Summary

Karehana Park stormwater catchment improvements options as presented to Porirua City Council

13 September 2021

Context

The Stormwater Catchment Management and Improvements Project Team has been investigating options for mitigating the impact of flooding in the Karehana catchment.

We are seeking a solution to reduce the number of habitable floors (therefore buildings) affected by flooding. “Habitable” in this sense means “necessary to life’s basics” - the need to eat, sleep, rest, wash, etc. This excludes, for example, garages, sheds, and decks.

As outlined at the last community drop-in session, there are a number of factors that contribute to flooding in this catchment:

- a small and steep-sided valley with unstable colluvial soils, prone to erosion
- historical development has seen waterways boxed in and built over, affecting stormwater drainage; and building on flood plains
- limited capacity in the existing stormwater network
- increasing extreme weather events and sea level rise due to climate change.

Work to date

A long list of 22 options to improve the stormwater network and reduce flooding was developed, covering all parts of the catchment.

We outlined a short list of options for further investigation at the community drop-in session and on the website, focussing on three areas: around Karehana Park, upstream of Firth Road, and to the eastern side of the valley (Cluny Road and Reserve Road).

We undertook a multi-criteria analysis (MCA) to assess the impact, effectiveness, risks and costs of the options.

Defence and retreat

Our work to date has focussed on improving the flood ‘defence’ in the catchment but we have found that, because of the challenges in the catchment, it is unlikely to be achievable or affordable to build a stormwater network that will keep every property in the catchment safe from regular flooding. This means that even with extensive upgrades to the network some properties would remain at risk of frequent flooding, which we describe as the ‘residual’ risk.

Improving the stormwater network is a ‘defence’ strategy; that is, to keep floodwaters away from people and property. The councillors have recognised the limitations of the ‘defence only’ approach and have requested more information on ‘retreat’ options. Retreat means to move people and property away from floods or *above* the flood, through raising properties or some other on-property measures such as flood walls. The main disadvantage of retreat is that the water remains, so there is still a health and safety risks and clean-up costs.

The engineering assessment of options has identified that the project outcomes are most practically achieved through a combination of 'defence' and 'retreat' – that is, improving the stormwater network and addressing the 'residual' risk of regular flooding through house-raising or other measures where it is possible, where the owner(s) agree, and where it makes sense to do so.

Council has been asked to consider a range of 'defence' options and to consider supplementing these with targeted 'retreat' options.

Council has asked for more information on 'retreat' options. Further work is required to identify which properties could face 'residual' frequent flooding risk and be potential candidates for retreat based measures. The engineers will be undertaking this work over the next couple of weeks to provide the Council with a range of retreat approaches and likely costs, but whether and how this cost would be funded is subject to Council decisions.

Flood levels

Council has also been asked to consider the frequency of flood that we design upgrades for, such as a 1-in-10 year, 1-in-30 year or 1-in-100 years. This doesn't mean we plan for a flood every 30 years, it means that we base our planning on predictions of the level of flooding that has a 1 in 30 chance of occurring in any given year (or 'odds' of 30 to 1). We will also be considering the expected impact of climate change into these predicted flood levels.

As you know, Plimmerton has experienced flood events three times in the last few years, and last November's flood was about equivalent to a 1-in-30 year rainfall.

The options presented here are based on trying to achieve protection of habitable floor levels against a 1-in-30 year flood as a minimum.

If this minimum could be achieved, we would help reduce the most significant impacts of flooding in the catchment, which are the threat to health and safety and the impact of economic losses that come with losing insurance.

The estimated costs for the three options (excluding house-raising) range from $14.6 million to $21.9 million. The indicative cost for options for a 1-in-100 year flood range from $24 million to $40 million.

Options

On the following pages we provide an overview of three options:

- The highest-scoring engineering solution following the multi criteria analysis, which is a balance of defence and retreat strategies
- Two alternatives to the highest-scoring solution, with more emphasis on retreat.

Also attached are:

- flood maps modelling the impact of a 1-in-30 and 1-in-100 year flood, and the modelled impact of the highest-scoring solution.
- an indicative outline of a potential pump station in Karehana Park.

Contact information

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MCA highest-scoring solution

Mostly Defence

Primary

1 A Pump Station in Karehana Park, a 'feeder' channel in the park, a discharge main in Cluny Road, and a new outfall in Moana Road.

