If calling, please ask for Democratic Services

Environment Committee

Thursday 10 September 2020, 9.30am

Via Zoom meeting

Members

Cr Gaylor (Chair)
Cr Blakeley
Cr Hughes
Cr Laban
Cr Lee
Cr Ponter
Cr van Lier

Cr Connelly (Deputy Chair)
Cr Brash
Cr Kirk-Burnnand
Cr Lamason
Cr Nash
Cr Staples

Barbie Barton

Recommendations in reports are not to be construed as Council policy until adopted by Council

Environment Committee

Thursday 10 September 2020, 9.30am

Via Zoom meeting

Public Business

Please note these minutes remain unconfirmed until the Environment Committee meeting on 10 September 2020.

Report 20.263

Public minutes of the Environment Committee meeting on Thursday 6 August 2020

Council Chamber, Greater Wellington Regional Council
Level 2, 15 Walter Street, Te Aro, Wellington at 9.30am.

Members Present

Councillor Gaylor (Chair)
Councillor Connelly (Deputy Chair)
Councillor Blakeley
Councillor Brash
Councillor Hughes
Councillor Kirk-Burnnand
Councillor Laban (Zoom, until 10.08am)
Councillor Lamason
Councillor Lee (Zoom)
Councillor Nash
Councillor Ponter
Councillor Staples
Councillor van Lier (by Zoom)

Members participating at this meeting by Zoom counted for the purpose of quorum, in accordance with clause 25B of Schedule 7 to the Local Government Act 2002.

Karakia timatanga

The Committee Chair invited Councillor Connelly to open the meeting with a karakia timatanga – Nau mai e ngā hua.

Public Business

1 Apologies

Moved: Cr Lamason / Cr Brash

That the Committee accepts the apology for absence from Barbie Barton.

The motion was **carried**.

2 Declarations of conflicts of interest

There were no declarations of conflict of interest.

3 Public participation

There was no public participation.

4 Confirmation of the Public minutes of the Environment Committee meeting on 11 June 2020 – Report 20.205

Moved: Cr Staples / Cr Lamason

That the Committee confirms the Public minutes of the Environment Committee meeting on 11 June 2020 – Report 20.205

The motion was **carried**.

5 Update on progress of action items from previous meetings – Report 20.256
[For information]

Al Cross, General Manager Environment Management, spoke to the report.

6 Whaitua update – Oral report

Tim Sharp, Programme Manager – Whaitua, updated the Committee on the progress of the work of the Whaitua Te Whanganui-a-Tara Committee (Whaitua Committee).

Mr Sharp advised that the Whaitua Committee is currently in phase three of the Whaitua project (deliberation and prioritisation). Mr Sharp explained that the Whaitua Committee is determined to take a holistic view of water management and look at all the options for interventions, such as education, investment and governance.

The Whaitua Committee is committed to a bicultural approach, and this is reflected in the four kawa/principles that guide the Whaitua Committee.

The Whaitua Committee identified 16 issues, which it will make recommendations on. The identified issues will require a mix of responses – setting limits in the Regional Plan, advice and education, and investment.

The two mana whenua authorities involved in this Whaitua have been working together through Te Kahui Taiao (a working group) to agree on their goals for the project and whaitua more generally.

Noted: The Committee requested that an update on the progress of the Whaitua Te Whanganui-a-Tara be provided at each Committee meeting.

Councillor Laban left the meeting at 10.08am, at the conclusion of the above item.

The Chair advised the Committee that the National Policy Statement for Freshwater Management had been released the previous day, and requested that it be discussed.

7 National Direction – Government announcements on Action for Healthy Waterways reforms – Oral report

Matt Hickman, Manager, Environmental Policy, provided a summary to the Committee of the reforms package including the National Policy Statement for Freshwater Management 2020 (NPSFM), the National Environmental Standard for Freshwater (NESFW), and new RMA (Stock Exclusion) Regulations.

Mr Hickman advised the Committee that the these new provisions were gazetted by the Government on 5 August 2020, and largely come into force on 3 September 2020.

Mr Hickman advised that Council was able to influence these provisions through its submission.

The NPSFM itself requires mana whenua to be heavily involved in setting vision and direction for freshwater management under Te Mana o te Wai, merging well with Council's current whaitua process design and freshwater management recommendations in existing Whaitua Implementation Programmes.

The NPSFM also sets out the prioritisation of water use:

- Health and wellbeing of water bodies
- Essential needs of people
- All other uses.

Noted: The Committee requested that a written summary of the National Policy Statement, including the wins that Greater Wellington achieved, be circulated to members; and a further paper be prepared to highlight implications for Greater Wellington's implementation.

Karakia whakamutunga

The Committee Chair invited Councillor Connelly to close the meeting with a proverb – Kia hora te marino.

The meeting closed at 10.10am.

Councillor P Gaylor
Chair

Date:

Environment Committee
11 September 2020
Report 20.311

For Information

UPDATE ON PROGRESS OF ACTION ITEMS FROM PREVIOUS MEETINGS – SEPTEMBER 2020

Te take mō te pūrongo
Purpose

1. To update the Environment Committee (the Committee) on the progress of action items arising from previous Committee meetings.

Te horopaki
Context

2. Items raised at the Committee's previous meetings, which require action by officers, are listed in **Attachment 1** – Action items from previous Environment Committee meetings. For all action items, the current status and a brief comment is provided on progress to date.

Ngā hua ahumoni
Financial implications

3. There are no financial implications from this report, but there may be implications arising from the actions listed.

Ngā tūāoma e whai ake nei
Next steps

4. All completed items will be removed from the action items table for the next report. Items not completed will continue to be progressed. Any new items will be added, following this Committee meeting, and circulated to the relevant business group/s for action.

Ngā āpitihanga
Attachment

Number	Title
1	Action items from previous Environment Committee meetings

Ngā kaiwaitohu
Signatories

Writer	Al Cross – Kaiwhakahaere Matua mo te Taiao / General Manager Environment Management Luke Troy – Kaiwhakahaere Matua Rautaki ./ General Manager Strategy

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or with Committee's terms of reference The action items are of an administrative nature and support the functioning of the Committee.
Implications for Māori There are no direct implications for Māori arising from this report.
Contribution to Annual Plan / Long Term Plan / Other key strategies and policies Action items contribute to Council's or Greater Wellington's related strategies, policies and plans to the extent identified in Attachment 1.
Internal consultation There was no additional internal consultation in preparing this report and updating the action items.
Risks and impacts - legal / health and safety etc. There are no known risks or impacts.

Attachment 1 to Report 20.311

Action items from previous Environment Committee meetings

Meeting date	Action	Status and comment
13 February 2020	**Strategic Priorities for the Environment Committee** – Report 20.20 **Resolution** That the committee considers the proposed strategic priorities for the 2019-22 triennium at a March 2020 workshop.	**Status** Completed. **Comment** A workshop was held with the Committee on 6 August 2020.
13 February 2020	**Regional water quality in the Wellington Region** **Resolution** Requests officers to report to the next committee meeting on:	**Status** Ongoing **Comment**
	a Options for a water quality monitoring regime at Owhiro Stream/Bay, with the report to identify the likely sources of contamination	This was reported to the 9 April Council meeting.
	b The feasibility on effective 'real-time' public notification system for recreational users of Owhiro Bay and other recreational coastal areas in the Wellington Region	A meeting was held on 31 March 2020 between Mr Doyle, Mr Ian Reid (Chair of Owhiro Bay Residents Association), the General Manager Environment Management, the Council Chair, and Councillors Gaylor and Connelly. The General Manager Environment Management and the Wellington Water Chief Executive later agreed to set up a workshop with the Owhiro Bay Residents Association and Regional Public Health to respond to issues of community engagement and communication, including notification processes. The General Manager Environment Management met with Mr Doyle in late July 2020,

Attachment 1 to Report 20.311

Action items from previous Environment Committee meetings

Meeting date	Action	Status and comment
		and convened a meeting with Wellington Water and Greater Wellington staff in early August to scope and co-design the process and workshops ahead. Following on, the first of a series of meetings was held and a meeting with the community is now being organised, coordinated by Wellington Water.
6 August 2020	**Whaitua update** **Noted** The Committee requested that an update on the progress of the Whaitua Te Whanganui-a-Tara be provided at each Committee meeting.	**Status** Completed. **Comment** The Forward Work Programme has been updated for this item to be included in future Envirnment Committee meetings.
6 August 2020	**National Direction – Government announcements on Action for Healthy Waterways reforms** **Noted** The Committee requested that a written summary of the National Policy Statement, including the wins that Greater Wellington achieved, be circulated to members; and further report be prepared to highlight implications for Greater Wellington's implementations.	**Status** Completed. **Comment:** A report has been prepared for 10 September Environment Committee "Action for Healthy Waterways – submission and implications for implementation" – Report 20.316.

Environment Committee
10 September 2020
Report 20.312

For Decision

REVIEW OF THE WELLINGTON REGION NAVIGATION AND SAFETY BYLAWS 2009

Te take mō te pūrongo
Purpose

1. To advise the Environment Committee (the Committee) on:

    a The requirements under the Local Government Act 2002 (the LGA) for reviewing regularly the Wellington Region Navigation and Safety Bylaws (the Bylaws), and for then consulting on proposed amended Bylaws using the special consultative process under the LGA

    b Related approvals for key requirements and the consultation process.

He tūtohu
Recommendations

That the Committee:

1 **Notes** completion of the internal review stage of the second 10-year review of the Wellington Region Navigation and Safety Bylaws.

2 **Determines** that making a bylaw is the most appropriate way to address the proposals raised in the internal review (Attachment 1).

3 **Considers** that the Wellington Region Navigation and Safety Bylaws should be amended to address these proposals.

4 **Agrees** that, in accordance with Council's *Significance and Engagement Policy*, these proposals are of medium significance, which are considered to be of "significant interest to the public" under the Local Government Act 2002.

5 **Notes** that agreement to recommendation 4 requires Council to use the special consultative process set out in the Local Government Act 2002 when consulting on these proposals.

6 **Adopts** the draft Statement of Proposal (Attachment 2), which includes the required Summary of Information, proposed amended Wellington Region Navigation and Safety Bylaws, and information on the submissions process.

7 **Approves** the proposed timetable and process (paragraph 30).

8 **Notes** that, following receipt of submissions and if this step is warranted, officers will seek the establishment of a hearing subcommittee at the Environment Committee's February 2021 meeting.

Te tāhū kōrero
Background

2. The process for reviewing the Bylaws has three key stages, being:

   a Internal review of the Bylaws and identification of any amendments to the current Bylaws

   b Decision on whether to use the special consultation procedure under the Local Government Act 2002 to consult on any Bylaw amendments.

   c Consideration of submissions on the proposed amendments, and adoption of proposed new Bylaws, if considered appropriate.

3. The requirements for these stages are set out below.

Legislative scheme for the Bylaws

4. In 2000, Council adopted, under section 684B of the Local Government Act 1974, the Wellington Region Navigation and Safety Bylaws. These Bylaws came into force on 15 December 2000 (see Wellington Regional Navigation and Safety Bylaws – Special Order – Report 00.854).

5. The Bylaws were reviewed in September 2003, pursuant to section 158 of the Local Government Act 2002[1], following the introduction of Maritime Rule Part 91 to ensure the Bylaws were not inconsistent with the new Rule. The Council made new Bylaws in 2003.

6. After our Harbour risk assessment, the Bylaws were reviewed again in 2008, pursuant to section 159 of the Local Government Act 2002[2]. Council adopted the current Bylaws (see Proposed amendments to the Wellington Regional Navigation and Safety Bylaws 2003 – Report 09.74), which came into force on 1 July 2009.

7. The Maritime Transport Amendment Act 2013:

   a Revoked the empowering provision in the Local Government Act 1974 for the Bylaws and moved this bylaw-making power to the new section 33M of the Maritime Transport Act 1994. That section provides for a regional council to make a range of navigation bylaws "for the purpose of ensuring maritime safety in its region"

[1] Section 158 of the LGA requires that "a local authority must review a bylaw made by it under the Local Government Act 1974... not later than 1 July 2008, if the bylaw was made before 1 July 2003…."

[2] Section 159 of the LGA states further that:

> A local authority must review a bylaw made by it under this Act, the Maritime Transport Act 1994, or the Local Government Act 1974 no later than 10 years after it was last reviewed as required by section 158 or this section.

b Provided for the current Bylaws to continue in force and be deemed to be made under section 33M[3].

Internal review of the Bylaws

8. Greater Wellington is undertaking the second 10-year review of the Bylaws, pursuant to section 159 of the LGA.

9. This review needs to be completed by 30 June 2021, as the Bylaws are deemed to be revoked "on the date that is 2 years after the last date on which the bylaw should have been reviewed"[4]. As we interpret 'review' to mean "bylaw reviewed and any new bylaw commenced", this date is 1 July 2021 (or 12 years after the current Bylaws came into force).

10. The current review was initiated at the Environment Committee's meeting on 20 June 2019. To allow for greater involvement of stakeholders and the public, and enable more options for submitters to comment on, the Committee agreed to "seek public feedback [at]… the beginning of the review process" for the Bylaws (see Review of Navigation and Safety Bylaws - Report 19.237).

Required decisions

11. In reviewing a bylaw[5], and before commencing the process for making a bylaw, a local authority must determine whether a bylaw is the most appropriate way of addressing the perceived problem[6].

12. If, after making this determination, the local authority considers the bylaws "should be amended, revoked, or revoked and replaced, it must act under section 156 [of the LGA]"[7].

Use of special consultative procedure when amending bylaws

13. Section 156(1) of the LGA requires that when amending a bylaw made under that Act[8], a local authority must:

(a) use the special consultative procedure (as modified by section 86) if—

(i) the bylaw concerns a matter identified in the local authority's policy under section 76AA[9] as being of significant interest to the public; or

3 Section 87(1) of the Maritime Transport Amendment Act 2013.

4 Section 160A of the LGA.

5 Section 160 of the LGA.

6 Section 155(1) of the LGA.

7 Section 160(3)(a) of the LGA.

8 We consider, to give effect to the Maritime Transport Amendment Act 2013, that this section also refers to bylaws deemed to be made under the Maritime Transport Act 1994.

9 Section 76AA refers to the requirement to adopt a significance and engagement policy. Council's current *Significance and Engagement Policy* was adopted on 31 October 2017 and was amended on 21 August 2019.

(ii) the local authority considers that there is, or is likely to be, a significant impact on the public due to the proposed bylaw or changes to… the bylaw; and

(b) in any case in which paragraph (a) does not apply, consult in a manner that gives effect to the requirements of section 82.

14. Together, sections 83 and 86(2) of the LGA require that:

a The local authority prepares and adopts a statement of proposal that includes a summary of information (if the local authority considers on reasonable grounds that it is necessary to enable public understanding of the proposal)

b This summary of information must be a fair representation of the major matters in the statement of proposal; be in a form determined by the local authority; indicate where the statement of proposal is available; and state the period within which persons interested in the proposal may present their views to the local authority[10]

c The statement of proposal must include a draft of the amended bylaw; the reasons for the proposal; and a report of any relevant determinations by the local authority under section 155

d The local authority makes publicly available the statement of proposal; describes how persons interested in the proposal will be provided with an opportunity to present their views to the local authority (including a hearing of submissions); and states the period (of longer than a month) within which these views may be provided

e The local authority must make the summary of information as widely available as is reasonably practicable as a basis for consultation.

Te tātaritanga
Analysis

15. Council cannot delegate to a committee "the power to make a bylaw" unless this is expressly provided for in an Act[11], which is not the case here. However, Council can delegate "the power to do anything precedent to the exercise of … [this power]"[12] and has done so in its committee delegations. The Committee can therefore make the decisions recommended in this report.

Internal review and section 155 determination

16. The internal review process and results are set out in **Attachment 1**.

17. At this stage of the overall review process, the Committee must determine whether a bylaw is the most appropriate way of addressing the perceived problems.

[10] Section 83AA of the LGA.

[11] Clause 32(1)(b) of Schedule 7 to the LGA.

[12] Clause 32(2) of Schedule 7 of the LGA.

18. The Bylaws have been in place for many years, and there is public expectation that these will continue. Initially these were made under the Local Government Act 1974; however, the Maritime Transport Amendment Act 2013 revoked the relevant empowering provisions and updated them as section 33M of the Maritime Transport Act 1994. This in itself signals that the Parliament considers that bylaws are regulations at the appropriate level for addressing navigation and safety on the Wellington Region's waters. Alternative means, e.g. public education, still require a regulatory framework and Bylaws are used as the basis for both education and enforcement. Consequently, we are satisfied that navigation and safety bylaws are appropriate in the circumstances. Therefore we recommend that the Committee agrees that it is the most appropriate way.

Proposed amendments

19. **Attachment 1** indicates that there are a range of desired changes arising from the initial external feedback and our own consideration of changing water use, different types of water activity, and the public's expectations. We also want to ensure there are controls in place, if needed, for future changes of activity. These proposed changes are intended to:

- Move towards national consistency with other regional councils
- Incorporate minor editorial changes to clarify the Bylaws
- Ensure we are addressing risks raised through our Port and Harbour Marine Safety Code (the Code) work[13]
- Include current practices into the bylaws that are not otherwise documented
- Ensure that the Bylaws reflect best practice for safety on the water.

20. The proposed amendments are explained in the draft Statement of Proposal (**Attachment 2**), and stated in **bold** in the proposed amended Bylaws (Part B of **Attachment 2**). The words in ***bold italics*** do not form part of the Bylaws – they explain the reasons for the proposed amendments.

21. As well as the public's responses during the proposed consultation, we will receive additional feedback through:

a Consultation with the Director of Maritime New Zealand, as required by section 33M of the Maritime Transport Act 1994. A copy of the proposed amended Bylaws has been provided to Maritime New Zealand

b Knowledgeable and specialist comment from the Navigation Safety Special Interest Group (NS-SIG), as this group aims to assist and encourage consistency on similar issues between regions (where appropriate).

22. We recommend that, pursuant to section 160(3)(a) of the LGA, the Committee considers that the Bylaws should be amended.

[13] Greater Wellington and CentrePort are partners in applying the Code. This means we jointly identify and consider risks related to the use of Wellington Harbour, by commercial and recreational users, and how to manage those risks. Bylaws are seen as a primary control mechanism for navigation risks.

Consultation process for amending the Bylaws

23. Assuming the Committee agrees to this recommendation, Greater Wellington must use the special consultative procedure if the proposed amended Bylaws concern a matter assessed as being "of significant interest to the public".

24. Applying Council's *Significance and Engagement Policy*, we consider that the proposal is of medium significance (which means it aligns with the test stated in paragraph 23). The reasons for our assessment are that the proposed amended Bylaws:

    a Are of significant importance to the Wellington Region as they address a range of key issues. These include managing commercial shipping to reduce risk to ships (including over a million ferry passengers per annum), their cargos, and the coastal environment; and providing rules for the public around the safe use of recreational craft and the Wellington Region's waters

    b Are of interest to the community, particularly around improving boating safety. The public's related interest includes a desire for better awareness of how to be safe, concerns about perceived restrictions of freedoms and right which creates strong feelings, and testing the value of additional costs

    c Are consistent with the Code agreed between Greater Wellington and CentrePort, and provide a key control for the risks identified by the Code process. Such bylaws are also consistent with Council's responsibilities for maritime safety under the Maritime Transport Act 1994.

25. Accordingly, officers recommend the Committee agrees that the special consultative procedure must be used for the proposed amended Bylaws.

Meeting the requirements of the special consultative procedure

26. We have addressed the requirements for the special consultative procedure (paragraph 14 above) by:

    a Preparing a draft Statement of Proposal that includes a Summary of Information (Part A of **Attachment 2**), as we consider the latter is necessary to help the public understand the proposal

    b This Summary of Information covers the major elements of the proposed amended Bylaws, uses the format of the summary from the previous review of the Bylaws, indicates where the Statement of Proposal is available (section 4 of Part A of **Attachment 2**), and indicates that there are 11 weeks for people to make submissions

    c The Statement of Proposal sets out the proposed amended Bylaws, the reasons for the proposal (see paragraph 19 above), and information on the section 155 determinations

    d We will make the Statement of Proposal widely available by:

        i Circulating it to stakeholders in the Wellington Region, including contacting some stakeholders directly

        ii Notifying it on social media and placing it on Greater Wellington's website

iii Advertising the proposed changes and inviting submissions through two Public Notices (see paragraph 32)

e Submitters will have the opportunity for to speak to their submissions at a hearing.

27. We recommend the Committee adopts the draft Statement of Proposal.

Ngā hua ahumoni
Financial implications

28. Any financial implications relating to the consultation and review process are expected to be minor and will be meet out of the existing Harbours operating budget.

Ngā tikanga whakatau
Decision-making process

29. The process for deciding the matters of concern is set out in various provisions of the LGA, which are stated in the Background section of this report.

Ngā tūāoma e whai ake nei
Next steps

Proposed timetable and process

30. The following table sets out the proposed timetable and process for public consultation, and approval and commencement of new Bylaws:

Process step	**Due date**
Environment Committee approves consultation process	10 September 2020
First Public Notice of invitation to review and submit on proposed Bylaws	12 September 2020
Second Public Notice of invitation to review and submit on proposed Bylaws	23 September 2020
Close of submissions	30 November 2020
Committee establishes hearing subcommittee[14]	February 2021
Hearing of submissions	Early March 2021
Hearing subcommittee reports to Environment Committee	Early April 2021
Environment Committee reports to Council, and Council adoption of new Bylaws	April 2021
Bylaws come into force	1 June 2021

31. After receipt of submissions (and feedback from the Director of Maritime New Zealand and the NS-SIG), officers will prepare a report outlining these submissions, evaluating the feedback, and recommending whether or not changes should be made to the proposed amended Bylaws.

[14] If it is not feasible or desirable for the Committee to hear these submissions.

32. We will also advise on how best to hear any requests to submit in person. The two options are:

    a The Committee hears these submissions in early March 2021

    b A hearing subcommittee is established (e.g. if there are a large number of such requests).

33. After the hearing, a report consolidating all feedback and recommendations will be prepared for the Committee. When the Environment Committee is satisfied with the final draft of the revised Bylaws, these can be recommended to Council for adoption.

Ngā āpitihanga
Attachments

Number	Title
1	Review of the Wellington Region Navigation and Safety Bylaws 2009
2	Draft Statement of Proposal

Ngā kaiwaitohu
Signatories

Writer	Grant Nalder, Harbourmaster
Approver	Al Cross, General Manager, Environment Management Group

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or with Committee's terms of reference
Only Council can amend the Bylaws. However, the Committee has delegation to "do anything precedent to the exercise of… [this power], so can make the decisions recommended in this report.
Implications for Māori
There are no implications that relate specifically to Māori.
Contribution to Annual Plan / Long Term Plan / Other key strategies and policies
The Bylaws are a primary control to meet the aims of the Port and Harbour Marine Safety Code.
Internal consultation
This report was prepared in consultation with the Democratic Services department.
Risks and impacts - legal / health and safety etc.
There are reputation risks from not updating the Bylaws and from people objecting to the proposed amendments and their impact. We recommend amending the Bylaws in this report and will manage the latter risk during the submission process.

Attachment 1 to Report 20.312

Internal review of the Wellington Region Navigation and Safety Bylaws 2009

1. Introduction

Greater Wellington has completed the internal review of the Wellington Regional Navigation and Safety Bylaws 2009 (the Bylaws) in line with the requirements of the Local Government Act 2002 (the LGA). The LGA requires that the Bylaws are reviewed every 10 years.

The overall review was initiated at the Environment Committee's meeting on 20 June 2019. The Committee agreed to "seek public feedback [at]… the beginning of the review process" for the Bylaws (see Review of Navigation and Safety Bylaws - Report 19.237).

2. Internal review process

We began the internal review process in June 2019 by seeking input from interested groups and individuals on possible changes to the Bylaws.

Porirua Harbour Trust and StraitNZ and provided written feedback and proposed amendments to restrict powered vessels in Pauatahanui Inlet (clause 3 of the Bylaws) and shipping movements in Wellington Harbour (clause 6).

We have also considered what changes are needed and the views of the Navigation Safety Special Interest Group (of which we are a member).

3. Proposed amendments

We incorporated some aspects of the feedback from StraitNZ and Porirua Harbour Trust into our proposed amendments to the Bylaws. These proposals include:

a Requiring lifejackets to be worn on vessels under six metres while these vessels are moving (not anchored, berthed or moored)

b Requiring divers from shore who go out more than 200 metres to have some means of showing their position

c Requiring ships wishing to come within the Wellington Region's waters, other than coming into Wellington Harbour, to seek approval Harbourmaster.

d Requiring registrations for Personal Watercraft (jet skis) and the naming of other recreational vessels

e Requiring the mandatory use of an Automatic Identification System (AIS) for certain commercial vessels in Wellington Harbour

f Introducing time limits on vessels anchored in Wellington Harbour and unattended vessels at anchor

g Reducing the type of hire operations that require licencing by Council

h Creating an area for non-powered vessels only in Pauatahanui Inlet

i Removing a seldom used water-ski lane in Pauatahanui Inlet.

Attachment 1 to Report 20.312

Internal review of the Wellington Region Navigation and Safety Bylaws 2009

The proposed amendments are intended to:

- Move towards national consistency with other regional councils
- Incorporate minor editorial changes to clarify the Bylaws
- Include current practises into the bylaws that are not otherwise documented
- Ensure we are addressing risks raised through our Port and Harbour Marine Safety Code work
- Ensure that the Bylaws reflect best practice for safety on the water.

The specific changes are included in the proposed amended Bylaws (Part B of **Attachment 2**).

4. Determinations under section 155 of the LGA

Applying section 160 of the LGA, Council must make a series of determinations under section 155 of that Act. That section requires that:

- Before commencing the process for making a bylaw, Council must determine whether a bylaw is the most appropriate way of addressing the perceived problem.
- If Council has so determined, it must before making the bylaw, determine whether the proposed bylaw:

  (a) is the most appropriate form of bylaw

  (b) gives rise to any implications under the New Zealand Bill of Rights Act 1990.

  No bylaw may be made that is inconsistent with the New Zealand Bill of Rights Act 1990, notwithstanding section 4 of that Act.

We have addressed the first determination below and will advise further on the other two determinations when seeking approval to make new Bylaws.

5. Is a bylaw the most appropriate way of addressing the perceived problems?

The Bylaws have been in place for many years, and there is public expectation that these will continue. Initially the Bylaws were made under the Local Government Act 1974. However, the Maritime Transport Amendment Act 2013 revoked the relevant empowering provision and deemed the Bylaws to be made under section 33M of the Maritime Transport Act 1994. This approach in itself signals that the Parliament considers that bylaws are regulations at the appropriate level for addressing navigation and safety on the Wellington Region's waters. Alternative means, e.g. public education, still require a regulatory framework and Bylaws are used as the basis for both education and enforcement. Consequently, we are satisfied that navigation and safety bylaws continue to be appropriate in the circumstances.

Attachment 2 to Report 20.312

Draft Statement of Proposal

Part A - Summary of Information

Proposed amendments to the Wellington Regional Navigation and Safety Bylaws 2009

1. Purpose

The purpose is to inform the public of proposed amendments to the Wellington Regional Navigation and Safety Bylaws 2009 (the Bylaws).

2. Background

As required by the Local Government Act 2002 (the LGA), Council has recently reviewed the Bylaws. As a result of the review, Council considers that the Bylaws should be amended.

The proposed amended Bylaws (attached below) are intended to:

- Move towards national consistency with other regional councils
- Incorporate minor editorial changes to clarify the existing Bylaws
- Ensure we are addressing risks raised through our Port and Harbour Marine Safety Code work
- Include current practices into the bylaws that are not otherwise documented
- Ensure the Bylaws reflect best practice for safety on the water.

3. Summary of the proposed Wellington Regional Navigation and Safety Bylaws

Section 1 - Preliminary Provisions

· Explain where the bylaws apply
· Include a definition clarifying the use of specific terms within these bylaws.

Section 2 - General Matters relates to:

· Carriage and use of lifejackets, including exemptions
· The movements of people and vessels around wharves in launching areas
· Maintaining vessels in seaworthy condition
· Anchoring and mooring
· Obstructions
· Adhering to International Collision prevention rules
· Notification of incidents and accidents
· Damage to navigation aids
· Use of flashing lights on vessels
· Use of distress signals
· Means of communication.

Attachment 2 to Report 20.312

Draft Statement of Proposal

Section 3 - Operating Requirements relates to:

- The age of power boat operators
- The speed of vessels in certain circumstances
- Restrictions and exemptions relating to speed of vessels
- The use of navigation lights on vessels
- Diving and use of flags or markers
- Water skiing and towing
- Access lanes and reserved areas, marking and usage
- Non-powered craft areas
- Flagged areas for swimming on beaches
- Special events
- Moorings
- Buoys in the harbour.

Section 4 - Commercial operations, including hazardous works and cargoes, relates to:

- Vessels carrying explosives
- Oil tankers, responsibilities of vessels and signals to be made
- Hot work (gas cutting welding etc.) on ships
- Discharges of cargo
- Specific conditions for vessels over 500 Gross Tonnage.

Section 5 - Administrative Matters relates to:

- Appointment of council officers
- Who is responsible for a vessel
- Notifications to the Harbourmaster
- Licensing of commercial operations
- Fees and charges.

Section 6 - Wellington Harbour relates to:

- Transiting Wellington Harbour entrance
- Marine radio reporting
- General directions in Wellington Harbour
- Pleasure craft keeping clear of shipping
- Speed limit in Lambton Harbour
- Restricted areas for non-commercial vessels.

Schedule 1 defines the areas to which the Bylaws apply.

Schedule 2 defines:

- Where not to anchor
- The explosives anchorage
- Where bulk oil may be discharged
- Restricted areas for non-commercial vessels.

Schedule 3 shows maps and gives descriptions for water-ski access lanes, reserved areas and beaches that may be flagged for swimming only in the Wellington Region.

Schedule 4 is an example of a hot work permit.

Schedule 5 has the recommended tracks for large ships in and out of Wellington Harbour.

Schedule 6 shows the part of Wellington Harbour that is defined as a narrow channel.

4. Availability of proposed amendments to the Bylaws

This Summary of Information contains the significant alterations proposed for the Wellington Regional Navigation and Safety Bylaws 2009. A full copy of the Statement of Proposal including the proposed amendment to the Bylaws is available from Greater Wellington's offices in Wellington and Masterton or from our website www.gw.govt.nz.

5. Submission process

Comments and submissions on the proposed amendments are invited to be received by Greater Wellington by 5pm, 30 November 2020. If required, a hearing will be held in March 2021. Submitters should therefore indicate in their submission if they wish to be heard to support their submission.

Please note that any submission you make may be publicly available under the Local Government Official Information and Meetings Act 1987. If you are making a submission as an individual, we will consider removing your personal contact details if you request this in your submission.

6. Determination under section 155 of the Local Government Act 2002

The Council has determined that Bylaws are the most appropriate form of regulation to manage maritime safety as provided for in s33M of the Maritime Transport Act 1994.

7. Summary of the significant proposed amendments to the Wellington Regional Navigation and Safety Bylaws 2009

2.1.2 Lifejackets to be worn on vessels under six metres in length. Lifejackets must be worn when the vessel is under way. If the vessel is anchored or moored and the skipper considers it safe, the lifejackets may be taken off. This is consistent with an increasing number of councils around New Zealand; however, it exceed the requirements of Maritime Rule Part 91 which is considered out of date.

This change addresses a safety issue identified by the Harbourmasters and National Pleasure Boat Safety Strategy.

2.1.3 Stand up paddle boards (SUPs) within 200 metres of shore only require a leash but outside of that also require a lifejacket. This clarifies the rules for SUPs and is supported by the national body.

