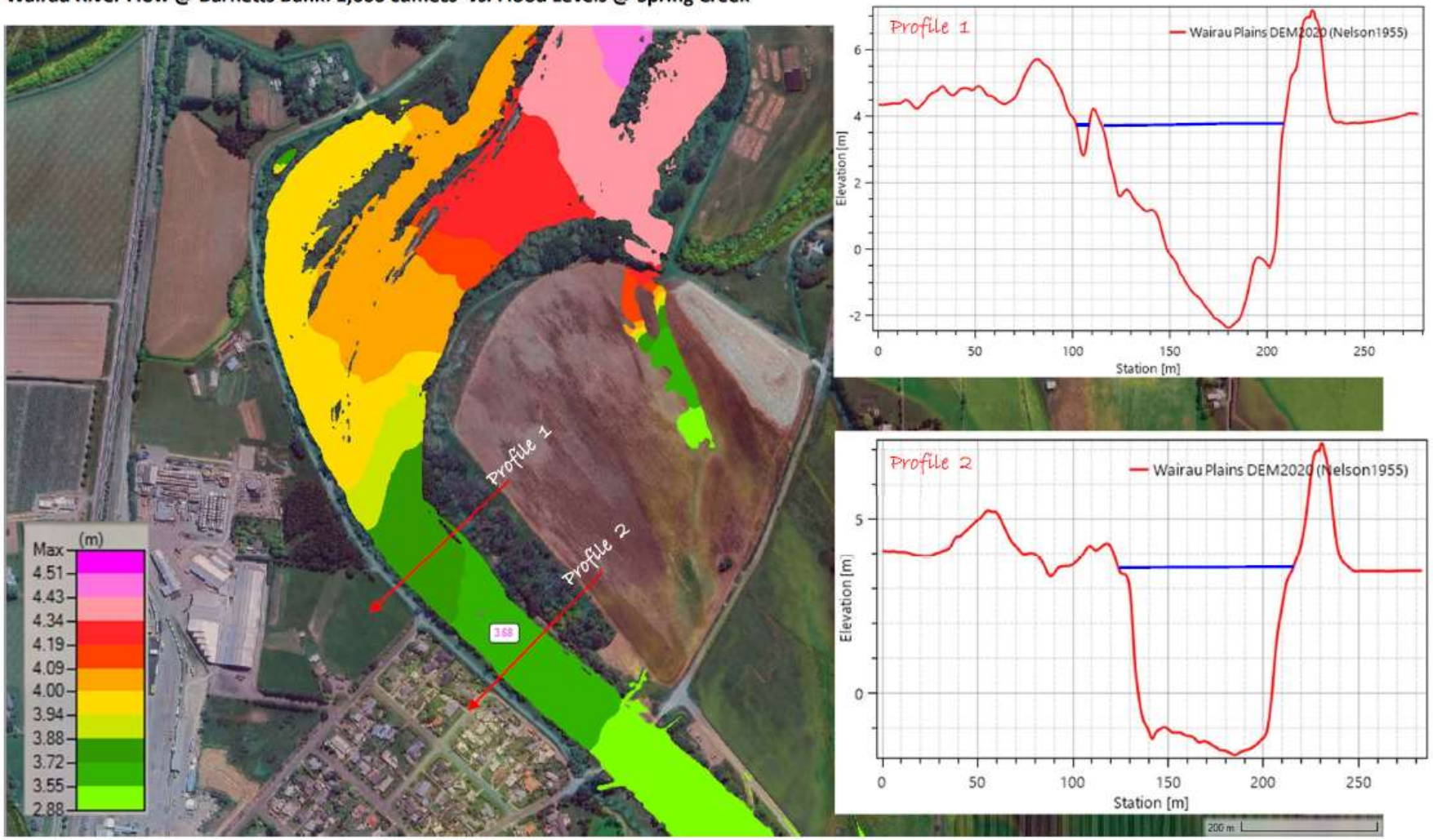
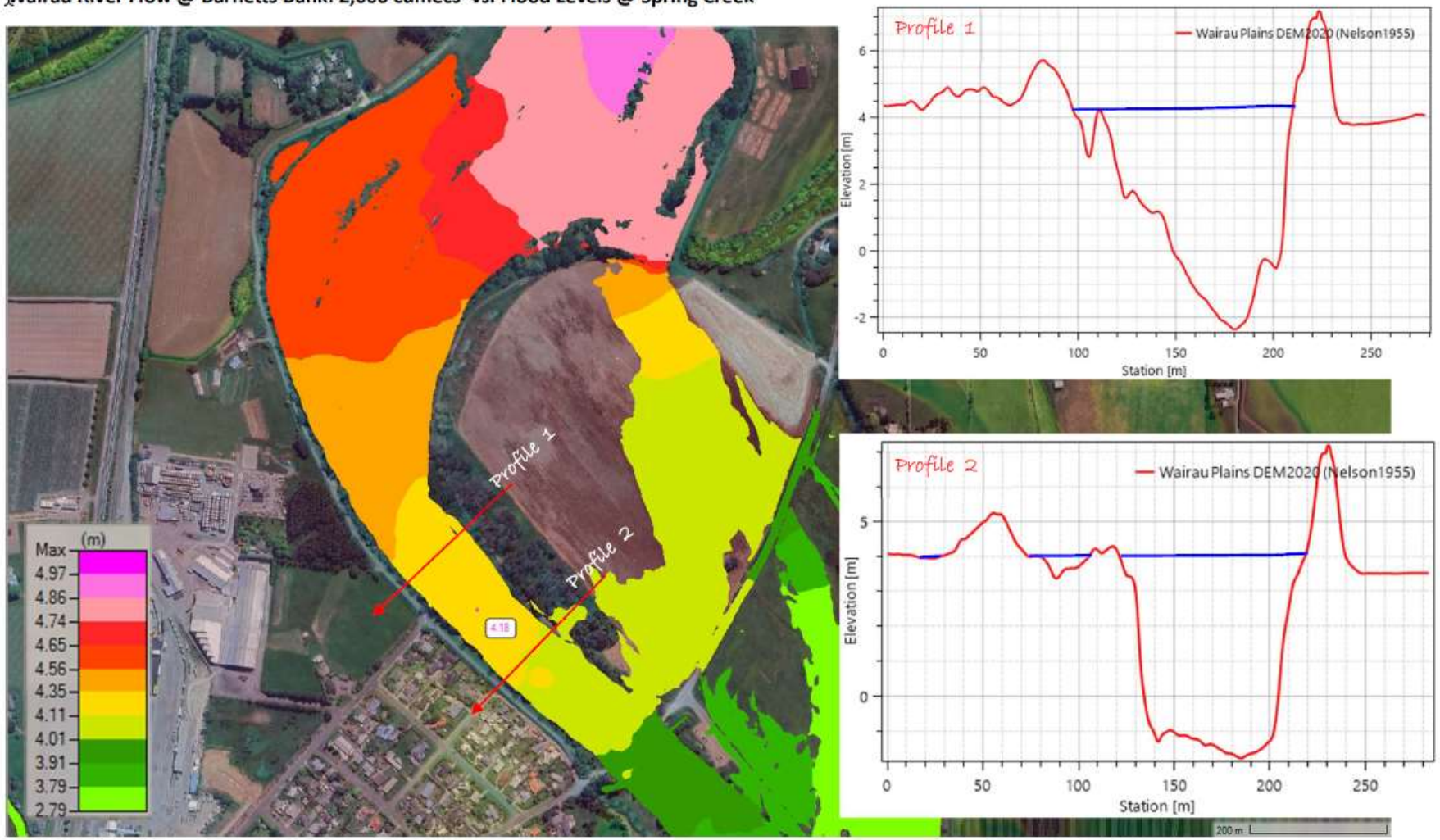
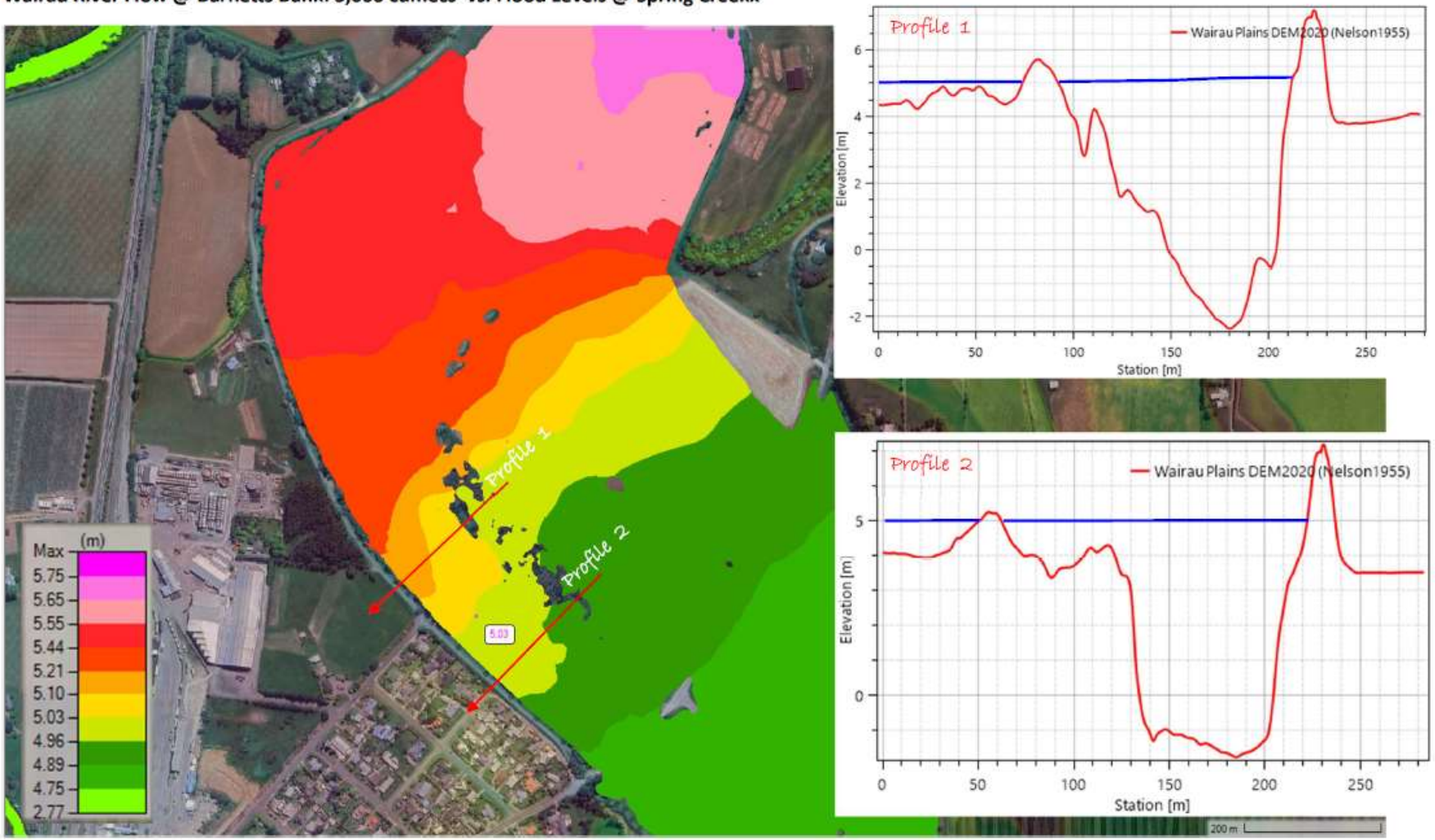
Wairau River Flow @ Barnetts Bank: 1,600 cumecs vs. Flood Levels @ Spring Creek



