WHAT THE SWOC? – POST CYCLONE STORMWATER STRATEGY DEVELOPMENT

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ABSTRACT (500 WORDS MAXIMUM)

Central Hawke's Bay District, a largely rural district in New Zealand, includes two main townships: Waipukurau and Waipawa, with the Tukituki River and its tributary, the Waipawa River, being the primary recipients of stormwater from the District. Central Hawke's Bay District Council (CHBDC) is a small council (with a population of ~16,000) with limited funds for stormwater management and maintains a network comprising largely open waterways draining into these two rivers, with some pipe networks and swales within the townships.

In the aftermath of Cyclone Gabrielle in February 2023 and subsequent heavy rain, widespread flooding occurred, primarily due to river overtopping stopbanks. With this, the towns were flooded, with stormwater flowing overland through them, highlighting the need for improved flood protection beyond the stopbanks. The Council saw this not just as a challenge but an opportunity to address immediate concerns of localised flooding and plan long-term management through a phased approach to a Stormwater Strategy.
This paper will explore the approach taken to developing the Stormwater Strategy, including the initial stages (already complete) and next stages (currently underway at time of writing).

The first stages of the Strategy development were:

- Setting up a Severe Weather Outlook Checklist (SWOC) to clearly set out Council's response to forecasted rain events.
- Creating a maintenance plan.
- Identifying short term "Quick Wins" projects.
- Setting up a framework for understanding and prioritising works.

The SWOC was one the first documents to be developed as it gave Council a tool to implement immediately for all future extreme rain events. The checklist notes critical assets for Council to inspect and perform maintenance needs any time a heavy rain event is forecasted.

The SWOC became part of a regular Maintenance Plan for Council to implement to help improve the function of the stormwater network. Details of how the Maintenance Plan was devised and the specific inspection and maintenance activities are also included in this paper.

In addition to the SWOC and Maintenance Plan, a list of projects was developed to improve the stormwater network that could be implemented over the following year ("Quick Wins"). The short-term projects included waterway maintenance works, a variety of network upgrades, flapgate installations, bank stabilisation, culvert upgrades/ replacements, and transformation of storage areas into treatment wetlands. As a method to help Council select the order of completion for these works a prioritisation framework was included.

By establishing these first parts of the strategy and implementing them the council was able to start meaningful work quickly, mitigate the risk in future events, and build its relationship with the community. An example of this is how the SWOC was put into action in November 2023 in response to a Met Service heavy rainfall warning, although flooding did not eventuate.

The Stormwater Strategy is now progressing to the second phase, setting future-focused objectives for stormwater management in the district.

The paper will set out how, using a staged approach, a Council can use a Stormwater Strategy to achieve both short term needs and longer term aspirations for stormwater management.

KEYWORDS
Stormwater Strategy, Cyclone Response, Hawke's Bay, flooding

1 INTRODUCTION

In February 2023 Cyclone Gabrielle, a severe tropical storm, hit the North Island causing widespread flooding. Central Hawke's Bay was seriously impacted, due predominantly by river flows overtopping stopbanks and flooding urban areas. Following Central Hawke's Bay District Council's (CHBDC's) immediate emergency response, the Council continued to establish a programme of works to address the stormwater network needs and a Stormwater Strategy to outline responsibilities and how progess would be measured. This paper outlines the Cyclone event and its effects, Council's response, and the Stormwater Strategy established to achieve short and long term aspirations for stormwater management.

2 CENTRAL HAWKE'S BAY DISTRICT

2.1 LOCATION

Central Hawke's Bay District is located at the southern end of the Hawke's Bay Region. The district covers 3,333 km^2, extending from the Pacific coast on the east across the Ruataniwha and Takapau plains to the Ruahine Range on the west. The three main townships in the District are Waipukurau, Waipawa, and Otāne.