Attachment 2 to Report 20.312

Draft Statement of Proposal

2.6.5-8 Restrictions on berthing at public wharves, anchoring in the harbour, anchoring unattended and information about live-aboards at anchor or on moorings. This change clarifies use of public wharves, and addresses an issue around vessels at anchor for prolonged periods of time.

2.13 Changes to restrictions on use of sound signals.

3.4 Diving requirements for shore divers to display a flag or a float if more than 200 metres from shore to increase their visibility.

3.13 Updating of swing mooring requirement in line with new licensing regime.

3.14 Buoys – requirement for marking and identifying buoys In Wellington and Porirua Harbours.

4.8 2.16 Restrictions on vessels over 500 Gross Tonnage entering the Wellington Region's waters and restricting double banking of ships. This change is to address the risk of large ships close to shore outside of the Wellington Harbour entrance. The double banking is a control in place ahead of the possible use of bunker barges in Wellington.

5.1 Changes to the appointment of officers, as this is now done under the Maritime Transport Act 1994 so is not needed in the Bylaws.

5.4 Changes to licensing of hire operations. Increasingly, small hire operators require audit by Worksafe or a Worksafe-approved auditor to operate. While we will still require these operators to seek approval for their area of operation we will no longer licence them. We will only licence hire operators that are not otherwise safety audited. We retain the right to direct operations that we feel are unsafe to halt operating.

5.4 Personal Water Craft (PWC)(also known as Jetskis) licencing. All PWC will need a licence number. This change enables identification of any PWCs causing issues and also exonerates those PWCs that aren't. This approach is becoming common, at least in the North Island, and any PWCs that get taken north will already be required to be registered. Many PWC owners have indicated support for this. Our intention is to use an existing registration system (probably Auckland's) to provide cost effective registration and a simplified solution.

5.5 Other vessel will need to be identified, this could be an existing name or sail number. A small vessel, like a kayak or dinghy only needs the owner's name and contact details written in the vessel. These changes are to assist with identification of a particular vessel either for bylaw breaches or for safety issues. With the small non-powered craft, this means if a kayak or the like is found drifting on its own it will be quickly possible to identify if anyone is missing.

6 Wellington Harbour section, some re-ordering and minor changes.

Attachment 2 to Report 20.312

Draft Statement of Proposal

Schedule 2 Location-specific information. Increasing the restricted area for non-commercial craft to include within 30 metres of the main wharf and Rail Ferry Terminals.

Schedule 3 Part A Water-ski access lanes. Remove the Duck Creek access lane due to little use, poor land access, and it being very close to the non-powered area. There is a nearby lane at Bradey's Bay.

Part B Part of Pauatahanui Inlet reserved for non-powered vessels only.

Attachment 2 to Report 20.312

Draft Statement of Proposal

Part B:

Proposed amended Navigation Safety Bylaws

Wellington Region

Purpose: These Bylaws are made for the purpose of **ensuring maritime safety in the Wellington Region**.

{the wording of the purpose has changed from the Local Government Act 1974 to the purpose of section 33M of the Maritime Transport Act 1994}

Notes about this proposed amended copy of the Bylaws:

- *Proposed changes are in **bold***
- *Explanations of changes are in contained in **{bold italics}** and do not form part of the Bylaws*
- *The maps in the Schedules are mostly from the existing Bylaws and are only for the consultation copy. In the final version these will be updated to provide better clarity both in print and on-line.*

FOR FURTHER INFORMATION

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GW/H-G-XXXX

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Contents

Attachment 2 to Report20.312

Draft Statement of Proposal

1. Preliminary provisions

1.1 Title and commencement

These Bylaws are the Wellington Regional Navigation and Safety Bylaws XXXX.

These Bylaws come into force XXXXXX.

(Explanation: These Bylaws replace the Wellington Regional Navigation and Safety Bylaws that were amended 1 July 2009.)

1.2 Areas within which these Bylaws apply

These Bylaws apply to the waters within the Region.

1.3 Definition of terms

Unless the context requires another meaning, a term or expression that is defined in the Act or a Maritime Rule and used in this Bylaw, but not defined, has the meaning given by the Act or Maritime Rule.

{s34 of the Interpretation Act 1999 says any term has the same meaning as in the Act under which it was made, in this case the Maritime Transport Act 1994, so allowing us to remove definition unless we use them differently in the Bylaws.}

In these Bylaws, unless the context otherwise requires:

Access lane	means those areas defined by words and maps in part A of Schedule 3 in these Bylaws.
AIS	**Automatic Identification Systems (AIS) means an operational transceiver of class A or class B that complies with the requirements of the International Maritime Organisation.** ***{this is equipment that has become more common on local vessels since the previous Bylaw review}***
Anchorage	in relation to vessels, means a place (enclosed or otherwise) used for the anchoring of vessels to the bed of waters, whether the place is reserved for such purposes by the Council or not.
Anchoring	means the securing of a vessel to the bed of waters by means of an anchor, cable or other device, that is normally removed with the vessel when it leaves the anchorage.
Beacon	means a light or mark set up as a navigation mark or a warning to vessels.
Body board	also known as a boogie board. Means a short foam board usually ridden in a prone or kneeling position and not designed to be ridden standing up.
Buoy	means an anchored float serving as a navigation or locational mark, or to indicate a mooring, reef or other hazard.

Attachment 2 to Report20.312

Draft Statement of Proposal

Buoyancy aid	means anything that complies with NZ Standard 5823:2005 or a buoyancy aid that the Director of Maritime Safety is satisfied substantially complies with the Standard and that provides a minimum of 53 newtons of buoyancy.
Class 3 packing Group I oil products	means oil having an initial boiling point less than or equal to 35 degrees centigrade.
Class 3 packing Group II oil products	means oil having a flashpoint of less than 23 degrees centigrade and an initial boiling point greater than 35 degrees centigrade.
Class 3 packing group III oil products	means oil having a flashpoint equal to or greater than 23 degrees centigrade up to and including 61 degrees centigrade and an initial boiling point greater than 35 degrees centigrade.
Commercial vessel	has the same meaning as commercial ship in section 2 of the Maritime Transport Act 1994.
Council	means the Wellington Regional Council as constituted under the Local Government (Wellington Region) Reorganisation Order 1989.
Crew	means the persons employed or engaged in any capacity on board a vessel, but does not include the master, a pilot, or a person temporarily employed on the vessel while in a harbour.
Dangerous Goods	has the same meaning as in the International Maritime Dangerous Goods (IMDG) code.
Distress signal	means a distress signal as prescribed in Maritime Rule 23 Appendix 3.
Double banking	**means mooring one (or more) vessels moored alongside another vessel with mooring lines going between the vessels. This applies to vessels alongside at a berth or at anchor.** ***{this is defining a reasonably common maritime comments, now defined for the purpose of bylaw 4.8.3}***
Explosive	has the same meaning as in Class 1 Substances under the Hazardous Substances (Classifications) Regulations 2001.
Flag A	means flag A of the International Code of Signals, a burgee (swallow-tailed) flag coloured in white and blue with white to the mast, or a rigid equivalent.
Flag B	means flag B of the International Code of Signals, a burgee (swallow-tailed) flag coloured in red, or a rigid equivalent.
Harbour	means:

	(a) Wellington Harbour; and (b) Porirua Harbour as defined by Order in Council, dated 24 March 1969, New Zealand Gazette, 2 April 1969, page 609 (Schedule 1 of these Bylaws).
Hours of darkness	**Means the time between sunset and sunrise as published in the NZ Nautical Almanac, NZ 204.** ***{Tidying of terminology, this incorporates the old sunrise and sunset definitions, to provide more consistent use of language in the Bylaws}***
Kite surfer	has the same meaning as sailboard.
Length	in relation to a vessel, means overall length.
Lifejacket	means a serviceable personal floatation device that meets NZ Standard 5823:2005 or a national or international standard that the Director of Maritime Safety is satisfied substantially complies with that Standard.
Master	means any person having command or charge of a vessel, but does not include a pilot.
Mean high water spring	means the average of each pair of successive high waters during that period of about 24 hours in each semi-lunation (approximately 14 days), when the range of tides is the greatest.
Mooring	means any weight or article placed in or on the sea bed or lake bed for the purpose of securing a vessel or floating structure; and (a) includes any wire, chain, rope, buoy or other device attached or connected to the weight; but (b) does not include an anchor that is removed with the vessel or floating structure when it leaves an anchorage.
Mooring area	**means any area described as a mooring area in the NRP maps 36-41.**
Natural Resources Plan (NRP)	**means the Regional Council's Natural Resources Plan made under the Resource Management Act. The current version as at 2020 is the Proposed Natural Resources Plan with some sections currently under appeal.** ***{Both of the above are in relation to transition from Coastal Plan to the NRP}***

Attachment 2 to Report20.312

Draft Statement of Proposal

Navigate	means the act or process of managing or directing the course of a vessel on, through, over or under the water.
Owner	includes: (a) in relation to a vessel, the agent of the owner and also a charterer; and (b) in relation to any dock, wharf quay or slipway, includes a lessee of the dock, wharf, quay or slipway.
Paddle craft	**Means a vessel powered only by the vessel's occupant(s) only by use of a single or double bladed paddle as a lever without the aid of a fulcrum provided by rowlocks, thole pins, crutches or like arrangements. This includes Stand up paddleboards and also includes any hydro foiling variation of the above.** ***{simplification of existing definitions and including stand up paddle boards and the variety of new foiling boards of different types}***
Person in charge of a vessel	means the master.
Pilot	In relation to any vessel means any person not being the master or a member of the crew of the vessel who has the conduct of the vessel.
Porirua Harbour	as defined in Schedule 1 of these Bylaws.
Powered vessel	means any vessel that is not solely powered manually or by sail.
Proper speed	means speed through the water.
Public notice	**Means published on the Council website** and a notice published in a newspaper circulating generally in the area adjacent to the waters to which the subject matter of the notice relates. {*including our website as a source of notification, we are still required to use Public Notices as they are required by legislation*}
Region	means the Wellington Region as constituted under the Local Government (Wellington Region) Reorganisation Order 1989.
Reserved area	means those areas defined by words and maps in part B of Schedule 3 of these Bylaws.
Reward	means the payment to, or for the benefit of, the owner or master of a vessel, of a contribution towards the expenses of a voyage by, or on behalf of, persons; but does not include

payment of any contributions by part owners of the vessel or by persons engaged as bona fide crew members.

Sailboard means any type of board that is propelled by a detachable sail apparatus and operated by a person standing on the board. This includes windsurfers and kite surfers**. This includes any hydro foiling variations of the above.**

Seaplane means a flying boat or any other aircraft designed to manoeuvre on the water.

Shore when referring to distance from shore, means distance from the water's edge.

Structure means any building, equipment, device or other facility which is fixed to land; and

(a) includes slipways, jetties, pile moorings, swing moorings, rafts, wharves, marine farms and other objects whether or not these are above or below the waterline; but

(b) does not include buoys, beacons or anchored floats.

Surfboard means any type of board that is designed to be used for surf riding and includes hydro foiling variations.

Tanker means any vessel which:

(a) is constructed, or has a compartment constructed, for the carriage in bulk of any Class 3 oil products; and

(b) either:

(i) has on board, or is about to take on board, a cargo the whole or any part of which consists of any Class 3 oil products in bulk; or

(ii) has discharged any cargo consisting of any such oil products in bulk, but the holds, tanks and compartments of which have not been rendered and certified gas-free; and

(iii) includes any tanker designed for carriage of bulk liquid harmful substances.

Unseaworthy **Means, in the opinion of the harbourmaster not being in a fit condition or readiness to navigate safely on the water.**

{a change in definition from seaworthy to unseaworthy as this is where the issue lies. There is no objective test and

the Harbourmaster will generally take special advice. The definition is one used in other regions}

Vessel	has the same meaning as ship in Section 2 of the Maritime Transport Act 1994, and shall include a seaplane when operating on waters
Waters	means all that area of: (a) seawater in estuaries, fiords, inlets or harbours, the outer boundary being three nautical miles from the shore of the Region and the inner boundary being the water's edge, except where that line crosses a river, in which case the boundary is a straight line representing the continuation of the line of mean high water spring on each side of the river at the outlet ; and (b) Lake Wairarapa, as defined by Order in Council (the National Water Conservation (Lake Wairarapa) Order 1989), dated 6 March 1989, New Zealand Gazette 9 March 1989 (Schedule 1 of these Bylaws); and (c) Lake Onoke, as defined by map in Schedule 1 of these Bylaws, where the river mouth of the Ruamahanga River shall be the landward boundary of Lake Onoke.
Wellington Harbour	means Wellington Harbour as defined by Order in Council, dated 17 January 1985 and amended 1 April 1985, New Zealand Gazette 14 February 1985, page 524 (Schedule 1 of these Bylaws).
Wellington Harbour Radio	Also known as 'Beacon Hill,' this is the Council's Harbour communication station, and is staffed 24 hours a day 365 days a year. The station can be contacted by marine VHF on channels 04 (East Coast approach to Wellington) 14, (Wellington Harbour) 16, International Distress and calling channel) and 62 (Western side of Cook Strait and Porirua, Mana and Kapiti areas). Telephone numbers include 04 388 1911, 04 388 5470, Fax 04 388 4319, e-mail: beaconhill@gw.govt.nz. The station is located at 41^{0}19.8S, 174^{0}49.7E.

2. General matters

2.1 Lifejackets

2.1.1 No person in charge of a pleasure craft may use it or allow it to be used unless it carries, at the time of use, in a readily accessible location, lifejackets of an appropriate size for each person on board.

2.1.2 The person in charge of any recreational craft that is 6 metres or less in length overall must ensure that every person on board is wearing a properly secured lifejacket of an appropriate size for that person while the craft is underway.

When not underway, the person in charge of any recreational craft that is 6 metres or less in length overall shall ensure that every person shall wear a properly secured lifejacket unless;

(a) the person in charge of that craft has expressly given permission for lifejackets not to be worn; and

(b) the person in charge of that craft considers that conditions are such that there is no significant reduction in safety if they allow any person to remove their lifejacket..

2.1.3 Subclauses 2.1.1 and 2.1.2 shall not apply to:

(a) any surfboard or similar unpowered craft **being used to ride breaking waves; and**

{*clarification on where the exemption applies, this is a definition used by Maritime NZ}*

(b) any sailboarder if a wetsuit is worn at all times; and

(c) a diver on a boat of six metres or less in length overall that is used for recreational diving within five nautical miles of shore, if a full body dive suit is worn at all times; and

(d) a person training for or participating in a sporting event, if the training or the event is supervised in accordance with the safety system of a national sporting organisation approved by the Director of Maritime Safety under Maritime Rule 91.4(3); and

2.1.4 **Subclause 2.1.2 shall not apply to any paddle craft, body board or surfboard, not covered by 2.1.3 (a), provided:**

(a) a leash is used as appropriate for the conditions, and

(b) it is being used within 200 metres of the shore

{Allows for use of a leash instead of wearing a lifejacket for things like Stand up paddle boards, within 200m of shore, outside of this distance a lifejacket must be worn}

2.1.5 In respect of any sporting event, training activity, ceremonial event or other organised recreational activity, subclauses 2.1.1 **and 2.1.2** shall not apply if a support vessel that is capable of providing adequate assistance in the event of an emergency remains in the immediate vicinity of the pleasure craft and the support vessel carries lifejackets or buoyancy aids of an appropriate size for each person on board the support vessel and the pleasure craft.

2.1.6 In respect of any sporting event, training activity or other organised recreational activity, the organising body may, where it is not practical to meet the requirements of subclause 2.1.5, apply for a written exemption to subclauses 2.1.1. **and 2.1.2** The Harbourmaster may grant an exemption for a specified time period, provided that the Harbourmaster is satisfied that adequate safety precautions are made for rescuing any persons participating in the event or activity.

2.1.7 No person in charge of a vessel may use it to tow any person and no person may cause himself or herself to be towed by any vessel, unless the person being towed wears a properly secured lifejacket of an appropriate size for that person.

2.1.8 Subclause 2.1.7 does not apply to a person:

(a) training for any trick water skiing element of a sporting event administered by a national sporting organisation approved under Maritime Rule 91.4(3); or

(b) participating in a sporting event that is administered by a national sporting organisation approved under Maritime Rule 91.4(3).

2.1.9 No person in charge of a pleasure craft may use that craft or allow it to be used in circumstances where:

(a) tides, river flows, rough seas; or

(b) adverse weather, adverse visibility or emergencies

cause a danger or a reduction in safety for the persons on board, unless each person on board is wearing a lifejacket of an appropriate size.

2.2 Persons to avoid swimming or diving around wharves

2.2.1 Without the permission of the Harbourmaster no person may dive **(using breathing apparatus)** or swim within 50 metres of:

{Clarification of current bylaw}

(a) any structure in the commercial port area as defined in the NRP; or

(b) any other wharf, boat ramp or designated boat launching area when a vessel is manoeuvring within 50 metres of the wharf, boat ramp or designated launching area.

2.2.2 Any person given permission to dive under subclause 2.2.1 must display flag A and meet any other conditions as required by the Harbourmaster

2.3 Use of vessel engine around wharves, ramps

2.3.1 No person may operate the propulsion system of a vessel while it is lying at any wharf, or while it is loaded to or from a boat trailer at any ramp, in such a way that it may damage any property, scour the bed of the waters, or injure any person. However, this subclause does not preclude the use of the propulsion system for the safe berthing or unberthing of any vessel at a wharf.

2.4 Vessels to be serviceable or removed

2.4.1 The master and the owner of any vessel anchored or moored in any waters must keep the vessel in a seaworthy condition at all times, unless the Harbourmaster has given prior written approval for it to be anchored or moored in an unseaworthy condition and subject to such conditions that the Harbourmaster may determine appropriate to ensure navigation safety.

2.4.2 If any vessel is a hazard to navigation by reason of it being unseaworthy:

(a) the Harbourmaster may give a written direction to the owner and/or the master of the vessel to move the vessel to an alternative location or to remove it from the waters within a reasonable time as specified in the direction; and

(b) the owner and master are jointly and severally responsible for ensuring the direction is complied with.

2.4.3 If the owner or master of the vessel fails to move the vessel in accordance with a direction given under subclause 2.4.2, the Harbourmaster may move that vessel to a position where it is no longer a hazard to navigation, or remove it from the water. **The**

costs incurred may be recovered from the owner, master or agent of the vessel in any court of competent jurisdiction as a debt due to the Council.

{Clarification of cost recovery abilities}

2.4.3 No person may operate any unseaworthy vessel except to comply with the directions, under these Bylaws, of the Harbourmaster or an Enforcement Officer to move the vessel to an alternative location.

2.5 Seaplanes

2.5.1 No person navigating a vessel may impede a seaplane in the process of landing or taking off.

2.6 Anchoring and mooring

2.6.1 No person may anchor a vessel so as to:

(a) obstruct the passage of other vessels or obstruct the approach to any wharf, pier or jetty; or

(b) create a hazard to other vessels at anchor, or

(c) **leave the vessel unattended for more than 24 hours without prior permission of the Harbourmaster.**

{U*nattended vessels at anchor are at risk of dragging due to changing conditions, many insurance companies will not cover vessel unattended for periods of time. This applies to anchored vessel, not vessels on moorings*}

2.6.2 Except in an emergency involving danger to life or property, no person may cut, break, destroy or unlawfully detach:

(a) the mooring of any vessel; or

(b) the fastening securing any vessel lying in, at or near a wharf, dock or at or near any wharf or landing place.

2.6.3 When a vessel is moored in, at or alongside a wharf or dock or other landing place, the owner or master must ensure that adequate and safe means of access to the vessel is provided, properly installed, secured and adjusted to suit all tidal conditions.

2.6.4 The owner or master of a vessel berthed at a wharf must ensure that it is securely fastened at all times and, if required by the Harbourmaster, maintain a person on board to keep watch.

2.6.5 No person may moor to a public wharf for more than 8 hours without permission of the wharf owner. This does not preclude the wharf owner from restricting berthage to a shorter time.

{Most public wharves are for short use only however few Councils have any rules in place around this. That has caused issues and frustration for both GW and a territorial authorities recently}

2.6.6 A vessel must not be anchored within the same or proximate location for longer than 14 consecutive days without the prior permission of the Harbourmaster.

{Long term anchoring tends to cause safety issues. In cases when reasonable precautions are being taken permission would not be unreasonably held. Many other Councils have a similar provision}

2.6.7 Any person intending to live on board a vessel at anchor or on a mooring for more than five consecutive nights shall inform the Council of the duration of their living on board and how they are complying with the NRP and Resource Management (Marine Pollution) Regulations 1988 in relation to vessel discharges.

{Live aboards outside of marinas are slowly becoming more common , while control of this is outside of our scope we are requesting confirmation that they are complying with GW requirements}

2.7 Prohibited anchorages

No person may anchor or moor any vessel within any prohibited anchorage as defined by words in Schedule 2 of these Bylaws.

2.8 Obstructions

2.8.1 No person may obstruct the access by waters to any wharf, landing place, boat ramp, slipway or mooring.

2.8.2 No person may place any obstruction, including any fishing apparatus, in any waters that is liable to:

(a) restrict navigation; or

(b) cause loss of life or injury to any person; or

(c) cause damage to any vessel or any property.

2.9 Collision Prevention

2.9.1 No person shall operate any vessel in breach of Part 22 of the Maritime Rules (Collision Prevention), made under the Maritime Transport Act 1994

2.10 Notification of collisions or accidents

2.10.1 The master of any vessel that:

(a) has been involved in a collision with any vessel, person or property, or has been sunk or grounded or become stranded in any waters; or

(b) by reason of accident, fire, defect or otherwise is in such a condition as to affect its safe navigation or to give rise to danger to any person, other vessels or property; or

(c) in any manner gives rise to an obstruction; or

(d) causes any damage to any navigation aid or structure, or to anything on the structure;

must, as well as complying with any accident reporting requirements of the Maritime Transport Act 1994, as soon as is practicable or at least within 48 hours notify the occurrence to the Harbourmaster.

2.10.2 A notification under subclause 2.10.1 must include:

(a) a full description of any injury to persons, and their names and their addresses; and

(b) a full description of any damage to vessels, navigation aids or structures; and

(c) the names and addresses of persons in charge of the vessel; and

(d) the time and date of the occurrence; and

(e) an outline of events relating to the occurrence.

2.10.3 If an incident described in subclause 2.10.1 involves damage to a vessel that affects, or is likely to affect, its seaworthiness, the master may not move the vessel except:

(a) to prevent the vessel from creating a hazard to navigation; or

(b) in accordance with the directions of the Harbourmaster or an Enforcement Officer.

2.10.4 Nothing in subclause 2.10.1(a) shall apply to any pleasure craft involved in organised racing if there are no serious injuries sustained.

2.10.5 **The Harbourmaster may request further information; the time frame and level of details required will be stipulated subsequent to the notification.**

{Provides for the ability to request information relevant to the event, this has been hard to do in the past}

2.11 Damage to buoys

2.11.1 No person may tie a vessel to any buoy, beacon or other device or structure erected as a navigation aid, warning marker or sign without the prior written permission of the Harbourmaster.

2.11.2 No person may damage, remove, deface or otherwise interfere with any buoy, beacon or other device or structure erected as a navigation aid, warning marker or sign.

2.11.3 No person may erect, maintain or display any beacon, buoy or other device, which may be used as, or mistaken for, a recognised navigation aid, without the written permission of the Harbourmaster and the Director of Maritime Safety.

2.12 Flashing lights and sound signals

2.12.1 No person shall use any flashing lights, sirens or other sound or light signals not prescribed in a Maritime Rule for that vessel, without the permission of the Harbourmaster.

2.12.2 The use of blue flashing lights and/or sirens is restricted to Police, Customs, Harbourmaster or other enforcement vessels authorised by the Harbourmaster.

2.12.3 A vessel authorised to use purple flashing lights by the Harbourmaster shall only display them when:

(a) The use is required to assist the location of a vessel or person in need of assistance.

(b) The use is required to assist the identification of the vessel to an aircraft involved in an incident.

(c) Is otherwise directed to do so by the Police or Harbourmaster.

The lights imply no status or privilege to that vessel.

2.13 Vessels making sound signals

No person may blow or sound, or cause to be blown or sounded, the whistle, siren or horn of a vessel, within any harbour, except as a navigation safety signal or **with permission of the Harbourmaster**. However, nothing in these Bylaws precludes the testing of such a whistle,

siren or horn before the vessel leaves any wharf **or use of the same as part of a vessel safety exercise.**

{Allows some discretion and reflects current practice}

2.14 Use of distress signals

2.14.1 A person must not make a distress signal, or cause or permit a distress signal to be made, unless that person is satisfied that:

(a) the vessel that is on the water (or any person from that vessel) to which the person belongs is in serious and imminent danger and requires immediate assistance; or

(b) another vessel (or any person from that vessel) is in serious and imminent danger and cannot itself make the signal and requires immediate assistance.

2.14.2 A person must not use signals which may be confused with the distress signals unless in distress.

2.14.3 The Director of Maritime Safety may, for the purpose of allowing instruction in the use of distress signals, authorise in writing the making of distress signals at such times and places, and subject to such other conditions, as the Director thinks fit.

2.15 Means of communication

Every person in charge of a vessel must ensure that at least one appropriate means of communication is carried on board the vessel that:

(a) provides the ability to communicate with land based and/or seaborne parties from any point within the area the vessel will be operated; and

(b) in the case of vessels under 6 metres in length, is able to be operated following submersion in sea water; and

(c) is adequate to provide communications for the duration of the voyage.

3. Operating requirements

3.1 Minimum age for operating powered vessels

3.1.1 No person under the age of 15 years shall be in charge of, or propel or navigate, a power-driven vessel that is capable of a proper speed exceeding 10 knots unless he or she is under the direct supervision of a person over the age of 15 years who is in immediate reach of the controls.

3.1.2 The owner of a powered vessel that is capable of a proper speed exceeding 10 knots must not allow any person who is under the age of 15 years to propel or navigate that vessel in contravention of subclause 3.1.1.

3.1.3 Subclause 3.1.1 does not apply to any person who has a written exemption from the Harbourmaster. Written exemptions may be given for training, competitions or other sporting events, and the Harbourmaster, when considering whether or not to grant such an exemption, shall have regard to the competence of the person, the level of supervision, and awareness of other relevant navigation safety matters.

3.2 Speed of vessels

3.2.1 No person may, without reasonable excuse, propel or navigate a vessel (including a vessel towing a person or some object) at a proper speed exceeding 5 knots:

(a) within 50 metres of any other vessel, floating structure or person in the water; or

(b) either within 200 metres of the shore or of any structure, or on the inshore side of any buoy(s) demarcating that distance from the shore or structure; or

(c) within 200 metres of any vessel or floating structure that is flying flag A; or

(d) when knowingly or deliberately approaching within 200 metres of a marine mammal.

3.2.2 No person may propel or navigate a powered vessel at a proper speed exceeding 5 knots while any person has any portion of his or her body extending over the fore part, bow or side of that vessel.

3.2.3 No person may cause or allow himself or herself to be towed by a vessel or any other means (whether or not on a water ski, aquaplane or other towed object) at a proper speed exceeding 5 knots in any circumstances specified in any of paragraphs (a) to (c) of subclause 3.2.1.

3.2.4 No person in charge of a vessel may permit the vessel to continue onwards, after any person being towed by that vessel has dropped (whether accidentally or otherwise) any water ski which may cause danger to any other person or vessel, without taking

appropriate action to recover that water ski or take measures to ensure that the water ski is visible to other water users.

3.2.5 Subclause 3.2.1(a) shall not apply to:

(a) a vessel over 500 gross tonnage, if the vessel cannot be safely navigated in compliance with subclause 3.2.1(a); or

(b) a vessel powered by sail in relation to any other vessel powered by sail, while the vessels are participating in a yacht race or training administered by:

(i) a club affiliated to Yachting New Zealand; or

(ii) a non-profit organisation involved in sail training or racing; or

(c) a craft training for or participating in competitive rowing or paddling; or

(d) a tug, pilot vessel, harbourmaster vessel, emergency response craft or police vessel, if the vessel's duties cannot be performed in compliance with subclause 3.2.1(a).

3.2.6 Subclause 3.2.1(b) shall not apply to:

(a) a vessel operating in an access lane or a reserved area for the purpose for which the access lane or reserved area was declared, unless, in the case of a reserved area, a navigation bylaw provides otherwise; or

(b) a vessel over 500 gross tonnage, if the vessel cannot be safely navigated in compliance with subclause 3.2.1(b); or

(c) a vessel powered by sail in relation to any other vessel powered by sail, while the vessels are participating in a yacht race or training administered by:

(i) a club affiliated to Yachting New Zealand; or

(ii) a non-profit organisation involved in sail training or racing; or

(d) a sailboard; or

(e) a craft training for or participating in competitive rowing or paddling; or

(f) a tug, pilot vessel, harbourmaster vessel, emergency response craft or police vessel when the vessel's duties cannot be performed in compliance with subclause 3.2.1(b).

3.2.7 Subclauses 3.2.1(b) and 3.2.2 shall not apply to a craft operated by a Surf Lifesaving Club affiliated to Surf Lifesaving New Zealand, that is being operated in accordance

with the appropriate operating procedure that has been approved by the Director of Maritime Safety.

3.2.8 Subject to subclause 3.2.1, every person who propels or navigates a pleasure craft must ensure that its wake does not cause unnecessary danger or risk of damage to other vessels or structures, or of harm to other persons.

3.3 Lights for sailing vessels underway and vessels under oars (including paddles)

3.3.1 Subject to the requirements of Part 22 of the Maritime Rules that stipulate when lights must be exhibited, a sailing vessel of less than seven metres in length must, if practicable, exhibit sidelights and sternlight, but if it does not do so, it must have ready an electric torch or lighted lantern showing a white light which must be exhibited in sufficient time to prevent collision.

3.3.2 A vessel under oars may exhibit the lights prescribed in this subclause for sailing vessels, but if it does not do so, it must have ready an electric torch or lighted lantern showing a white light which must be exhibited in sufficient time to prevent collision.

3.3.3 In Wellington and Porirua Harbours any of the vessels in paragraphs 3.3.1 and 3.3.2 above who are not able to exhibit sidelights and a sternlight must exhibit an all-round white light where it can best be seen.

3.4 Diving

3.4.1 Every person diving from a vessel must ensure that flag A is displayed in such a manner that it can be clearly identified by the watchkeeper of another vessel at a distance in excess of 200 metres.

3.4.2 The master of every vessel from which dive operations are in progress must ensure that flag A is displayed in such a manner that it can be clearly identified by the watchkeeper of another vessel at a distance in excess of 200 metres.

3.4.3 The minimum size for a flag that is required under 3.4.1 or 3.4.2 is 60cm by 60cm.

3.4.4 **Any free-diver from shore intending to dive more than 200 metres from shore must either tow a distinctive float or use a raft displaying a dive flag.**

3.4.5 **Any shore diver that surfaces more than 200 metres from shore must display a surface marker buoy or similar that marks their position prior to surfacing.**

{*These are being introduced as shore divers venture further out from shore. Current rules require vessels to slow to 5 knots within 200metres of shore, outside of that without a flag or float a diver (free or scuba) on the surface is very hard for a boat skipper to see.* }

3.5 Lookouts on vessels used for water skiing and towing any person

3.5.1 No person in charge of a vessel may use it to tow any person at a speed exceeding 5 knots unless at least one additional person is on board who is responsible for

immediately notifying the person in charge of every mishap that occurs to the person who is being towed.

3.5.2 No person may cause or allow himself or herself to be towed at a speed exceeding 5 knots by or from any vessel unless at least one additional person is on board who is responsible for immediately notifying the person in charge of every mishap that occurs to the person who is being towed.

3.5.3 No person who is under the age of 10 years is permitted to act as the additional person required by subclauses 3.5.1 and 3.5.2.