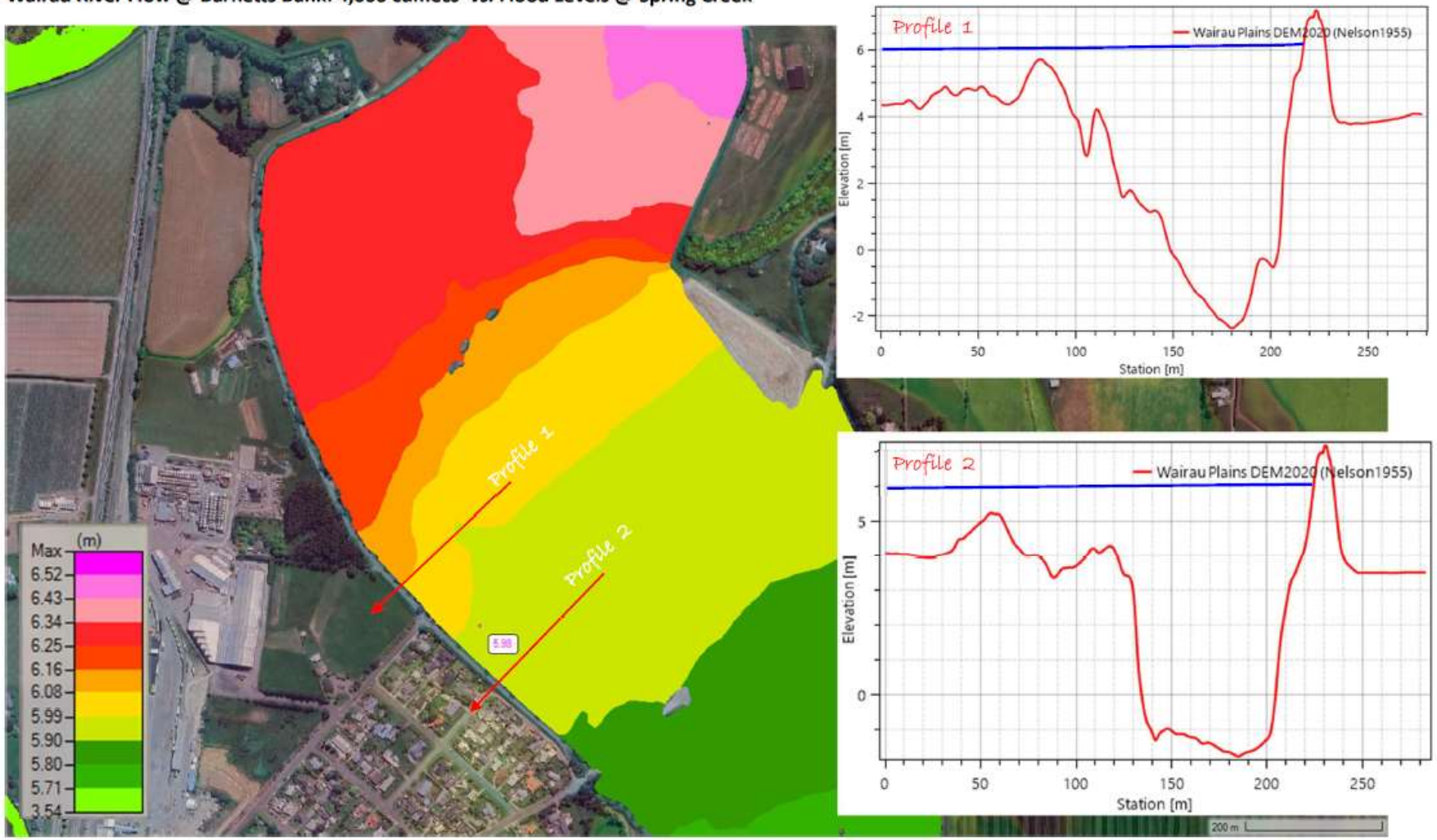
Wairau River Flow @ Barnetts Bank: 2,000 cumecs vs. Flood Levels @ Spring Creek