Secondary

2 Stream Upgrades between nos. 42 and 64 Airlie Rd.

3 Improved Inlet Protection at key network entry points.

4 Network Diversions to free up system capacity.

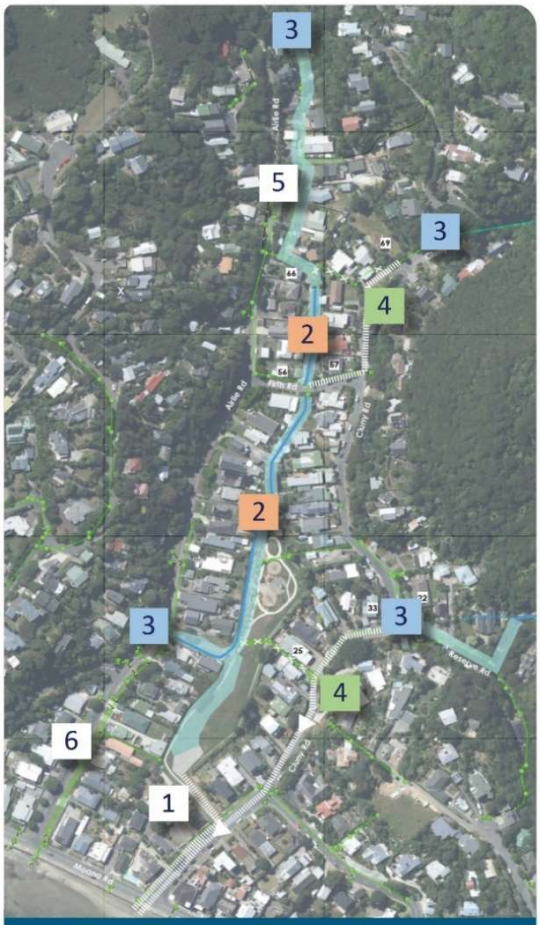
5 Secondary Flow Path Improvements where upgrades and diversions are impracticable.

6 Improvements to the Airlie Road Culverts.

Tertiary

Residual House Raising (not shown).

To protect habitable floors against a one-in 30-year flood, it is estimated this would involve raising approximately around 10 houses (numbers would be refined as work progresses).



The estimated cost is **$17.9** million (excluding house-raising).

Alternative 1:

Less Defence, More Retreat

Primary

1 A Pump Station in Karehana Park, a 'feeder' channel in the park, a discharge main in Cluny Road, and a new outfall in Moana Road.

Secondary

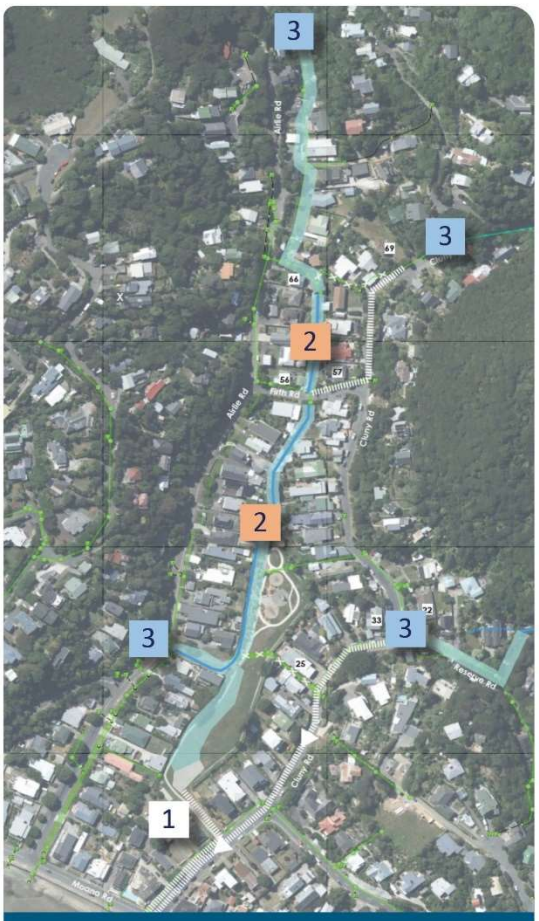
2 Stream Upgrades between nos. 42 and 64 Airlie Rd.

3 Improved Inlet Protection at key network entry points.

Tertiary

Residual House Raising (not shown).

To protect habitable floors against a one-in 30-year flood, it is estimated this would involve raising around 10 to 15 houses (numbers would be refined as work progresses).



The estimated cost is **$12.7** million (excluding house-raising).

Alternative 2:

Even More Retreat

Primary

1 A Pump Station in Karehana Park, a 'feeder' channel in the park, a discharge main in Cluny Road, and a new outfall in Moana Road.