3.6 Water skiing or towing during the hours of darkness

3.6.1 No person may operate, **during the hours of darkness or in restricted visibility**, a vessel that is towing any person, whether or not that person is on a water ski, aquaplane, paraglider or other similar object. ***{this was only a change in terminology to improve consistency}***

3.6.2 No person may allow himself or herself to be towed by a vessel or any other means, **during the hours of darkness or in restricted visibility**.

3.7 Conduct in access lanes

3.7.1 No person may, in any access lane, propel, navigate or manoeuvre a vessel except by the most direct route through the access lane and on that side of the access lane that lies to the starboard or right-hand side of the vessel.

3.7.2 No person may:

(a) while being towed by a vessel in any access lane, cause himself or herself or any water ski, aquaplane or other towed object, on or by which he or she is being towed; or

(b) cause any object that is being towed by a vessel in any access lane

to travel other than by the most direct route through the access lane and on that side of the access lane that lies to the starboard or right-hand side of the vessel.

3.7.3 No person within an access lane may proceed in any manner that is dangerous in relation to any vessel or other person in the access lane.

3.7.4 No person may obstruct any other person while that other person is using an access lane for the purpose for which it has been declared.

3.7.5 If one or more persons are using an access lane for the purpose for which it is declared, no person may enter, remain in or use the lane for any other purpose.

3.7.6 The access lanes to which these Bylaws apply are those prescribed in Schedule 3 of these Bylaws.

3.8 Marking of access lanes

3.8.1 Every access lane must be marked on shore, by pairs of posts in transit. These posts will be orange with black horizontal bands.

3.8.2 An access lane may also be marked with orange buoys with vertical black stripes.

3.8.3 Each access lane shall have an adequate sign or signs in the vicinity of the access lane that declares the purpose of that lane.

3.9 Reserved areas

3.9.1 No person may obstruct any other person while that other person is using a reserved area for the purpose for which it has been reserved under these Bylaws.

3.9.2 If any person is using a reserved area for the purpose for which it is reserved, no other person may enter, remain in or use the area for any other purpose.

3.9.3 A permanent reserved area must be marked on shore, by pairs of posts in transit. These posts will be white with black horizontal bands.

3.9.4 If the reserved area is marked at sea it is marked by black buoys with white vertical stripes.

3.9.5 Each permanent reserved area shall have an adequate sign or signs in the vicinity of the reserved area that declares the purpose of that area.

3.10 Areas for non-powered vessels only

The use of powered vessels within the waters of the Pauatahanui Wildlife Reserve is prohibited, except with the written permission of the Harbourmaster. The area is shown in Part D of Schedule 3.

{This came from discussion with the Porirua Harbour Trust. The water here is increasingly shallow and better suited to paddle craft. On high tides the yacht club sometime sail this far in and they will have permission for the support boat for mark laying and assisting if required.}

3.11 Flagged areas on beaches

3.11.1 A Surf Life Saving New Zealand Patrol Captain, may, from time to time, subject to 3.11.4, set aside areas of beaches as flagged areas for the purposes of swimming and body boarding only.

3.11.2 No person may carry out any activity other than the activities for which the area has been flagged. This shall not prevent Surf Lifesaving or other rescue services operating in this area in case of an emergency.

3.11.3 The areas on which flagged areas signify swimming only areas are detailed in Part C of Schedule 3.

3.11.4 Flagged swimming areas on beaches shall consist of two red/yellow flags forming the area boundary. These flags shall meet NZ Standard NZS8690:2003 – 5.1 Design of flags and 5.2 Use of flags.

3.12 Special events

3.12.1 Any person intending to conduct a race, speed trial, competition or other organised water activity in any area to which these Bylaws apply should apply to the Harbourmaster to:

(a) temporarily suspend the application of subclauses 3.2.1(a) and (b) and clause 6.8 of these Bylaws in that area during the conduct of the race, speed trial, competition or other organised water activity; and/or

(b) temporarily reserve the area for the purpose of that activity; and/or

(c) temporarily suspend the designation of permanent access lanes or reserved areas.

3.12.2 Where the Harbourmaster is satisfied, on considering an application under these Bylaws, that the application may be granted without endangering the public, he or she may grant the application accordingly, for a period not exceeding 10 days, and on such conditions (if any) as he or she may specify.

3.12.3 Every grant of an application under these Bylaws shall, subject to subclause 3.12.4, have effect according to its tenor.

3.12.4 No grant of an application under these Bylaws shall have effect unless, not less than seven days or more than 14 days before the commencement of the activity, a public notice is given specifying the period of the activity and details of the suspension or reserved area.

3.12.5 The Harbourmaster may recover from the applicant all actual and reasonable costs incurred for the publication of a public notice under subclause 3.12.4.

3.13 Moorings

3.13.1 No person may place a mooring in any waters, whether in a mooring area or not, unless a licence in terms of subclause 3.13.4 has been obtained.

3.13.2 The Harbourmaster may remove or authorise the removal of any unauthorised mooring and all costs of so doing are a debt by the owner of the mooring to the Council.

3.13.3 No person may anchor any vessel so as to obstruct any licensed mooring unless they are the license **holder of, or contractor to** that mooring.

3.13.4 The Harbourmaster may, subject to the conditions specified in subclause 3.13.6, grant a mooring licence to which subclause 3.13.1 applies.

3.13.5 Every mooring licence issued by the Harbourmaster shall apply only to the vessel and owner(s) named in the licence.

3.13.6 The conditions of any mooring licence issued by the Harbourmaster may include, but are not limited to:

(a) the precise location of the mooring; and

(b) the size and type of any vessel which may be attached to the mooring;

(c) the design and specifications of the mooring; and

(d) a requirement for maintenance and inspections of the mooring; and

(e) the type of buoy or float with which the owner of a mooring must mark the location of the mooring when it is not being used by a vessel; and

(f) a requirement that the owner of the mooring shall be liable in any event for the position, insufficiency or insecurity of **their** licensed mooring.

3.13.7 The Harbourmaster shall not grant any licence for a mooring unless satisfied that:

(a) there is adequate space in the mooring area for the proposed mooring; and

(b) the mooring is of adequate specifications to accommodate the proposed vessel to be moored.

3.13.8 No owner of a licensed mooring may leave a mooring vacant or unattended for a period of longer than six months without the written permission of the Harbourmaster.

3.13.9 Where the owner of a mooring has left it vacant or unattended for a period of longer than six months without the written permission of the Harbourmaster, the Harbourmaster may cancel the licence and direct that the mooring be removed.

3.13.10 No owner of a licensed mooring may, except with the written permission of the Harbourmaster:

(a) part with the possession of the mooring; or

(b) assign the mooring to any other person; or

(c) suffer any such other person to have the use of the mooring; or

(d) use the mooring for a vessel other than the vessel named in the licence.

3.14 Buoys

3.14.1 No person may place a marker buoy in any waters of Wellington or Porirua Harbour unless that buoy is clearly and indelibly marked, or fitted with a permanent tag, showing at least one of the following—

(a) the owner's initials and surname, and contact telephone number or address; or

(b) in the case of a mooring, the mooring licence number.

3.14.2 No person may place a marker buoy in any waters of Wellington or Porirua Harbour unless that buoy is sufficiently buoyant to remain at least 50% afloat or otherwise clearly visible.

3.14.3 No buoy should be placed so that it becomes a hazard to navigation

{These ensure that various temporary markers in the harbour are visible and can be easily identified.}

4. Commercial operations including hazardous works and cargoes

4.1 Vessels carrying explosives

4.1.1 The master of a vessel having on board, or intending to load, explosives must ensure that:

(a) the ship remains within the explosives anchorage specified in Schedule 2 of these Bylaws when not underway, except with the written permission of the Harbourmaster; and

(b) no person loads or unloads explosives outside the explosives anchorage, except with the written permission of the Harbourmaster; and

(c) the Harbourmaster is provided with the Dangerous Goods declaration for the explosives at least 48 hours prior to loading or discharging. For weekend loading or discharging documentation shall be provided no later than 12 noon on Friday.

(d) Harbourmaster's written permission is required to load or discharge class 1 explosives

4.1.2 Nothing in clauses 4.1.1 applies to any vessel which:

(a) is carrying not more than 27 kilograms of explosives; or

(b) is carrying or is intending to load, with only explosives of Safety Ammunition Class 1.4S as defined under the Hazardous Substances (Classes 1 to 5 controls) Regulations 2001 or Fireworks of Classes 1.3G; 1.4G and 1.4S as defined under the Hazardous Substances (Fireworks) Regulations 2001 in quantities that do not require an Hazardous Substance and New Organisms Approved Handler.

4.2 Signals to be displayed by any vessel taking in, or discharging or carrying Dangerous Goods.

On or immediately before the arrival in harbour of any vessel carrying dangerous goods, and for as long as that vessel remains in harbour, the master must display by day flag B and by night a red light at the masthead or where it can best be seen from all directions.

4.3 Distance from vessels showing flag B

Where possible, the master of a vessel **underway** must not allow that vessel to approach within 200 metres of an oil tanker or any other vessel, while it is at a berth, anchored or underway, that is showing flag B by day or a red all-round light by night. This shall not apply to a vessel acting in accordance with 4.5.1.

4.4 Duties of master of a tanker

4.4.1 While in harbour, the master of an oil tanker must operate in accordance with the International Safety Guide for Oil Tankers and Terminals (ISGOTT).

4.4.2 The master of a tanker must:

(a) berth or moor the tanker only at such wharf or place as specified for bulk oil discharges in Schedule 2 of these Bylaws, or as otherwise permitted in writing by the Harbourmaster; and

(b) keep the tanks containing Class 3 packing groups I and II oil cargo securely closed, except when opened for loading or discharging; and

(c) unless exempted by the Harbourmaster, ensure that sufficient motive power is available at all times to enable the vessel to be moved from the berth in case of fire or other emergency; and

(d) submit to the Harbourmaster a plan showing the layout of the vessel's tanks and contents, giving the products and approximate quantities that will be on board when arriving at Wellington Harbour, at least 12 hours prior to arrival.

4.5 Berthage requirements for tankers and vessels carrying Class 1 explosives

4.5.1 The master of a tanker or gas carrier must ensure that, the tanker does not lie within 30 metres of another vessel without prior written approval of the Harbourmaster.

4.5.2 The master of a vessel carrying Class 1 explosives in excess of the quantities that require a test certificate shall berth only at a berth which complies with the Designated Transfer Zone provision of a Dangerous Goods Handling Plan. Such a plan will illustrate the limits of the Designated Transfer Zones on a case by case basis.

4.6 Hot work operations

4.6.1 Within Wellington Harbour or commercial areas, the person carrying out the hot work and the master or ship's engineer if available, of every vessel on board which, or on the hull of which, it is proposed to carry out welding or flame-cutting operations in or from any position, whether on board the vessel or not, must **request** from the Harbourmaster a Hot Work Permit, no less than **three** hours before commencing the work. A copy of the permit is shown in Schedule 4 of these Bylaws,

4.6.2 The person carrying out the hot work or the master or ship's engineer, if available, of the vessel must ensure that before any welding operations are commenced, precautions are taken for the detection, prevention and extinguishing of fire on board the vessel or elsewhere during the welding operations, and that the requirements of

the Hot Work Permit are met. Provision must be made for the continuance of the precautions until the operations are completed.

4.6.3 No person may commence hot work without having seen and understood a current Hot Work Permit for the work to be undertaken.

4.6.4 The Harbourmaster may grant a written exemption from compliance with subclauses 4.6.1 and 4.6.2 to the master or owner of a vessel lying at any ship-repairing establishment.

4.6.5 The Harbourmaster may issue a Hot Work Permit if they are satisfied that the requirements of the Permit, as shown in Schedule 4 of these Bylaws, have been met in full.

4.7 Loading or Discharge of Cargo

4.7.1 No person shall discharge, drop, cause or allow to be discharged into the region's waters any cargo or anything from any vessel, wharf or from land that would or may constitute a danger to navigation safety.

4.7.2 The person who is loading or discharging or drops the cargo, or any other material discharged, into navigable waters shall be liable for the costs of removal.

4.7.3 Any person that intends to load logs shall ensure that a plan has been submitted to the Harbourmaster that relates to the loading and recovery of lost logs. The loading needs to be monitored so as to immediately identify any logs that have been lost in the harbour and track them until they can be removed.

4.7.4 Wellington Harbour Radio shall be informed of any logs lost into the harbour as soon as they are observed missing and again once they have been recovered.

4.8 Vessels over 500 Gross Tonnage within the Wellington Bylaw area.

4.8.1 Any vessel over 500 gross tonnage intending to enter the Bylaws area, except for the purposes of entering Wellington Harbour, must submit a passage plan for prior approval.

4.8.2 The Harbourmaster may grant permission for 4.8.1, subject to a satisfactory passage plan and any additional conditions as required.

{From time to time we have small cruise ships and other ships that wish to come within our Bylaws area (3 nautical miles off the coast). Generally these are in remote places with little support should there be any issues with the vessels. Stopping, anchoring, restarting engines are all sources of increased risk. Being able to require pre-planning and set conditions of entry into our Bylaw area is an important control for our risk management. We cannot outright prevent vessel entering our waters as that would restrict their freedom of navigation and likewise should a ship be in distress that situation would be handed differently also.}

4.8.3 No vessels over 500 Gross Tonange may double bank without prior permission of the Harbourmaster.

{This is not a common occurrence in Wellington, however there are indications that there may an increase in "bunker barges", effectively small fuel tankers, working in port supplying ships. A restriction on double banking indicated that there will be steps for them to go through and discussions to be had before such an operation could happen in Wellington.}

4.8.4 The master of any commercial vessel over 500 Gross Tonnage that wishes to immobilise and/or test engines must seek permission from the Harbourmaster and comply with any conditions provided. This includes maintenance on one or more of the main propulsion units and /or steering systems.

{Including current practise into the bylaws}

4.8.5 The master of any commercial vessel over 500 Gross Tonnage that wishes to conduct safety drills or exercises, including, but not limited to, lowering of lifeboats, shall, prior to commencing the drill or exercise inform Wellington Harbour Radio of their intention and take heed of any advice given relating to the safe conclusion of the drill or exercise.

{This is including current practise into the bylaws and also that vessels need only to inform and not seek permission}

5. Administrative matters

5.1 Appointment of officers

The Council, when appointing Enforcement officers, Honorary Enforcement officers or other authorised persons, may impose conditions which may include but not limited to restrictions specified powers and area of jurisdiction and specifying bylaws that may be enforced.

{R*emoval of authorisations that fall under the Act, the remaining paragraph allows Council to limit powers via the appointment process}*

5.2 Application to master/owner

5.2.1 Where any clause in these Bylaws imposes an obligation or duty on the master of any vessel, that obligation or duty must, in the case of a vessel that has no master, be performed or carried out by the owner.

5.2.2 Where any clause of these Bylaws imposes an obligation or duty on both the master and the owner of a vessel, then, if that clause is not complied with, the master and the owner are deemed severally to have committed an offence against these Bylaws. If

any such clause is complied with by either the master or the owner, then, for the purposes of these Bylaws, compliance by one is deemed to be compliance by the other.

5.3 Notifications to Harbourmaster

Any notifications required to be made to the Harbourmaster, that occur outside of normal office hours (Monday to Friday 0830-1700) shall be made to Wellington Harbour Radio.

5.4 Commercial vessels and hire operations

5.4.1 **No person shall operate any commercial vessel for hire or reward or any vessel hire operation if, in the opinion of the Harbourmaster, such operation may be deficient in terms of safety or compliance with good practice for such an operation, and the Harbourmaster instructs them to cease operating.**

5.4.2 Any operation for hire and reward that is not subject to licensing by Maritime New Zealand, Worksafe New Zealand or a Worksafe accredited certification organisation, must obtain a Commercial Vessel Licence.

5.4.3 The Harbourmaster may issue a Commercial Vessel Licence subject to provision of a suitable safe operating plan.

{We are trying to avoid licencing hire operations that already have to have their procedures checked and audited by accredited bodies. We do however need to maintain a catch all that ensure anyone offering hire vessels (unpowered, off the beach type ventures) to the public do have an adequate safety plan in place. }

5.4.4 Any person intending to operate vessels for hire or reward must notify the Harbourmaster before commencing the activity and gain approval for operating locations and any other specific conditions.

{While hire operations may be licenced by other organisations we, as the local harbour authority, will still need to approve their area of operation to ensure non-compatible activities do not clash}

5.4 Registration of personal water craft (commonly known as a jetski)

5.4.1 **Every personal water craft being used on the waters of the Wellington region must be registered with:**

- **the Council;**
- **an authorised agent of the Council; or**
- **another regional council.**

5.4.2 The registration with the Council shall be completed to the satisfaction of the Council, and include the name and address of the owner and details of the personal water craft.

5.4.3 The Council or authorised agency or another regional council will issue a unique registration number. This number must be clearly displayed above the water line on both sides of the craft at all times. Each number used shall be a

minimum height of 90 millimetres and the numbers must be legible at a distance no less than 50 metres.

5.4.4 The owner selling or otherwise disposing of a personal water craft must complete in writing to the Council a change of ownership or de-registration form, (which includes the name and contact information of the new owner), within 30 days of selling or disposing of the craft.

{This is in common with several other councils around the country and we intend to join with one of the larger registration systems to avoid the need for our own and to provide better value for jet skis that travel by allowing a single registration. Being registered encourage improved behaviour as owners can be more easily identified and also compliant jet ski users can be equally ruled out where issues occur.}

5.5 Vessel identification

5.5.1 The skipper of a vessel not covered by clause 5.4 shall ensure the vessel is clearly marked with a minimum of two letters or numbers which must not be a vessel's brand, make or model, and must not have the potential to be misrepresented as a harbourmaster, coastguard, police, customs, fishery officer or similar response vessel. The marking shall be clearly displayed in a position that it is above the water line on both sides of the vessel at all times.

Each letter or number shall be a minimum height of 90 millimetres and the letters or numbers must be legible at a distance no less than 50 metres.

5.5.2 Subclause 5.5.1 does not apply to:

i) non power-driven vessels; or

ii) power-driven vessels of 4 metres or less in length.

5.5.3 Any vessel exempted under subclause 5.5.2 i) or ii) should be clearly marked somewhere on or in the vessel, with the owner's name and contact details.

{Being able to distinguisher between similar looking vessels has advantages for following up on complaints regarding safety incidents and being able to positively identify vessels if there is a distress situation. For small craft the owners name and number should allow quick confirmation if there is a person missing. These provision are becoming common around the country.}

5.6 Fees and charges

5.6.1 Council may from time to time, by resolution, publicly notified, set fees and charges for any activity undertaken in these bylaw. **These fees will be in the annual plan**

5.6.2 The fees and charges set under bylaw 5.6.1 must be paid on invoice by the specified person to the Council.

5.6.3 The cost of any Public Notices required by this Bylaws or required in an approval or permission, will be passed on at actual cost.

{Fees have been moved from the bylaws to the Annual plan to enable simpler adjustment.}

6. Wellington Harbour

6.1 Directions for transiting Wellington Harbour entrance

6.1.1 The Master of any vessel entering Wellington Harbour limits must call Wellington Harbour Radio on VHF Ch14 and report their intention to enter the harbour. They shall also inform Wellington Harbour Radio of:

a) the number of persons on board, if the vessel is carrying passengers.

b) the name of master, if the master is exercising a Pilotage Exemption

c) the operational status of the vessel.

or any other information that may be requested.

6.1.2 During the hours of daylight and in good visibility pleasure craft are exempt from 6.1.1. and 6.1.2.

6.1.3 The master of a vessel not carrying a marine VHF radio and unable to communicate with "Wellington Harbour Radio" satisfactorily by other means (such as a cellular phone), shall not transit the Wellington Harbour entrance during the hours of darkness or during restricted visibility, except in an emergency.

6.1.4 All vessels of 18 metres or more, on passage, shall follow the recommended tracks as detailed in Part A of Schedule 5. This does not exempt a vessel to which this Bylaw applies that is less than 500 gross tonnage from their obligations under 6.3.1.

6.1.5 The master of an inward-bound vessel that is not under Pilots instructions, and is required to follow the recommended tracks shall join the leading line at least two nautical miles south of the charted position of Barrett Reef buoy, except where it would be unsafe to do so because of extreme weather conditions.

6.1.6 The part of Wellington Harbour, detailed in Schedule 6, is deemed to be a narrow channel in accordance with Part 22.9 of the Maritime Rules (Narrow Channels). All vessels in this area should navigate in accordance with this rule.

6.1.7 Outbound vessels shall continue to monitor VHF Ch 14 until seaward of the position of Barrett Reef Buoy.

6.2 Radio reporting procedures - Wellington Harbour Limits

6.2.1 At least 10 minutes prior to planning to leave their berth, the master of any vessel of 18 metres or more shall call Wellington Harbour Radio on VHF Ch 14 to report their intentions, to provide the master's name and operational status of the vessel and, to obtain information about known shipping traffic movements, and to obtain current weather conditions at the harbour entrance.

6.2.2 After leaving a berth, mooring or anchorage, the master of either any vessel 18 metres or more or any commercial vessel carrying passengers shall, as soon as practicable, call Wellington Harbour Radio on VHF Ch 14 and report that the vessel has cleared

the berth, mooring or anchorage, and their intentions. The master of any commercial vessel carrying passengers shall advise of the total number of persons on board.

6.2.3 Any vessel to which 6.2.1 or 6.2.2 applies shall advise Wellington Harbour Radio on VHF Ch 14 when secured at a berth, mooring or anchorage, or when seaward of the position off Barrett Reef buoy, if outward bound.

6.2.4 **Any vessels that are crossing the Wellington Harbour Entrance, south of Barrett Reef, must report their intention to Wellington Harbour Radio. This does not apply to Pleasure Craft during daylight and good visibility.**

{This is to be able to inform fished vessel crossing the entrance of shiping movements and via-versa, some of these vessel are doing this currently}

6.3 General directions for navigating in Wellington Harbour

6.3.1 All commercial vessels in Wellington Harbour shall maintain a listening watch on VHF Ch 14.

6.3.2 During the hours of darkness or restricted visibility all vessels on Wellington Harbour, that have a VHF radio fitted or carried on board, shall maintain a listening watch on VHF Ch 14.

6.3.3 The master shall ensure that while within Wellington Harbour:

(a) automatic-steering devices are not to be used, unless a helmsman is standing by in the immediate vicinity of the helm or wheel, otherwise the vessel is to be in the hand-steering mode; and

(b) main engines are to be immediately available for reducing speed, stopping or going astern at all times without delay; and

(c) anchors are to be immediately available for use in an emergency, and capable of being lowered without power; and

(d) all information from aids to navigation and charts is fully monitored; and

(e) an appropriate passage plan is developed and executed.

6.3.4 While within Wellington Harbour all aids to navigation on board vessels, including but not limited to radar, Automatic Identification System (AIS) and depth recording devices, are to be in continuous operation and fully utilised.

6.3.5 The number of persons on the bridge of the vessel shall be sufficient to enable compliance with subclause 6.3.3. and Part 22.5 of the Maritime Rules.

6.3.6 Any vessel required to follow the recommend tracks shall, in a prudent seamanship like manner, unless for reasons of safety of navigation or pressure of weather, follow the relevant track as shown in Schedule 5. Any deviation for the reasons stated

herewith shall be notified to Wellington Harbour radio by VHF Ch14 prior to deviating.

6.3.8. No vessel over 18 metres on passage, shall pass less than 3 cables (556 metres) off a line from Point Halswell to Kau Point, and not less than 2.8 cables (519 metres) off a line from Kau Point to Point Gordon.

6.3.9 All vessels over 500 gross tonnage departing from Lambton Harbour during the hours of daylight shall give one blast on their horn immediately prior to leaving the berth.

6.3.10 All vessels over 18 metres or any passenger vessel licenced to carry more than 12 passengers or any passenger vessel operating during the hours of darkness or in restricted visibility, shall transmit an AIS signal when in Wellington Harbour limits.

6.3.11 In addition to 6.3.10, the Harbourmaster may require the owner of any other vessel to install and use an AIS unit.

{AIS is an automated position indicating system, vessels transmitting this signal are visible and identifiable to other vessel with the system and Wellington Harbour Radio. In the evening we are aware of the charter boats out on the harbour but neither Harbour Radio or other shipping know exactly where. Making this a requirement has benefits for safe navigation and also emergency response should any of these vessel get into difficulties, as has happened in the past.}

6.4 Radio reporting for vessels taking part in organised events within Wellington Harbour

During the hours of darkness or during restricted visibility, as defined in Part 22 of the Maritime Rules, when a group of vessels is taking part in an organised event, the controlling officer of that event must advise "Wellington Harbour Radio" of the approximate number of vessels involved, the location and duration of the event, and the radio channel being used.

6.5 Duties of persons in charge of motor boats, yachts, launches etc. in Wellington Harbour

6.5.1 The master of every vessel in Wellington Harbour, under 500 gross tonnage (including vessels at anchor), shall not impede the navigation of any vessel of 500 gross tonnage or more.

6.5.2 While within Wellington Harbour the master of any vessel should avoid anchoring within 100 metres of the marked inward and outward tracks as shown in Part A of

Schedule 5, or if they do so, shall move in good time to avoid impeding any vessel over 500 gross tonnage that is required to follow those tracks.

6.5.3 For the purpose of 6.4.1 and 6.4.2 'impede' shall include, but is not limited to any action or inaction that requires the master of the vessel over 500 gross tonnage, to take avoiding action.

6.6 Navigational documents required for Wellington Harbour

When navigating in that part of the harbour between Makaro/Ward Island and Pencarrow Head, all vessels of six metres in length and above shall carry and consult a current copy of Chart NZ4633 (or approved electronic equivalent).

6.7 Reporting of vessels' air draught prior to entering Evans Bay

Any vessel with a height of mast or superstructure exceeding 24 metres shall at least 15 minutes prior to entering or before leaving any berth in Evans Bay report to "Wellington Harbour Radio" on VHF Ch 14.

6.8 Speed limits in Lambton Harbour area

6.8.1 In addition to bylaw 3.2 **(5 knots within 200m of shore),** no vessels shall exceed a speed of 12 knots in the Lambton Harbour area **(westwards of a line between the Pile Light at the southeastern corner of the Thorndon Container Terminal and the Carter Fountain in Oriental Bay) unless exempted by the Harbourmaster. As shown in Schedule 1.**

{clarification of the existing rule}

6.8.2 Emergency-service vessels are exempted from complying with subclause 6.8.1 when responding to emergencies.

6.8.3 The Harbourmaster may instruct any vessel not to exceed a specified speed, as determined by the Harbourmaster, in certain parts of the harbour for the purposes of ensuring navigational safety.

6.9 Restricted access for non-commercial vessels

Non commercial vessels shall not enter the commercial areas as shown in Schedule 2 without permission from the Harbourmaster.

{This is being extended to include the main wharf and the rail ferry terminals}

Attachment 2 to Report20.312

Draft Statement of Proposal

Schedule 1 – areas defined

Wellington Harbour

All that area of sea and tidal waters the outer limits being the arc of a circle running from the landward boundary of the foreshore just north of Baring Head and thence into Cook Strait, and thence to the landward boundary of the foreshore south-west of Owhiro Bay, such arc being an arc of a circle of 3.85 nautical miles radius and having its centre at a point on the outer rock in the Harbour of Wellington, such point being in position 41° 20'.96 S, 174° 50'.1 E based on WGS 84.

The inner limits being a straight line across the Hutt River at the seaward side of the Hutt Estuary road bridge and a straight line across the Waiwhetu Stream at the seaward side of Port Road. The above limits are more particularly shown on the plan marked MD 16306 and deposited in the Office of the Ministry of Transport at Wellington.

Porirua Harbour

All that area of water bounded by the line of mean high water spring tides and having as its seaward limit the arc of a circle commencing from the landward boundary of the foreshore of Rocky Bay and thence into Cook Strait and thence to the landward boundary of the foreshore of the coast northwards of Te Rewarewa Point, such arc being the arc of a circle of 1.75 nautical miles radius centred at peg XXIV, Lot 23, D.P.2093, Block 8, Paekakariki S.D.

Lake Wairarapa

The more or less continuous area of water commonly known as Lake Wairarapa, including the Ruamahanga Cut-off, in Featherston County, the shoreline of which is the outer edge of the area within which the vegetation changes from predominantly aquatic to predominantly terrestrial, except at the outlet of the lake, where the shoreline is the lakeward foot of the barrage gates. For the avoidance of doubt it is declared that the shoreline adjacent to the land known as Lots 1 and 2 on Deposited Plan 4547 (Wellington Land District) is the lakeward foot of the stopbank on that land.

Evans Bay

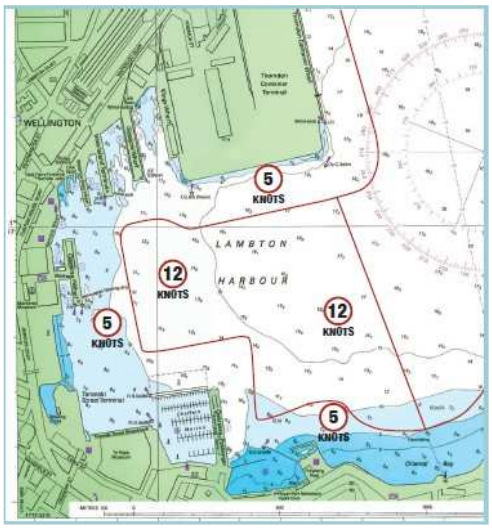
All that area of water in Wellington Harbour south of a line drawn between Point Halswell and Point Jerningham.

Lambton Harbour

All that area of water westwards of a line between the Thorndon Container Pile Light and the Carter Fountain in Oriental Bay. In the map below the extensions from 200 metres shore to the land are not show, however the eastern edge of the 12 knot area is the limit as defined.

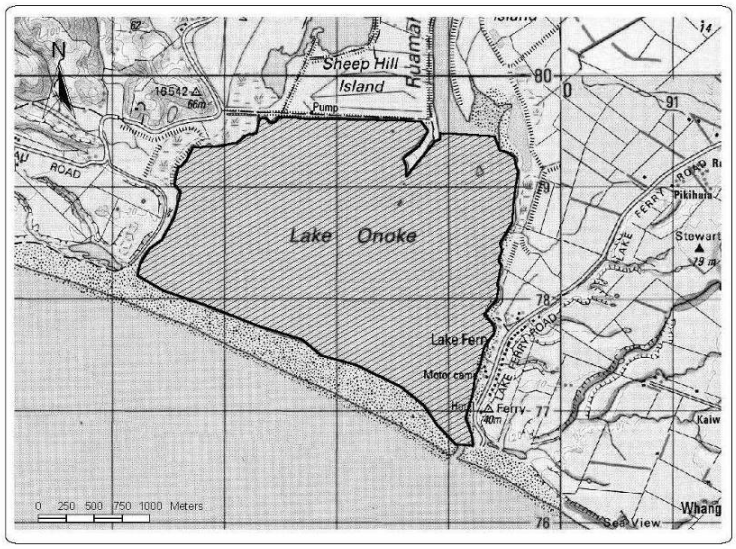
Attachment 2 to Report20.312

Draft Statement of Proposal



Lake Onoke

All that area of water shaded grey on the map.



Attachment 2 to Report20.312

Draft Statement of Proposal

Schedule 2 – location-specific information

Prohibited anchorages

Within 500 metres of the underwater cable between Mahanga Bay and Webb Point.

Within 100 metres of any other underwater power or telephone cable.

Within 50 metres of the Greta Point sea-water intake which is marked by a white triangle.

Within 70 metres of the floating breakwater at Chaffers Marina.

Note: White triangular beacons on the foreshore mark the ends of the power cables.

Explosives anchorage

Explosives anchorage is an area, radius three cables, centre bearing due north distant 1.45 miles from Point Halswell Light (41° 17'.1 S, 174° 49'.6 E), or as designated by the Harbourmaster, depending on weather conditions.

