

# Wairoa Flood Protection Optioneering Multi-Criteria Analysis



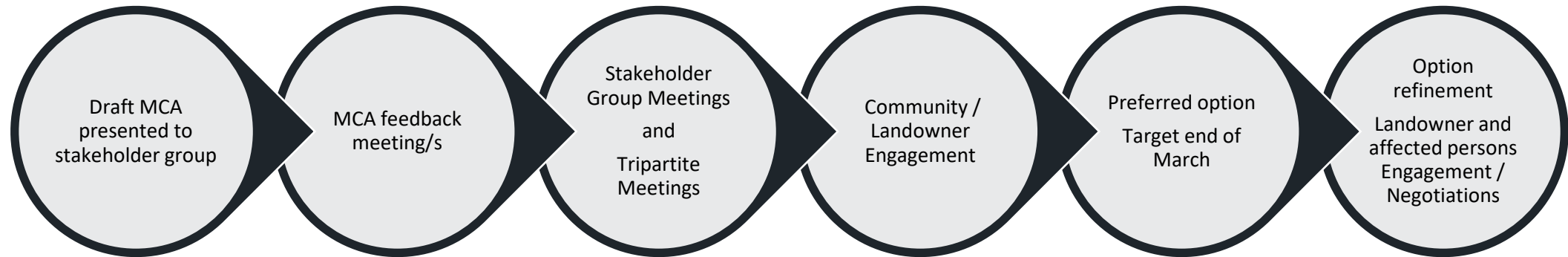
# Overview

- What is a Multi-Criteria Analysis and why do one?
- Process from here
- Options overview
- 'Do nothing' as an option
- Scoring and criteria
- MCA Results
- How the results were derived

# What is a Multi-Criteria Analysis (MCA) and why do one?

- 'A MCA is an analysis tool used to identify and compare different options by assessing their effects, performance, impacts, and trade-offs'
- An MCA provides a systematic approach often used for supporting complex decision making
- Does not result in a recommendation or a decision

# Process from here?



Peer reviews anticipated along the process

# Summary of Options



Option 1A  
(floodway)

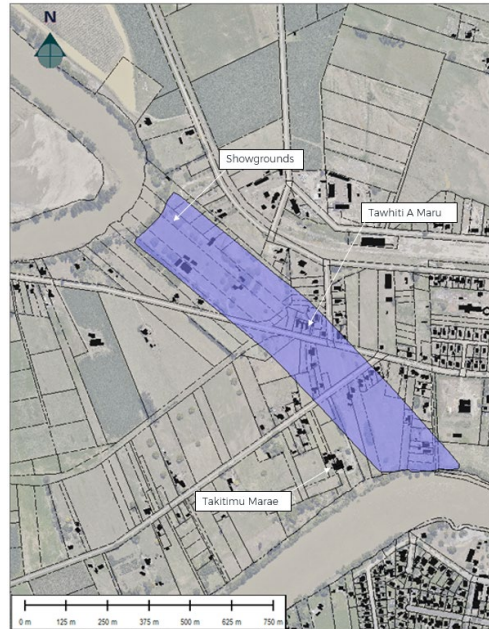


Option 5  
(stopbank)