Wairau River Flow @ Barnetts Bank: 3,000 cumecs vs. Flood Levels @ Spring Creekx



Wairau River Flow @ Barnetts Bank: 4,000 cumecs vs. Flood Levels @ Spring Creek



Flood Return Period Analysis

Wairau River at Tuamarina

3,000 cumecs: 6.5-year ARI or 15% AEP

4,000 cumecs: 18.9-year ARI or 5.3% AEP

Flood Return Period Analysis, Wairau River at Tuamarina

Prepared by Charlotte Tomlinson, Environmental Scientist – Hydrology, MDC April 2024

The entire flow record for the site Wairau River at Tuamarina was used in this analysis, from the 5th of July 1960 to the 24th of April 2024. A GEV (generalised extreme value) distribution was used, with the resulting flow-return period curve displayed with a linear scale.

Return periods have **decreased slightly** for each flow compared to historical return period analysis. This is because several large floods have occurred in recent years, which makes their occurrence more frequent in the time series.

Table 1. Return periods of different flood flows for Wairau at Tuamarina.

Flood flow m^3/s	Return period (yrs)	Annual Probability	Annual Probability (%)
1,941	2.33 (mean annual flood)	0.43	43%
2,000	2.4	0.42	42%
3,000	6.5	0.15	15%
4,000	18.9	0.053	5.3%