Bulk oil discharges

Bulk oil discharges are permitted at:

Seaview Wharf

Aotea Quay No 1 or 3

Burnham Wharf

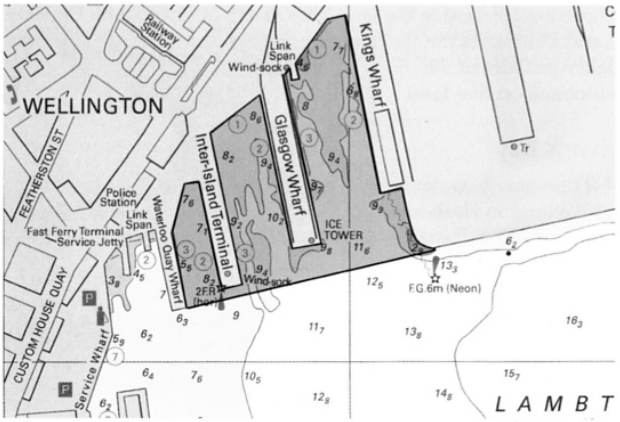
Restricted access area for non-commercial craft

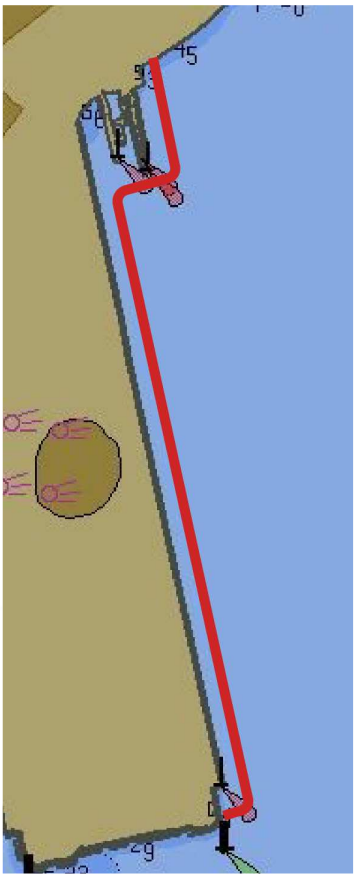
The shaded area as shown on the map, that is immediately north of a line between the south end of Waterloo Quay Wharf and the south-west corner of the container terminal reclamation.

{This area is being extended to include the man wharves and rail ferry terminals. There will be on-going maintenance and construction work for many years and public access right up close to this is not desirable from a safety point of view.}

Attachment 2 to Report20.312

Draft Statement of Proposal



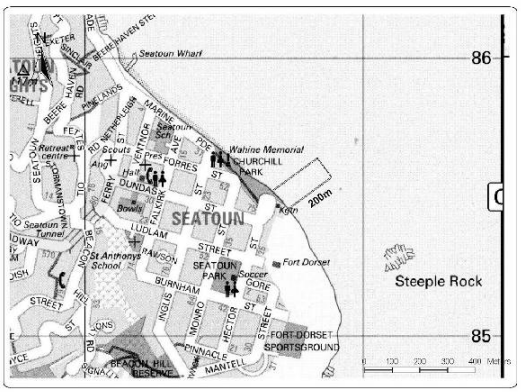


Schedule 3 – restricted use areas including access lanes and reserved areas

Part A – Access lanes for use by waterskiers

Seatoun, Wellington

All that area of water on the southern end of Worser Bay as indicated, bounded on the sides by parallel lines approximately 100 metres apart, and extending in a north-easterly direction 200 metres from the edge of the water.

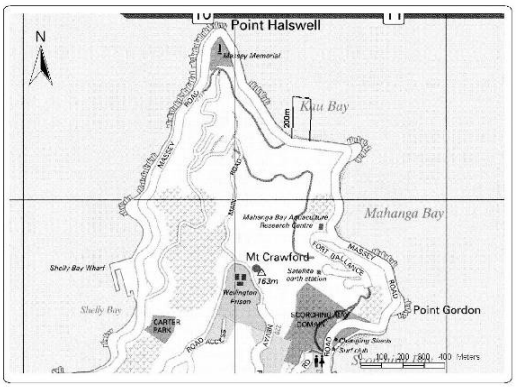


Attachment 2 to Report20.312

Draft Statement of Proposal

Kau Bay, Wellington

All that area of water on the eastern side of Kau Bay as indicated, bounded on the sides by parallel lines approximately 90 metres apart, and extending in a northerly direction 200 metres from the edge of the water.

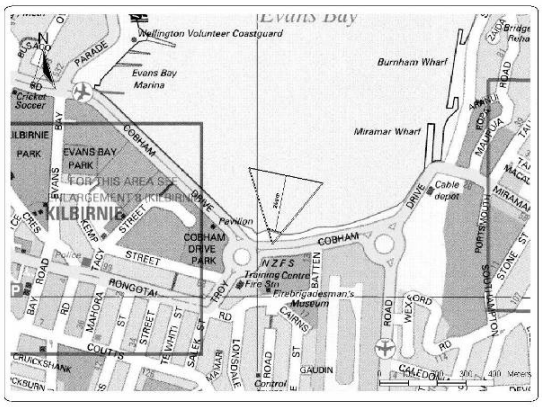


Attachment 2 to Report20.312

Draft Statement of Proposal

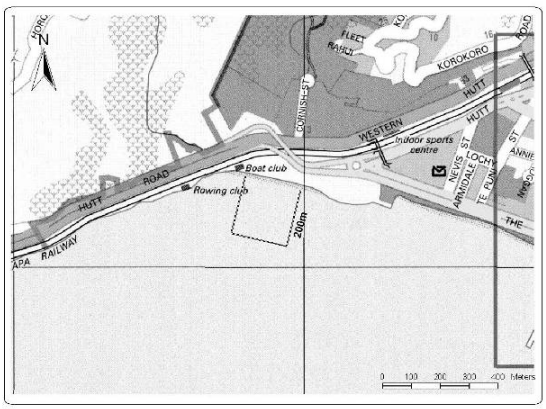
Evans Bay, Wellington

All that area of water at the southern end of Evans Bay as indicated, bounded on the sides by straight lines approximately 50 metres apart at high water mark, divergent at an angle of approximately 60°, and extending in a northerly direction 200 metres from the edge of the water.



Petone Beach (West), Lower Hutt

All that area of water at Petone Beach west of the Korokoro Stream as indicated, bounded on the sides by parallel lines approximately 200 metres apart, and extending in a southerly direction 200 metres from the edge of the water.

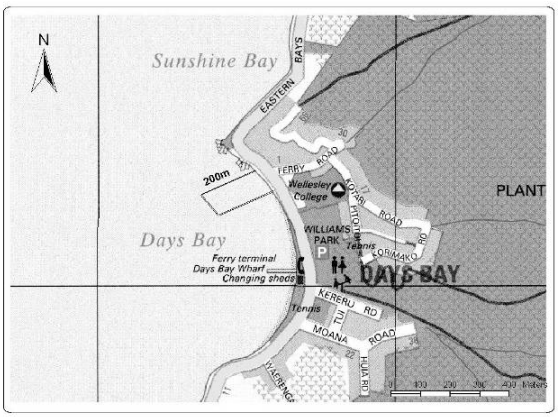


Days Bay, Lower Hutt

All that area of water at the northern end of Days Bay as indicated, bounded on the sides by parallel lines approximately 90 metres apart, and extending in a westerly direction 200 metres from the edge of the water.

Attachment 2 to Report20.312

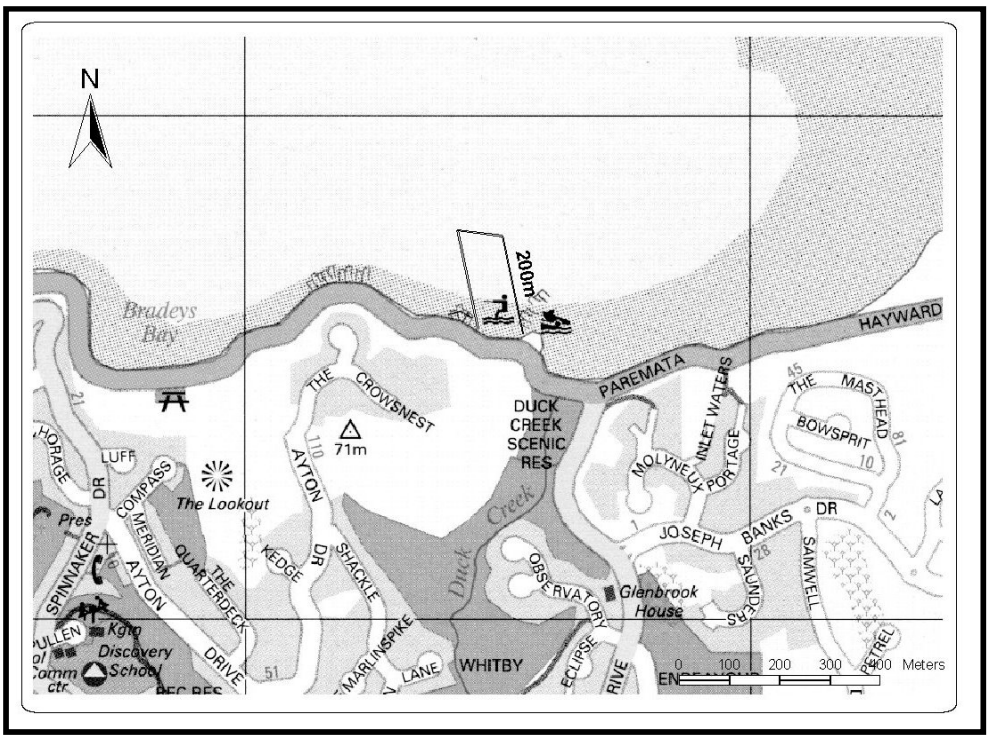
Draft Statement of Proposal



~~Duck Creek, Pauatahanui Inlet~~ – To be removed

~~All that area of water at the south-eastern end of Pauatahanui Inlet, bounded on the sides by parallel lines approximately 90 metres apart, and extending in a northerly direction 200 metres from the edge of the water.~~

{This lane had poor land access, very little beach and is not well used. It is also very close to the non-powered area, there is a better lane located nearby at Bradeys Bay}

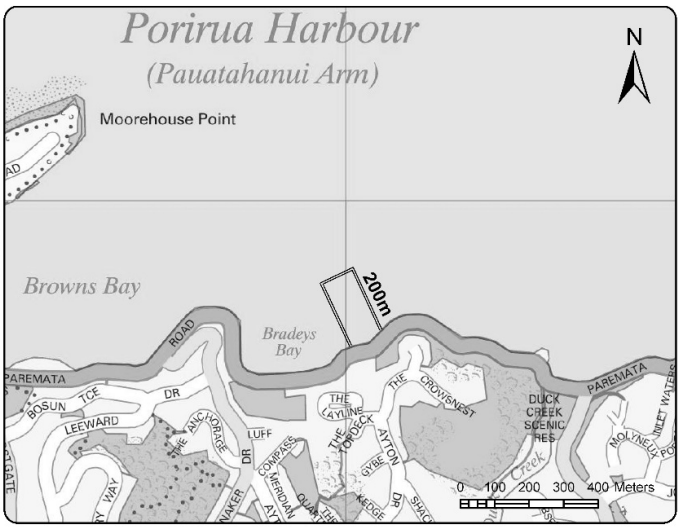


Attachment 2 to Report20.312

Draft Statement of Proposal

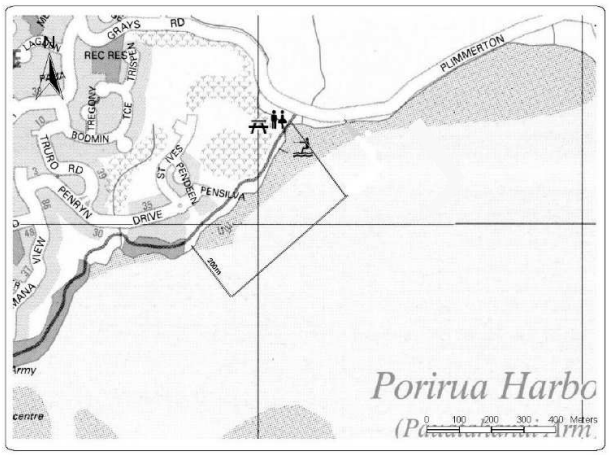
Bradey's Bay, Pauatahanui Inlet

All that area of water on the eastern side of Bradley's Bay, bounded on the sides by parallel lines approximately 90 metres apart, and extending in a north westerly direction 200 metres from the edge of the water.



Grays Road, Pauatahanui Inlet

All that area to the south-west of the launching ramp extending south-west towards Camborne as indicated, bounded by parallel lines approximately 500 metres apart, and extending in a south-easterly direction 200 metres from the edge of the water.



Attachment 2 to Report20.312

Draft Statement of Proposal

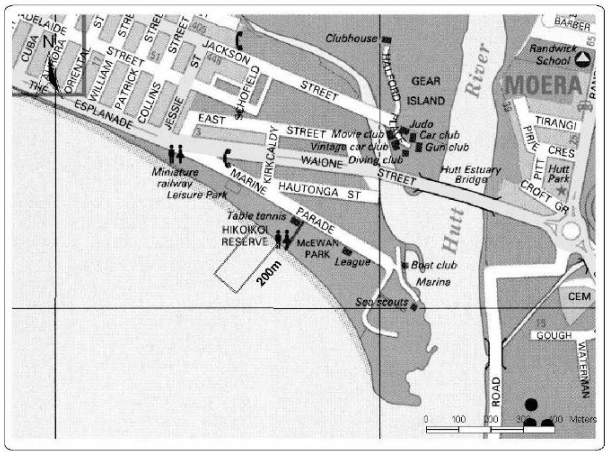
Part B – Reserved areas

Areas reserved for use by personal water craft

Black and white horizontally striped poles shall mark these areas.

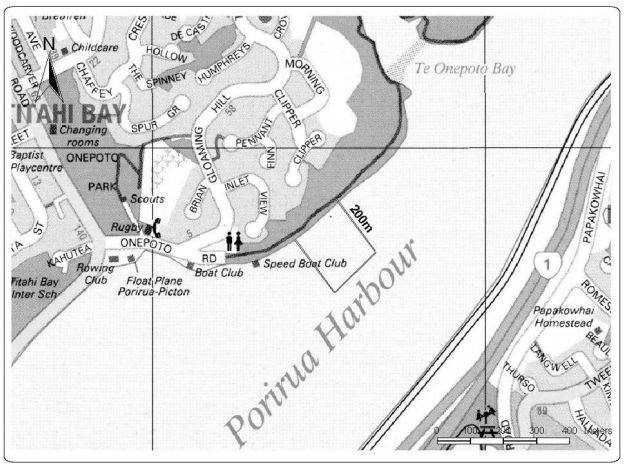
Petone Beach (East), Wellington

All that area of water at the eastern end of Petone Beach as indicated, bounded on the sides by parallel lines approximately 90 metres apart, and extending in a southerly direction 200 metres from the edge of the water.



Onepoto Arm, Porirua Harbour

All that area of water on the north-western side of Porirua Harbour, Onepoto Arm (at the end of Onepoto Road) as indicated, bounded on the sides by parallel lines approximately 200 metres apart, and extending in a south-easterly direction 200 metres from the edge of the water.



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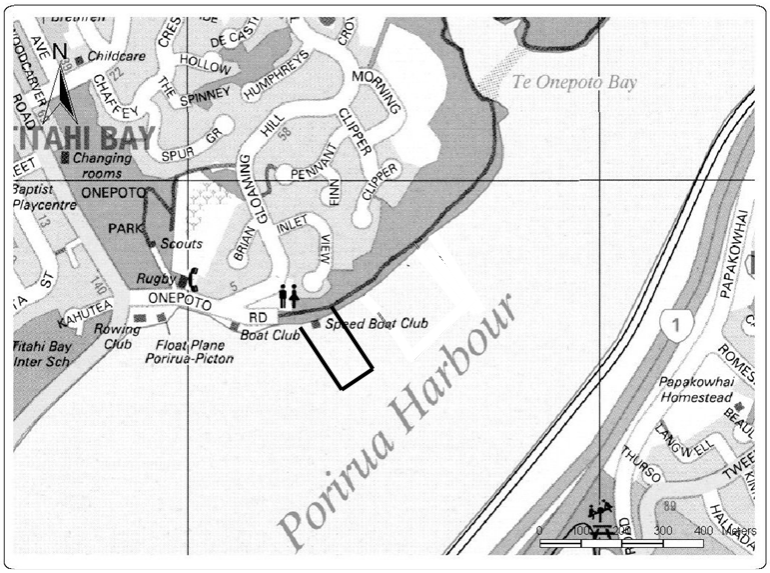
Draft Statement of Proposal

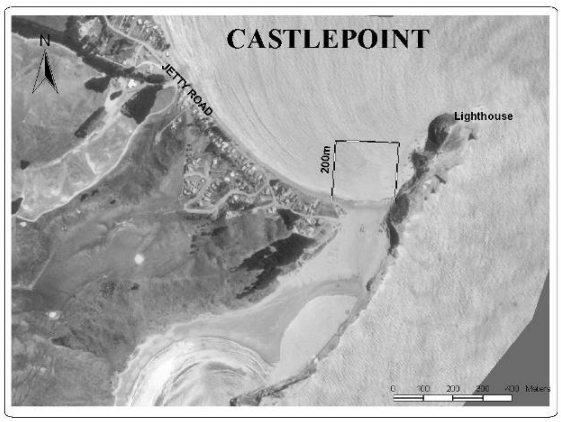
Wellington Powerboat Club, Onepoto Arm, Porirua Harbour

The area adjacent to the Wellington Powerboat Club rooms at Onepoto, only for use on race days as approved by the Harbourmaster, and to be marked by buoys on the water and a notice displayed on the exterior of clubrooms at least 7 days before the event.



Castle Point, Masterton

All that area of water from the road end on the north-eastern side of the beach as indicated, bounded on the sides by parallel lines approximately 200 metres apart, and extending in a north-easterly direction 200 metres from the edge of the water.

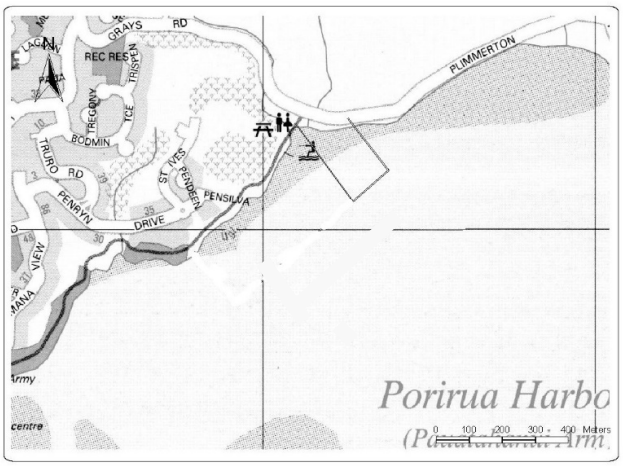


Attachment 2 to Report20.312

Draft Statement of Proposal

Grays Road, Pauatahanui Inlet

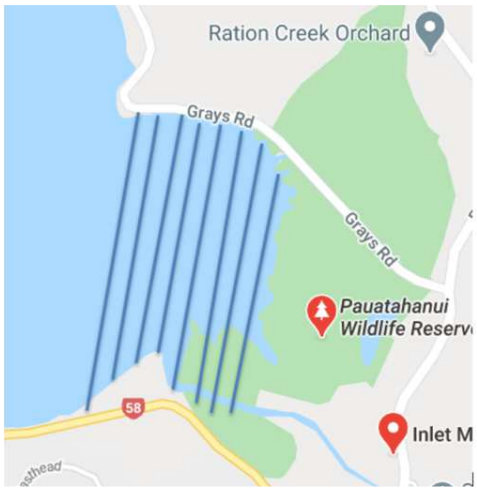
All that area of water to the east of the launching ramp as indicated and bounded on the sides by parallel lines approximately 150 metres apart extending south-east from the shore.



Area reserved for non-powered craft only - Pauatahanui Inlet

The area shown below at the eastern end of Pauatahanui Inlet.

In variance to Bylaw 3.9.3 this area will be marked by a single black and white pole at either end of the outer boundary.



Part C – Flagged areas

The following areas may be marked by flags, in accordance with Bylaw 3.12.

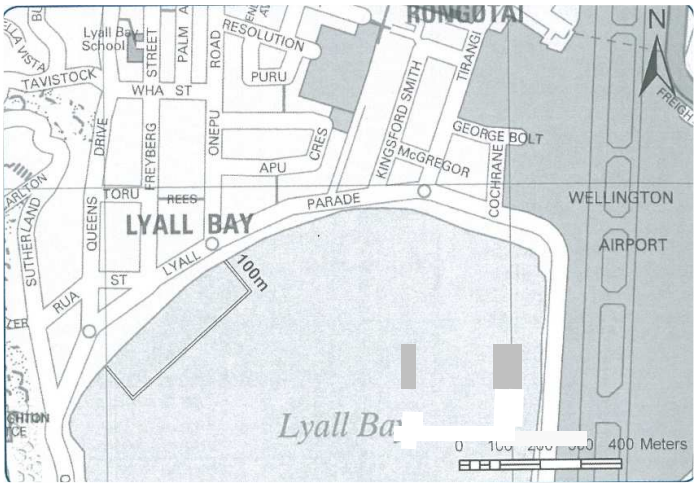
Western end of Lyall Bay beach

Any area within the indicated area may be marked by flags for the purpose of swimming and body boarding only. The outer limits of the area being adjacent to Queens Drive at the western end and

Attachment 2 to Report20.312

Draft Statement of Proposal

Onepu Road at the Eastern end and the area extends from the waters edge to seaward for 100 metres.



Attachment 2 to Report20.312

Draft Statement of Proposal

Schedule 4 – hot work permit

P O Box 11646
142 Wakefield Street
Wellington
New Zealand

t 04 384 5708
f 04 471 1373
e 04 388 4319 AHrs

greater WELLINGTON THE REGIONAL COUNCIL | Harbours

HOT WORK PERMIT

Not for use on tankers/pipeline

Permit No.

Under the Provisions of Section 4.6 of the Wellington Regional Navigation and Safety Bylaws, or any subsequent legislation, permission is hereby given for gas cutting/burning/welding (electric/gas) to be carried out in the said locations:

.....

.....

.....

.....

.....

on board vessel ..... berth ..... CentrePort,

subject to the following conditions:

1. All combustible materials within surrounding areas removed or made safe.
2. No flammable liquids, vapours, gases or dusts present.
3. No Hot Work while any bunkering operations are in progress.
4. Suitable fire extinguishers/hoses provided onsite and tested operational.
5. Operator knows how to use fire equipment.
6. Operator knows how and where to raise fire alarm.
7. Inspections of the surrounding work area must be carried out for at least one hour after hot work is completed.
8. Other specified conditions:

.....

.....

.....

Gas Free Certificate Yes/ No Issued by .....

I/We agree with the above conditions and will ensure that they are complied with for the duration of this permit.

Signed

For the vessel ..... Position ..... Date .....

For the contractor ..... Position ..... Date .....

Permit issued by ..... Position ..... Date .....

This permit is valid From ..... Hrs Date ..... 'til ..... Hrs Date .....

This permit must be displayed at work area

If more than one work area, original to be kept in ship's office/wheel house and a duplicate copy to be displayed at each work area.

Greater Wellington is the promotional name of the Wellington Regional Council

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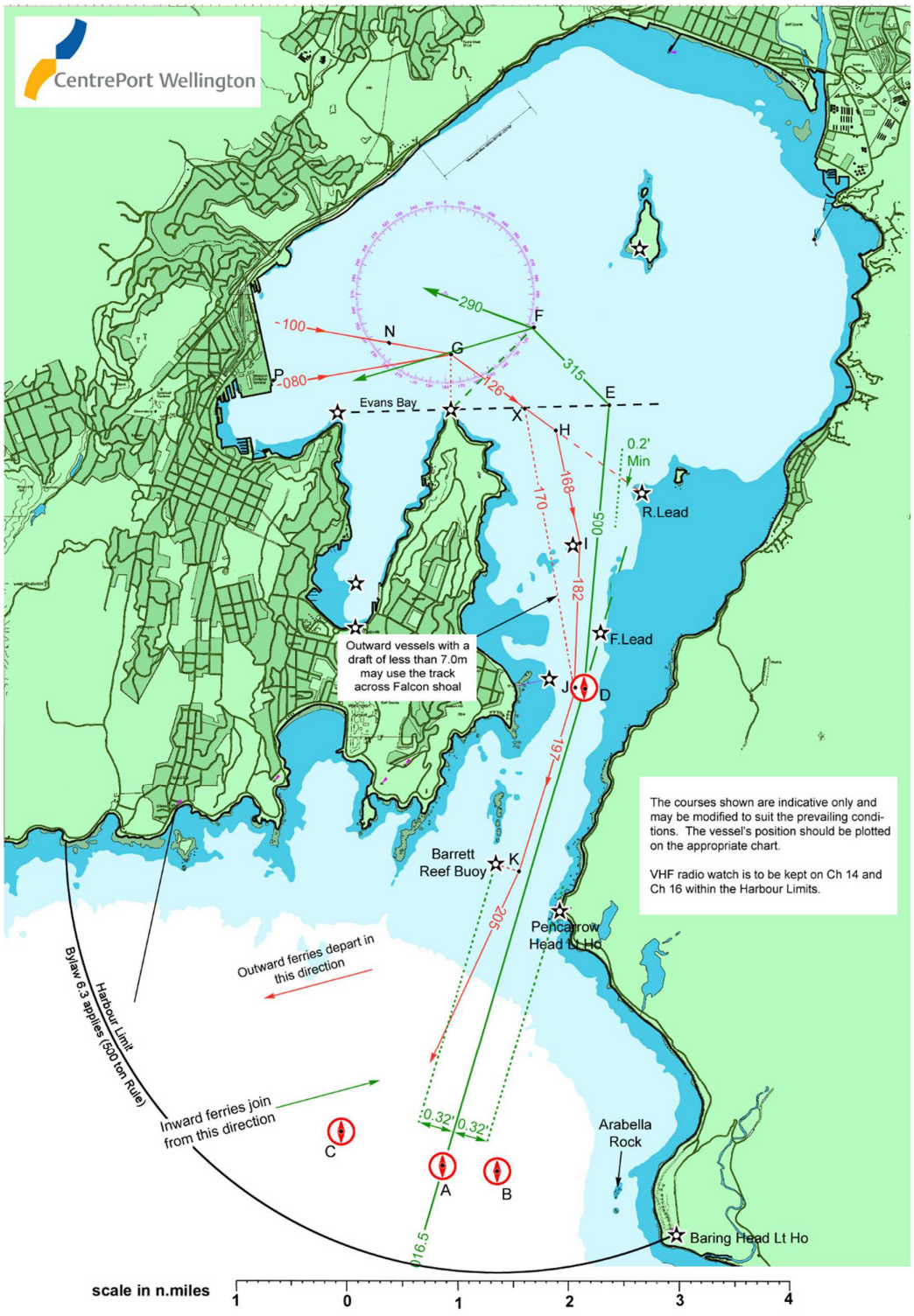
Draft Statement of Proposal

Schedule 5 – Recommended tracks

Part A Tracks to main wharves, including ferry berths



Attachment 2 to Report20.312

Draft Statement of Proposal

Wellington pilotage waypoints

(Based on WGS 84 datum)

Note: The following waypoints may be used for setting tracks on the GPS equipment or ECDIS, Council takes no responsibility for the accuracy of this data

PILOT STATIONS

"A"	41 23.89' S 174 49.47' E	steer 016.5	Pilot Station "Alpha"
"B"	41 23.93' S 174 50.12' E		Pilot Station "Bravo"
"C"	41 23.57' S 174 48.24' E		Pilot Station "Charlie"
"D"	41 19.56' S 174 51.16' E	steer 005	Pilot Station "Delta"

INWARDS TO MAIN WHARF

"A"	41 23.89' S 174 49.47' E	steer 016.5	Pilot Station "Alpha"
"D"	41 19.56' S 174 51.16' E	steer 005	Pilot Station "Delta"
"E"	41 17.00' S 174 51.46' E	steer 315	Transit Halswell/Jerningham.
"F"	41 16.31' S 174 50.53' E	steer 264/290	Abeam Halswell

OUTWARDS FROM MAIN PORT

"G"	41 16.54' S 174 49.57' E	steer 126	Posn. North of Halswell
"H"	41 17.22' S 174 50.82' E	steer 168	To pass East of Falcon Shoal
"I"	41 18.26' S 174 51.11' E	steer 182	Posn. Abeam Falcon Shoal Lt.
"J"	41 19.70' S 174 51.04' E	steer 197	Posn. Off Steeple Lt.
"K"	41 21.22' S 174 50.41' E	steer 205	Posn. Abm. Barrett Buoy

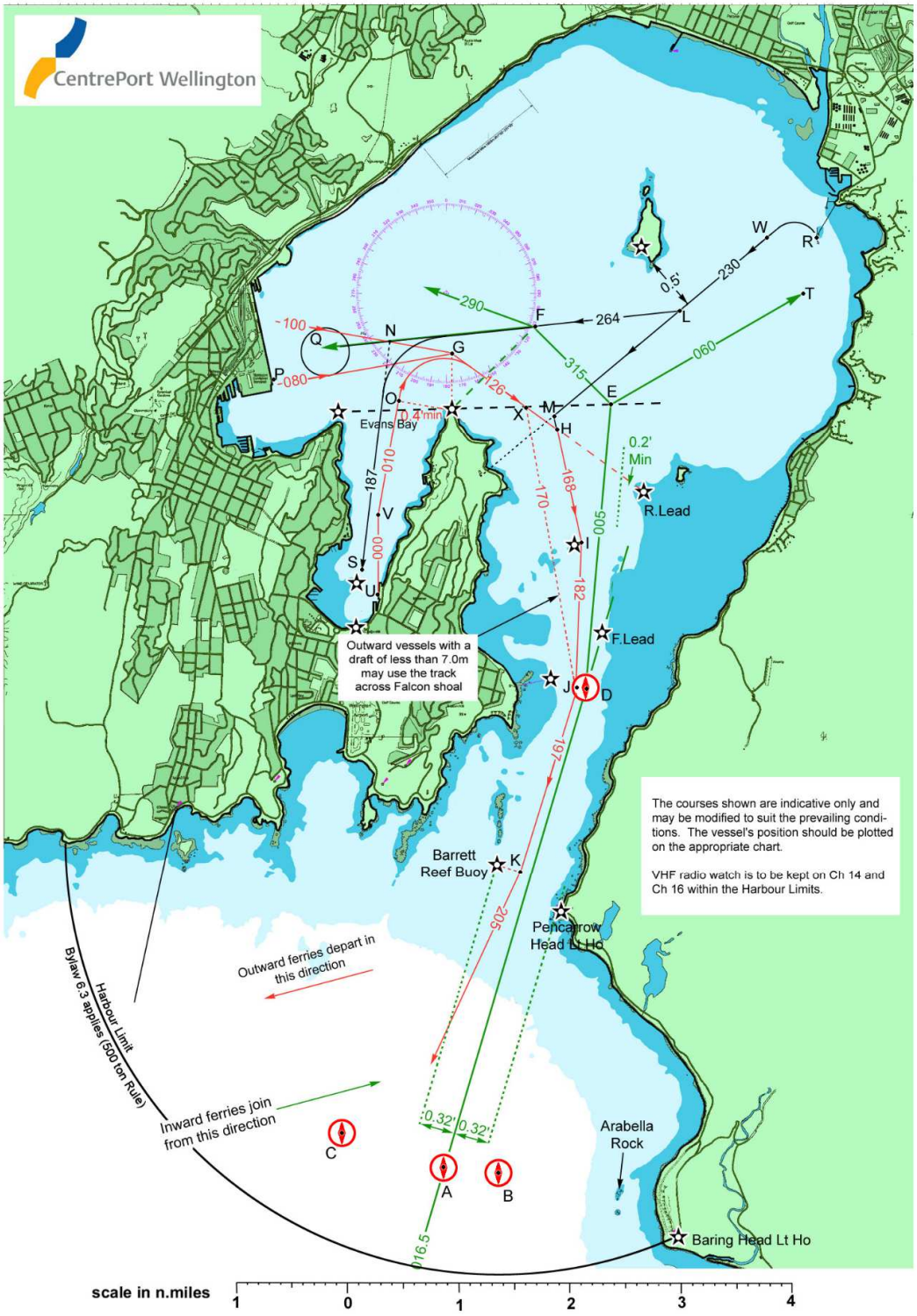
OUTWARDS FROM MAIN PORT CROSSING FALCON SHOAL

"G"	41 16.54' S 174 49.57' E	steer 126	Posn. North of Halswell
"X"	41 17.00' S 174 50.41' E	steer 170	Course to Cross Falcon Shoal
"J"	41 19.70' S 174 51.04' E	steer 197	Posn. Off Steeple Lt.
"K"	41 21.22' S 174 50.41' E	steer 205	Posn. Abm. Barrett Buoy

Attachment 2 to Report20.312

Draft Statement of Proposal

Part B - Tracks to all Centreport wharves



Attachment 2 to Report20.312

Draft Statement of Proposal

Wellington pilotage waypoints

(Based on WGS 84 datum)

Note: The following waypoints may be used for setting tracks on the GPS equipment or ECDIS, Council takes no responsibility for the accuracy of this data

PILOT STATIONS

"A"	41° 23.89' S 174° 49.47' E	steer 016.5	Pilot Station "Alpha"
"B"	41° 23.93' S 174° 50.12' E		Pilot Station "Bravo"
"C"	41° 23.57' S 174° 48.24' E		Pilot Station "Charlie"
"D"	41° 19.56' S 174° 51.16' E	steer 005	Pilot Station "Delta"

INWARDS TO MAIN WHARF

"A"	41° 23.89' S 174° 49.47' E	steer 016.5	Pilot Station "Alpha"
"D"	41° 19.56' S 174° 51.16' E	steer 005	Pilot Station "Delta"
"E"	41° 17.00' S 174° 51.46' E	steer 315	Transit Halswell/Jerningham
"F"	41° 16.31' S 174° 50.53' E	steer 264/290	Abeam Halswell

INWARDS TO SEAVIEW WHARF

"A"	41° 23.89' S 174° 49.47' E	steer 016.5	Pilot Station "Alpha"
"D"	41° 19.56' S 174° 51.16' E	steer 005	Pilot Station "Delta"
"E"	41° 17.00' S 174° 51.46' E	steer 060	Transit Halswell/Jerningham
"T"	41° 16.00' S 174 53.72' E	various	Approach Posn. Seaview
"R"	41° 15.50' S 174 53.90' E		Seaview Wf.