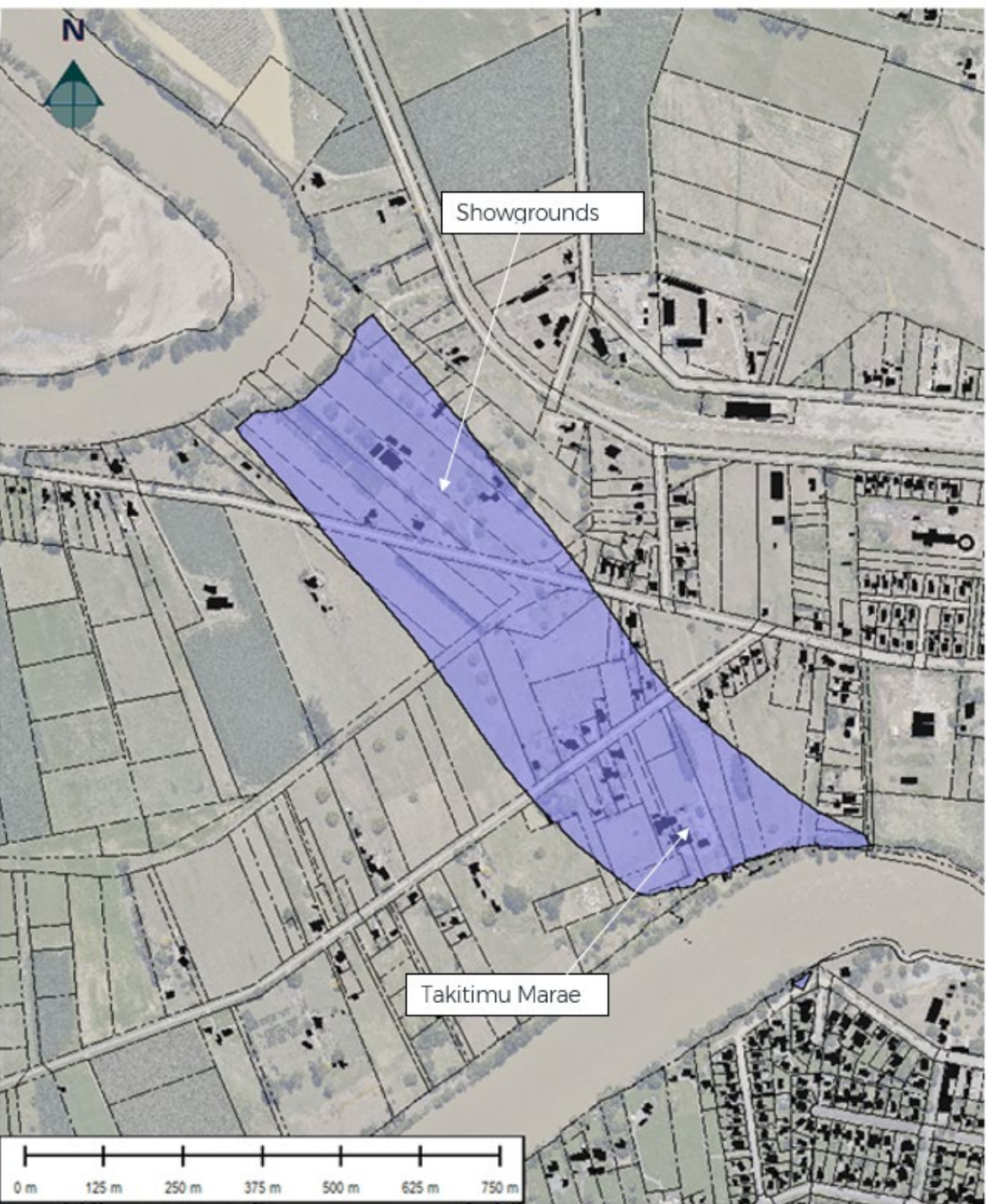
Option 17 (combination  
of Option 5 and Option  
7)