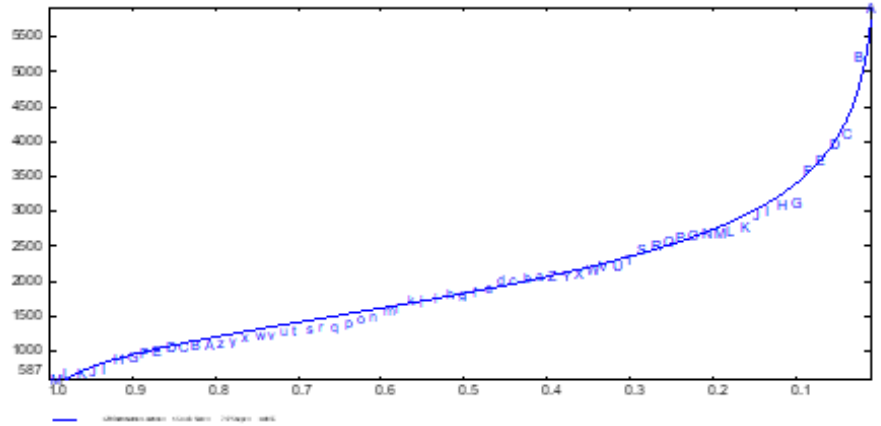
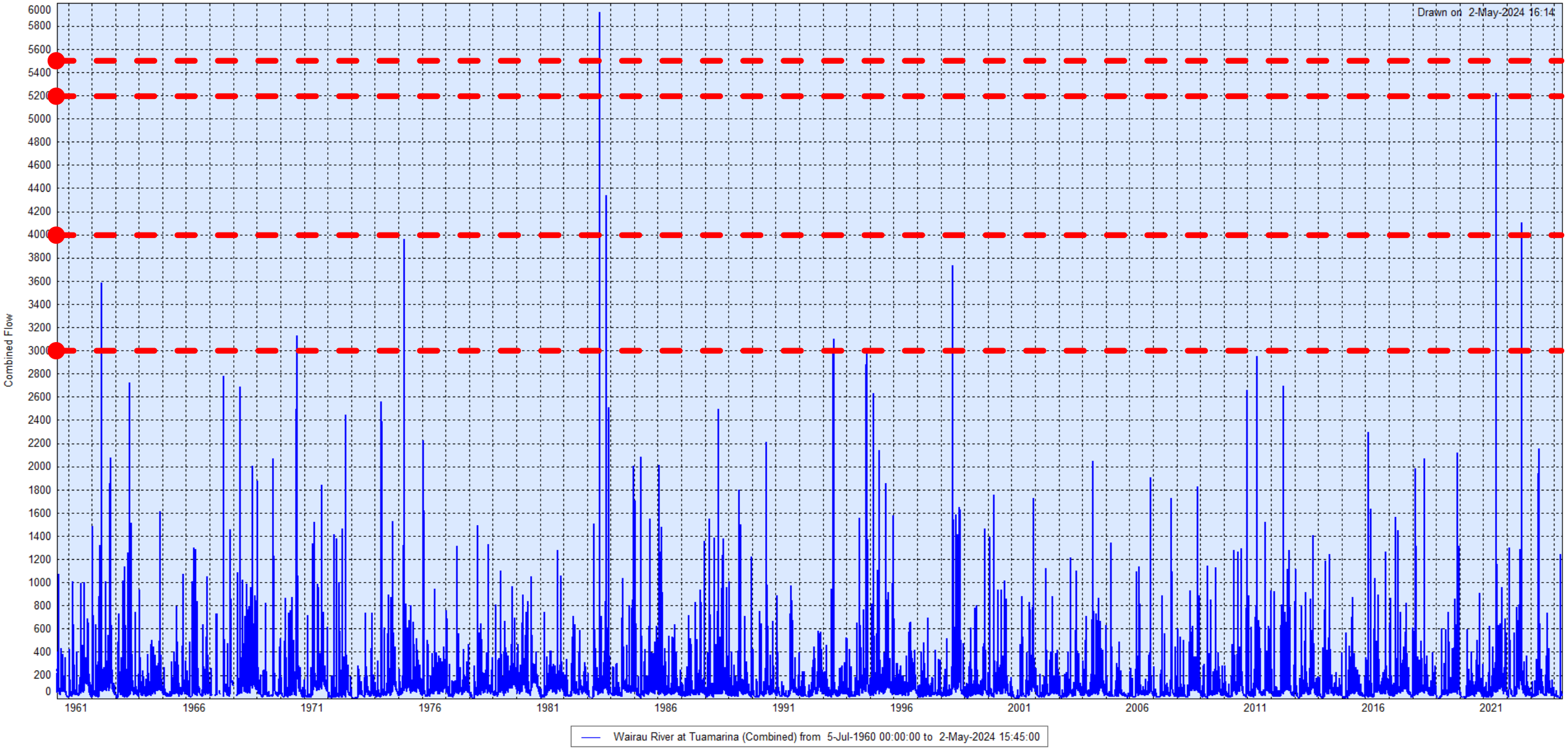


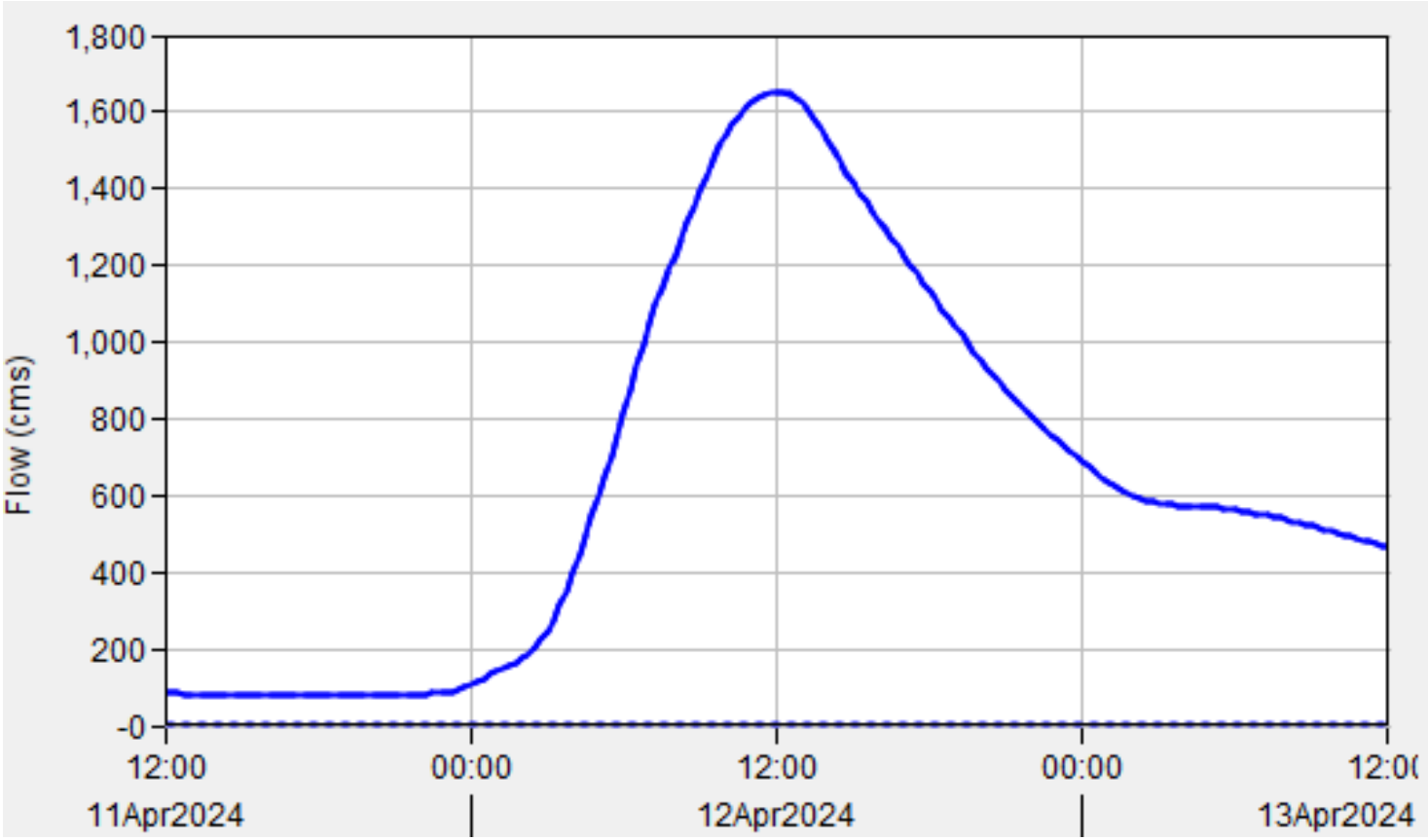
Figure 1. Fit distribution analysis for Wairau at Tuamarina (y-axis is flow, x-axis is annual probability).