Attachment 2 to Report20.312

Draft Statement of Proposal

INWARDS TO BURNHAM WHARF

"A"	41° 23.89' S 174° 49.47' E	steer 016.5	Pilot Station "Alpha"
"D"	41° 19.56' S 174° 51.16' E	steer 005	Pilot Station "Delta"
"E"	41° 17.00' S 174° 51.46' E	steer 315	Transit Halswell/Jerningham
"F"	41° 16.31' S 174° 50.53' E	steer 264	Abeam Halswell
"N"	41° 16.44' S 174° 48.85' E	steer 187	Course for Evans Bay
"S"	41° 18.50' S 174° 48.50' E	various	Approach Posn. Burnham Wf
"U"	41° 18.70' S 174° 48.69' E		Burnham Wharf

SEAVIEW / BURNHAM SHIFT

"R"	41° 15.50' S 174° 53.90' E	various	Posn. Seaview Wharf
"W"	41° 15.50' S 174° 53.28' E	steer 230	Departure Posn. off Seaview
"L"	41° 16.17' S 174° 52.23' E	steer 264	Posn. South of Somes Is.
"N"	41° 16.44' S 174° 48.85' E	steer 187	Course for Evans Bay
"S"	41° 18.50' S 174° 48.50' E	various	Approach Posn. Burnham wf
"U"	41° 18.70' S 174° 48.69' E		Burnham Wharf

OUTWARDS FROM MAIN PORT

"G"	41° 16.54' S 174° 49.57' E	steer 126	Posn. North of Halswell
"H"	41° 17.22' S 174° 50.82' E	steer 168	To pass East of Falcon Shoal
"I"	41° 18.26' S 174° 51.11' E	steer 182	Posn. Abeam Falcon Shoal Lt.
"J"	41 19.70' S 174° 51.04' E	steer 197	Posn. Off Steeple Lt.
"K"	41 21.22' S 174° 50.41' E	steer 205	Posn. Abm. Barrett Buoy

OUTWARDS FROM MAIN PORT CROSSING FALCON SHOAL

"G"	41° 16.54' S 174° 49.57' E	steer 126	Posn. North of Halswell

Attachment 2 to Report20.312

Draft Statement of Proposal

"X"	41° 17.00' S 174° 50.41' E	steer 170	Course to Cross Falcon Shoal
"J"	41° 19.70' S 174° 51.04' E	steer 197	Posn. Off Steeple Lt.
"K"	41° 21.22' S 174° 50.41' E	steer 205	Posn. Abm. Barrett Buoy

OUTWARDS FROM SEAVIEW WHARF

"R"	41° 15.50' S 174° 53.90' E	various	Posn. Seaview Wharf
"W"	41° 15.50' S 174° 53.28' E	steer 230	Departure Posn. off Seaview
"M"	41° 17.09' S 174° 50.78' E	steer 168	To pass East of Falcon Shoal
"I"	41° 18.26' S 174° 51.11' E	steer 182	Posn. Abeam Falcon Shoal
"J"	41° 19.70' S 174° 51.04' E	steer 197	Posn. Of Steeple Lt.
"K"	41° 21.22' S 174° 50.41' E	steer 205	Posn. Abeam Barrett Buoy

OUTWARDS FROM BURNHAM WHARF

"U"	41° 18.70' S 174° 48.69' E	steer 000	Burnham Wharf
"V"	41° 18.00' S 174° 48.69' E	steer 010	Centre Evans Bay
"0"	41° 16.95' S 174° 48.93' E	various	Posn to turn out of E. Bay
"G"	41° 16.54' S 174° 49.57' E	steer 126	Posn. N. Halswell (optional)
"H"	41° 17.22' S 174° 50.82' E	steer 168	To pass East of Falcon Shoal
"I"	41° 18.26' S 174° 51.11' E	steer 182	Posn. Abeam Falcon Shoal
"J"	41° 19.70' S 174° 51.04' E	steer 197	Posn. Of Steeple Lt
"K"	41° 21.22' S 174° 50.41' E	steer 205	Posn. Abeam Barrett Buoy

WHARF AND APPROACH POINTS

"P"	41° 16.78' S 174° 47.42' E	Posn. Off TCW1
"Q"	41° 16.50' S 174° 48.05' E	H. O. Anchorage
"R"	41° 15.50' S 174° 53.90' E	Posn. Seaview Wharf
"S"	41° 18.50' S 174° 48.50' E	Approach Posn. Burnham Wf

Attachment 2 to Report20.312

Draft Statement of Proposal

"T"	41° 16.00' S 174° 53.72' E	Approach Posn. Seaview
"U"	41° 18.70' S 174° 48.69' E	Burnham Wharf
"V"	41° 18.00' S 174° 48.69' E	Centre Evans Bay

Attachment 2 to Report20.312

Draft Statement of Proposal

Schedule 6 – Narrow Channel

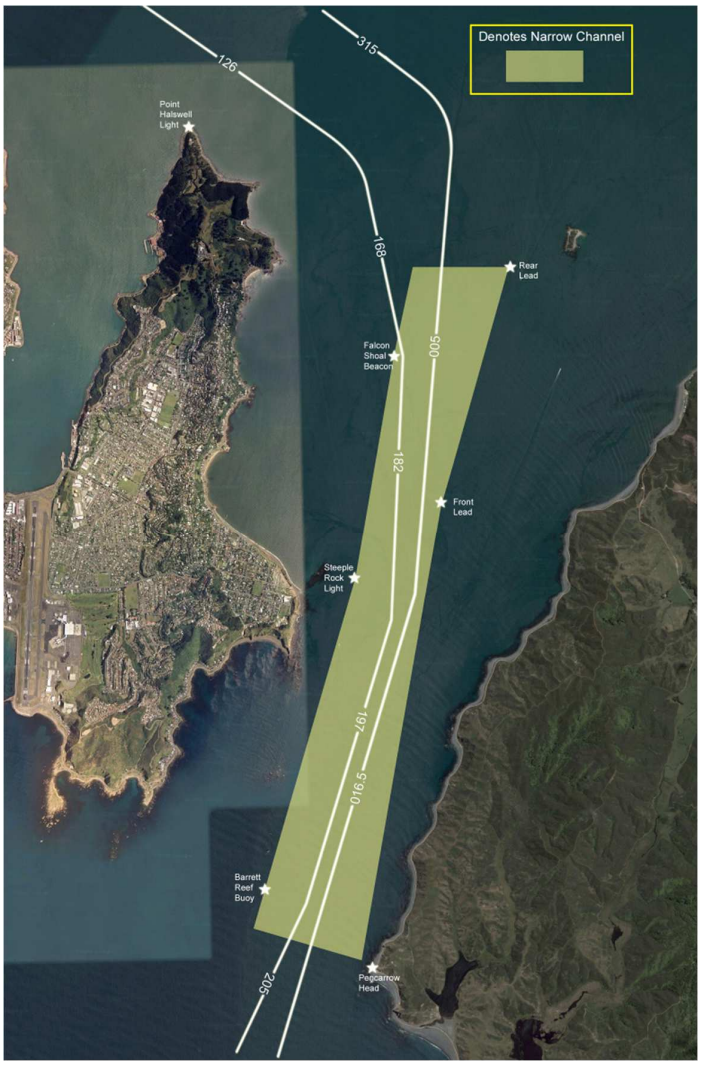
The western boundary

a) extends northward from Steeple Rock light though Falcon Shoal light until it reaches 41°17.5'South.

b) Extends southward from Steeple Rock light though the position of Barrett Reef buoy until it reaches 41°21.6' south.

The eastern boundary

The eastern Boundary is from the rear leading light to the point where the eastern side of the intensified lead light meats 41° 21.6' south, adjacent to Pencarrow Head.



Environment Committee
10 September 2020
Report 20.306

For Decision

REGIONAL FLOOD PROTECTION ASSET MANAGEMENT REPORT 2019/20

Te take mō te pūrongo
Purpose

1. To advise the Environment Committee (the Committee) of progress made with the Flood Protection Department's asset management system, and the overall performance and physical condition of flood protection and erosion control infrastructure assets.

He tūtohu
Recommendations

That the Committee

1 **Notes** that at the August Hutt Valley Flood Management Subcommittee and the June/July Wairarapa River Scheme meetings, the committees were satisfied that flood protection and erosion control infrastructure assets for those catchments have been satisfactorily assessed and that identified issues are being addressed through maintenance and improvement work programmes.

2 **Agrees** that the flood protection and erosion control infrastructure assets on the 15 schemes across the Greater Wellington region have been satisfactorily assessed and that identified issues are being addressed through maintenance and improvement work programmes.

Consideration by Committee

2. At its meeting on 6 August 2020 the Hutt Valley Flood Management Subcommittee reviewed the flood protection and erosion control infrastructure assets for the catchments in the Hutt Valley. The Hutt Valley Flood Management Subcommittee resolved to recommend to the Committee that the assets have been satisfactorialy assessed and that identified issues are being addressed through maintenance and improvement work programmes.

3. The Wairarapa River Scheme committees met in June and July 2020, and were satisfied that the flood protection and erosion control infrustrature assets for the Wairarapa catchments have been satisfactorialy assessed. The Wairarapa River Scheme committees were also satisfied that identified issues are being addressed through maintenance and improvement work programmes.

Te tāhū kōrero
Background

4. The the Department is responsible for flood protection and erosion control infrastructure assets, and land and property located on 15 river schemes across the region. These assets have a total combined value of $494 million and provide flood and erosion protection to the communities, businesses and infrastructure located on these floodplains.

5. The Department has a comprehensive asset management system, which demonstrates that the service levels of our infrastructure assets are being maintained in an efficient and cost-effective manner, will perform as designed and, where required, are being improved.

6. The Committee oversees the implementation and review of regional resilience priorities. The performance and condition of the infrastructure assets that form the 15 flood protection and erosion control schemes of the Region form a critical element of this. The Committee also relies on feedback from the Hutt Valley Flood Management Subcommittee, Wairarapa River scheme committees, and Kāpiti Rivers' friends groups to assess this.

Te tātaritanga
Analysis

Asset condition and maintenance

7. Asset condition is a measure of the physical state of the asset and is assessed visually on an annual basis. Asset condition does not identify the criticality of the asset or whether the asset meets the required service level.

8. Monitoring asset condition enables us to predict and plan maintenance, forecast renewal requirements and develop effective, proactive operational work programmes. This is essential to managing flood risk, because condition influences the likelihood of asset failure and therefore the asset performance to achieve a required service level.

9. Infrastructure assets across the region are being well maintained with 88 percent of assets rated in Very Good (1) to Moderate (3) condition. This is a slight decrease from 2019 as shown in Table 1 below. A detailed summary of asset condition by asset type is included in **Attachment 1** – breakdown of condition by asset type.

Year	**2020**		**2019**		**2018**	
Asset Condition Rating Scores	Ratio	Count	Ratio	Count	Ratio	Count
1 - V. Good	88%	593	92%	575	88%	577
2 - Good		3126		3860		3423
3 - Moderate		1909		1316		1538
4 - Poor	12%	675	8%	449	12%	560

Year	2020		2019		2018	
5 - V. Poor		108		60		140
Totals	100%	6411	100%	6260	100%	6202

Table 1: Summary of asset condition

10. A variety of assets feature in the 4 and 5 condition rating categories as shown in Attachment 1, including substantial asset types such as willows, stopbanks and floodgates. This change in condition profile better reflects the actual condition of assets and that we have aging willow lines infested with weeds, vegetation present on stopbanks and floodgates that are not visible.

11. Tree removal from stopbanks has been a priority for the Operations team and this will continue. A comprehensive maintenance programme will be developed for outlet structures, including floodgates, as well as a long term rejuvenation strategy for willows. This will ensure that maintenance is targeted and condition is gradually lifted across these asset types as these initiatives take effect.

12. Greater Wellington Regional Council (Greater Wellington) also contributes to reserves on an annual basis to repair damage to infrastructure assets following a flood event. In the Wairarapa this is contributed to by the respective river scheme and scheme reserves can be drawn upon to repair damage from floods in the five to 25 year return period range. The Greater Wellington Flood Contingency Reserve and the Greater Wellington Major Flood Investment are available for events greater than a 25 year return period. Currently river scheme reserves are $9.7 million; this figure increases to $15.9 million once the Greater Wellington Flood Contingency Reserve and the Greater Wellington Major Flood Investment are considered. The total flood reserves put Greater Wellington in a good position to fund repairs to infrastructure assets following a flood.

Asset performance, criticality and risk

13. The Department uses a comprehensive risk based framework developed at a national level to produce a risk profile for each river.

14. The framework assesses both the probability and consequence of failure of a group of assets within a discrete section of the river. Assessing the probability of failure includes analysing the structural strength of stopbanks (intrinsic strength), the capacity of the channel to attenuate flood flows, and the physical condition of infrastructure assets based on the technical information available. The consequence of failure relates to risk posed to both the community and environment from failure at a design flood event. Once a probability and a consequence score have been determined for each discrete section of the river, risk is assigned at this level from 'Very Low' to 'Very High'; the framework is shown schematically in **Attachment 2** – schematic of asset risk.

15. Application of the framework also highlights where the confidence in the underlying technical information is low and informs the Department's investigative work programme to gather new or additional information to improve confidence.

16. Assets do not work in isolation, they typically belong to a system of assets, which itself is a collection of assets that interact or are interconnected. Flood protection and erosion control schemes are no different. A system of assets can be distinguished as being critical in the same way as individual assets can.

17. The risk profile produced for each river identifies critical assets systems or river sections, and critical assets within those systems or sections are defined as those which have a high consequence of failure.

18. Generally, the majority of the infrastructure assets on the river schemes across the Wellington Region are assessed as 'Very Low' to 'Medium' risk and this continues the trend from the previous years.

19. There are, however, a small number of sections of schemes across the region that have been assessed as 'High' or 'Very High' risk. This risk can be attributed to one or more of the following failure modes: intrinsic strength, capacity, condition, or consequence. **Attachment 3** – breakdown of 'High' and 'Very High' risk areas and treatment, identifies these.

20. All 'High' or 'Very High' risks captured in Attachment 3 are known to officers and have been identified for treatment either through an existing or proposed Floodplain Management Plan (FMP), a technical investigation or operational work programme. Existing and proposed FMP improvements works have been budgeted and prioritised. For those FMPs under development, while a budget and timing for an improvement work has been signalled in the Long Term Plan (LTP), and Infrastructure Strategy (IS), the exact nature of the improvement may still be under discussion with the relevant community.

21. Treatment of 'High' and 'Very High' risks are described in paragraphs as follows:

    a Poorly constructed stopbanks that will overtop in the design flood event located on Te Awa Kairangi/Hutt River through the Hutt City centre will be upgraded through the RiverLink project. Those stopbanks located at the river mouth, Woollen Mills and Moonshine all have improvements works signalled in the IS but only Woollens Mills is programmed within the next 10 years. The priority of the Moonshine work is being reviewed as part of the LTP process given the very high risk associated with this piece of stopbank. It is important to note that even when improvement works are completed, these sections of the river will potentially remain at a 'High' or 'Very High' risk due to the consequences of a stopbank failure. This will also apply to the stopbank that borders the Waipoua River through Masterton.

    b Further technical investigation is required to determine the appropriate treatment options for the stopbanks on the Wainuiomata River scheme.

    c For the Rivers in Kāpiti, geotechnical investigations of the stopbanks downstream of the current State Highway 1 Bridge in Ōtaki have been completed and this will feed into the review of the Ōtaki River FMP to inform the budget and timing of these stopbank improvements. The work to improve the Chrystall's stopbank is substantially complete with a small section outstanding, which is due for completion by Christmas 2020. For the Waikanae River, river management issues are complex and will take time to address. A key

area to is channel aggradation, which requires resource consent for gravel extraction. River management. Investigations into the low floodwall and stopbank at Otaihanga will progress this year.

d For the eastern part of the Wellington Region, stopbanks on the Waiohine River cannot be progressed until the completion of the River Plan; this also applies to the stopbank through urban Masterton on the Waipoua River that relies on direction from the Waipoua Working Group. Implementation of the Te Kāuru FMP will address the remaining stopbank concerns.

Asset revaluation

22. Historically the Department has completed revaluations of infrastructure assets every five years but in 2019 this was amended to three yearly.

a The total value of all infrastructure assets, effective as of 30 June 2020, is $494 million:

- Infrastructure assets $427 million
- Land $67 million

b The revaluation complied with statutory requirements, namely the Local Government Act 2002, and relevant financial reporting standards.

c This is an increase of $93 million and is spread across the Department's infrastructure asset base and is due to either a refinement in how unit rates are calculated or an improvement in asset data. The remaining $26 million is due to asset acquisition related primarily to RiverLink property purchase.

d All river schemes have increased in value. The notable increase relates to willows used as edge protection; the unit rate has increased significantly resulting in a large movement for this asset type. This is most evident in the Wairarapa where willow buffers dominate the flood and erosion protection schemes. The increase reflects Greater Wellington's move to mechanical planting methods and larger tree stock to establish buffers as opposed to the manual methods and small tree stock used historically. The nature of the Wellington Region's river systems, which are steep and aggressive, coupled with high banks and entrenched channels, is driving the need to use larger tree stock to ensure a greater success rate.

Ngā hua ahumoni
Financial implications

23. The proposed decision has no financial implications.

Ngā tikanga whakatau
Decision-making process

24. The matters requiring decision in this report have been considered by officers against the requirements of Part 6 of the Local Government Act 2002.

Te hiranga
Significance

25. Officers considered the significance (as defined by Part 6 of the Local Government Act 2002) of this matter, taking into account Council's *Significance and Engagement Policy* and Greater Wellington's *Decision-making Guidelines*. Officers recommend that this matter is of low significance due to the administrative nature of the decision.

Te whakatūtakitaki
Engagement

26. Due to the low significance of this matter, no engagement was considered necessary.

Ngā tūāoma e whai ake nei
Next steps

27. No further action from the Committee is required.

Ngā āpitihanga
Attachments

Number	Title
1	Breakdown of condition by asset type
2	Schematic of asset risk
3	Breakdown of 'High' and 'Very High' risk areas and treatment

Ngā kaiwaitohu
Signatories

Writer	Jacky Cox – Section Leader, Operations Planning
Approvers	Colin Munn – Team Leader, Operations Planning and Delivery Graeme Campbell – Manager, Flood Protection Wayne O'Donnell – General Manager, Catchment Management

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or with Committee's terms of reference The Committee provides oversight of the development, implementation and review of regional resilience plans and activities related to river control and flood protection. The performance and condition of the infrastructure assets that form the 15 flood protection and erosion control scheme of the Region form a critical element of this.
Implications for Māori There are no known implications for Māori.
Contribution to Annual Plan / Long Term Plan / Other key strategies and policies Confirmation from the Committee that the infrastructure assets across the 15 flood protection and erosion controls scheme in the Wellington Region have been satisfactorily maintained fulfils one of the Department's non-financial performance measures in the Long Term Plan. This report, and confirmed minutes, is supplied as evidence to Audit NZ that the Department has achieved this.
Internal consultation The Department's Strategic Business Partner and finance team were consulted and played a major role in the revaluation of the Department's infrastructure assets.
Risks and impacts - legal / health and safety etc. The reports notes that there are a small sections of various Rivers across the Region that pose a high risk to the communities and businesses on those River's floodplain but that the majority of infrastructure assets providing protection are in very good to moderate condition.

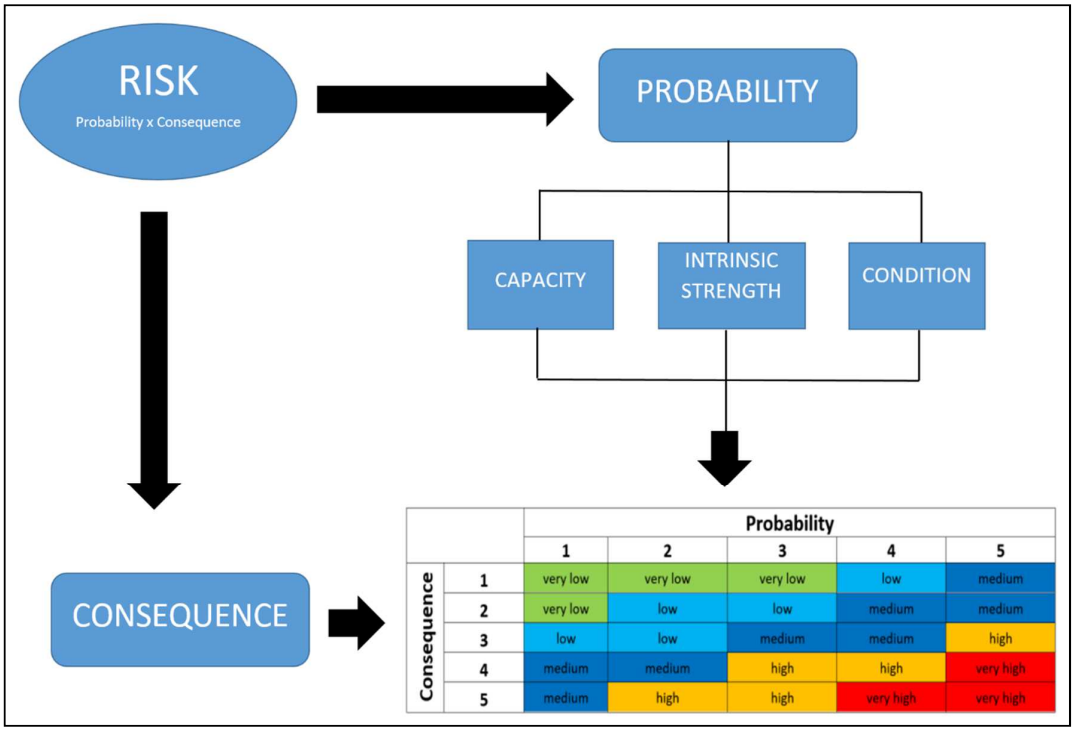
Attachment 1 to Report 20.306

Detailed breakdown of condition by asset type

Asset Type	1 - Very Good	2 - Good	3 - Moderate	4 - Poor	5 - Very Poor	Total
ACCESS PLATFORM		1				1
ARTWORK		1				1
BARRAGE GATE		7				7
BLOCKLINE	4	10	18	3	1	36
BRIDGE	2	7				9
BUILDING		3	2	1		6
CHANNEL	140	588	262	70		1060
CONCRETE INTAKE		4	1			5
CULVERT	3	36	11	4		54
DEBRIS ARRESTOR	1	12	2	1	2	18
DEBRIS FENCE	3	213	147	49	23	435
DEMOLITION LINE		1	4	10		15
DETENTION DAM	1	1				2
DIVERSION CUT		1	1			2
DRAIN	31	52	14	2		99
DROP STRUCTURE	1	1				2
ELECTRICAL CONTROL	1	4		1		6
FASCINE			2			2
FENCE	4	30	15	6	1	56
FENCE RAIL IRON NET		10	5	6	2	23
FLOODGATE	13	64	30	41		148
FLOODWALL	28	16				44
FLOODWAY SILL		5	6	1		12
GATE	6	22				28
GENERATOR SET		1				1
GROYNE	5	806	341	68	42	1262
INTAKE SCREEN	1	2	2			5
NATIVE PLANTING	23	55	32	10	2	122
PUMP		9	1			10
RETAINING WALL		4	4	1		9
RIPRAP	25	190	95	7	4	321
ROCK MATTRESS	1	7	1			9
SEAT	3	20	2		1	26
SIGN	23	15	2		1	41
STOPBANK	115	242	342	196	4	899
Sump		1				1
TRACK	154	288	91	3	1	537
TRAINING BANK	1	11		1		13
WEIR		10	11			21
WILLOW	2	370	463	194	24	1053
WINGWALL	2	6	2			10
Total	**593**	**3126**	**1909**	**675**	**108**	**6411**

Attachment 2 to Report 20.306

Schematic showing how asset risk is determined



Consequence	Probability 1	2	3	4	5
1	very low	very low	very low	low	medium
2	very low	low	low	medium	medium
3	low	low	medium	medium	high
4	medium	medium	high	high	very high
5	medium	high	high	very high	very high

Attachment 3 to Report 20.306

Detailed breakdown of High and Very High risk areas and treatment

Location	Description	Risk	Treatment
Hutt River Pharazyn Street	Stopbank will overtop from 2800 cumec event. Stopbank intrinsic strength is 'average'	**Very High**	RiverLink will retreat, raise and improve stopbanks.
Hutt River City Centre	Stopbank will overtop from 2800 cumec event. Stopbank intrinsic strength is 'average'	**Very High**	RiverLink will retreat, raise and improve stopbanks.
Hutt River River Road above Moonshine Bridge	Stopbank will overtop from 2800 cumec event. Stability of stopbank is average.	**Very High**	Stopbank section identified in Hutt River Floodplain Management Plan but requires additional investigation.
Hutt River mouth	Stopbank will overtop from 2300 cumec event.	**Very High**	
Waipoua River Urban section	Stopbank and bank edge will overtop from 100 year flood event with climate change.	**Very High**	Issue being considered by Te Kauru Floodplain Management Plan Waipoua Urban Reach investigations
Hutt River Strand Park to Moera	Inherent high consequence will result in high risk. Some cross sections have condition issues.	**High**	Operational work programs to prioritise maintenance of critical assets to improve condition rating.
Hutt River Alicetown	Inherent high consequence will result in high risk. Some river sections have condition issues.	**High**	
Hutt River Harcourt Werry/Taita Drive	Inherent high consequence will result in high risk. Some river sections have condition issues.	**High**	
Hutt River Various River Road	Inherent high consequence will result in high risk. Some river sections have condition issues.	**High**	
Wainuiomata River Wood St	Stopbank may overtop from 100 year flood event and/or inadequate bank edge assets.	**High**	Combination of investigation and operational work required.
Wainuiomata River Main Rd bridge	River will overtop banks during 100 year flood event event.	**High**	Further investigation work required.
Ōtaki River Chrystalls	A small section of stopbank will overtop during the 100 year flood event with climate change.	**High**	Stopbank improvements to be undertaken in conjunction with Peka Peka to Ōtaki project.
Ōtaki River Chrystalls	Channel capacity reduced during bridge construction.	**High**	Capacity will be restored following completion of Peka Peka to Ōtaki project.
Ōtaki River downsteam of SH1	Stopbank at risk of failure from 20 year flood event.	**High**	Included in review of Ōtaki Floodplain Management Plan project.
Waikanae River Jim Cooke Park	Gravel aggradation reduces channel capacity.	**High**	Monitored through gravel investigations and operational work programme.

Location	Description	Risk	Treatment
Waikanae River Greenaway Rd	River assets to be improved.	**High**	Operational work programme to improve condition.
Waikanae River Otaihanga Domain	Stopbank and floodwall will overtop in 100 year flood event.	**High**	Investigation required to confirm floodwall capacity.
Waiohine River Fullers Bend	Stopbank will overtop in 100 year flood event.	**High**	Included in Waiohine River Plan.
Waiohine River Rail bridge	Stopbank surface and intrinsic strength is average.	**High**	Included in Waiohine River Plan.
Waipoua River Urban section	Stopbank will overtop in 100 year flood event with climate change.	**High**	Issue being considered by Te Kāuru Floodplain Management Plan Waipoua Urban Reach
Waingawa River	Water supply pipeline at risk of erosion.	**High**	Will be considered in Te Kāuru Floodplain Management Plan implementation programme.
Ruamāhanga River Rathkeale	Inadequate information on stopbank design. Poor intrinsic strength	**High**	Will be considered in Te Kāuru Floodplain Management Plan implementation programme.
Ruamāhanga River Waipoua confluence	River will overtop banks during 100 year flood event.	**High**	Will be considered in Te Kāuru Floodplain Management Plan implementation programme.

Environment Committee
10 September 2020
Report 20.316

For information

NATIONAL RESOURCE MANAGEMENT DIRECTION FOCUSING ON ACTION FOR HEALTHY WATERWAYS AND THE INFLUENCE OF OUR SUBMISSION

Te take mō te pūrongo
Purpose

1. To advise the Environment Committee (the Committee) of:

   a the final freshwater reforms and Greater Wellington's successes through the submission process

   b the challenge of implementing the full suite of recent and upcoming national direction.

Te tāhū kōrero
Background

2. The Action for Healthy Waterways Package (the Freshwater Package) was released on 5 August 2020 by the Ministry for the Environment (MFE). The Freshwater Package is designed to do two things:

   - Stop further degradation of New Zealand's freshwater resources and improve water quality within five years, and
   - Reverse past damage and bring New Zealand's freshwater resources, waterways and ecosystems to a healthy state within a generation.

3. The Freshwater Package consists of changes to the National Policy Statement for Freshwater Management (NPSFM), new National Environmental Standards for Freshwater (NESFM), new Resource Management (Stock Exclusion) Regulations 2020, revised Resource Management (Measurement and Reporting Water Takes) Regulations 2010 and amendments to the Resource Management Act 1991.

4. Greater Wellington Regional Council lodged a submission on the draft Freshwater Package in October 2019 (**Attachment 1** – Greater Wellington's submission on NPSFM discussion documents October 2019). Generally we welcomed, and were largely supportive of, the overarching intent of the draft Freshwater Package giving clear direction for freshwater management.