# Additional Option



Option 1B

Option 1A



# Option 5 (Stopbank)

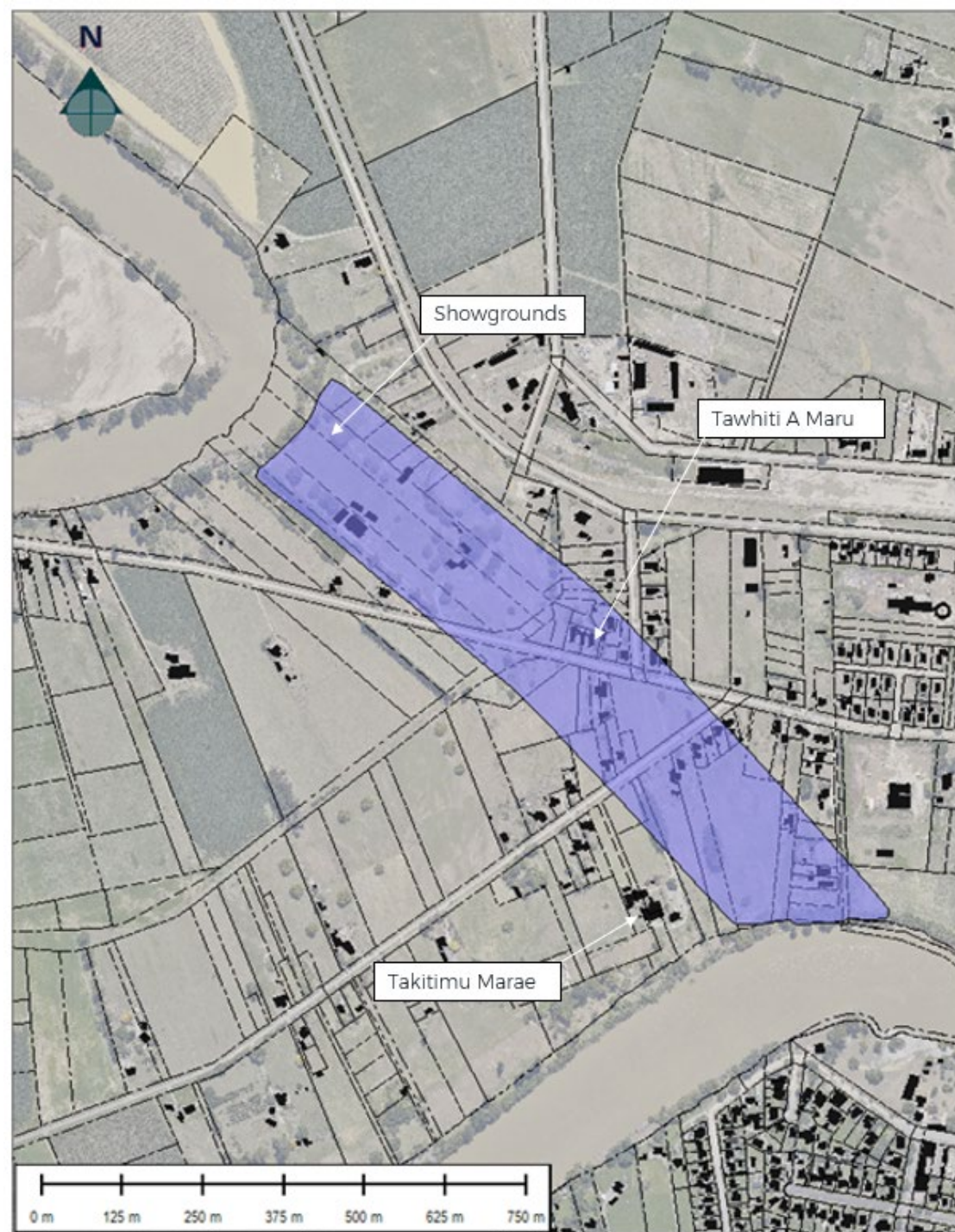




Option 17  
(combination  
of Option 5  
Stopbank and  
Option 7  
Floodway



Option 1B



‘Do nothing’ as  
an option

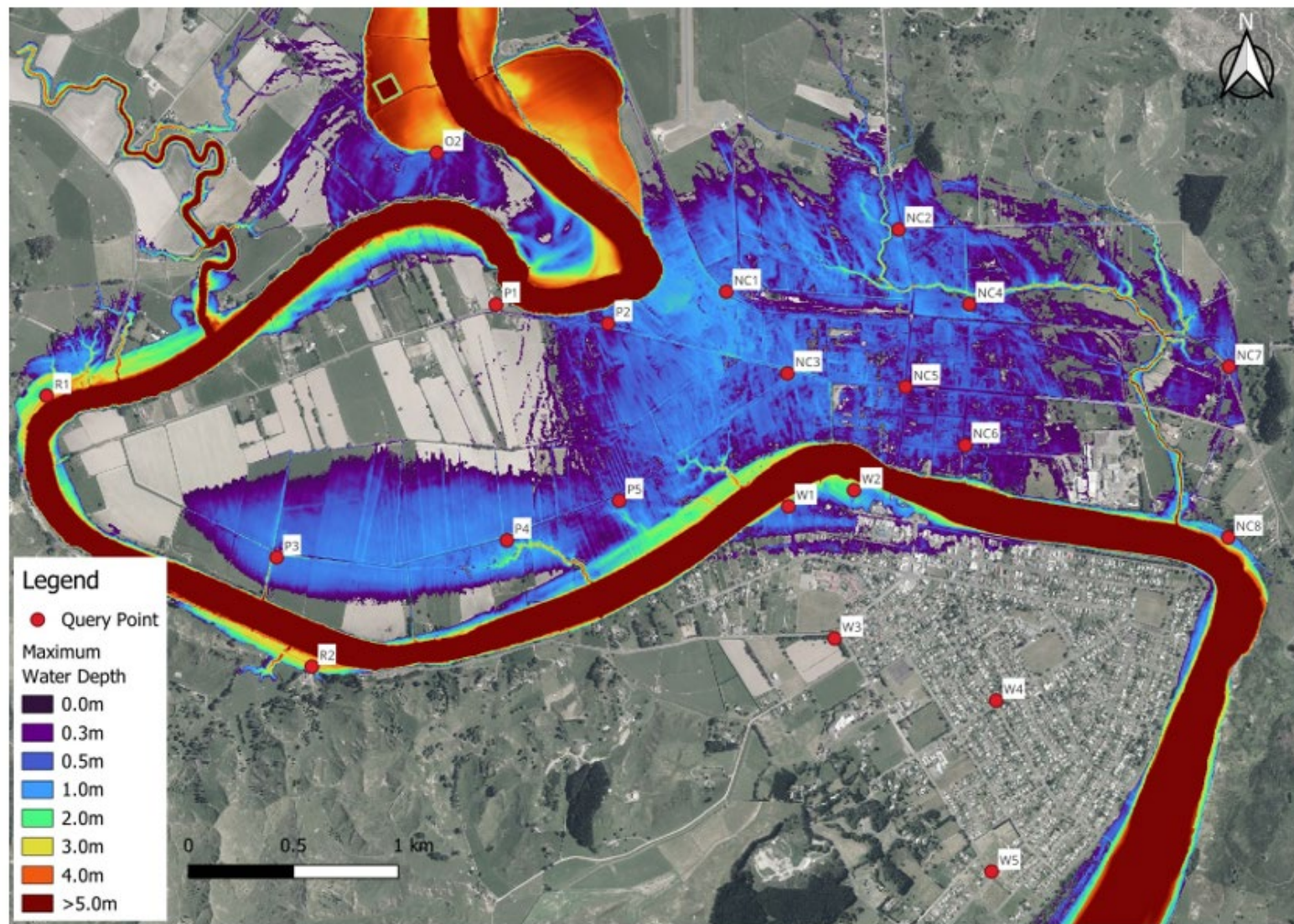


Figure A-2. 1% AEP, current climate predicted maximum water depth.