Drawn on 2-May-2024 16:14
Combined Flow
6000
5800
5600
5400
5200
5000
4800
4600
4400
4200
4000
3800
3600
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
1961
1966
1971
1976
1981
1986
1991
1996
2001
2006
2011
2016
2021
Wairau River at Tuamarina (Combined) from 5-Jul-1960 00:00:00 to 2-May-2024 15:45:00

12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

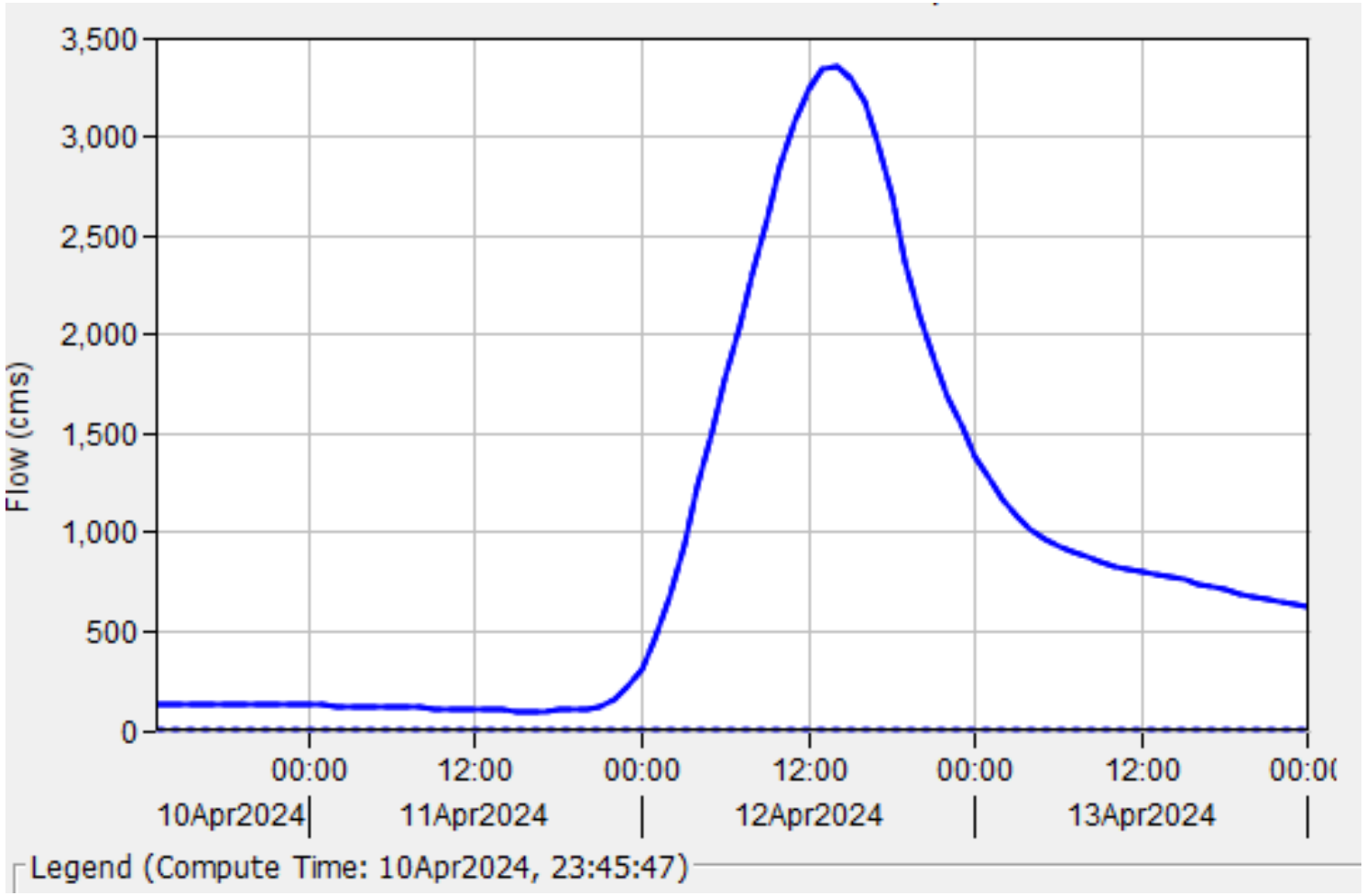
14:31 – Weds 10.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