Te tātaritanga
Analysis

Influence of Greater Wellington's freshwater submission

5. Overall, the most important submission points were accepted. A key provision Greater Wellington supported was the new hierarchy for water management encompassed in an expanded framework for Te Mana o te Wai. The hierarchy has been retained and a new objective enabled to give effect to it at a catchment-level

6. The hierarchy of obligations in Te Mana o te Wai prioritises:

   a first, the health and well-being of water bodies and freshwater ecosystems

   b second, the health needs of people (such as drinking water)

   c third, the ability of people and communities to provide for their social, economic, and cultural well-being, now and in the future.

7. A number of the key areas of concern raised in Greater Wellington's submission, such as any immediate requirement for mandatory farm plans and reliance on OVERSEER to manage nitrogen (and linked to specifically named catchments, including Parkvale), have been removed from the Freshwater Package. Over the next 12 months, the Government will engage with primary sector representatives, iwi, regional councils, environmental organisations and other interested groups to develop new farm plan regulations. These regulations will set out requirements for freshwater farm plans and timeframes.

8. A small but significant success of Greater Wellington's submission has also been a change to the effects management hierarchy, which has been altered to be consistent with the Proposed Natural Resources Plan (PNRP) and international best practice. Changes to the effects management hierarchy in the NPSFM promote two environmentally beneficial procedures. First, the change in ordering puts 'minimise' before 'remedy', ensuring that, where possible, adverse effects are reduced before repairs are considered. Second, the change in terms from 'mitigate' to 'minimise' promotes clarity of outcomes and requires applicants to reduce harm to the greatest extent possible. This is an acknowledgment that our own regional resource planning documents are current and best practice.

9. However, officers' concerns about the impact of the Freshwater Package on rural communities remain. Rural communities are facing many new regulations and other challenges, such as droughts and the impacts of climate change. In addition, officers are concerned about the workability and enforceability of some of the stock exclusion regulations such as break-feeding and pugging. All regional councils are also navigating through the various layers of regulation (the NESFW has even already been updated to clarify the pugging rules; issues remain with break feeding).

10. Greater Wellington's submission sought an ability to focus monitoring efforts towards the attributes that are a priority for each particular freshwater management unit (FMU). The new NPSFM requires monitoring of all attributes in all FMUs, which will significantly increase the resource requirements for monitoring, and will potentially have less impact than a more targeted monitoring approach.

11. Further information about the key changes in the Freshwater Package and our submission points on these changes is in **Attachment 2** – Analysis of Greater Wellington's submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020.

Immediate implementation

12. Some of the NESFM regulations came into force on 3 September 2020, which means immediate changes to some consenting regimes such as some activities in wetlands, reclamation of waterways and fish passage requirements. Officers do not anticipate a significant increase in the number of resource consents as a result of these changes. However due to some of the complexities in the regulations, officers expect to see an increase in enquiries and associated time to work through complex issues.

13. Land use intensification (including some conversions) is now controlled through the NESFW (from 3 September 2020) while intensive winter grazing requirements come into effect in May 2021. This means that officers must quickly get up to speed with the changes in order to provide the latest advice to the Wellington Region's farmers, many of whom will be planning next winter's grazing regimes preparing land for cropping during spring 2020. Industry leaders are also supporting farmers to understand the new requirements and how they will affect their businesses.

14. Officers are also providing material for the Environment Court on the interaction between the national direction and the PNRP provisions currently under appeal, to determine what impacts it will have on mediation outcomes (as the PNRP can be more stringent than the national instruments).

15. Officers are still working across the organisation to understand the implications of the Freshwater Package for our work programmes now and in the future, and will provide further advice in a report to the Committee at its meeting in October 2020.

Wider national direction and regional implementation requirements

16. In addition to this Freshwater Package, Greater Wellington is required to implement other national directions with specific timelines and requirements, such as the National Planning Standards and the National Policy Statement on Urban Development (see **Attachment 3** - Implementing major national policy direction to 2025).

17. Officers are also aware of other imminent national direction, including a National Policy Statement for Highly Productive Soils, updated National Environmental Standards for Air Quality, and a National Policy Statement for Indigenous Biodiversity. These instruments are also likely to impose requirements within specific timeframes on regional councils.

18. At the regional level, Greater Wellington must develop plan changes to implement the Ruamāhanga and Te Awarua o Porirua Whaitua Implementation Programmes and the other three to-be developed Whaitua Implementation Programmes (WIPS) (Te Whanganui-a-Tara, Kāpiti Coast and Wairarapa Coast). The non-regulatory components of the WIPs also require strategic implementation from Greater

Wellington in order to meet the expectations of our partners involved in the development of the WIPs and our wider community.

19. Implementing Te Mana o te Wai and the hierarchy for water management will require genuine partnership with mana whenua to successfully deliver the environmental outcomes sought by the Government but also recommended by the Whaitua Implementation Programmes. Delivery of these environmental outcomes will ultimately require significant mana whenua capacity and it will be essential that Greater Wellington enables mana whenua to fully partner in this way for water and natural resource management more generally.

20. Under the Resource Management Amendment Act 2020, a new freshwater planning process (FPP) must be used by regional councils for any proposed freshwater provisions in regional policy statements and regional plans (notified after 30 June 2020) instead of the usual Resource Management Act 1991 Schedule 1 process. The FPP requires regional councils to notify freshwater plans (and policy statements) that give effect to the National Policy Statement for Freshwater Management 2020 by 31 December 2024 and make final decisions within two years of notification. The Resource Management Amendment Act 2020 also establishes independent freshwater hearings panels with additional hearings powers, made up of expert freshwater commissioners, councils and tangata whenua nominees.

21. Recent national direction including the Freshwater Package has generated a number of new requirements for Greater Wellington to deliver. If Greater Wellington is to effectively implement the Government's direction, while also meeting the expectations of our community and partners committed to implementing the WIPs, officers consider significant new resourcing will be required. Greater Wellington will need to prioritise between national direction and aspects of Greater Wellington's current work programmes to remain affordable for the Wellington Region's communities. Officers will provide further analysis including options for the Committee meeting scheduled for October 2020.

Ngā hua ahumoni
Financial implications

22. There will be financial implications associated with implementing the full suite of national direction. A more detailed report will set out the resourcing implications of the Government's changes.

Ngā tūāoma e whai ake nei
Next steps

23. Officers will continue to work through the implications of the Freshwater Package to inform a more detailed report for the Committee meeting scheduled for October 2020.

Ngā āpitihanga
Attachments

Number	Title
1	Greater Wellington's submission on NPSFM discussion documents October 2019
2	Analysis of Greater Wellington's Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020
3	Implementing major national policy direction to 2025

Ngā kaiwaitohu
Signatories

Writer	Caroline Watson, Policy Advisor, Environmental Policy
Approver	Al Cross, General Manager, Environment Management Group

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or with Committee's terms of reference This report enables the Committee to consider changes in the legislative frameworks and their implications for Council's plans, policies and initiatives as well as regulatory systems, processes and tools.
Implications for Māori Mana whenua have a key role in determining our implementation priorities for freshwater and other national direction going forward.
Contribution to Annual Plan / Long Term Plan / Other key strategies and policies Long Term Plan bids will be required to ensure effective implementation of national and regional direction for resource management.
Internal consultation Officers from Catchment Management and Environmental Management were consulted for this report.
Risks and impacts - legal / health and safety etc. There may be reputational risks in terms of not delivering outcomes or meeting expectations from our community.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Shed 39, Harbour Quays
PO Box 11646
Manners Street
Wellington 6142
www.gw.govt.nz

29 October 2019

Freshwater submissions
Ministry for the Environment
PO Box 10362
Wellington 6143

Submitted to: consultation.freshwater@mfe.govt.nz

Submission on Action for healthy waterways

Please find enclosed the Greater Wellington Regional Council's submission on the Action for healthy waterways proposals.

Feel free to contact me on 04 830 4320 or matthew.hickman@gw.govt.nz if you have any questions or concerns.

Yours sincerely

Matt Hickman
Manager, Environmental Policy
Greater Wellington Regional Council

Greater Wellington Regional Council: Submission

To:	Ministry for the Environment
Submission on:	Action for healthy waterways: Our proposals, your views

1. Reason for submission

1.1 The Greater Wellington Regional Council (GWRC) wishes to make a submission on the Action for healthy waterways: Our proposals, your views document.

1.2 GWRC is **supportive** of the direction of the freshwater package. It signals a direction that is broadly consistent with our whaitua programme. This programme was set up as a means to meet the requirements of the 2014 National Policy Statement for Freshwater Management, especially understanding iwi and community values, and the setting of objectives and limits. However, the timeframes to achieve an increased workload are unrealistic.

1.3 GWRC is currently halfway through this whaitua programme; the message from our iwi partners and communities is clear: all are seeking significant improvement in how we all manage our land and water. Although the direction is similar, the methods to get there differ from the proposals. We have learnt that even though a conversation starts with water quality, it soon broadens to encapsulate all catchment issues. The whaitua process has been powerful in the sense that it provides a 'container' for all these issues to be put on the table.

1.4 We had envisaged a catchment community-led approach leveraging off good management practice, farm planning (as distinct from mandatory farm plans), and investment in ageing infrastructure, all backed up by limits and regulation. We believed that this is the appropriate approach for the pressures in our region. If these proposals go ahead, we will unfortunately be forced to rethink this approach and lose much of the ground we have gained through the processes so far.

1.5 We have provided answers to the questions set out in the discussion document and specific comments on the proposed National Policy Statement for Freshwater Management, the NES-FW and the stock exclusion regulations.

2. Key points of our submission

2.1 Support for the Regional Sector submission

GWRC **supports** the over-arching intent of the proposals and, as such, **supports** the submission from the regional sector.

The proposals provide strong (and mostly clear) national direction that we have needed for many years; however, linked to this they do represent the biggest change in land and water management in a generation. Have no doubt that this represents a shock to our social, cultural and economic system – the speed of change will need to

be carefully considered; the proposals should also recognise the amount of good work already done in the rural sector.

We are already in a process of significant change. The GWRC whaitua programme, our response to climate change and building resilient sustainable communities is transforming our relationship with land and water. Our iwi partners and communities expect more from us, and we are already shifting to a new way of working.

Even though GWRC is relatively well placed with our existing whaitua programme; speeding up of these processes means additional planning, consultation, monitoring and reporting work will be required. This will pose a significant implementation challenge for us leading to some hard decisions regarding our resource allocation. Our partners and communities will also face similar challenges. Significantly improving our land and water management will come at a cost for Councils, partners, landowners, stakeholders and our communities.

2.2 Concern about the impact on our rural communities

While GWRC supports the general direction of these proposals, we are concerned that the speed of change puts an unsustainable burden on our rural communities and does not recognise what has already been achieved.

The Ruamāhanga Whaitua Implementation Programme, developed with our iwi partners and community, envisaged a catchment community approach with all working together to deliver on land and water outcomes. The more regulatory approach, as proposed, will mean we will need to rethink this to some extent.

The direction of change is certainly consistent with our whaitua programme; the main differences being the pace of change, the attribute states that may be relevant, and the methods used to achieve the outcomes sought.

We **recommend** considering a rebalancing between rural and urban requirements. There is continued pressure from both new urban growth and the existing urban footprint. The loss of wetlands and streams is primarily happening due to new urban development; modern urban design methods are available to protect and enhance these threatened systems. The proposals could be firmer in this regard. The proposals do not include some urban contaminants, such as metals, that need to be addressed.

We **strongly support** the direction to district plans regarding the cumulative environmental effects of urban development. Consideration should also be given to clarifying the wording of Sections 30 and 31 of the Resource Management Act to ensure it is totally clear that territorial authorities have a major responsibility in managing the environmental effects from urban development and growth.

2.3 Undue regulation of the region's landowners – not commensurate to the problem

GWRC **opposes** the way certain pollutants are proposed to be managed. The framework around nitrogen is unlikely to be the most efficient and effective means of achieving improved ecosystem health. Dropping a model that has been developed

for regions with severe nitrogen problems on other catchments will lead to excessive costs, a focus on compliance and a reduction in the ability of landowners and communities to innovate.

The proposed options for managing nitrogen are not well suited to our region. GWRC has been developing a plan built around iwi and community-led catchment planning. The Ruamāhanga Whaitua Implementation Programme sets out a plan for the Parkvale catchment, for example (http://www.gw.govt.nz/assets/Ruamahanga-Whaitua/Final-Ruamhanga-WIP-August-2018-Pdf-version.pdf). GWRC wants to stick to this plan and bring the community along with us. This includes reducing nitrogen to the proposed national bottom line. Reducing nitrogen alone will not improve ecosystem health in this catchment. The regulatory approach toward managing nitrogen on farm will not solve issues in this catchment.

GWRC supports the drive to farm planning but **opposes** mandatory farm planning for all. This may be appropriate in some FMU's (particularly where sediment is an issue) but not across all FMUs and all regions.

The proposed systems will result in large compliance costs, both for GWRC and landowners. This will have a knock-on effect to ratepayers. Increases in rates should be focused on infrastructure investment not increases in compliance and monitoring. We need a system that drives innovation; we believe this sits in our whaitua process not in mandatory farm plans, the mandatory use of OVERSEER and a heavy consenting regime.

2.4 Support for Te Mana o te Wai but question the need for a long-term vision

GWRC **supports** clarifying Te Mana o te Wai and introducing a hierarchy for water management. The draft NPS-FM provides clear wording for giving effect to Te Mana o te Wai. It states that Te Mana o te Wai requires the following, and may include other things as determined locally:

a) adopting the priorities set out in the hierarchy of obligations

b) providing for the involvement of iwi and hapū in freshwater management and identifying and reflecting tangata whenua values and interests

c) engaging with tangata whenua and communities to identify matters that are important to them in respect of waterbodies and their catchments

d) enabling the application of broader systems of values and knowledge, such as mātauranga Māori, to the health and wellbeing of waterbodies and freshwater ecosystems

e) adopting an integrated approach, ki uta ki tai, to the management of waterbodies and freshwater ecosystems.

This approach is consistent with GWRC's whaitua programme and the basis of the Proposed Natural Resources Plan. It does provide further certainty for these processes.

The Crown will have to resolve mana whenua water rights to implement Te Mana o te Wai effectively. Treaty settlements have reset expectations that the Crown and Councils protect and provide for mana whenua values. Co-management at all scales is a likely outcome for this. National direction must be provided to enable Councils to provide local leadership to deliver on the Crown's Treaty obligations.

GWRC questions the workability of a single 'vision' in the Regional Policy Statement. The risk with such a vision is that is sits at too high a level to be useful. A vision in itself also has no statutory weight; we **recommend** that such a vision can be articulated at the *catchment or sub-catchment scale* and must sit as an *objective* in the Regional Policy Statement in order to carry the appropriate statutory weight.

2.5 Timeframes are too tight and resourcing limited in the short term

While GWRC supports the intent of the proposals, timeframes are very tight which will put pressure on our (and others) ability to deliver. The practicalities of change mean that the limited numbers and capacity of planners, scientists, land managers, contractors, auditors, etc. cannot result in the extent of change in the envisaged timeframe.

Lead-in time to build sufficient capacity is going to be key. Expectations of how much can be achieved in five years needs to be managed. There currently are not enough commissioners, farm planners, fencing contractors, and so on to meet the level of demand. Even if we were to embark on training programmes right now, the trainees would lack the 'on the ground' knowledge and expertise required to understand the multiple challenges rural landowners face and how these might be addressed in the context of the NES.

GWRC **supports** the introduction of a new centralised water planning hearing process; however we do express concern about the practical application of this. The process will be a significant undertaking for the country, meaning other planning and legal processes will need to be put on hold to free up capacity to concentrate on freshwater matters. Government should consider if all freshwater plans should be notified by **2025** in order to build sufficient capacity (and capability) in the resource management system.

2.6 There is not sufficient Mana whenua capacity to engage in all national and regional processes

Disparity in availability and ability of iwi to partner is a critical obstacle to implementation of Te Mana o te Wai. Equity in participation needs to be addressed. Integration of taiao and mātauranga Māori into resource management will require additional commitment of mana whenua which in turn will require either additional resource or reprioritising of current delivery.

This will also require investment in building the capability and capacity of both mana whenua kaitiaki and Council employees in leading Te Mana o te Wai.

All national direction places expectations and obligations on mana whenua to engage in resource management planning processes. The reality of this means that it's often the same people or group or people that are asked to engage in an endless

round of consultation/co-design processes. The system was already at a breaking point in this regard. Significant central government investment is required to ensure capacity and capability meets the increasing demands placed on all parties.

2.7 Monitoring requirements are onerous and out of date

The current proposals create comprehensive monitoring requirements that significantly increase the resource requirements in this area. Monitoring of *all* attributes in *all* Freshwater Management Units (FMUs) could shift monitoring efforts away from areas where we could offer greater impact through more targeted deployments of resources.

We **recommend** the focusing of effort towards those attributes and/or FMUs that have clear problems as a much more efficient use of monitoring resources. We would like to see the proposals more clearly and consistently recognise that effort should be directed commensurate with the significance of the water quality or quantity issues applicable to each particular FMU.

The management approach suggested through the proposals suggests a strong use of monitoring, evaluation, adaptive management and reporting. At a conceptual level, GWRC **generally supports** this direction. However, we consider that there are more efficient and effective methods to achieve these results. The resourcing and time implications are potentially heavy for the regional council to satisfy them as proposed.

The monitoring and accounting parts of the proposals seem to be highly related and could potentially be harmonised together. Similarly, the detecting deterioration and assessing and reporting sections seem to be about identifying and evaluating causes for the environmental conditions and opportunities to make improvements. They all seem to be about tracking the instream conditions, immediately responding to deteriorations in those through additional action plans and evaluating. But this is often too late - tracking changes in land use and modelling the impact may be a more useful tool in adaptive management.

In some parts of the proposals, there is a strong preference for monitoring data/exclusion of modelled data, while in other parts the value of a range of data sources including monitoring and modelling is recognised. GWRC **suggests** that modelling is a useful tool to provide information across a range of catchment types that don't have monitoring. This supports a more efficient use of monitoring resources, particularly enabling greater targeting of monitoring towards areas where there are greater risks/issues to the values of the FMU. Such modelling approaches have been successfully used in Auckland, Sydney and Melbourne for example.

We **strongly suggest** that the proposals need to more clearly and consistently recognise the value of modelling information.

2.8 Recognising the status of work to date towards implementing the NPS-FM 2014/2017

GWRC has undertaken significant work in developing a community-led catchment planning approach to understand values and the setting of objectives and limits. Two Whaitua Implementation Programme documents have been completed (Ruamāhanga and Te Awarua-o-Porirua [to be read with the Ngāti Toa Statement]). A third whaitua is underway (Te Whanganui-a-Tara) with two more planned (Kāpiti and Eastern Wairarapa Hills).

GWRC **supports** the continuation of the values, objectives and limit setting process and use of the National Objectives Framework. To achieve implementation of this, GWRC will continue to use our whaitua programme as a means to understand community and iwi values to set objectives and limits. We will leverage off existing completed Whaitua Implementation Programmes to ensure the new requirements are met.

This creates an issue for us when the outcomes of this process do not align with this proposed national direction. A good example of this is the Parkvale catchment. We have a plan for the catchment, articulated as part of the whaitua process. We want to implement this plan. However, a new regulatory regime is proposed for very little beneficial outcome.

GWRC **does not envisage** repeating any processes *or* short-cutting others in order to meet the required timeframes. Additional investment and reprioritisation of resources will be required to meet the shortened timeframe to notify all freshwater plans by the end of 2023. We had originally been working to a target to notify all relevant plan changes by 2025 (in a staged approach). There is an additional opportunity cost here of course; **government should consider** extending some of the shorter timeframes for the national planning standards (such as the RPS completion date) to ensure all councils prioritise freshwater planning processes.

2.9 Opportunities to go wider – water bottling and green infrastructure

One further aspect of national direction that is helpful is national regulation regarding the activity of water bottling. GWRC **requests** that the government consider regulation of water use for water bottling through the National Environmental Standard for Freshwater.

Significant pressure exists at the local and regional level to manage this use more strongly. However, the lack of a legislative framework to enable the targeted management of water bottling activities combined with the lag in planning processes could be overcome with a strong piece of national direction.

There is currently no recommended guidance at a national level about incorporating green infrastructure into policy and planning provisions or on stormwater design and management. GWRC **requests** that the government consider providing this guidance on a national scale.

3. Final statement

Overall, Greater Wellington Regional Council supports the intent of the freshwater package. The objectives are very similar to the outcomes of GWRC's whaitua process. However, where we diverge is on the methods on how we achieve the outcomes; a heavy handed regulatory approach will not work for our region. We have a plan, designed through our whaitua process, and we want to stick to it.

Thank you for the opportunity to make a submission on the proposed package. Please do not hesitate to contact GWRC to discuss any of the points raised.

Greg Campbell
Chief Executive, Greater Wellington Regional Council

Date: 29 October 2019

Address for service:

Matt Hickman
PO Box 11646
Manners Street
Wellington 6142

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Responses to questions from the discussion document

Overview – the health of our nation depends on the health of our freshwater

Q1. Do you think the proposals set out in this document will stop further degradation of New Zealand's freshwater resources, with water quality materially improving within five years?

No, it will take much longer than 5 years to show a material improvement in water quality.

In respect of GWRC's situation, we have recently reviewed our regional plan and have provisions in the plan that seek to maintain or improve water quality. We also are not experiencing declining trends in water quality or increasing pressures on our water resources. In some cases our waterways are showing improvement.

Q2. Do you think the proposals will bring New Zealand's freshwater resources, waterways and ecosystems to a healthy state within a generation?

The proposals should result in movement toward a healthy state within a generation. Some locations will improve more quickly than that, others more slowly depending on the current state and the pressures on those water resources.

The proposals do not include a requirement to achieve a certain state within a specified timeframe. Therefore, it is uncertain as to whether these proposals would achieve a healthy state within a generation.

Q.3 What difference do you think these proposals would make to your local waterways, and your contact with them?

Gradual improvement over time as per our whaitua process.

Q.4 What actions do you think you, your business, or your organisation would take in response to the proposed measures?

- In essence, there will be 'more' of everything:
    - Lots more research for limit setting, monitoring and reporting.
    - Lots of community engagement including land owner discussions
    - Lots of plan changes
    - Lots more iwi and mana whenua engagement
    - Lots of action plans
    - Lots more farm plans
    - Lots of compliance activity to enforce regulations.

- All of which will require a lot of money and many additional staff.

We support the regional sector's analysis of the increased resourcing requirements of this package.

Q. 5 What support or information could the Government provide to help you, your business, or your organisation to implement the proposals?

We recommend the provision of funding for councils to implement these changes to mitigate very large rate rises which would be unaffordable for many communities. This is especially true in the 3 Waters infrastructure space.

Q. 6 Can you think of any unintended consequences from these policies that would get in the way of protection and/or restoration of ecosystem health?

The focus on certain pollutants (e.g. nitrogen) will drive short-term compliance actions that will not benefit overall ecosystem health.

Possibly knock on effects regarding land becoming unproductive resulting in lower income, lower tax take, land values dropping, reduced rating income meaning less money in the system to pay for improvements.

Q. 7 Do you think it would be a good idea to have an independent national body to provide oversight of freshwater management implementation, as recommended by KWM and FLG?

Not at this stage. This function could be picked up in environmental reporting (StatsNZ and MfE), investigations (PCE and EPA) and a centralised drinking water regulator.

Q. 8 Do you have any other comments?

Not at this stage.

3.1 Te Mana o te Wai

Q. 9 Do you support the Te Mana o te Wai hierarchy of obligations, that the first priority is the health of the water, the second priority is providing for essential human health needs, such as drinking water, and third is other consumption and use?

Yes, this is a much needed shift away from the economic vs environment dichotomy which has not provided for water quality. The hierarchy recognises that water is a primary entity upon which all wellbeing is reliant. It follows that our first and most important obligation is to provide for the health of water.

It also opens up a drive for innovative solutions that achieve a 'win-win' between water and land use. Ultimately we need to shift to a situation whereby good profits can be achieved while protecting land and water. Some of this can be driven by best practice (in both the urban and rural context) but most will need to come from enabling innovation.

Q. 10 Do you think the proposals will have the desired effect of putting the health of the water first?

The Crown will have to resolve mana whenua water rights to implement TMOTW effectively. Treaty settlements have reset expectations that the Crown and Councils protect and provide for mana whenua values. Co-management at all scales is a pre-requisite for this. National direction must be provided to enable Councils to provide local leadership as Treaty partners.

Disparity in ability of iwi to partner is a critical obstacle to implementation of TMOTW. Equity in participation must be addressed. Integration of taiao and mātauranga Māori into resource management will require additional commitment of mana whenua which in turn will require either additional resource or reprioritising of current delivery. It will also require investment in building the capability and capacity of both mana whenua kaitiaki and Council employees in leading TMOTW.

Q. 11 Is it clear what regional councils have to do to manage freshwater in a way consistent with Te Mana o te Wai?

No. Councils need guidance, direction and measures to ensure implementation of TMOTW

The NPSFM must make Councils accountable for "giving effect" to Te Mana o te Wai beyond biophysical parameters for human health and consumptive uses.

Q. 12 Will creating a long-term vision change how councils and communities manage freshwater and contribute to upholding Te Mana o te Wai?

A *regional* vision for TMOTW is working against the principle of devolved responsibility for water quality delivered through localism which GWRC has articulated as the Whaitua process in the PNRP and which has now been devolved as far as FMUs. If we were to develop a regional vision for TMOTW it should be aggregated up from the collective visions of our Whaitua and catchment communities responsible for freshwater management.

3.2 New Māori value

Q. 13 Do you think either or both of these proposals will be effective in improving the incorporation of Māori values in regional freshwater planning?

We generally support proposal 1 and agree mostly with the comments of Te Kāhui Wai Māori regarding both proposals.

Q. 14 Do you foresee any implementation issues associated with either approach?

Investment is required in mana whenua kaitiaki and learning institutions to lead the work of bringing forward mātauranga Māori necessary to implement these proposals at all regulatory spatial scales.

Q. 15 What are the benefits and impacts of either of these approaches?

Proposal 1 Mahinga kai is a fundamental lens into the assessment and management of freshwater for mana whenua that incorporates place, species and activities. There is a wealth of existing knowledge and expertise that can be further developed into regulatory frameworks and not regulatory provisions.

Proposal 2 Tangata whenua values recognises that whilst sharing generic basis, Māori values for water need to be identified, developed and applied at an appropriate cultural scale in order to capture local conditions, uses, attributes and relevant decision making structures. This is critical to supporting mana whenua leadership and broader community commitment to implementation of TMOTW.

Q. 16 What implementation support will need to be provided?

A national public awareness programme supporting TMOTW as the national lens for freshwater improvement. We need to understand as a nation the need for healthy water and how this is perceived through understanding mahinga kai and tangata whenua values. This will encourage the wider community to reflect on their own values and measures. This could include:

- TMOTW national leadership programme that develops existing and emerging leaders as TMOTW champions and auditors
- TMOTW audit programme.
- National training programme and qualifications for Council staff to develop TMOTW as an integral element of service delivery.
- Recruitment and recognition of "dual competency" staff who can work with mana whenua values and have or develop specific skills and knowledge (mātauranga) supporting TMOTW
- TMOTW understanding developed as a curriculum through all levels of the education system.
- More immediately, existing wānanga and university programmes that focus on Te Taiao Mātauranga Māori learning should be supported to expand and promote their programs.

3.3 New planning process for freshwater

Q. 17 Do you support the proposal for a faster freshwater planning process? Note that there will be opportunity to comment on this proposal in detail through the select committee process on the Resource Management Amendment Bill later this year.

In principle GWRC supports this process. It is becoming increasingly clear that the standard RMA Schedule 1 process takes too long and costs too much for limited additional benefit. The Proposed Natural Resources Plan has taken ten years to get to a decision stage; this is too long.

We believe that the proposed restriction on avenues for appeal will reduce the duration and expense needed to give effect to this important NPS.

However, we have concerns that there are not enough practitioners to complete a parallel hearing process across the country. This applies to both Hearing Commissioners and subject experts. Councils and submitters will all be seeking the same experts meaning that some councils will 'lose out'. This is already happening as all Councils aim to have limits and objectives in place – a centralised process will expose the thinness of the domestic planning and expert market.

The "major urban centre areas" from the NPS-UD could also benefit from being able to use the freshwater planning process for their plan changes. Managing the effects of urban development on freshwater bodies, ecosystems and sensitive environments is critical to implementing this NPS-FM.

3.4 More integrated management of freshwater

Q. 18 Does the proposal make the roles and responsibilities between regional councils and territorial authorities sufficiently clear?

No. Although we are very encouraged to see the direction to territorial authorities, it's not actually clear who is responsible. Sections 30 and 31 require further clarification. Some planners and lawyers argue that territorial authorities have no role in water quality management because Section 31 is not explicit enough in this regard.

The Resource Management Amendment Bill provides an opportunity to clarify the role of territorial authorities in relation to the cumulative effects from urban development.

3.5 Exceptions for major hydro schemes

Q.19 Does the proposal to allow exceptions for the six largest hydro-electricity schemes effectively balance New Zealand's freshwater health needs and climate change obligations, as well as ensuring a secure supply of affordable electricity?

There are no major hydro schemes within the Wellington region. However, we support the proposal to make exceptions concerning water flow levels and variability for major hydro schemes. We agree that Government has to balance the need to support freshwater ecosystem health with the need to reduce carbon emissions. Continued operation of major hydro schemes is an important part of NZ's efforts to reduce our carbon footprint.

3.6 Attributes

Q.20 Do you think the proposed attributes and management approach will contribute to improving ecosystem health? Why/why not?

GWRC questions whether there might be some redundancy in attributes. A number of the attributes are likely to have strong correlation between them, and/or are likely to require the same responses in order to achieve improvements in their condition. This adds potentially significant additional complexity for community processes to set objectives and adds cost for understanding current conditions and tracking changes over time, for little marginal benefit in terms of providing protection for ecosystem health or justifying additional management responses. We would like to

see an ability to focus on the critical few attributes that help describe the current conditions, desired changes and most clearly support/justify the management responses. Focusing on those attributes that are most related to the pressures present within an FMU would also be a more efficient way to deploy council resources, justify actions and reduce complexity for community processes.

There may be scenarios where a target attribute state is not met but other elements of ecosystem health are provided for, such as a non-native species fulfilling a particular ecosystem function, for example a non-native species providing habitat/food for native species.

There may also be scenarios where we need to acknowledge a likely short term deterioration in an attribute state in order to allow longer term improvements. An example might be a transition phase through gorse for retirement of erosion prone land. This might provide a short term increase in nitrogen load as the retirement vegetation grows, but a longer term reduction in both sediment and nitrogen would be expected. These shorter term increase for longer term decrease scenarios need to be acknowledged and provided for.

Q. 21 If we are managing for macroinvertebrates, fish, and periphyton, do we also need to have attributes for nutrients that have been developed based on relationships with aquatic life?

How macroinvertebrates, fish and periphyton respond to nutrients will vary and it will occur through different pathways (e.g. for macroinvertebrates, nutrient levels that effect ecosystem health can play out through a periphyton pathway. This was the case for the stressor specific metrics developed as a part of the MfE macroinvertebrate metrics project). This would mean having one attribute table based on ecological responses would be difficult from an ecosystem health point of view

3.7 Threatened indigenous species

Q.22 Do you support the new compulsory national value?

Yes, we support a new compulsory value for threatened indigenous species because of the significant proportion of New Zealand's native freshwater species that are threatened or declining and the critical need for regional and district planning to identify and protect their habitat. We request that this provision applies to all threatened species that rely on freshwater systems, not just freshwater fish, e.g. river nesting birds and wading species, as well as freshwater plants and invertebrates

3.8 Fish passage

Q.23 Do you support the proposed fish passage requirements?