# MCA Criteria

- Cultural Values
  - Public Safety Risk
  - Risk of Failure during a flood
  - Houses protected from flooding
  - Ecological Impacts
  - Construction Costs
  - Property Impacts
  - Landscape Impacts
  - Archaeological Site Impacts
  - Construction Implementability
  - Consentability
- Flood resilience and mana whenua / community wellbeing

# MCA Scoring

Magnitude	Definition	Score
Large positive (+ve)	Major positive impacts resulting in substantial and long-term improvements or enhancements of the existing environment (social, economic, cultural, environmental, wellbeing and safety). Very Low cost. Very low number of affected properties. Very High number of protected houses.	3
Moderate positive (+ve)	Moderate positive impacts, possibly of short-, medium-, or long-term duration. Positive impacts may be in terms of new opportunities and outcomes of enhancement or improvement to environment (social, economic, cultural, environmental, wellbeing and safety). Low cost. Low number of affected properties. High number of protected houses.	2
Slightly positive (+ve)	Minimal positive impact, possibly only lasting over the short term. May be confined to a limited area. Moderate - Low cost. Moderate-Low number of affected properties. Moderate-high number of protected houses.	1
Neutral	Neutral - no discernible or predicted positive or negative impact/ Counterfactual could be the do-minimum or do-nothing.	0
Slight negative (-ve)	Minimal negative impact, possibly only lasting over the short term, and <u>definitely able</u> to be managed or mitigated. May be confined to a small area. Moderate-high cost. Moderately high number of affected properties. Low to moderate number of protected houses.	-1
Moderate negative (-ve)	Moderate negative impact. Impacts may be short-, medium-, or long-term and are highly likely to respond to management actions. High cost. High number of affected properties. Low number of protected houses.	-2
Large negative (-ve)	Impacts with serious, <u>long-term</u> and possibly irreversible effect leading to serious damage, degradation or deterioration of the physical, economic, cultural or social environment. Very high cost. Very high number of affected properties. Very low number of protected houses.	-3

# MCA Scoring

Option	MCA Score	Ranking
Option 1A (Floodway)	-6.2	2
Option 5 (Stopbank)	-4.2	1
Option 17 (combination of Option 5 and 7)	-6.7	3
Option 1B (Floodway)	-6.9	4

# Cultural Values Impacts

- No Cultural Impact Assessment currently available to guide scoring
- All options impact a marae
- All options may impact archaeological sites
- All options therefore given a score of 'Large Negative'

## Public Safety Risk

- Public access and safety under normal conditions
- Risk to livestock and people under flood conditions
- Potential to catch people and livestock un-prepared
- Vehicle hazards
- Evacuation
- Ability to trap / strand livestock and people
- Ability to carry debris

Option	MCA Score
Option 1A (Floodway)	Moderate Negative
Option 5 (Stopbank)	Slight Negative (-1)
Option 17 (Combination of Option 5 and 7)	Moderate Negative
Option 1B (Flood way)	Moderate Negative

