Stantec

Memo

To:	Alistair Osborne	From:	Caitlin Meister Petone
Project/File:	310104067	Date:	20September 2024

Reference: Flood Hazard Handover

1 Background

The Greater Wellington Region is surrounded by both the ocean, and a network of rivers. This hazard presents challenges associated with planning, and having appropriate, relevant data to support this is crucial to the future of the region. Stantec was engaged by Wellington Water Ltd (WWL) to assist in the development of a tool to extract hazard information and produce a planning layer method. This memo provides a brief outline of the process, and tools created.

2 Tools

The process has six-steps with a separate tool for each of the first five steps. Each tool has been outlined in following subsections, as well as the important considerations undertaken, and the assumptions for each step. Figure 2-1 below outlines the process and the 6 steps.

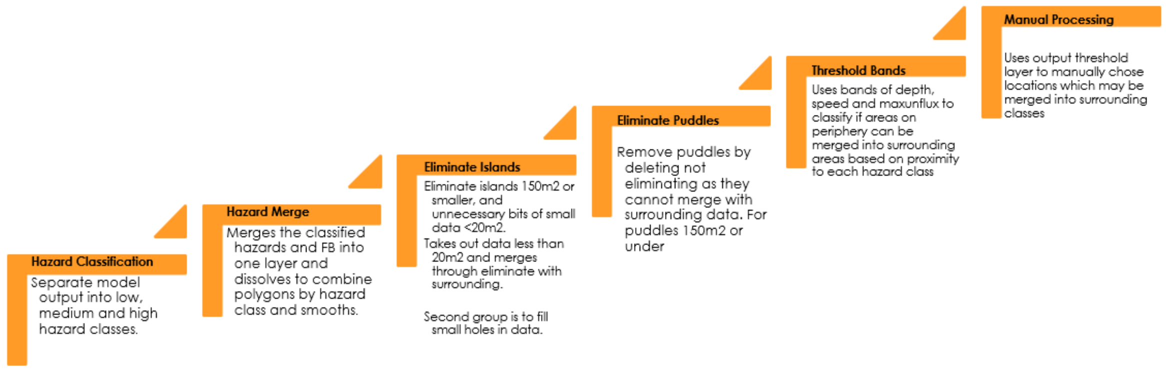

Figure 2-1 Processing tools for each stage for flood hazard planning layer

2.1 Step 2 Hazard Merge

Step 1: the Hazard Classification Tool has been excluded from this memo as it was produced by WWL and has not been amended.

The ‘Layer Smoothing’ tool was produced by WWL to smooth the classified hazard layer. This tool was edited to run and assessed. Issues identified in the WWL tool included:

- Loss of connectivity in the stream paths on the western hills, and
- Loss of individual polygons and attributes through multi-part.

The hazard merge tool (step 2) tool was produced as an alternative to the WWL 'Layer Smoothing' tool. Hazard Merge aims to bring the separate layers produced by the hazard classification tool (step 1) (low, medium and high hazard) to one layer. The purpose of this step is to enable editing where the layers move with each other. This tool also dissolves the polygons together with their neighbours where a matching hazard class exists, in order to produce a more cohesive map and integrates the freeboard output. An overlain comparison of the outputs from each tool is highlighted below, where the integrity of the stream connectivity is maintained.

It is recommended to extend the Hazard Merge tool to also integrate the steam channel layer as high hazard.