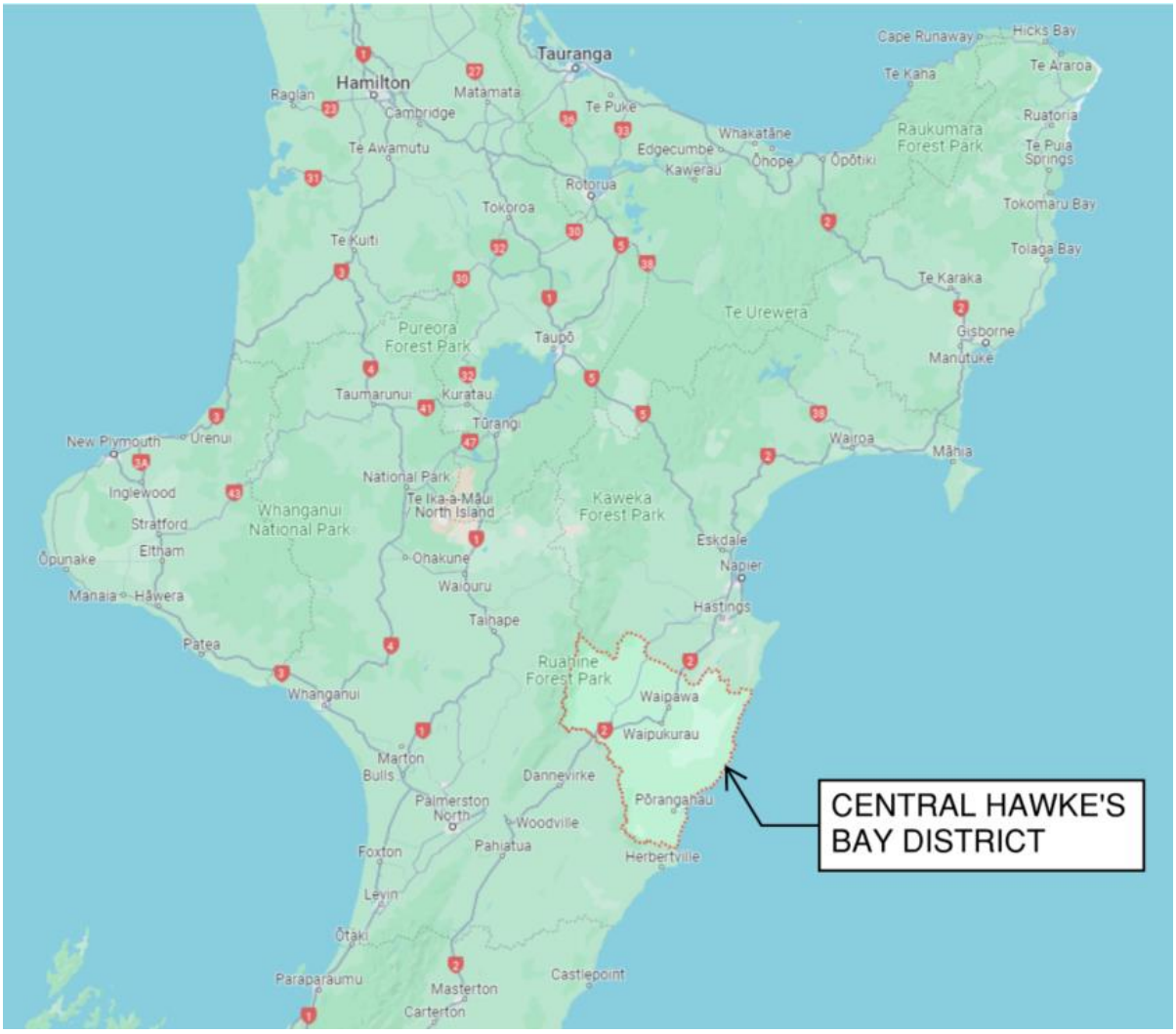

Figure 1 Location of Central Hawke's Bay District

Figure 2 Main townships in Central Hawke's Bay District

2.2 POPULTATION GROWTH

Central Hawke's Bay is experiencing rapid growth in population and significant development is seen in the major centres. The rate of development presents a case for future proofing of the stormwater network but also offers challenges to management and performance of the system.

2.3 WATERWAYS AND STORMWATER NETWORK

Two major rivers run through the District; the Tukituki River and one of its major tributaries, the Waipawa River. Each of these rivers have stopbanks running along them through the main townships.

Waipawa, Waipukurau and Otane are small rural settlements; most of the stormwater generated in these areas is managed by an open waterway network, with some piped stormwater networks in the town centres. The Waipawa River and the Tukituki River are the two main receiving environments for the stormwater.