## Risk of Failure During a Flood

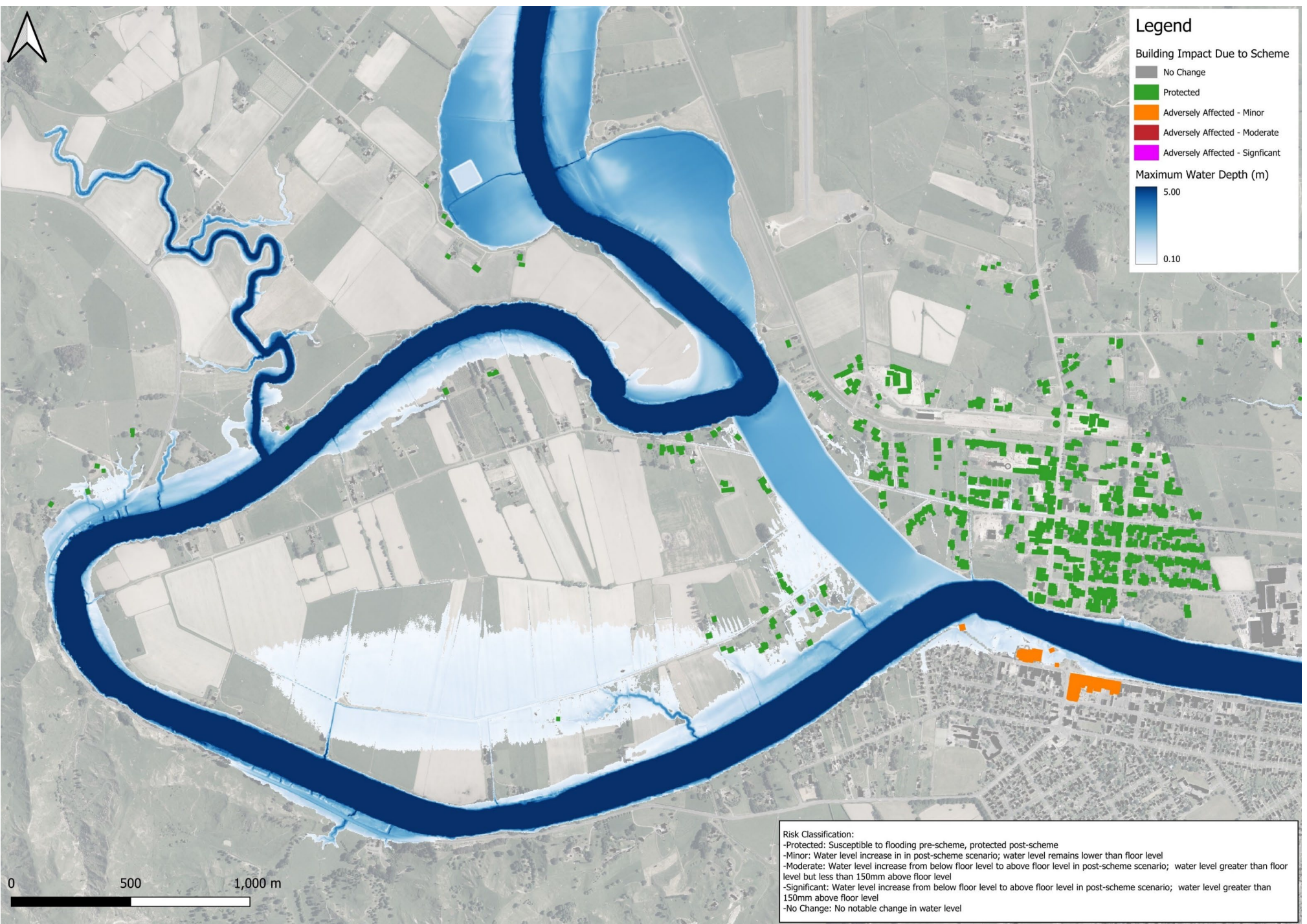
- Speed and consequence of failure
- Potential for failure

Option	MCA Score
Option 1A (Floodway)	Slight Negative (-1)
Option 5 (Stopbank)	Large Negative (-3)
Option 17 (Combination of Option 5 and 7)	Large Negative (-3)
Option 1B (Flood way)	Slight Negative (-1)



# Houses Protected From Flooding

Option	Approx Number of dwellings that no longer flood with the option in place	Approx. Number of dwellings with a decrease of freeboard as consequence of option	Approx. Number of dwellings that did not flood before that will now experience flooding as a consequence of option implementation, plus number of dwellings demolished to construct option	MSC Score
Option 1A (Floodway)	163	0	7	Moderate Positive
Option 5 (Stopbank)	161	21	7	Moderate Positive
Option 17 (Combination of Option 5 and 7)	161	21	7	Moderate Positive
Option 1B (Flood way)	163	0	18	Slightly positive



**Legend**

**Building Impact Due to Scheme**

- No Change
- Protected
- Adversely Affected - Minor
- Adversely Affected - Moderate
- Adversely Affected - Significant