Yes – The policy provides greater strength to the NZ Fish Passage Guidelines and correlates with the work programme being developed by Greater Wellington Regional Council in response to these guidelines.

One area to consider is how regional councils will reconcile 3.17 (2) b) and c) preventing passage of "undesirable species" while d) taking into account Sports Fish and Game Management Plans? Some further clarity on this will be required.

Q. 24 Should fish passage requirements also apply to existing instream structures that are potentially barriers to fish passage, and if so, how long would it take for these to structures to be modified and/or consented?

Yes, but this would need to recognise and provide for the significant time and cost required to remediate existing structures, as there are many hundreds of structures across NZ that will require attention. Any extension of the existing policy should require regional councils to develop a strategic plan for fish passage remediation, identifying priority structures and or catchments for progressive improvements, recognising the cost-effectiveness of altering structures as opportunities arise with upgrades.

We do not have a record of instream structures that meet the permitted activity rules; although we are starting to identify instream structures and the barrier they pose to fish passage in priority catchments as part of our whaitua process. It would be an incredibly expensive exercise to identify all instream structures across the region and ensure that they meet the new fish passage requirements or make people get a consent.

3.9 Wetlands

Q. 25 Do you support the proposal to protect remaining wetlands?

Yes, we strongly support the provisions to protect New Zealand's remaining wetlands due to the importance of wetlands (for their provision of ecosystem services including reducing impacts of floods, absorbing pollutants, improving water quality; and the habitat they provide for animals and plants); the significant loss of wetlands throughout New Zealand, including in the Greater Wellington Region; and because of the ongoing loss of wetland extent and functionality.

We support the proposal to protect our remaining wetlands and put tighter control on activities that damage them. Requirements to identify natural wetlands, monitor their health, set policies to protect them, and support active restoration all align with GWRC's existing approach. A clear definition of wetlands with associated implementation guidance will be required to remove any uncertainty and ensure consistent application across the country.

We request that provision is made to enable supportive policy pathways for activities associated with wetland restoration, maintenance/improvement of indigenous values and monitoring/research. Under the Proposed Natural Resources Plan, GWRC provides for wetland restoration activities that have been identified in an approved restoration management plan as a controlled activity, with provision to waive resource consent fees. Under the current drafting of the NES, restoration is a discretionary activity – this would override this controlled activity rule and is likely to be a deterrent to wetland restoration. Landowners will exclude stock, and

revegetation will occur, but actions such as providing a wetland with the right amount of water are likely to be discouraged by a discretionary consent.

Q. 26 If this proposal was implemented, what would you have to do differently?

GWRC has 190 significant wetlands greater than 0.1ha scheduled in the PNRP. We would need to undertake more research to identify and map wetlands greater than 0.05ha.

We would need to expand our existing wetland monitoring programme to include newly mapped wetlands identified in the 0.05-0.1ha category. We already have a monitoring programme in place and have monitored 90 wetlands to date.

We would need to develop a programme to respond when degradation of the condition of these wetlands is detected.

All of these actions would require consultation, consent and cooperation of landowners with wetlands on their property. In previous research and mapping exercises, 20% of landowners have refused access to their property. This number is likely to increase if rules are seen as being 'too' restrictive.

3.10 Streams

Q. 27 Do you support the proposal to limit stream loss? Why/why not?

We support the direction to avoid infilling of streams and rivers following the internationally-recognised mitigation hierarchy to ensure *at least* a no net loss of river extent or health. However, in some areas there has been a significant loss of stream network due to reclamation/piping, therefore we consider that in these areas the aim of the policy should be to achieve a net gain.

To achieve this, NES 18(1)(d) **must** be amended so that clauses (a)-(c) are linked to (d) with an 'and', otherwise the NES provides a significant pathway for the continued loss of streams [18(1)d refers to "for which there are no practical alternative methods of enabling the activity to take place"]. This means that for every subdivision or new development, a case will be made that there is no practical alternative. This means that there is no certainty or consistency across councils – essentially leaving this to be considered on a consent-by-consent basis. We ask for the removal of (d) as a stand- alone clause (noting that it should be retained as a requirement linked to clauses a-c) to provide certainly and to align correctly with the higher level direction to avoid such infilling.

Q. 28 If this proposal was implemented, what would you have to do differently?

If the two proposals in the NPS and NES for streams were implemented as written, we would have to apply their inconsistency on a consent-by-consent basis.

Q. 29 Do the 'offsetting' components adequately make up for habitat loss?

We consider it needs to be clear how this aligns with the strong avoid objective.

The answer here depends on whether the changes to the NES section 18, as requested in our detailed comments on each provision, are accepted. If so then there are limited circumstances in which infilling is possible. This question should refer to application of the full effects management hierarchy (rather than just offsetting) as the most effective approach is the requirement to avoid in the first instance, and only then minimise, then remedy stream loss. We consider that offsetting for projects of the likely scale of nationally significant infrastructure should be required to achieve 'net gain' to provide greater confidence of a good environmental outcome in the face of uncertainty/risk associated with the application of any offset and the time lag between impact and the positive outcomes anticipated. This approach will help to address cumulative losses over time and space and is consistent to the NES requirement associated with wetlands.

3.11 New bottom line for nutrient pollution

Q. 30 Do you support introducing new bottom lines for nitrogen and phosphorus? Why/why not?

No, GWRC does not support these new bottom lines. We support the regional sector view on this issue.

While the bottom lines mostly work for Wellington region, there are a number of areas nationally where improving nitrogen and phosphorous concentrations to above the bottom line does not improve ecosystem health. In many places, a wider response beyond just managing nutrients is required. A number of places in this region have nitrogen concentrations below the national bottom line. Communities have already set nitrogen objectives at the bottom of the "A band" for nitrogen toxicity. This is the same as the proposed national bottom line.

Q. 31 If this proposal was implemented, what would you have to do differently?

Mostly minimal changes as it lines up with the direction of our whaitua process; but it may force us to focus narrowly on one pollutant type rather than whole ecosystem health.

Q. 32 Do you have a view on the STAG's recommendation to remove the 'productive class' definition for the periphyton attribute?

Yes we do have a view. The spatial differentiation is important. Removing this class would make management in some of our soft sedimentary rock catchments difficult.

3.12 Reducing sediment

Q. 33 For deposited sediment, should there be a rule that if, after a period (say five years), the amount of sediment being deposited in an estuary is not significantly reducing, then the regional council must implement further measures each and every year? If so, what should the rule say?

Estuaries are a particular concern for us (Porirua Harbour being under significant pressure). The whaitua process for Te Awarua-o-Porirua and recent monitoring has highlighted the sedimentation issues for this area. An action plan that links though

to clear targets should be the approach here; large weather events are particularly difficult to manage for and this may be the increasing norm with climate change.

Q. 34 Do you have any comments on the proposed suspended sediment attribute?

Why has this been based on turbidity and not suspended sediment? Readings can differ between turbidity metres. The units are also FNU and many turbidity metres read in NTU.

Q. 35 If this proposal was implemented, what would you have to do differently?

It aligns with the direction of the whaitua process but will mean a lot more resources put into monitoring.

3.13 Higher standard for swimming

Q. 36 Do you agree with the recommended approach to improving water quality at swimming sites using action plans that can be targeted at specific sources of faecal contamination? Why/why not?

GWRC supports the use of an action plan to improve water quality at swimming sites.

There are issues with the proposed monitoring regime. The approach is not feasible with current resources and communicates the risk to the public after a sample has been collected and processed. At GWRC we are shifting from the surveillance monitoring approach to a modelling approach based on a relationship with rainfall/riverflow and E.coli levels using several years of data. Warnings are placed on the GW recreational water quality website and give an indication of real time risk to the public.

3.14 Minimum flows

Q. 37 Is any further direction, information, or support needed for regional council management of ecological flows and levels?

Yes. The NPS is not clear enough on what restrictions are expected at minimum (or other) flows including what exceptions there should be (if any) for municipal supply takes.

3.15 Reporting water use

Q. 38 Do you have any comment on proposed telemetry requirements?

This is a positive change and while it will increase compliance workloads initially (ensuring that consent holders have telemetry set up) in the long run it will improve compliance workloads. We support the proposal to mandate telemetry.

3.16 Raising the bar on ecosystem health

Q. 39 Do you have any other comments?

No.

3.17 Draft NPS-FM (see the draft NPS-FM on the Ministry for the Environment's website)

Detailed comments on the draft NPS-FM are provided in the table with this submission.

3.18 Supporting the delivery of safe drinking water

Q. 43 Do you agree with the proposed amendments to the Drinking Water NES? Why/why not?

Yes. Additional protection is needed for group and community water supplies. Amendments reflect some of what is in PNRP, e.g. defining a spatial area for the protection zone based on contaminant transport times. Default zones should only be temporary. Definition of the specific spatial area for each supply by the supplier should be mandatory at some point e.g. when a water permit is applied for, or reviewed, or within 5 years for existing consents, or when district or regional plans are reviewed.

GW supports the proposal that it requires greater input from territorial authorities to control land use that might affect Community Drinking Water Supply Areas (CDWSA) e.g. subdivision, sewage servicing and stormwater management.

Nitrate needs faster attention as the health effects may be prevalent when levels are lower than the NZDWS, and there is no practicable treatment available, especially to smaller water suppliers.

Q. 44 Are there other issues with the current Drinking Water NES that need to be addressed?

There is a need to accurately identify the 'registered' water supplies. The MoH Register is not accurate and existing activities and land uses in CDWSA may be impacting on water quality, e.g. verified contaminated land, on-site sewage systems.

This standard is based on treatment capability of existing community drink water supply, and there is no requirement for the supplier to meet minimum quality.

Q. 45 Do you have any other comments?

How does this fit with 3 Waters Review?

There needs to be a review of MoH/TA/RC roles in drinking water quality. We suggest centralised management.

There needs to be a requirement for CDWS to meet minimum water quality criteria.

We recommend that individual/small supplies (less than 25 people or 25 and above for less than 60 days) are given the current level of protection for supplies >25 people has under current NES-HDW i.e. that they are notified if something happens or is authorised to occur within the vicinity of their intake that may affect their drinking water.

In those CSWS catchments where it exists, recognise the linkage between surface water and groundwater.

3.19 Better managing stormwater and wastewater

Q. 46 Does the proposed Wastewater NES address all the matters that are important when consenting discharges from wastewater networks? Will it lead to better environmental performance, improve and standardise practices, and provide greater certainty when consenting and investing?

No. A resource consent is authorising what leaves or escapes the network. There is a need to look back into the network to assess suitability, efficiency, effectiveness, capacity, weaknesses, leaks, laterals and sections not owned or managed by the operator etc. Design systems based in the receiving environment not an engineered system 'forced' on the environment.

The focus appears to be, but is not stated, on discharges of wastewater to water. It needs to be clearer to ensure those limits which may not be relevant to discharges to land.

The mechanism needs to integrate with the NES outcomes e.g. discharges of contaminants to land usually have effects on groundwater and surface water quality.

Wastewater systems can or will be some of the largest sources of nutrients in a catchment.

Q. 47 Do you agree with the scope of the proposed risk management plans for wastewater and stormwater operators? Are there other aspects that should be included in these plans?

No – the scope is too simplistic. It adds no more than what is required currently under the resource consent process. Stormwater management plans need to be driven by receiving environment *outcomes*. There is a risk in setting out the scope of a management plan as each will be slightly different.

Stormwater operators (as wastewater operators can do now) need to manage/control what goes into the stormwater system.

GWRC currently has issues with the use of natural waterways as stormwater conduits, i.e. these waterbodies being managed as a stormwater "drain" rather than as an aquatic ecosystem.

Q. 48 What specific national level guidance would be useful for supporting best practice in stormwater policy and planning and/or the use of green infrastructure and water sensitive design in stormwater network design and operation?

GWRC **suggests** that it would be useful to have national level guidance on:

- incorporating green infrastructure into policy and planning provisions or on stormwater design and management

- a national requirement to use Water Sensitive Urban Design principles at all scales of new development and

- retro-fitted solutions for the existing urban footprint .

Q. 49 What are the most effective metrics for measuring and benchmarking the environmental performance of stormwater and wastewater networks? What measures are most important, relevant and useful to network operators, regional councils, communities, and iwi?

A focus on outcomes, or waterbody objectives, rather than network performance is important. A focus on network performance as the key measures will lead to over investment in upgrades in some places and under investment in other places. Investment in network upgrades should be determined based on environment outcomes.

Q. 50 Do you have any other comments?

No.

3.20 Restricting further intensification

Q. 51 Do you support interim controls on intensification, until councils have implemented the new NPS-FM? Why/why not?

Yes we support the proposed controls on intensification which is consistent with the direction of the Ruamāhanga Whaitua Implementation Programme. This programme includes a recommendation to include a new discretionary rule for land use changes that result in an increase in contaminant load into the Proposed Natural Resources Plan for the Wellington Region.

If this direction were to come from Government it could also reduce dispute and litigation between Council and stakeholders over the ways land use change is controlled.

Q. 52 For land-use change to commercial vegetable growing, do you prefer Option 1: no increase in contaminant discharges OR Option 2: farms must operate above good management practices. What are your reasons for this?

GW supports option 1 as this aligns with the Ruamāhanga Whaitua Implementation Programme recommendations to use regulatory means to control land use change and intensification.

Q. 53 How could these regulations account for underdeveloped land, and is there opportunity to create headroom?

This is unclear. There is an ability to create headroom, but this would be made easier if offsetting is allowed for. Clarity around the spatial scale at which water quality is maintained may assist.

3.21 Farm plan options

Q. 54 Do you prefer mandatory or voluntary farm plans (acknowledging that farm plans may be required by councils or under other parts of the proposed Freshwater NES?) What are your reasons for this?

GWRC strongly prefers continuing the voluntary approach to farm plans and prioritising and supporting the development of farm plans in high priority catchments on an FMU-by-FMU basis.

In the Wellington region, our research and modelling shows that sediment is the main contributor to poor water quality and ecosystem health as well as impacting on cultural health values. As a result of this information, both the Ruamāhanga and Porirua Whaitua Implementation Programmes have recommended that farm plans are implemented in the freshwater management units (FMUs) with highest sediment issues (Ruamāhanga) and on properties with erosion-prone land (Porirua). Farm plans would be prioritised and incentivised in these FMUs and in the Ruamāhanga catchment, farm planning would also encompass cultural, economic and social outcomes It is much more effective and efficient to focus on the biggest issues for our region, and the multiple impacts that it has on the values our community wants to restore and protect. Prioritising farm plans in these particular FMUs will allow for a co-ordinated and targeted response.

Q. 55 What are your thoughts on the proposed minimum content requirements for the freshwater module of farm plans?

The scope of the FP-FW set out in Section 38 of the draft NES is a copy of the Canterbury FEP scope. That scope is developed for a largely flat land, groundwater hydrogeology, nitrogen loss-the-principal-concern setting. This scope is not necessarily relevant to all other parts of NZ. The scope should be developed for a wider range of situations and contaminants. It should also include contaminants from human effluent systems on a property.

Q. 56 What are your thoughts on the proposed priorities and timeframes for roll out of farm plans, as set out in the proposed Freshwater NES?

While it is useful to identify priority areas, it is important to determine what is a 'priority area' which needs further and more broad scoping e.g. assessing nature and scale of the problem, likely cost and time response to achieve improvements etc. This scoping would be more usefully done by a regional council and their community e.g. GWRC's Whaitua process.

We oppose the prioritisation of catchments based on nitrogen alone.

Q. 57 Do you have any comment on what would be required to ensure this proposal could be effectively implemented, including options for meeting the cost of preparing, certifying and auditing of farm plans; and on financing options for other on-the-ground investments to improve water quality?

If farm plans were to be mandatory everywhere, in order to meet the required timeframes it is essential that there are appropriate resources provided by Government to design an appropriate training programme and upskill the certified farm environment planners to prepare these plans. This will also need to be the case for approved auditors. The case for mandatory farm plans everywhere is not a strong one, entailing excessive costs; it would not be the most effective and efficient way of meeting the government's objectives.

GWRC has a long history of strong working relationships with farmers and their farm plans. We strongly encourage these FW-FPs to be farmer led or at least that farmers are integral to the process. In our experience, many farm plans become irrelevant without some level of farmer buy in.

To effectively implement this proposal, there needs to be a co-ordinated integrated approach from industry, land owners, regulators, iwi and the wider community in each catchment (FMU). There needs to be investment in the resource to prepare these plans and investment in the community capacity to uptake, adapt and implement these plans.

3.22 Immediate action to reduce nitrogen loss

General response:

GWRC opposes the specific catchment rules targeting nitrogen only. Our whaitua process focuses on ecosystem health; targeting one pollutant may not be the most effective and efficient way to achieve improved ecosystem health.

The focus appears to be on surface water quality, while groundwater also has high nitrate concentrations that eventually affect surface water, and has human health issues. With the lag time in some groundwater catchments, some may take years to see the effects of nitrogen loss from past and current land use. Nitrate concentrations in water in the Wellington region may increase in some catchments for some time.

Generic response risks over, under or not achieving targets/outcomes. Response needs to be targeted to the specific situations for each catchment. The limits on nutrients need to take into account all inputs – including any additional sources that may not just be current land use.

Q. 58 Which of the options (or combination of them) would best reduce excessive nitrogen leaching in high nitrate-nitrogen catchments? Why?

None of the options would work for GWRC. We have run a 5-year process to develop a plan to deal with such pollutants; the current options in the proposal are the antithesis of our approach. An advisory committee of council, with members covering iwi, TAs and community members has developed an approach that has been received by GWRC. The plan is set out in each Whaitua Implementation Programme – targeted to be the most efficient way of achieving the objectives and limits.

Q. 59 If you are in a high nitrate-nitrogen catchment, what would you have to do differently under these options?

We oppose the heavy regulatory regime being imposed on high nitrogen catchments. This type of regulation would not work in our region; there are very large compliance costs and very narrow benefits. Focusing on one pollutant may not give the best outcomes for ecosystem health. The Canterbury model will not work everywhere in the country.

These options would require best farming practices across all activities that lead to high nitrate loss (as is targeted in the Ruamāhanga WIP), and it would possibly require changing the farm system including reducing stock numbers or land-use change. It will not encourage innovation, but rather lock in the status quo and focus on compliance.

Q. 60 In addition to those already identified, are there other high nitrate-nitrogen catchments that should be subject to these options?

No.

Q. 61 Do you think the action already underway in five regions (identified in section 8.4) will be effective in reducing excessive nitrogen leaching in those high nitrate-nitrogen catchments?

No, the focus on compliance works against innovation. A big part of the Ruamāhanga WIP was working with landowners and communities to drive innovation to meet the desired values and objectives.

The Canterbury model is not appropriate for our region.

Q. 62 Should there be higher thresholds for farms that produce food products in winter, and if so, which food products?

No, best farming practice for winter production should be followed.

Q. 63 What alternative or additional policies could contribute to reducing nitrogen loss?

Promotion of innovation (such as GW's current work with dung beetles), establishment of community driven catchment groups, alternative land uses, produce and farming systems that require a lower intensity.

Q. 64 Do you have any comment on what would be required to ensure this proposal could be effectively implemented?

There is a risk that linking any proposal to nitrogen caps calculated by individual farm nutrient losses modelled in OVERSEER will leave it vulnerable to changes in the OVERSEER model, as well as the inherent margins of error present in the model.

OVERSEER is unreliable in this context and will only drive compliance rather than innovation.

3.23 Excluding stock from waterways

Q. 65 Do you support excluding stock from waterways? Why/why not?

The section heading "excluding stock" does not accurately describe the purpose of these regulations. The issue is managing stock access rather than excluding all stock everywhere.

The draft regulations are convoluted and difficult to understand and interpret.

The only difference between stock exclusion requirements based on land slope is that on 'Non-low slope' land, i.e. land with slope over 5, 7 or 10 degrees, there is no requirement to exclude beef cattle, deer or dairy support cattle from rivers or lakes, where:

- the farm base carrying capacity is <14+ SU/ha, or
- if the farm scale is <14 SU/ha, the paddock scale is <18+ SU/ha.

The base carrying capacity is calculated using Crown Pastoral lease procedure, based on LUC, but with a lot of other considerations and appears very difficult to implement. LUC is 1:50,000 scale and does not definitively describe LUC for an individual farm, or 'paddock'.

All other provisions in the Regulations are the same for 'Low slope' and 'Non-low slope' land.

It would be more efficient for the Regulations to state that they don't apply to cattle deer and pigs in the situation described above, i.e. only apply to stock access to rivers >1m wide and lakes on farms >14 SU/ha farm scale, or >18 SU/ha paddock scale.

The Regulations could be simplified and made more easily understood e.g.

Cattle, deer and pigs must be excluded with a 5m setback from wetlands on all farms.

Implementation:

- *Immediately for wetlands on new pastoral systems*
- *by 2021 for wetlands identified in RPs or DPs,*
- *by 2023 for all other wetlands.*

Cattle deer and pigs must be excluded with a 5m average setback from rivers >1m wide and lakes on farms with >14 SU/ha farm scale, or >18 SU/ha paddock scale.

Implementation:

- *Immediately for rivers and lakes on new pastoral systems*

- *By 2021 for*
  - *Dairy cattle and pigs*
  - *Cattle or deer feeding on irrigated pasture, fodder crops or break-feeding*
- *By 2023 for*
  - *Beef cattle, dairy support cattle, deer*

Concerns with the low-slope map produced by MfE

GWRC has some concerns about the low slope land for stock exclusion map produced by MfE. There is a lack of clarity as to the intent and purpose of this map. Is this the map required to be used and implemented by regional councils or are we able to use our own and potentially more detailed information?

The use of parcels to determine the average slope results in some illogical boundaries for stock exclusion application.

a. An example is the screen grab (attached in Appendix A) where one side of the river is included (and requires stock exclusion) and the other is not though they are owned by the same person and the land is equally flat on both sides.
b. The other is that tree covered areas have been excluded from the parcels which impacts the average slope calculation.

GWRC suggests that a data set like the NZLRI could be a more appropriate data set to use to determine slope and the stock exclusion requirements.

GWRC supports excluding stock from waterways and wetlands when the stock is likely to cause adverse effects on the environment. The rules in our Proposed Natural Resources Plan (decision version) are effects-based, with specific rules in high value areas and a rule using permitted activity conditions to manage adverse effects everywhere else.

Defining stock types in the regulations does not recognise that any livestock, if present in the bed of a waterbody has the potential to cause adverse effects, although the scale of those effects may differ with the type of stock and waterbody. The regulations focus separately on dairy cattle, dairy support cattle, beef cattle, deer and pigs. Access to waterbodies by **all cattle** should be managed in the same way and with the same implementation time limits, as with deer and pigs.

There are other livestock that also have an affinity to water or wallowing, and have potential to cause adverse effects in waterbodies e.g. horses, llamas.

Q. 66 Do you have any comment on the proposed different approach for larger and smaller waterbodies?

Evidence shows that there can be a significant contribution of contaminants from very small tributaries on to larger tributaries of a river, or to a wetlands or a lake. On low-slope land the entire river should be subject to regulations on stock access. On non-low-slope land managing stock access to rivers <1m wide could be part of the farm plan.

Q. 67 Do you have any comment on the proposed five metre setback, or where it should be measured from?

The requirement for a setback is positive for water quality, and potentially biodiversity, however it is important to acknowledge that there will be a large financial cost associated with the larger areas of fencing required to incorporate bigger buffers, not only for farmers but also on councils such as GWRC who support fencing through our wetland programme and contestable funds etc.

A 5m setback 'on average across a property' will be difficult to interpret, implement and monitor. These large riparian margins will also require significant maintenance in order to keep them free of infestations of weeds and large investment of planting to prevent large areas being infested. These setbacks should be measured from edge of water body, not the wetted area because this varies greatly.

We have concerns about minimum requirements being imposed on existing fences. What about a fence that has been in place for 20 years around a wetland and it has now expanded to be up to the fenceline, do they have to move it back? And then move it back again when it expands down the track?

Q. 68 Are there any circumstances that are appropriate for allowing exemptions to the stock exclusion regulations? If so, please give examples.

Geography/terrain plays a large role in the practicability of being able to exclude stock from waterbodies and wetlands. Many of our rivers and streams are highly erodible and subject to flooding which can make fencing problematic. Many of our farms are also partly in the coastal marine area where excluding stock with fences is also troublesome due to the harsh environmental conditions of the coast. There should therefore be common sense exemptions to the stock exclusion regulations on a case-by-case basis, where options could be considered such as offset mitigation in hill country with wetland retention ponds and planting to take up the nutrients.

It is also unclear what happens when livestock are held in a paddock for a short amount of time (e.g. overnight) such as before shearing and what the stock exclusion requirements might be in these cases.

3.24 Controlling intensive winter grazing

Q. 69 Do you prefer Option 1: Nationally-set standards or Option 2: Industry-set standards? Why?

GWRC supports national standards developed with industry input.

Q. 70 For the proposed nationally-set standards, which options do you prefer for the area threshold, slope, setback, and pugging depth components of the policy?

GWRC prefers standards, limits in rules, or consent categories that consider the slope of the land where the activity in occurring adjacent to a surface water body, the width of the set-back area from the water body from which stock are excluded, and the necessity for the set-back area to be in un-grazed vegetation.

These are the three main factors that will influence the movement of sediment and contaminants from the break-feeding area to the water body. Increasing slope increases rate of run-off and a vegetated set-back is needed to slow and filter run-off before it enters water body.

A threshold area (before the rule applies) is not supported, as run-off and effects from a small area or cumulative effects of small areas could be significant. Pugging depth limits will be very difficult to assess, monitor and enforce. It is more efficient to approach this through good practice guidelines in a Farm Plan.

Some of the conditions proposed under Clause 30 for intensive winter grazing will be difficult to monitor and enforce e.g. re-sowing timeframe and the amount of pugging which will be subjective.

3.25 Restricting Feedlots

Q. 71 Do you have any comment on the proposal to restrict feedlots?

It is not clear what the resource consent for a feedlot would be for – land use or discharge to land/air? What effects would be considered? The discussion document states there are about 5 feedlots currently in NZ, but the definition given would include smaller feed pads and herd homes on dairy farms, and intensive farming of chickens both in barns and limited free range (still have barns but access to outside). Time element of the feedlot definition needs strengthening, e.g. is a 'day' a continuous 24 hr period?

Some of the conditions proposed for feedlots will be difficult to monitor and enforce e.g. the permeability standard of the sealed stockholding area.

3.26 Reducing pollution from stock holding areas

Q. 72 Do you support the proposal relating to stock holding areas? Why/why not?

While it is useful to specify minimum requirements and best practice for the locations and operation for stock holding areas, including effluent management, this could be incorporated into the Farm Plan, and not separately regulated. It is also unclear as to whether the definition of a stockholding area would include paddocks that contain high densities of stock for a short period of time (e.g. overnight) during a shearing muster for example.

Q. 73 Do you think sacrifice paddocks should be included?

GWRC believe that sacrifice paddocks should not be included. As for stockholding areas, sacrifice paddocks should be managed within farm plans on a case-by-case basis. Requiring a consent for a sacrifice paddock is not practical in some circumstances. Sacrifice paddocks sometimes only happen when weather forces a farmer's hand, therefore they won't apply for a consent and wait 20 working days for processing.

Q. 74 What would you have to do differently if this proposal was implemented?

The proposal in the NES that stockholding areas would require resource consent would set standards for permeability and managing effluent. The Wellington Regional Proposed Natural Resources Plan (pNRP) does not have rules controlling land use for stockholding areas, but has rules managing discharge of collected animal effluent. If the NES requires GWRC to enforce the NES rules, there will likely be a need to 'rationalise' the pNRP rules so overlap/conflict is removed. This may mean having to vary or change pNRP and hence an additional cost.

The discussion document acknowledges "we recognise this may lead to a large number of consent applications, and we are seeking feedback on what would be required to ensure this proposal could be effectively implemented".

There will need to be a significant increase in resources if stock holding areas are managed via a consent process. An **alternative** would be for the NES to specify what best practice for stock holding areas is, and require that this is managed through a farm plan.

Q. 75 Do you have any comment on what would be required to ensure this proposal could be effectively implemented?

As above, specify best practice, include in FP.

3.27 Draft proposed National Environmental Standards for Freshwater

Q. 76 Are the definitions used in the policies accurate, and if not, how do you suggest improving them?

Bankfull discharge and **bankfull** width are not helpful. The RMA defines riverbed and introducing new definitions is unhelpful when it comes to enforcement.

These standards exclude properties <20ha for pastoral or arable or <5ha for horticulture. However, cumulative nitrogen losses from small properties can also impact on water quality as the nitrogen all ends up in same place. Smaller holdings often use fertiliser, can have high stocking density, and higher density of on-site sewage systems. 10 x 20ha farms could have greater water quality impact that a 200ha property, it all depends on how the farm is managed and the practices that are used.

Small properties are also not likely to have a farm plan or use OVERSEER, or use commercial fertiliser applicators, so there is a greater chance of over-application of fertiliser. We recommend a more risk based approach and potentially a lower threshold in those high risk catchments.

Q. 77 What are your thoughts on the proposed technical definitions and parameters of the proposed regulations? Please refer to the specific policy in your response.

Earth disturbance

Planting poles for erosion prevention purposes in or within 10m of a natural wetland is not provided as a permitted activity. This is a key activity of our Land

Management Department to help minimise the amount of sediment coming off hill country farms.

The definition of earth disturbance should be amended to provide for planting for erosion prevention purposes under Clause 9(b).

9(B)(iv) planting for erosion prevention purposes.

Clause 21 - Culverts

Permitted activity for culverts

This regulation will be difficult to implement by those who install culverts who will need to have a clear understanding of what is required and what parameters they measure when installing a culvert. Similarly, enforcement officers need to be able to determine if a culvert meets this rule. For example, velocity will be dependent on the amount of water in the river at the time of measurement. Temporal conditions (four-fifths of the time) are impossible to measure without a specified period (e.g. 24 hours / 1 week). Providing for the continuity of geomorphic processes is similarly difficult for a landowner or enforcement officer to prove or disprove. We recommend reconsidering the content and wording of the rule to assist implementation.

Clause 22 – Weirs

Permitted activity clause (e)

This clause is too specific to enforce as a permitted activity.

Remove reference to the rationale for this condition e.g. "to create a hydraulically diverse flow…").

Clause 30 - Intensive winter grazing

Permitted activity

Remove "as soon as practicable" from permitted activity clause (f).

Clause 34 – Irrigated farming

Permitted activity and discretionary activity

GWRC does not currently maintain a register of the amount of irrigated land, so is not currently in a position to monitor or determine increase in irrigated area.

Dairy cattle

The definition of dairy cattle in the NES is different to the Draft stock exclusion s360 regulations. Ensure consistency here.

Q. 78 What are your thoughts on the timeframes incorporated in the proposed regulations? Please refer to the specific policy in your response.

Part 3 – Farming

All farms to have a certified farm plan by 2025, (except commercial vegetable growers and farms in Schedule 1 areas have to have a farm plan within 2 years). This will be a significant task for GWRC with limited capacity and resources including setting up the auditing service.

Further prioritisation of catchments would be more practicable and achievable as well as being effective at addressing issues and meeting outcomes. It would be more appropriate to set targets for regional councils e.g. to have 50% of farms engaged in Farm Planning within 3 years, 30% have approved and audited farm plans within 5 years etc. In addition, there are not the experienced independent consultants to assist landowners. New graduates won't be up to it in the short term.

3.28 Aligning RMA national direction

Q. 79 Do you think there are potential areas of tension or confusion between the proposals in this document and other national direction? If so, how could these be addressed?

There is still tension between urban development, water quality, wetland protection and the infilling of stream and river beds.