3 FEBRUARY 2023 CYCLONE GABRIELLE

3.1 BACKGROUND

On February 13th and 14th, Cyclone Gabrielle swept across the Hawke's Bay region, with gale-force winds and record rainfall. Rainfall records for the Waipawa river headwaters show more than 300mm of rain over the two day period. Township weather stations recorded 90mm of rain in this timeframe. The heavy rainfall in some areas caused river levels to rise to greater than 100yr ARI flows, resulting in numerous breaches of stopbanks across the region, overwhelming the already saturated networks. The townships of Waipawa and Porangahau experienced serious flooding with over 200 residents in Waipawa being forced to evacuate due to the flooding.

Figure 3 Flooding in Waipawa during Cyclone Gabrielle

3.2 EFFECTS

The Cyclone flooding in the Central Hawke's Bay district was largely due to breaches of the stopbanks and the influence of the river on the network. Areas of the towns adjacent to river stopbanks were flooded witih excess water from the 1,805 and 1,810 m^3/s flows in the Tukituki and Waipawa Rivers, while other areas were flooded with stormwater unable to be discharged to the rivers from local drains and pipes. Waipawa and the beach community of Porangahau experienced serious flooding from the rivers, which also exacerbated flooding in Waipukurau. Large volumes of the populace were displaced and many homes and businesses needed remediation after the floodwaters subsided. Communications were down, power outages abounded and water supplies were compromised.

Stormwater planning done by Council in the years prior had been primarily discharge consent driven, resulting in a stormwater catchment management plan that had a water quality focus. Council wanted to take the opportunity presented by the increased flooding awareness to take immediate action that would not jeopardise future outcomes, but also to ensure that there was a robust plan for longer-term management of stormwater in the region. Council opted to do this through the development of a two-phased approach to a Stormwater Strategy.

Figure 4 Waipawa stopbank rebuild

3.3 COUNCIL RESPONSE

The immediate focus for cyclone recovery was on vulnerable locations and providing community welfare. In addition to this, the possibility of further rainfall causing further damage and re-traumatising the community was of serious concern. Initially, this culminated in rapid repairs of breaches in the stopbanks, with which CHBDC assisted.

Following this, large scale clearance of major drainage channels was commissioned. Deferred maintenance had resulted in sedimentation buildup, vegetation overgrowth and point blockages affecting performance of the network which was addressed in the response works.

Figure 5: Partial blockage in Waipukurau drainage channel

Figure 6: Excavation of sediment from Waipawa drainage channel

3.4 COMMUNITY RESPONSE

Following the Cyclone, the community called for a focus on stormwater improvements. They asked Council to take action to prevent future heavy rain events from causing further damage to the district via flood protection, networks improvements, and preparedness

measures. Their concerns were mainly around stream maintenance (capacity), road flooding, and culvert capacity. Three community focus groups were set up to engage and advise affected residents specifically around stormwater. Wider cyclone recovery assistance was made available to anyone in the district.

4 STORMWATER STRATEGY

The first phase of the strategy was designed to meet the immediate concerns around cyclone recovery, focusing on flood risk, stormwater management, and community education. This resulted in the development of the Quick Wins workstream and Stormwater Strategy Iteration 1. The Quick Wins workstream would allow Council to take action immediately, with the first iteration of the Stormwater Strategy in place to help ensure they made robust decisions in a reactive situation.

Figure 7 below shows the two-stage approach to the strategy.

Figure 7 Two-iteration approach for CHBDC's Stormwater Strategy

The first iteration of the Strategy focussed on immediate action post-cyclone, and helped Council with:

- Giving support for Council staff decision making
- Providing clarity to the community on how Council manages risk and prioritises work
- Demonstrating how future extreme weather events will be managed
- Making a plan for further development of the strategy to support the Long Term Plan and Annual Planning Cycle

5 QUICK WINS

5.1 BACKGROUND

As part of the first iteration of the Strategy, the Quick Wins work developed a list of maintenance works and short term projects that would help alleviate localised flooding in

the main townships by improving the function of the stormwater network. The projects were focused on the three main townships where they were likely to have the greatest impact and were likely feasible to complete within the next year. The projects were identified based on a variety of factors including:

- Service requests
- Council feedback
- Community feedback
- A site visit in June 2023
- Frequently flooded areas based on historical data
- Frequently flooded areas based on flood models
- Previous drainage investigations

5.2 MAINTENANCE WORKS

The maintenance works recommended were intended to give Council opportunities that would not require extensive design work, making them faster to action. These works mainly consisted of the clearing of overgrown vegetation, sediment build-up, and blocked grates in some of the critical open waterways.