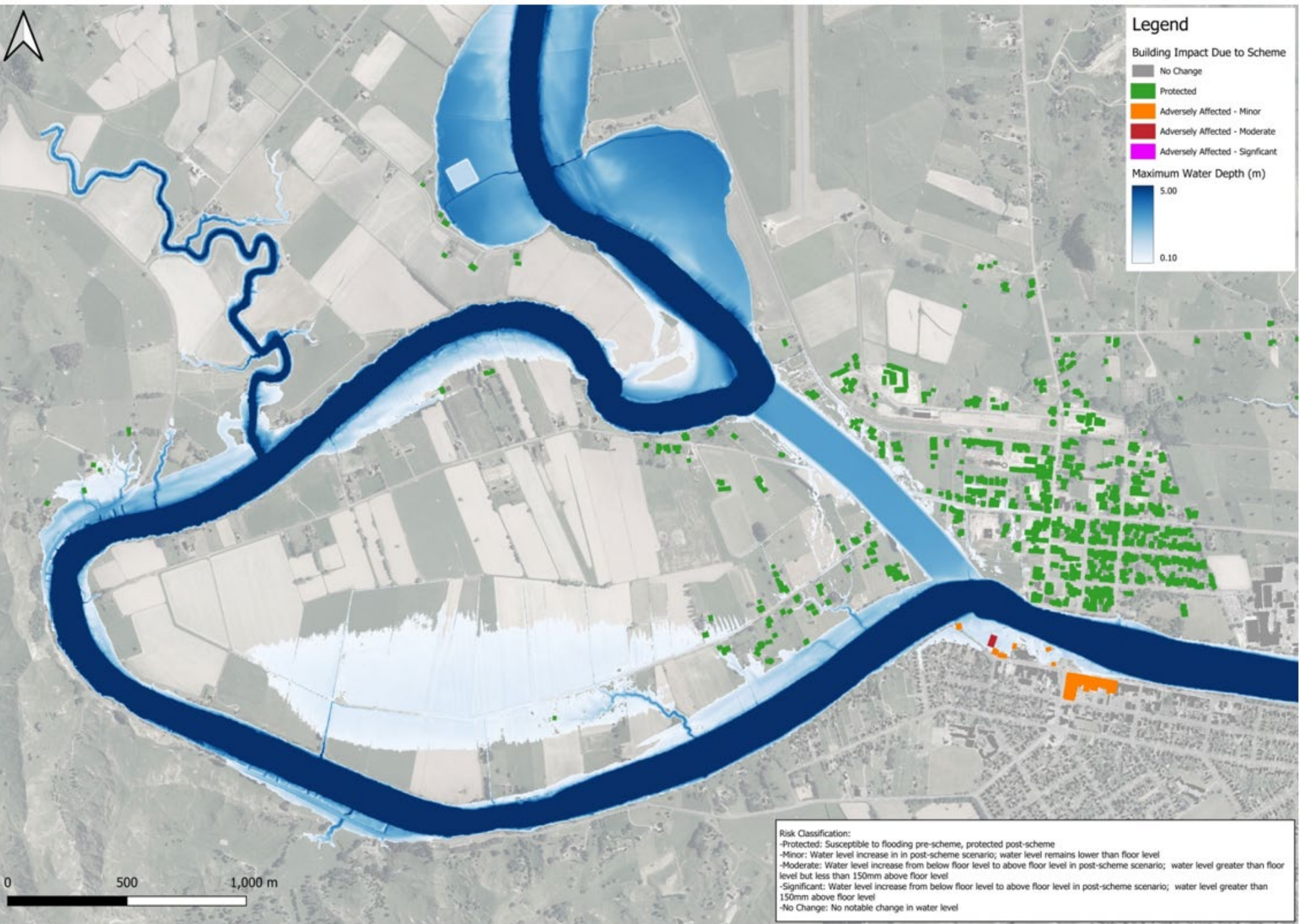
**Maximum Water Depth (m)**

- 5.00
- 0.10

0 500 1,000 m

**Risk Classification:**  
-Protected: Susceptible to flooding pre-scheme, protected post-scheme  
-Minor: Water level increase in post-scheme scenario; water level remains lower than floor level  
-Moderate: Water level increase from below floor level to above floor level in post-scheme scenario; water level greater than floor level but less than 150mm above floor level  
-Significant: Water level increase from below floor level to above floor level in post-scheme scenario; water level greater than 150mm above floor level  
-No Change: No notable change in water level





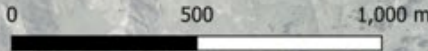
**Legend**

**Building Impact Due to Scheme**

- No Change
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- Adversely Affected - Minor
- Adversely Affected - Moderate
- Adversely Affected - Significant