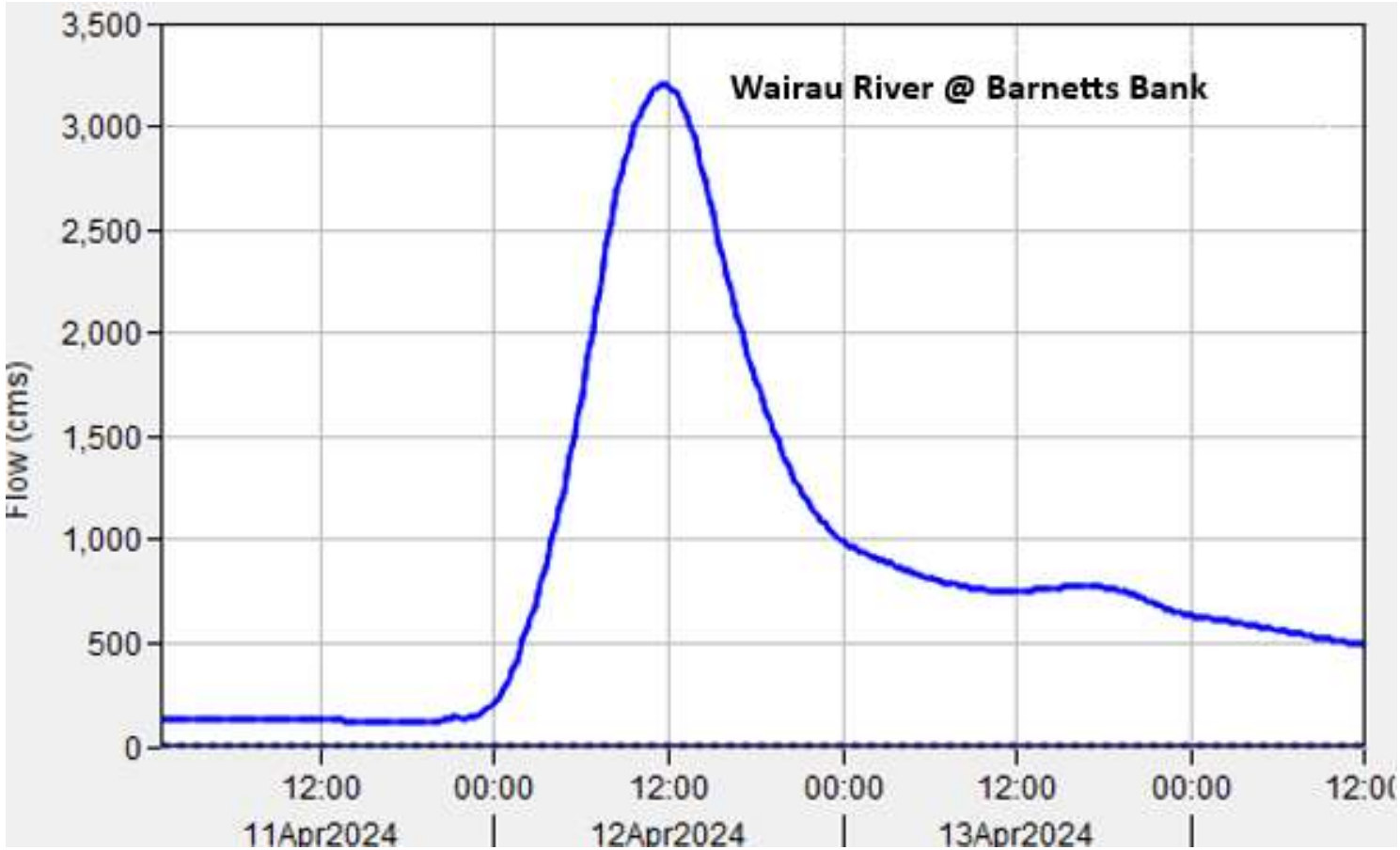
00:10 – Thur 11.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

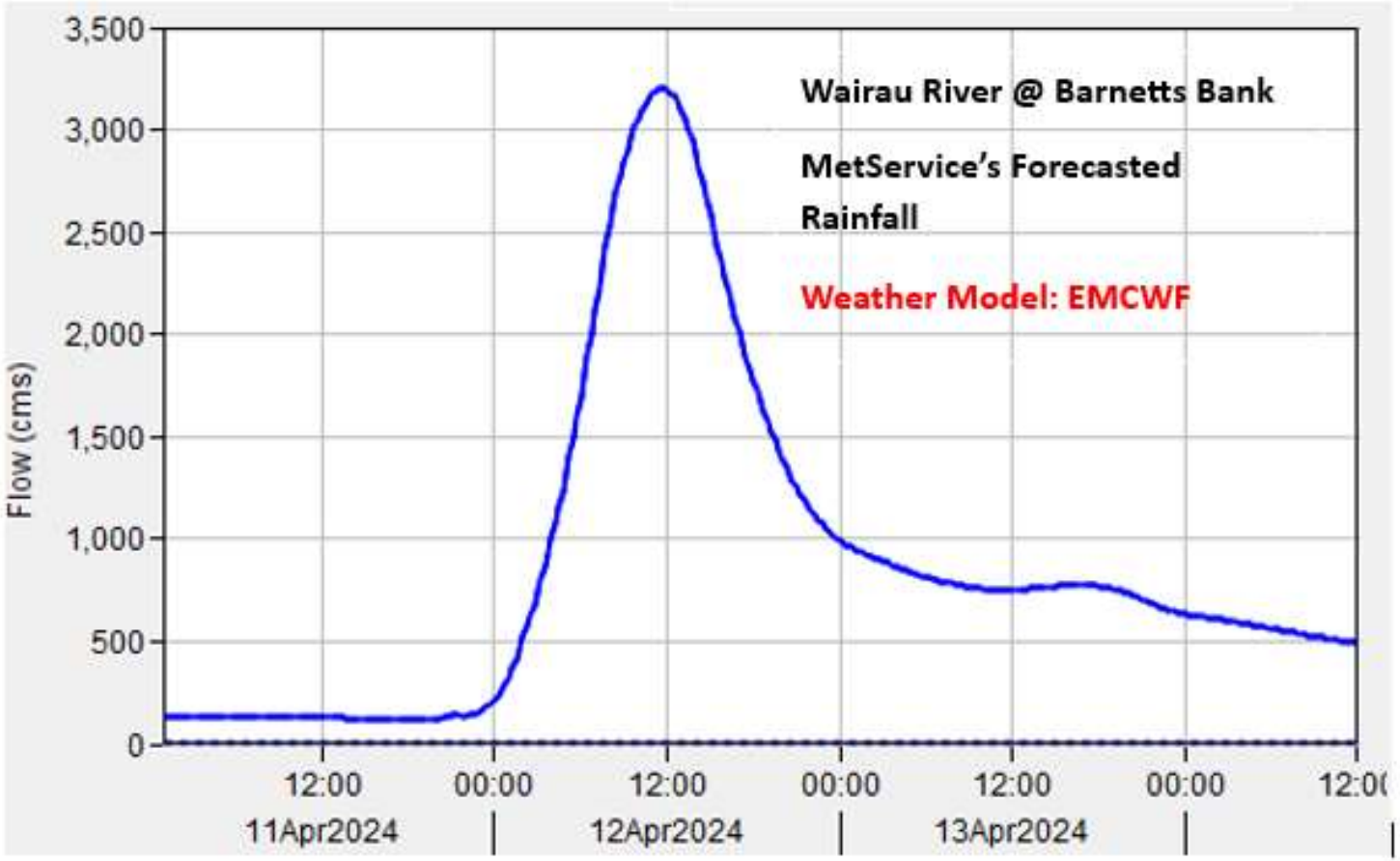
11:42 – Thur 11.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