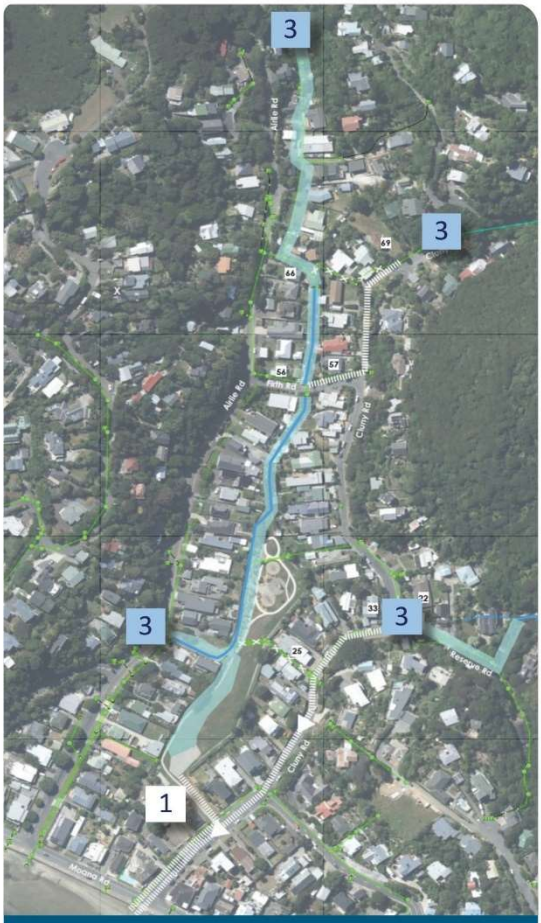
Secondary

3 Improved Inlet Protection at key network entry points.

Tertiary

Residual House Raising (not shown).

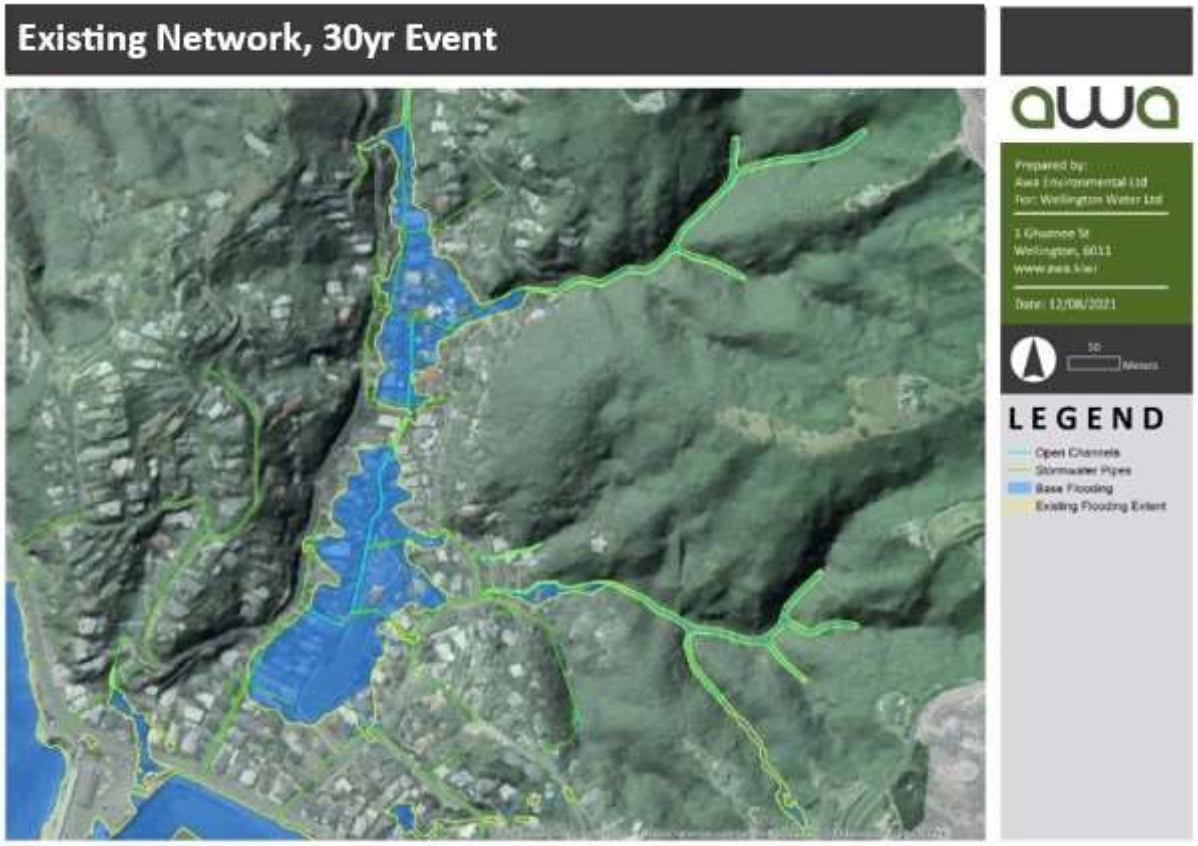
To protect habitable floors against a one-in 30-year flood, it is estimated this would involve raising about 15 to 20 houses (numbers would be refined as work progresses.