Figure 8 Clearing of willow-choked drainage channel

5.3 SHORT TERM WORKS

A variety of projects were also proposed as short-term works to be designed and constructed over the following year. Network upgrades were recommended for a couple of areas based on flood-risk modelling. Flapgate installations were recommended on waterways that rising river levels could influence. To help prevent further slumping in the open waterways, bank stabilisation across the network was recommended. Other opportunities for improvement that were recommended included culvert upgrades/replacements and the transformation of storage areas into treatment wetlands. This gave Council a range of opportunities to choose from.

5.4 PRIORITISATION

In recognising the limited budget availability there was a need for a framework to help Council prioritise the various projects. A prioritisation was included to provide confidence

and justification for selected works and the ideal order of completion. A rating system was developed to assess each project against the following factors:

1. Flood risk – severity, criticality, likelihood
2. Cost – costs and/or budget available
3. Benefits – no. people benefitting from the project
4. Implementation – ease of implementation
5. Constructability – availability of resources, complexity
6. Environment – water quality, ecology, habitat impacts

Both the maintenance projects and short term projects were scored based on the prioritisation matrix. Based on the proximity and/or similarity of projects, combinations of works to generate work package opportunities were also created.

5.5 MAINTENANCE PLAN

To help Council take a more proactive approach to their management of stormwater assets, a Maintenance Plan was developed as part of the Quick Wins work. The Maintenance Plan includes lists of inspection and maintenance activities for each type of asset in the network. It also provides a target frequency for each maintenance activity to help maximise the function of the network. With the understanding that the target frequencies are likely not feasible within the available maintenance budget, a priority and minimum frequency were also given for each activity to help Council focus their efforts.

To make implementation of the Maintenance Plan easier for Council, a few additions were included. The document contains a list of common problems to look for when performing inspections, probable causes for each problem, and potential solutions, allowing Council staff to identify some maintenance needs more easily. This includes photo examples of good and poor condition of each of the asset types to help with visual inspections. In addition to identifying maintenance needs, a section was added to clarify what assets CHBDC is responsible for maintaining and what maintenance needs Council may need to coordinate with residents, regional council, and other entities.

This plan helps realise community expectations around maintenance of their stormwater systems. It is seen as a step change in Council's network management and demonstrates a commitment to reduction of flood risk and increase in amenity values of the drainage network.

6 SEVERE WEATHER OUTLOOK CHECKLIST (SWOC)

6.1 CHECKLIST

The Severe Weather Outlook Checklist contains a list of key stormwater assets to be inspected and actions to take prior to forecasted heavy rain events including:

- Open waterways
- Culverts
- Catchpits
- Flap Gates & Outlets
- Other (checking recent service requests, deployment of temporary pumps, public communications, notification of vulnerable members of the public)

The key assets were determined by high flood risk areas (based on flood mapping), areas with multiple customer service complaints, and Council's knowledge of known problem areas. This allows Council the opportunity to take pre-emptive measures to help mitigate the impact of the rain on the community.

The checklist contains space to note if any maintenance is needed for each item and if any maintenance was completed at the time of use for Council's records, which can be input into a maintenance database in the future.