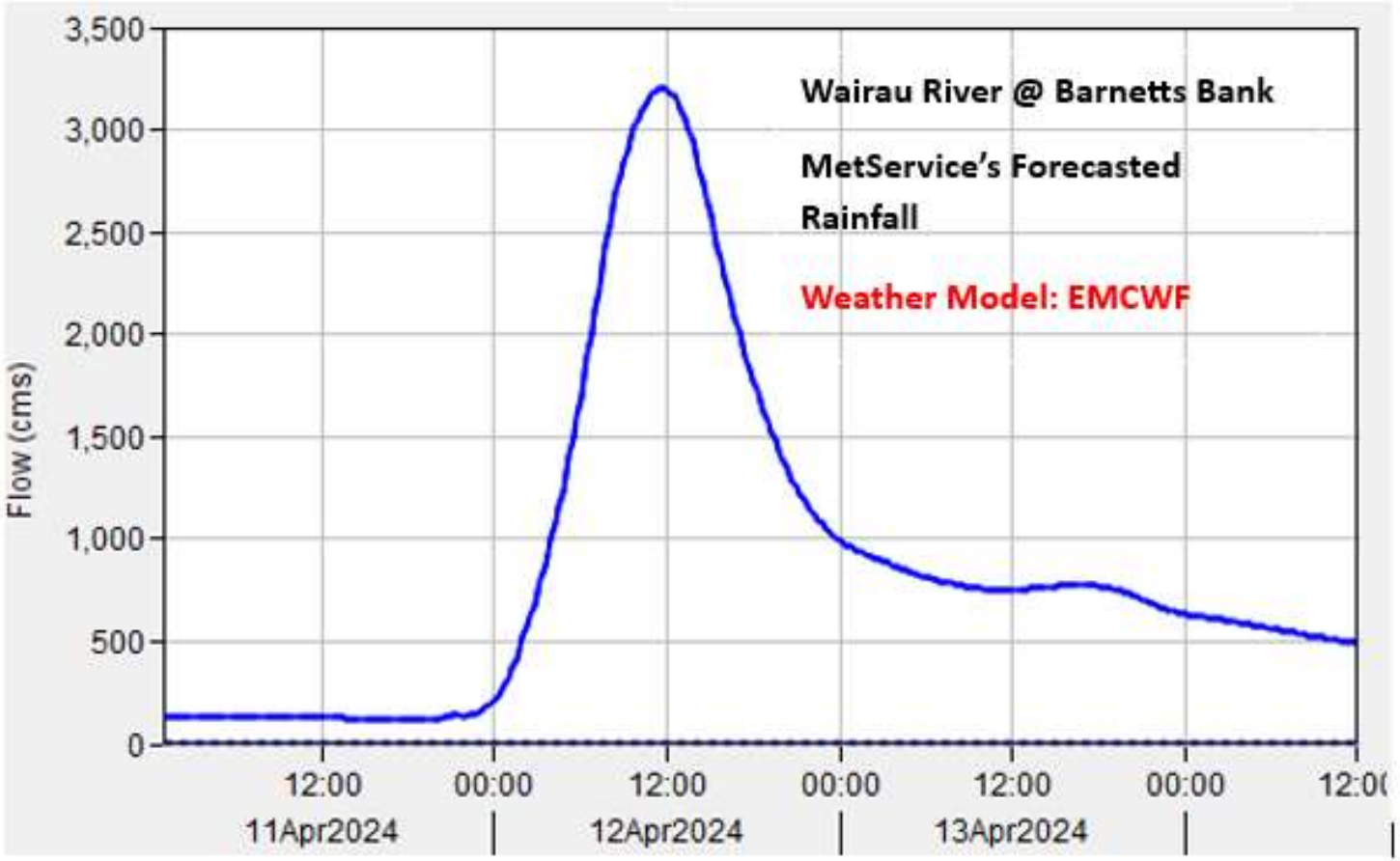
17:50 – Thur 11.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