**Maximum Water Depth (m)**

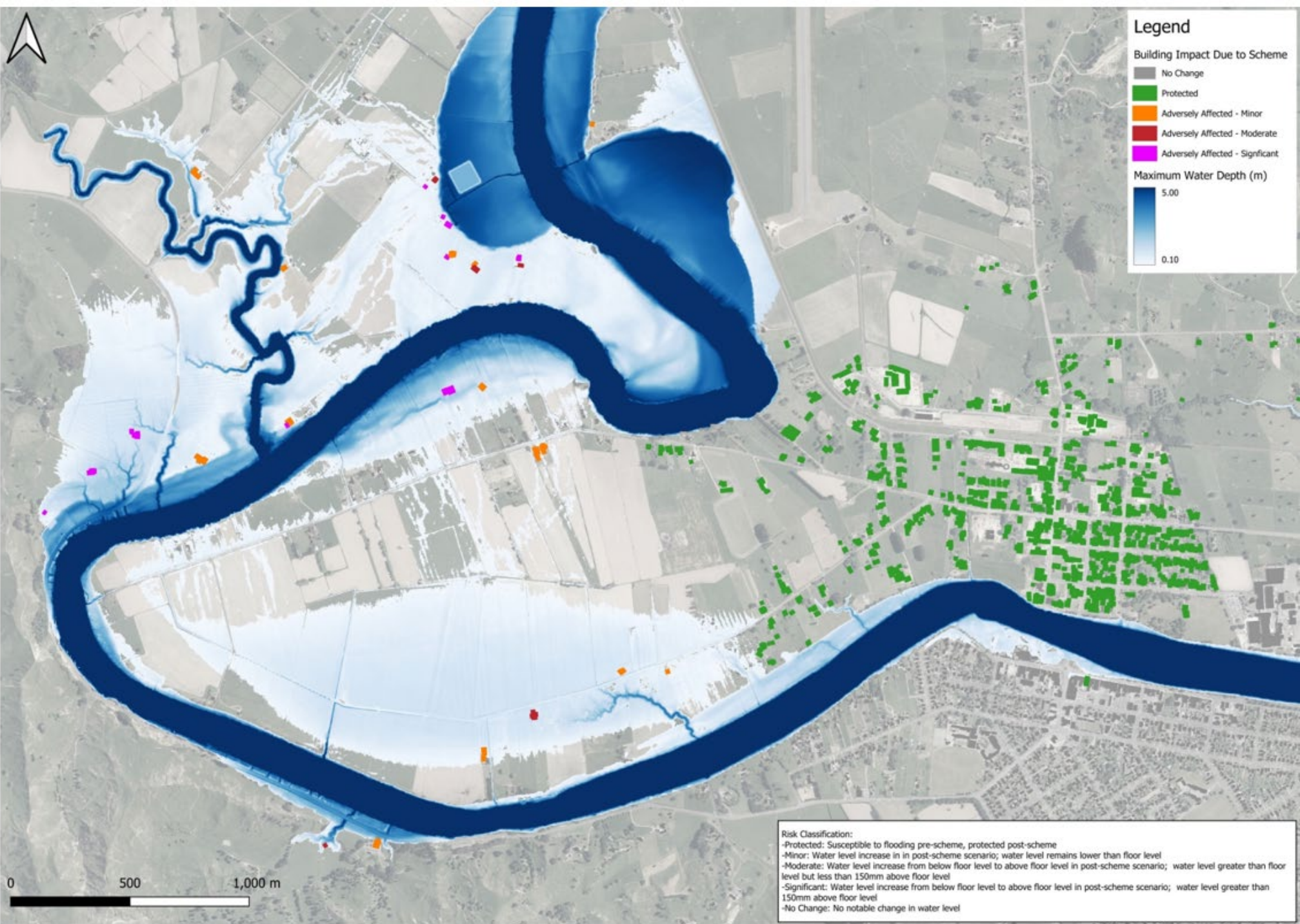
- 5.00
- 0.10

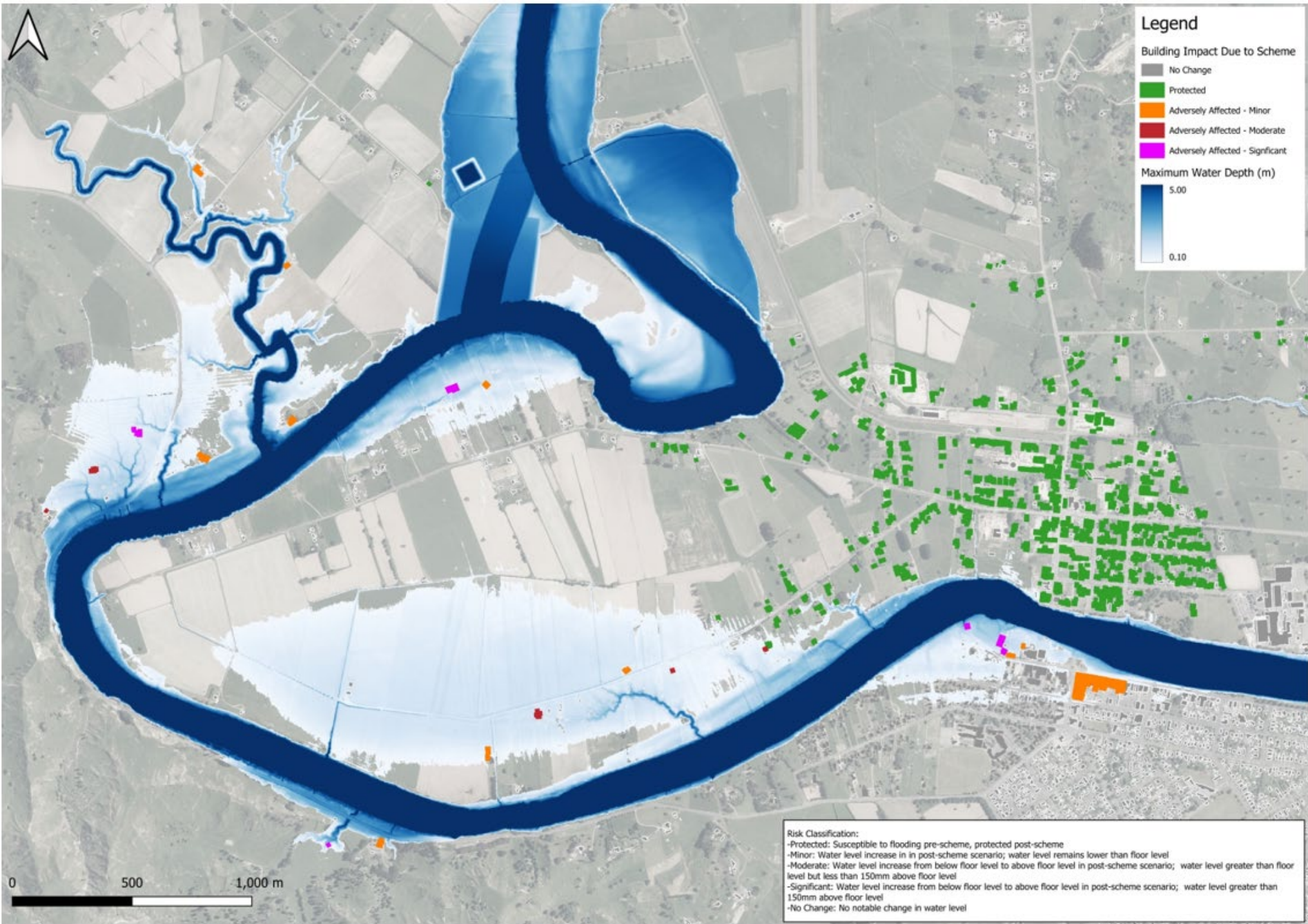


**Risk Classification:**

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# Ecological Impacts

	Option 1A	Option 1B	Option 5	Option 17
Vegetation	Low	Low	Low	Low
Habitat for birds	Low	Low	Low	Low
Habitat for bats	High	High	High	High
Habitat for Lizards and/or frogs	High	High	Moderate	Moderate
Wetlands	Low	Low	Low	Low
Watercourses	Low	Low	Low	Low
Freshwater Fauna	Low	Low	Very Low	Very Low
Aggregated MCA score	Slight Negative	Slight Negative	Slight Negative	Slight Negative

# Construction Costs

Option	Mid cost estimate	MCA Score
Option 1A (Floodway)	\$83.6 million	Slight Negative (-1)
Option 5 (Stopbank)	\$35 million	Large Positive (3)
Option 17 (Combination of Option 5 and 7)	\$76 million	Neutral (0)
Option 1B (Flood way)	\$63.6 million	Neutral (0)

- Costs within 10% of the 70 million budget were scored 0.
- Costs greater than 10% but less than 25% scored -1 or +1,
- Costs greater than 25% but less than 50% scored -2 or +2
- Costs greater than 50% scored -3 or +3

# Property Impacts

Option	Number of houses needing relocation /demolition for the option construction	Number of community buildings needing relocation/ demolition for the option construction	Number of other buildings needing relocation/ demolition for the option construction	Number of properties with land within the extent of the option	Estimated land area within the extent of the option.	MCA Score