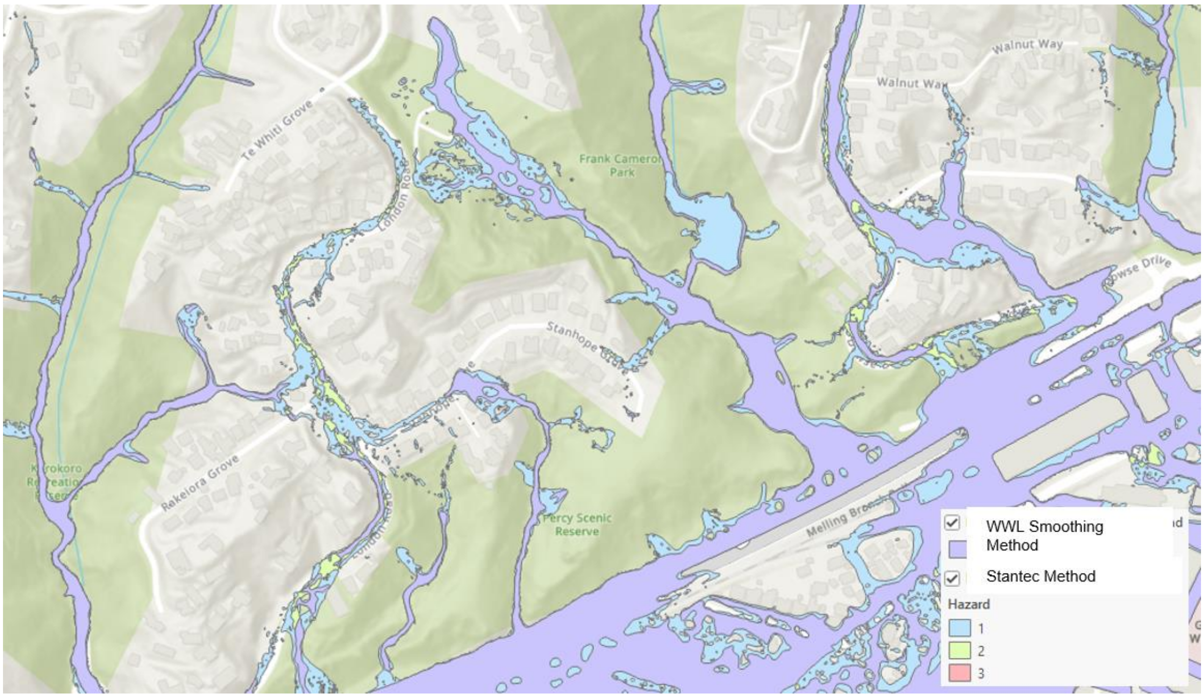

Figure 2-2 Overlain WWL smoothing tool output (purple) on Stantec smoothing tool output (multi) showing areas of lost stream connection

Two alternative tools were also produced for this step, which included a raster method using majority filter tools and an alternative eliminate and smooth tool but they were less effective than the hazard merge tool.

2.2 Step 3 Eliminate Islands

Step 3, or eliminate islands is another tool produced. This tool's aim is to integrate islands of different hazard classes with the surrounding class if the island is 150m^2 or smaller. This tool also removes holes in the data, that are smaller than 20m^2. The islands and holes operations are broken down into two separate groups. Key tools employed in this tool are eliminate, merge and dissolve. The tool's effect on the output of tool 2 (hazard merge) is shown below in Figure 2-3.