The estimated cost is **$9.5** million (excluding house-raising).

Map 1

This map shows the maximum flood extents of a 1-in-30 year flood in the existing network (yellow line). Note this is close to but not exactly the same as the November 2020 flood extent.



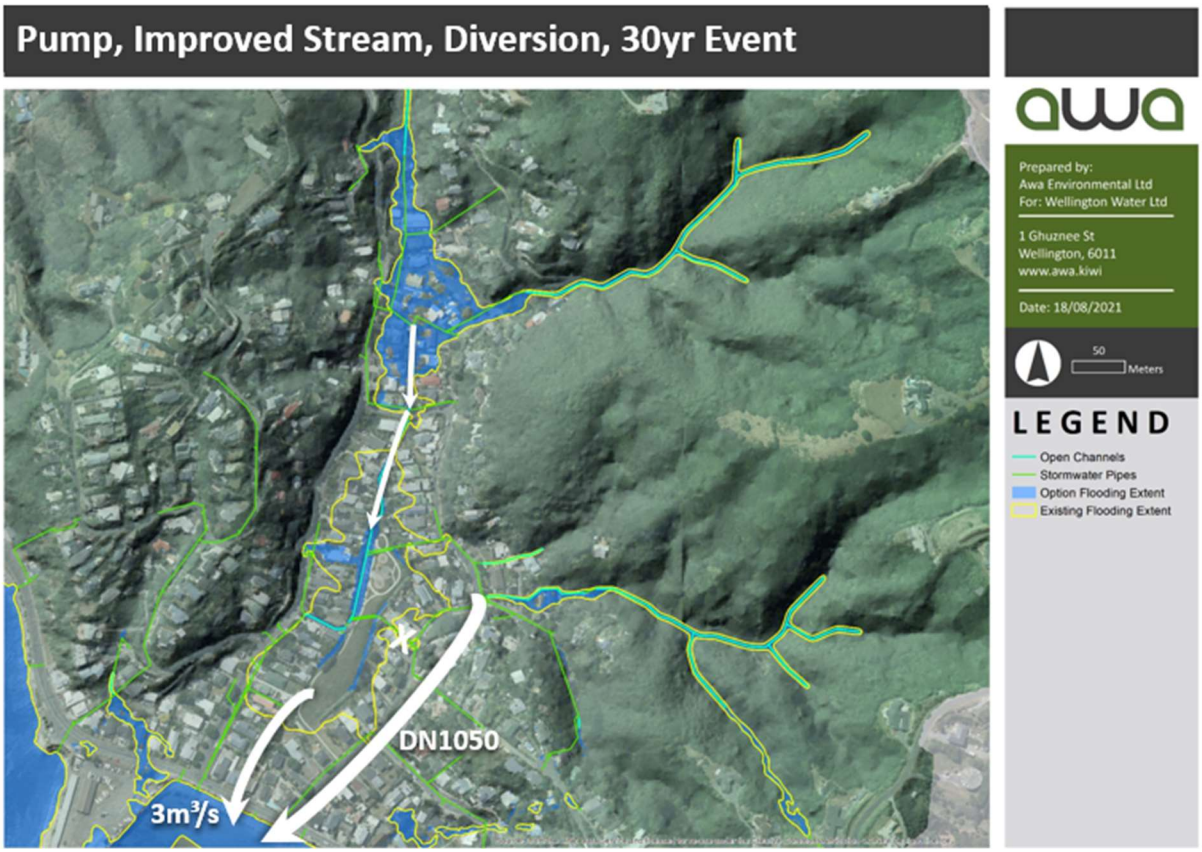
Map 2

This map shows the modelled impact of the highest-scoring solution on a 1-in-30 year flood. This includes:

- a pump station in Karehana Park with a capacity in the order of 3 cubic metres per second
- a diversion of a large sub-catchment's incoming flows through a main pipe in Cluny Road, preventing them from reaching the park
- improved capacity in Karehana Stream.