Option 1A	7	5	15	41	33ha	Slight Negative (moderately high number of affected properties)
Option 1B	18	5	32	47	23ha	Moderate Negative (High number of affected properties)
Option 5	2	1	8	18	32ha	Slightly Positive (Moderate-high number of affected properties)
Option 17	3	1	12	23	47ha	Slightly Positive (Moderate-high number of affected properties)



# Landscape Impacts

Option	Score
Option 1A (Floodway)	Moderate Negative
Option 5 (Stopbank)	Moderate Negative
Option 17 (combination of Option 5 and 7)	Moderate Negative
Option 1B (Flood way)	Moderate Negative

# Archaeological Site Impacts

Option	Number of recorded sites	Risk rating recorded sites(4= max, 1 = least)	Risk rating earthworks volume (4=max, 1 = least)	Overall provisional risk assessment	MCA Score
Option 1A	1	1.5	3	Moderate to high	Moderate Negative
Option 1B	1	1.5	3	Moderate to high	Moderate Negative
Option 5	2	3	3	Moderate	Moderate Negative
Option 17	3	4.5	3	Moderate to high	Moderate Negative

# Construction Implementability

Option	Construction Implementability MCA score
Option 1A (Floodway)	Slight Negative
Option 5 (Stopbank)	Moderate Positive
Option 17 (combination of Option 5 and 7)	Slight Negative
Option 1B (Flood way)	Slight Negative

# Resource Consenting

Option	MCA Score
Option 1A (Floodway)	Moderate Negative
Option 5 (Stopbank)	Moderate Negative
Option 17 (combination of Option 5 and 7)	Moderate Negative
Option 1B (Flood way)	Moderate Negative