Reference: **Flood Hazard Handover**

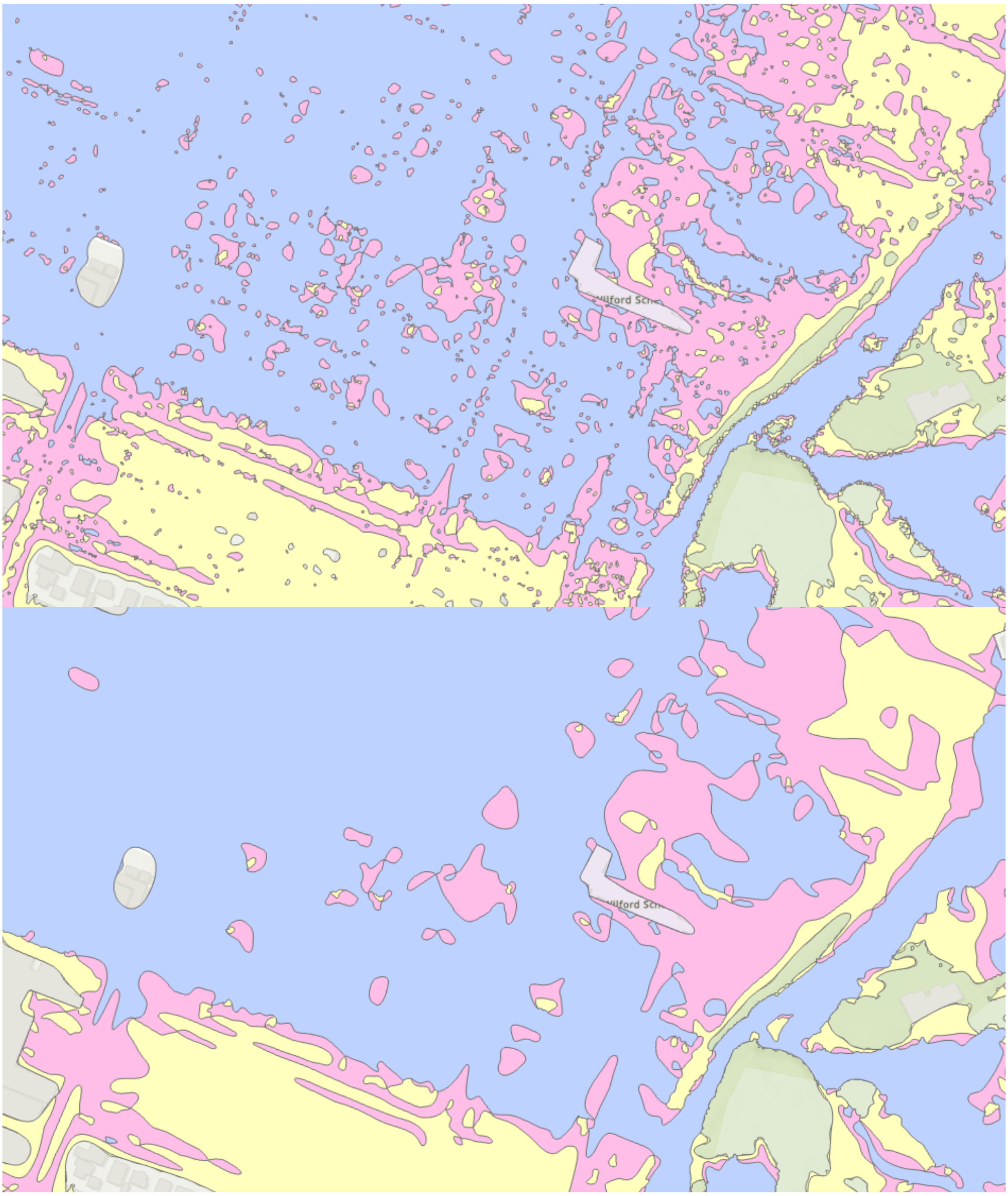

Figure 2-3 Hazard merge layer before using eliminate islands tool (top image) compared to after using the eliminate islands tool (bottom).

2.3 Step 4 Eliminate Puddles

The purpose of this tool (step 4) is to remove isolated puddles that were not captured in tool 3. Puddles are areas of risk disconnected from other zones with an area less than 150m^2. The tool also cleans up artefacts from previous processing by eliminating areas smaller than 20m^2 and deleting areas of null hazard. The workflow selects zones less than 20m^2, then eliminating them by merging with the neighbour with the longest boundary, which leaves a selection of isolated features also less than the specified size, which are suitable for deletion. Increasing the threshold may help further simplify the data.

2.4 Step 5 Threshold Bands

The threshold bands tool was produced by WWL and edited by Stantec to reflect the new hazard classes.

Table 2-1

Band	class	> DEPTH2D	< DEPTH2D	SPEED2D	SPEED2D	MAXUNFL2D
High, Low Hazard	HLH	0.2	0.25	0	0.5	0.2
High, Low Hazard	HLH2	0.05	0.2	0.45	0.5	0.2
Low, Medium Hazard	LMH	0.25	0.3	0	0.55	0.25
Low, Medium Hazard	LMH2	0.05	0.25	0.5	0.55	0.25
High, Medium Hazard	HMH	0.45	0.5	0	2	0.45
High, Medium Hazard	HMH2	0.05	0.45	1.95	2	0.45
Low, High Hazard	LHH	0.5	0.55	0	2.05	0.5
Low, High Hazard	LHH2	0.05	0.5	2	2.05	0.5

Hazard threshold bands were derived based on the supplied hazard classes graph below in Figure 2-3. However, the medium hazard shape was simplified to a rectangle.

Step 6 involves manually refining the output of step 4 eliminate puddles considering the output of step 5 threshold bands. This process may be suitable for automation based on learnings from manual processing.

Reference: **Flood Hazard Handover**

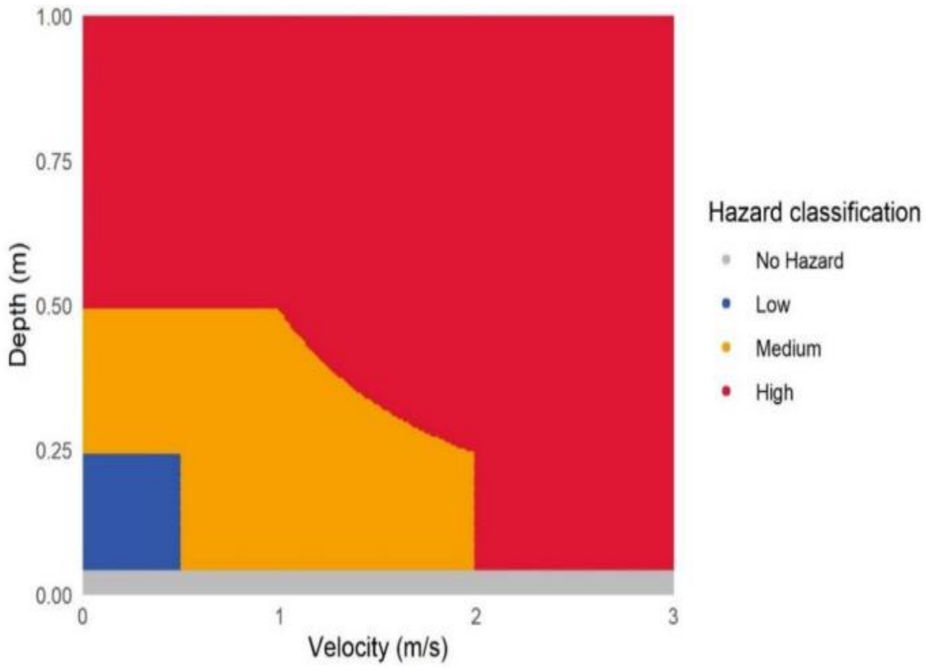

Figure 2-4 Supplied hazard class bands graph

Ngā mihi nui,

STANTEC NEW ZEALAND

Caitlin Meister BSc Hons (First Class)
Water Resources Scientist
Phone: +64 4 910 8615
Mobile: +64 0274103673
caitlin.meister@stantec.com

Attachment: [Attachment]