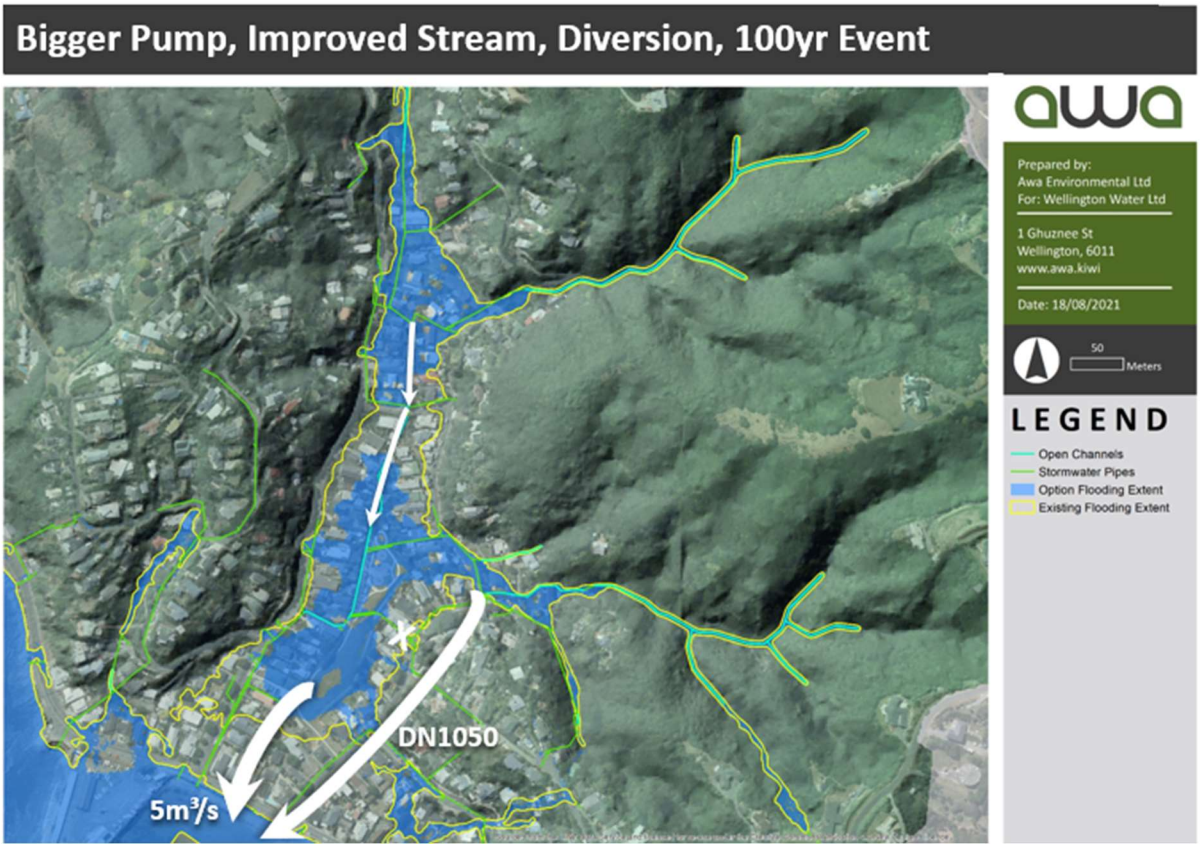
Note that the Project Team sees potential to further upgrade the stream above Firth Road to remove more water, with the co-operation of the owners of stream-side properties, and this would be explored in the concept design stage.

The yellow outline shows the flood extent in the existing, unimproved network (as shown on the previous map). This blue shows where the water would reach with this solution in place, demonstrating its effect.



Map 3

This map shows the modelled impact of the recommended option on a 1-in-100 year flood, with a larger (five cubic metre per second) pump.



Potential pump station

The image below shows:

1: “Feeder” channel through Karehana Park - a landscaped area shaped to carry water to the pump station

2: Pump station (mostly underground. The entry screen, access hatches, and electrical building would be visible)

3: Discharge pipe to sea

4: New outfall with outlet chamber, integrated into the existing sea wall and footpath. Access hatches and the outlet to the beach will be visible.

Indicative overview of pump station and associated works