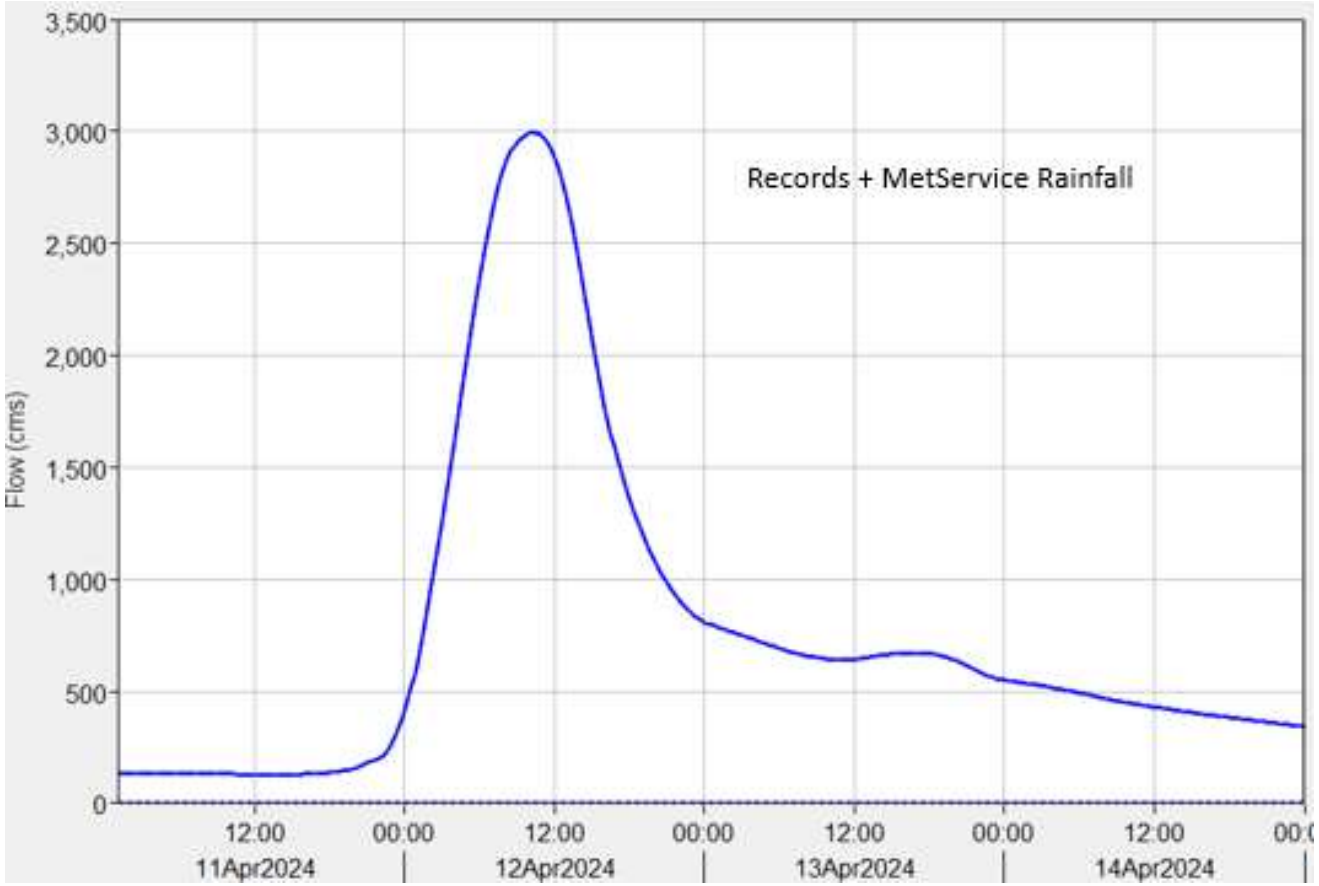
17:50 – Thur 11.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

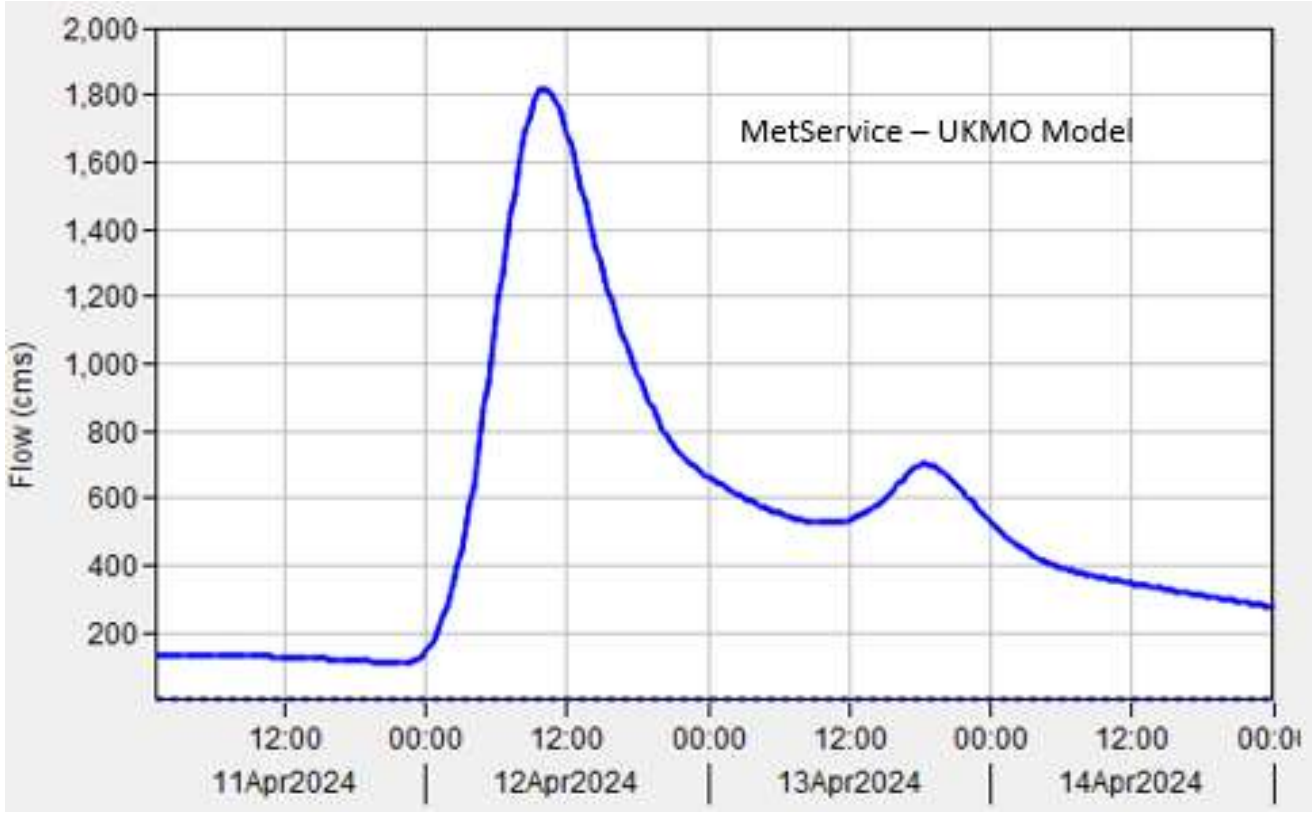
23:14 – Thur 11.04.2024



12th April 2024 Flood

HEC-HMS Hydrologic Modelling System

23:46 – Thur 11.04.2024



MARLBOROUGH DISTRICT COUNCIL

Questions & Answers

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

marlborough.govt.nz

Thank you

Andy White MSafLead | BEng (Hons) | MEngNZ
Rivers and Drainage Engineering Manager

Anne Bruce
Engineering Assistant

Rivers and Drainage | Marlborough District Council

p. +64 (0)3 520 7400
e. rivers@marlborough.govt.nz

Resilient River Communities