Open Waterways

- Walk the length of the waterway (council-maintained sections as per plan attached), inspecting for debris/blockages, clearing as needed
- Inspect outlets to the river for blockages, clearing as needed

	Checked?		Maintenance Needed?			Maintenance Performed?	
	Y	**N**	**Y**	**If Yes, Details?**	**Y**	**N**	**Y**
Bush Drain							
McGreevy Street Dain							
Pah Flat Drain							
Eastern Interceptor							
Harris Street Drain							

Figure 9 Open Waterways portion of SWOC

The SWOC also includes:

- Maps of each township showing the critical assets to be checked
- A list of vulnerable locations to be notified
- Images showing good and poor conditions for each asset type

Figure 10 Examples of good and poor condition included with SWOC

6.2 IMPLEMENTATION

A heavy rain event was defined as any forecasted MetService Red or Orange warning. Once an alert is forecast, Council will send out contractors with the checklist to inspect each of the listed assets for potential maintenance needs. Council staff will then determine if maintenance needs to be undertaken prior to the rain event. Examples of maintenance that can occur prior to a rain event include removing debris or vegetation blocking a waterway, clearing a blockage in a culvert, or clearing debris from a catchpit grate, etc. Each of these tasks help to ensure that the stormwater network will function as best as possible.

6.3 CHECKLIST VALIDATION

Council put the SWOC into action for the first time on 17th November 2023 prior to a forecasted rain warning. Two Council staff members were deployed and the following actions were taken:

- Five open waterway blockages were identified, one was remediated at the time, and others were added to the maintenance schedule
- Three culverts blockages were identified, all were remediated at the time
- Two flap gates required maintenance; this was relayed to Hawke's Bay Regional Council for actioning
- Vulnerable members of the public were notified of the forecast event

This demonstrated that the checklist was an effective way to highlight maintenance needs for critical assets prior to heavy rain events. This also gave Council an opportunity to address the maintenance needs prior to the rain event, giving the community assurance that actions are being taken by Council for their safety.

7 NEXT STEPS

7.1 SWOC

The SWOC will continue to be implemented prior to forecasted heavy rain events. Feedback from both the community and the Council is necessary to improve the effectiveness of the checklist over time.

Initial feedback from Council on the SWOC after its first use includes:

- Reducing the extent of open waterway to be inspected to areas accessible by vehicle
- Adding contact details for a contractor resource to assist in remediation of large issues
- Adding contact details for vulnerable people and locations
- If 2 officers are available, the workload can be split between open drains/associated culverts and catchpits/standalone culverts

This feedback will be used to update the SWOC to be fit for future use.

As the District grows over time and the stormwater infrastructure expands, Council will need to consider revising the critical assets listed in the SWOC.

7.2 STRATEGY ITERATION 2

The inception of the Stormwater Strategy's first phase has acted as a much-needed initial response to the recent cyclone. The quick wins programme is progressing, with the implementation of a bank stabilisation programme being the first to kick off. The maintenance plan is likewise being actioned, and external funding has been secured to realise the plan and step up to community expectations

While the Quick Wins determined in the first phase are being implemented, Council keenly recognises the importance of advance planning. They have consequently decided to move ahead with the second phase of the Strategy, implementing a more collaborative approach.

Iteration 2 of the Stormwater Strategy is for Council to build on their existing relationships with iwi and the wider community, which has been an area of focus since the cyclone. By fostering open dialogue and collaboration, Council will set forth comprehensive, future-focused stormwater objectives encompassing all aspects of the community and environment. The current catchment management plan and asset

management planning tools will be modified to align projects with strategic objectives and priorities. This will help Council to positively shape how stormwater is managed throughout the district for years to come.

ACKNOWLEDGEMENTS

Central Hawke’s Bay District Council Staff

REFERENCES

Central Hawke's Bay District Council. (2021 June). Long Term Plan 2021 - 2031. Retrieved from https://www.chbdc.govt.nz/assets/Links/002923-Full-LTP-2021-2031-aSCN.pdf

Central Hawke’s Bay District Council. (2022 November). Central Hawke's Bay Stormwater Catchment Management Plan. Retrieved from https://storymaps.arcgis.com/stories/e2f9d994711d4ade96c2870dc5c6fbbd

Terralink International. (2013). Retrieved from https://d1pepq1a2249p5.cloudfront.net/media/documents/North-Island-PNG.png

Bowls New Zealand. (2023 February). Waipawa Bowling Club: Surviving Cyclone Gabrielle. https://bowlsnewzealand.co.nz/waipawa-bowling-club-surviving-cyclone-gabrielle/

Hawke’s Bay Regional Council. (2024 February). NIWA Letter Report. https://www.hbrc.govt.nz/assets/Document-Library/Reports/External-Reports/NIWA-letterreport-230224.pdf