The NES provides a pathway for the continued reclamation of streams (18(1) d refers to "for which there are no practical alternative methods of enabling the activity to take place"). This means that for every subdivision or new development, a case will be made that there is no practical alternative. This means that there is no certainty or consistency across councils – essentially leaving this to be considered on a consent-by-consent basis. We ask for the removal of (d) to provide certainly and to align correctly with the higher level direction to avoid such infilling.

Q. 80 Do you think a planning standard is needed to support the consistent implementation of some proposals in this document? If so, what specific provisions do you consider would be effectively delivered through a planning standard tool?

No more planning standards at this stage.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Specific comments on the Draft NPS-FM

Provision	Support or Concern	Amendment requested
Part 1: Preliminary Provisions		
Section 1.6 - Definitions		
FMU, or **freshwater management unit**, means all or any part of a waterbody or waterbodies, and their related catchments, that a regional council determines under clause 3.6 is an appropriate unit for freshwater management and accounting purposes	GWRC is supportive of the amendments to the FMU definition to include the waterbody and its catchment.	Supportive, no amendment requested.
Outstanding waterbody	Support	
Target	The meaning has changed from existing NPS from referring to a limit to referring to attribute state (objective). This should be made clear.	Define target
Environmental flow and level	Not defined in definitions. Not clear whether environmental flow is same as "minimum flow"	Define environmental flow or add note making it clear the term relates to the common term "minimum flow"
Threatened species taxa that meet the criteria specified by Townsend et al. (2008) for the categories Nationally Critical, Nationally Endangered, and Nationally Vulnerable Species		Add: 'all taxa that rely on freshwater habitat that meet the criteria specified by…
Section 1.7 - Application		
Geographical application	GWRC strongly supports the consideration of coastal receiving	Supportive, no amendment requested.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	environments when managing freshwater. The GWRC process for implementing the NPS-FM 2014 within the Te Awarua-o-Porirua Whaitua catchment has found that the values associated with the harbour have heavily influenced the management of the fresh waterbodies entering the harbour.	
Temporal application	The requirement to maintain water quality is already an objective in the NPS-FM 2011. Therefore the date at which the requirement to "maintain" is measured must be from July 2011, when the NPS-FM was first gazetted. Otherwise, if the date is taken as the gazettal of this latest version of the NPS-FM, there is a tacit acceptance of any decline in water quality over the last decade.	Set the date at which the requirement to "maintain" is measured to 2011.
PART 2: Objectives and Policies		
Objective (2.1) The objective of this National Policy Statement is to ensure that resources are managed in a way that prioritises: a) first, the health and wellbeing of waterbodies and freshwater ecosystems; and b) second, the essential health needs of people; and c) third, the ability of people and communities to provide for their social, economic, and cultural wellbeing, now and in the future.	Support GWRC suggests amending the objective to elevate Te Mana o te Wai to the objective level. All the other policies are working together to achieve this so should be at an objective level rather than sitting on its own at the policy level. Doing this will drive the integration of the other elements of the NPS-FM.	The objective of this National Policy Statement is <u>to give effect to Te Mana o te Wai</u> ensur<u>ing</u> that resources are managed in a way that prioritises: a) first, the health and wellbeing of waterbodies and freshwater ecosystems; and b) second, the essential health needs of people; and c) third, the ability of people and communities to provide for their social, economic, and cultural wellbeing, now and in the future
Policy 1: Freshwater is managed in a way that gives effect to Te Mana o te Wai	Move to objective 2.1	Incorporate into the objective.
Policy 2: Freshwater is managed	Support.	Freshwater is managed through a national objectives

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
through a national objectives framework, in order to ensure that the health and wellbeing of waterbodies and freshwater ecosystems is maintained or improved		framework, in order to ensure that the health and wellbeing of waterbodies and freshwater ecosystems is maintained or improved
Policy 3: The condition of waterbodies and freshwater ecosystems is systematically monitored over time, and action is taken to reverse deteriorating trends	Support.	
Policy 4: Freshwater is managed in an integrated way that considers the effects of the use and development of land on a whole-of-catchments basis, including the effects on sensitive receiving environments	Support, but suggest that the policy should include the "…effects of the use and development of land and water…"	
Policy 5: Iwi and hapū are involved in freshwater management, and tangata whenua values and interests are identified and reflected in the management of, and decisions relating to waterbodies and freshwater ecosystems	Support but suggest changing the "reflect" to "provide for"	
Policy 6: The national target for water quality improvement (as set out in Appendix 3) is achieved	Support	
Policy 7: Freshwater is allocated	Support	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
and used efficiently, all existing over-allocation is phased out, and future over-allocation is avoided		
Policy 8: There is no further loss or degradation of natural inland wetlands	*More aspirational policy* Extend Policy 8 to also aspire to an increase in wetland extent and condition, given the significant loss of both wetland extent and condition across New Zealand. We note that 3.15(7) refers to councils providing for and encouraging restoration, therefore it is important that this is reflected in Policy 8. *Consistent policy approach across all wetlands* We are concerned that Policy 8 applies only to inland wetlands and request a more integrated and consistent approach to the management of all wetlands. An artificial split between the approach to 'inland' and 'coastal' wetlands makes no practical sense. Coastal wetlands have the same range of values as inland wetlands and have also been significantly reduced in extent and condition, therefore the mandate for no further wetland loss/degradation should be extended to apply to both inland and coastal wetlands. We note that the NZCPS does not include strong provisions to prevent the loss of coastal wetlands, merely requiring that significant adverse effects are avoided, and other adverse effects are avoided, remedied or mitigated (Policy 11). We note the particular significance of coastal wetlands as a coastal defence and an important element of climate change mitigation and community resilience strategies, and therefore consider that this is an extra rationale for a stronger policy approach.	There is no further loss or degradation of natural ~~inland~~ wetlands, <u>their extent is increased, and their condition restored to a healthy functioning state.</u>
Policy 9: There is no further net loss of streams	Support the objective of no further net loss but, because in some areas there has been a significant loss of stream network due to reclamation/piping, the policy should aim to restore stream length in	Policy 9: There is no further net loss of streams <u>and, in areas where there has been a significant loss, there is a net gain.</u>

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	those areas.	
Policy 10: The significant values of outstanding waterbodies are protected	Support but consider that this is an objective rather than a policy. Also the policy should also aim to restore outstanding waterbodies.	The significant values of outstanding waterbodies are protected and restored
Policy 11: The habitats of indigenous freshwater species are safeguarded	Support but submit that it would be helpful if the policy used wording consistent with other policies such as Policy 10 and also aims to restore habitats.	The habitats of indigenous freshwater species are ~~safeguarded~~ protected and restored
Policy 12: Information about the state of waterbodies and freshwater ecosystems, and the challenges to their health and wellbeing, is regularly reported on and published	Support	
Policy 13: Communities are enabled to provide for their economic wellbeing while managing freshwater in a manner consistent with Te Mana o te Wai and as required by the national objectives framework and other requirements of this National Policy Statement	Support, but the policy should also provide for social and cultural wellbeing aligning it more to section 5 of the RMA.	Communities are enabled to provide for their social, economic and cultural wellbeing while managing freshwater in a manner consistent with Te Mana o te Wai and as required by the national objectives framework and other requirements of this National Policy Statement
PART 3: Implementing objectives and policies		
Section 3.2 Te Mana o te Wai		
Section 3.2 (1) "The management of freshwater in our region must be carried out in a manner that gives effect to Te Mana o te Wai, as it is described in the National Policy Statement	Greater Wellington strongly supports the inclusion of an objective in respect of Te Mana o te Wai into the regional policy statement.	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
for Freshwater Management 2019 and understood locally." Section 3.2(2) Every regional council must give effect to Te Mana o te Wai in implementing this National Policy Statement. Section 3.2(3) Te Mana o te Wai must inform the interpretation of: a) the objective and policies of this National Policy Statement; and b) the objectives and policies required by this National Policy Statement to be included in local authority policy statements and plan		
Parts 5 -8: Long term vision	Greater Wellington supports the inclusion of a long term vision that gives effect to Te Mana o te Wai but we submit that this should be enabled to be at the catchment or sub-catchment level. A regional-level vision will most likely be generic and difficult to implement. We support the vision sitting in the Regional Policy Statement but given that a vision has no statutory weight, it needs to be framed up as an objective.	Amend wording to enable articulation of vision at the catchment or sub-catchment level. Amend wording to require the vision (at the regional, catchment or sub-catchment level) to be an objective in the regional policy statement. District and regional plans must then give effect to this objective.
Section 3.3 – Tangata whenua roles and interests		
	GWRC supports the engagement of tangata whenua in the management of freshwater but as noted in the main body of the submission providing resourcing to tangata whenua is a priority.	Supportive, but provision must be made to adequately resource tangata whenua to enable effective engagement.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
Section 3.4 Integrated management		
	GWRC supports the proposal to give more direction to city and district councils to manage effects of urban development on water.	
Section 3.4(5)	GWRC supports its direction to require wording to this effect in RPSs. The wording of the direction to territorial authorities to manage "the cumulative adverse effects resulting from urban development" is too narrow. Urban development itself could have adverse effects on waterbodies and receiving environments. We submit that the wording is change to be "urban land use and development". Additionally there is inconsistency between the wording of Sections 3.4(5) and (6) it would be helpful if the wording was consistent given territorial authorities must give effect to both the NPS-FM and the RPS. In terms of the structure of our RPS wording of this nature is a policy direction that then must be given effect to through district plan. The method identified in our RPS is the process to amend the district plan.	Amend direction to territorial authorities to require the management of urban land use and development. Provide the option for regional councils to insert the direction as a policy in their RPS. Consider consequential amendments to the Resource Management Amendment Bill to further clarify Sections 30 and 31.
Section 3.4(6)	We query whether Section 3.4(6) directs enough urgency with its wording that territorial authorities would only be required to do this 'at the next review' of their plan. Some of these plans may not be reviewed for another 10 years. This lack of urgency does not appear to align with that seen elsewhere in the freshwater package.	Amend direction to territorial authorities to require changes to plans to be publicly notified by 31 December 2025 where the plan change is necessary to give effect to the NPS-FM.
Section 3.5 – Overview of national objectives framework		
Section 3.5	GWRC is generally supportive of the proposed national objectives framework.	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	In regards to section 3.5(2) GWRC supports the engagement with communities and tangata whenua in order to give effect to the national objectives framework and Te Mana o te Wai. However, GWRC submits that there are stages within the process that are purely technical in nature and do not require engagement with communities and tangata whenua.	
Section 3.6 – Identifying FMUs		
Section 3.6 – Identifying FMUs	GWRC supports the FMU approach and the ability to monitor sites that are representative of the FMU.	
(3)(c) location of threatened species	Support but request further guidance regarding how threatened species habitat should be mapped (e.g. minimum map scale, minimum size of habitat to be mapped, and whether this should be mapped as points or polygons). We note that springs, seeps and ephemeral wetlands contain a high proportion of threatened species; their size is often 0.05ha or less therefore any minimum mapping scale must provide for this. Guidance would also be helpful regarding mapping habitats that are under pressure from collection (i.e. how to mask these sites).	Support the implementation of this requirement by developing national guidance.
Section 3.7 – Identifying values and environmental outcomes		
Section 3.7(1) - "must identify the values that apply to each FMU…"	GWRC supports: – the identification of the values associated with waterbodies and freshwater ecosystems – supports the compulsory values Our interpretation of the wording of the NPS-FM 2014 is that values must be identified for all FMUs. This value identification exercise could be undertaken for a single FMU or a group of FMUs. In our experience the process of delineating FMUs, identifying values,	Amended wording in the NPS-FM to improve clarity. "Every regional council must identify the values that apply to each FMU, as follows: … (c) any other value as the council considers, after consultation with its community and tangata whenua, applies to <u>an individual FMU or group of FMUs</u>" OR Guidance that supports our interpretation of the wording in the NPS-FM.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	and describing freshwater objectives that provide for the values has not been a purely step-wise process. It has been iterative in nature. FMUs were initially delineated on biophysical factors and land-use characteristics. Values were then identified at either an FMU or whaitua scale. Then freshwater objectives were set to provide for the values within each FMU. Finally, a consolidation exercise was undertaken where by FMUS with similarly objectives and management approaches were grouped together. In our experience, the values associated with waterbodies and freshwater ecosystems are often shared across the FMUs within the whaitua. The difference (between FMUs) comes when considering the relative importance of these values when setting objectives to provide for the values within each individual FMU.	
	Section 3.7 (2) and (5) environmental outcomes The use of the terms "environmental outcome" and "objective" is confusing	Use objective instead of environmental outcome Support these appear as objectives in regional plans rather than policies
Section 3.7(2)(b)	Does the value of human contact have components articulated in the NPS-FM?	Amend to include components of human contact value.
Section 3.7(4)	GWRC supports the need for attributes to be specific and the allowance for narrative attributes where numeric terms are not possible to define.	Supportive
Section 3.8 – Identifying current attribute states		
Section 3.8 – Identifying current attribute states	In principle, GWRC supports the identification of current state. Particularly Section 3.8(3), which recognises that Councils do not always have complete and scientifically robust data and that, the use of best efforts is sufficient.	
Section 3.9 – Setting attribute states		
Section 3.9 – Setting attribute	GWRC generally supports setting the value human contact above	Support but would appreciate guidance on rivers already in

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
states	current state. However, what happens if a river is already in excellent (A band) state? Is it the best use of Council resources to improve that river further? Additionally we are assuming that above current state could still be within the same band.	an excellent state and what is expected
	Where do "target attribute states" sit in regional plans	Make it clear that "target attribute states" are objectives in regional plans
Section 3.9 (5) b)	Requires the setting of "interim targets". Does this imply that limits change over time thus allowing a transition of load reductions? The change in the term "target" to be related to attribute state rather than limits makes the limit transition path unclear.	Add note to 3.10 that clarifies that limits may be set to assist achievement of "interim targets" and change over time
Section 3.10 – Identifying limits on resource use and preparing action plans		
Section 3.10(1) – Identifying limits on resource use and preparing action plans	Section 3.10(1)(a) GWRC questions the wording of clause (a) "limit on resource use that <u>will</u> achieve the target attribute state". Significant uncertainty exists in relating particular land use changes to environmental outcomes. This is recognised in multiple places throughout the draft NPS-FM (eg, 3.9 (6) b) and c), and 3.10 (4) and (5). However, section 3.10 (1) (a) does not appear to recognise such uncertainty in knowing whether an identified limit on resource use will achieve the target attribute state. We can identify limits that will take us towards the target attribute state, but it's difficult/impossible to say that it will reach that target state – it may hit it, fall short or overshoot. Additionally, it is often difficult to achieve the target attribute state through one limit/response alone – a number of responses are collectively required. The use of "will" could then be used to argue that a given limit alone doesn't	Amend wording. "must identify limits on resource use that will <u>contribute to achieving</u> the target attribute state"

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	satisfy 3.10 (1) a) so shouldn't be there. It would be useful to acknowledge the uncertainty in this.Limits are likely to be one tool in the toolbox that will all work together to achieve the target attribute state. For example: A periphyton objective may be achieved by reducing the nutrient load (by setting and implementing N and P limits), providing shading in places and modifying the minimum flow. The N and P limits may not achieve the objective alone	
Action plans	GWRC supports the use of action plans to achieve target attributes states. We support the location of them outside of the regional plan which allows them to be proactive and reactive allowing for adaptive management without amending the regional plan through a schedule 1 process. Guidance will be critical to the success of this approach.	
Section 3.11 Setting environmental flows and levels		
Section 3.12 Identifying take limits		
3.12 (2)	Not clear enough. Take limits should include the conditions under which the taking of water will be restricted (and which takes will be restricted), including when taking shall cease (and which takes shall cease).	Add to (2). Add note to clarify how this relates to the commonly used term "minimum flow"
Section 3.13 – Monitoring		
	Refer to main body of submission	
(2)(b) Matauranga Maori	We support this requirement but note that it is going to take time and significant resources to enable meaningful involvement of mana whenua in developing and implementing these measures. National guidance would be very helpful.	Support the implementation of this requirement by developing national guidance.
Section 3.14 – What to do if deterioration detected		
Section 31.4(1)	GWRC is supportive of the need for action if a trend is detected	Amend to direct the amendment of an existing action plan.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	indicating deterioration or failure to achieve identified environmental outcomes. GWRC questions what would constitute a declining trend. In addition, trends might continue to decline long after positive action is taken. Modelling can predict whether the action will be good enough. In regards to the direction for action plan it should allow for the amendment of an existing action plan as a response to the deterioration or failure to achieve the identified environmental outcome.	Support the provision of guidance to define what constitutes a declining trend.
Wetland Definitions (NPS 3.15 (1) and NES Section 4)		
Location of definitions	It is unhelpful to have the definitions split across the document. Please locate all definitions at the beginning of the document for clarity and ease of use.	Combine all definitions and locate in section 1.6
Coastal wetland	While there is a definition for 'coastal wetland' provided in the NPS, there is no mention of coastal wetlands in subparts (2-9). As requested above, we consider that the NPS-FM policies should also apply to coastal wetlands (including policies to protect them from further loss/degradation, as well as a requirement to map them). We note that including seagrass meadows in intertidal and subtidal zones as an example of a coastal wetland is not ecologically accurate.	Apply the provisions set out in subparts 2-9 to **coastal natural wetlands**. Remove clause b) seagrass meadows from this definition
Constructed wetland	We support the exclusion of constructed wetlands in areas where a natural wetland does not already exist from the definition of a natural wetland, but this should not extend to wetlands constructed for conservation or biodiversity offsetting. These areas should be treated as 'natural wetlands' as their purpose is to provide habitat for valued biodiversity, and they do not require the management activities (e.g. occasional vegetation clearance) that are contrary to the objectives of	Specify the constructed wetland types to be excluded from the definition of a natural wetland, but not including wetlands constructed for conservation or biodiversity offsetting. Refer to the PNRP definition for 'natural wetland' clause (b) for possible wording **(b) :**

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	a natural wetland. Constructed wetlands provide one of the primary mechanisms for extending natural wetland area, and associated ecological and biodiversity values, around the country. Wetlands that have been constructed as an offset requirement associated with a resource consent should be subject to regulatory control to ensure that they continue to provide the agreed offset values. We note that Information Note (pg17) provides a list of examples of constructed wetlands. We consider that these should be specified in the definition for constructed wetland, but excluding wetlands constructed for conservation or biodiversity offsetting.	**(i) water storage ponds for** a) public water supply, or b) hydroelectric power generation, or c) firefighting or d) irrigation, or e) stock watering or **(ii) water treatment ponds for** a) **wastewater**, or b) **stormwater**, or c) nutrient attenuation, or d) sediment control, or e) **animal effluent**, or **(iii) beautification, landscaping, amenity,**
Inland wetland	It is unclear why this definition is needed. The provisions apply to 'natural inland wetland' but there is no definition for this. It is unclear why geothermal wetlands are excluded from the definition. Geothermal wetlands are a naturally uncommon ecosystem type – there should be some protective / offsetting mechanisms rather than just a blanket exemption from the NPS. We suggest developing a different policy approach, if necessary, rather than excluding this wetland type from the definition.	Delete this definition. Develop a new policy provision to apply to geothermal wetlands and provide justification for this.
Natural wetland	Exclusions (a) and (b) are similar to exclusions in the PNRP natural wetland definition a) We have found that the terms 'wet pasture' and 'dominated by pasture' lack sufficient definition and we are constantly being	Amend a) to read: wet pasture or paddocks where water temporarily ponds after rain in places dominated by pasture, ~~or that contains patches of exotic sedge or rush species.~~ 'Wet pasture' and 'dominated by pasture' means that more

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	questioned/ challenged as to whether wet pastoral areas are 'natural wetlands' or not. Usually the contention is that they are not. We have developed guidance that the determination is that more than 50% pasture species must be present using the nationally recognised pasture species text Pasture and Forage Plants for NZ. Stewart et al, 2014. We recommend adding this detail to the NPS to provide clarity, ensure a consistent interpretation across NZ, and reduce the time and resources used in debating whether an area is a natural wetland and therefore subject to the plan provisions. For this reason we also recommend deleting the clause "or that contains patches of exotic sedge or rush species" as this is very difficult to apply in wetland identification. How big is a patch? This is very hard to assess at a paddock scale. We have found that using the % pasture determination will remove patches of rushes anyway. We note that the exceptions in the definition (for wet areas or 'pasture wetlands' cause some confusion as many of these areas are functioning wetlands as defined by the RMA, providing important ecosystem services (e.g. retention of water, nutrient attenuation). There should be recognition of the values of these areas in the NPS to promote appropriate management of these areas, even if they are not subject to regulatory controls. We note that the intent of excluding 'pasture wetlands' from the PNRP natural wetland definition was to provide for ongoing pastoral farming, however this also enables complete loss of pastoral wetlands for urban use, with no requirement to recompense for the ecosystem services and biodiversity values lost. Consideration should be given to closing this loophole. b) Note our comments on the definition of constructed wetlands	than 50% pasture species (as listed in Pasture and Forage Plants for NZ. Stewart *et al*, 2014) are present. Provide recognition of the ecosystem values of 'pastoral wetlands' (wetlands that meet the Clarkson criteria as 'wetland' but are dominated by pasture) and promote appropriate management to sustain their values. Consider adding a provision so that if a 'pasture wetland' is to be developed for urban use, there is a need to "offset" the lost ecosystem values. b) change the definition for constructed wetland as suggested above Delete c) geothermal wetlands and provide a different policy approach to manage or exempt geothermal wetlands from management.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	above c) It is not clear why there is a blanket exclusion for all geothermal wetlands. Perhaps this is due to the use of these systems for geothermal energy generation? If this is the case, a better approach may be to provide a rule framework for certain activities within these particular systems, or through an exception clause (as provided for large hydro schemes in the NPS). In principle we do not support a blanket exclusion for this wetland type.	
Effects management hierarchy	We strongly support the requirement to follow the internationally accepted effects management hierarchy when considering effects on wetlands (3.15(4)) and streams (3.16(3)). However, the current sequencing of the hierarchy requires an amendment to ensure that effects are minimised before they are remedied. An appropriate effects management cascade recognises that effects must be avoided in the first instance. If they are not avoided they should then be minimised (synonyms include, moderate, reduce, alleviate). Effects that cannot be avoided or minimised should then be remedied (synonyms include rehabilitate, restore, reinstate). Finally, residual adverse effects may be offset or compensated. These three actions (avoid, minimise, remedy) collectively comprise 'mitigation'. The current ordering of the effects management hierarchy allows effects to be remediated before they are mitigated (minimised). This is contrary to the intention of the hierarchy which is to take a precautionary approach to risk management (i.e., avoiding and minimising effects before making good on damage caused). The internationally accepted sequencing of the effects management hierarchy is correctly reflected in Policies P32 and P41 of GW's Proposed Natural Resources Plan. We also suggest using 'minimise' in place of 'mitigate' in the hierarchy because this is the term used	Amend to: Effects management hierarchy means an approach to managing the adverse effects of subdivision, use and development that requires that – a) adverse effects are avoided ~~where possible~~; and b) adverse effects that cannot be demonstrably avoided are <u>minimised</u> ~~remedied where possible~~; and adverse effects that cannot be demonstrably <u>minimised are</u> remedied ~~are mitigated~~; and […]

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	throughout the world in the effects management hierarchy. 'Minimise' is also preferable because 'mitigate' is often used in the industry as a collection of avoid, remedy and mitigate actions (i.e., a 'mitigation package'). Furthermore, 'minimise' is more directive than 'mitigate' as minimise means to make something as small or as insignificant as possible whereas mitigate simply means to reduce, lessen or decrease, with no direction as to how far. Lastly, we suggest that the qualifier 'where possible' be removed from parts a) and b) of the definition. This phrase is highly ambiguous, seemingly allowing for any justification for what 'possible' might mean (e.g., possible financially, technically, ecologically?). It is also redundant. Consent applicants, in the general sense, can only ever consider actions that are 'possible'.	
Loss or degradation	Support	
Net gain	Support	
Net Loss	This definition is for 'no net loss', not 'net loss'. In a net loss situation the adverse effects of an activity exceed (rather than 'match') the positive effects.	Amend to read: 'Net loss means the point at which the environmental losses due to the impacts of a specific development project exceed the measurable positive effects from targeted environmental management activities so that, compared to a baseline, there is a net reduction in environmental values over space and time'. Alternatively amend the term defined to read: **No net loss**
Public flood control or drainage (in NES)	Clause (b)… We challenge the appropriateness of providing a more permissive (discretionary activity) pathway for wetland drainage when carried out under the Land Drainage Act 1908 given the limited extent of remaining wetlands and Policy 8 of the NPS –FM which is for no further loss of natural inland wetlands. We consider that any wetland drainage, especially of the scale likely to be associated with an activity for the public good, should be a non-	Public flood control ~~or drainage~~ And remove clause (b)

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	complying activity.	
NPS 3.15 Policy		
(2) The loss or degradation of all or any part of a natural inland wetland is avoided	Include specific reference to extent and ecosystem health	Amend to read: The loss of extent or degradation of ecosystem health of all or any part of a natural inland wetland is avoided.
(3)	This qualifier is confusing as it appears to undermine the direction of clause (2), implying that some provisions in the NES for Freshwater allow for wetland loss or degradation. Our understanding is that the only situation in which that could be the case through the NES Freshwater is through exceptions for nationally significant infrastructure. But even in that case standard condition 6(a) requires a wetland net gain from effects relating to nationally significant infrastructure. The qualifier also seems to imply that the policy would not trump 'any more stringent rules that the council…includes in its regional plan'. However, we do not see how regional plan rules can be more stringent than avoiding effects on wetlands, or how that would contradict the policy direction in any case. The other qualifiers around allowing for temporary losses for the purposes of wetland restoration are also seemingly redundant as they are included within the relevant rule wordings in the NES Freshwater.	Remove (3).
(5)(a) wetland mapping (b) wetland inventory	(5)(a) We support the mapping of wetlands but note that it will require significant extra resources for regional councils and query whether there is sufficient wetland expertise available across the country to support councils to map the wetlands in each region. It would be helpful for MFE to clarify expectations as to the level of mapping required. Currently different councils have different ways of mapping wetlands in their region e.g. desktop assessment methods versus full ground truthing/formal delineation of each wetland using the Clarkson methodology.	Add coastal wetlands to (5) In 5(a)(iii) replace ephemeral wetlands with seepage wetlands as a more appropriate example 5(b)(ii) Replace with 'mapped spatial extent' 5(b)(iii) Provide a standardised list of wetland types and guidance on how to classify wetlands which include more than one type e.g. swamps and marshes

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	Extend this mapping requirement to coastal wetlands. In 5(b)(ii) Polygon mapping may not be appropriate for very small wetlands. Note that research has shown small wetlands are critical for threatened native species. Replace this clause with mapped spatial extent. 5(b)(iii) and (iv) Provide a standardised list of wetland types and nomenclature for describing ecosystem services and amenity values to ensure national consistency.	5(b)(iv) Provide a list of (minimum) ecosystem services and amenity values to guide the inventory of wetlands
(6) wetland delineation	Support	
(7) restoration	Support – Note the importance of the NES providing for a less onerous rule framework to support and encourage restoration	Ensure the NES Freshwater enables activities carried out for the purpose of wetland restoration in accordance with an approved wetland restoration plan as permitted or controlled activities (as per PNRP Rules R104-R106).
(8) constructed wetlands	Do not use the word 'permit' as it implies it will be a permitted activity without control	Regional councils must <u>provide for</u> the management of …
(9) monitoring	Support Note inconsistency with 3.13 which requires monitoring of flora and fauna – add fauna to clause a. Add a specific requirement to monitor the extent and condition of wetlands that provide habitat for threatened species (as required by 5(a)(ii)) Provide guidance regarding monitoring minimum extent as it is not practical to map wetlands from aerial imagery. Provide a time frame for monitoring change in extent 3.13 also refers to methods to measure matauranga Maori – regional councils while enthusiastic to do this are not sure how. Provide some guidance of how to do this.	Amend 9(a) to read '… at a minimum their extent, vegetation, flora, fauna, hydrology, and …' Add a specific clause to require monitoring of the extent and condition of wetlands that provide habitat for threatened species. Provide guidance on time-frame for monitoring minimum extent e.g., as they are discovered over the next 5 years. Link monitoring of changes in extent to consent monitoring Provide guidance on monitoring matauranga Maori
Information Note	This guidance should be incorporated into the definition for 'constructed wetland' as noted above.	Next to landscaping add beautification and amenity Add 'sediment control'

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
		Delete 'conservation or biodiversity offsetting'
NPS 3.16 Streams		
Definitions under 3.15	These definitions should also apply to 3.16 as definitions such as effects management and net gain apply across both these sections.	Relocate the definitions to the beginning of the document to apply across sections.
(1) Add to RPS: "The extent and ecosystem health of rivers and streams in the region, and their associated freshwater ecosystems are, at least, maintained."	To be consistent with NPS policies 2 and 3 (and 9 if amended as requested), the aspiration should also be to improve/restore the ecosystem health of rivers and streams which are degraded and to restore extent in areas where there has been a significant loss.	Amend to read: "The extent and ecosystem health of rivers and streams in the region, and their associated freshwater ecosystems are ~~at least~~ maintained and restored where they have been degraded or reduced in extent."
(2) and (6)	3.16 clauses (2) and (6) are confusing and potentially undermining. The term 'however' implies that the NES includes provisions that might not meet the directive of the NPS.	Delete 3.16 (2) and (6)
(3) The effects management hierarchy is to be used to manage adverse effects on streams (in consent applications)	Support, but note Greater Wellington Regional Council (GWRC) request for amendment of the definition for 'effects management hierarchy' for accuracy and effectiveness	Amend definition for 'effects management hierarchy' as requested under GWRC comments on **Wetland Definitions (NPS 3.15 (1) and NES Section 4)**
(4) Ensure diversions and culverts do not result in a net loss in extent or ecosystem health of a stream	Support – but consider that the wording of (b) culverting a stream, **where that is allowed and as far as practicable** is neither helpful nor necessary. Request that this text is deleted. Clarify that this only applies to a culvert formed for the purpose of creating a reasonable crossing point.	Amend (b) to read: culverting a stream~~, where that is allowed and as far as practicable~~ for the purpose of forming a reasonable crossing point.
(5) Ensure infilling of river or stream beds is avoided, except for three listed activities and there is no other practicable alternative method	Generally support Replace the term 'infilling' with the more commonly used term 'reclamation' and provide a definition for this. Or, as a minimum, provide a definition for 'infilling'. Note that infilling / reclamation of a stream is generally considered to include filling associated with piping (culverts are a form of pipe) and stream diversions. (b) Provide a definition for 'nationally significant infrastructure' so that	Replace 'infilling' with 'reclamation' and provide a definition for this. Reclamation means the creation of dry land. (Alternatively provide a definition for infilling). (b) Provide a definition for 'nationally significant infrastructure' – if all definitions are located at the beginning of the NES then the definition in subpart 1 applies.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	each region does not have to re-litigate this. Consider requiring a more strategic test for (b). The criteria for deciding whether there are "other practicable alternative methods" most often appears to be one of cost and convenience for the infrastructure provider. We would like to have a result that strategically addresses longer-term management requirements for river and stream corridors and includes consideration of bridge upgrades, public (pedestrian/cycle) accesses and clustering services.	Consider adding more strategic requirements to the 'no practicable alternative test' for nationally significant infrastructure (e.g. the infrastructure is part of a strategic spatial plan agreed with the regional council).
NPS 3.17 Fish Passage		
(1) Include aquatic life objectives to achieve diversity and abundance of fish in all or specified streams	Support but consider that this objective is broader than just fish passage and should be part of, or additional to, the ecosystem health objective required by 3.16(1). Amend 3.17(1) to focus on fish passage. The suggested amendment is based partly on the NZ Fish Passage Guidelines and partly on objectives in the GWRC Proposed Natural Resources Plan (PNRP). If 3.17 retains the term "aquatic life", add a definition as per the attribute detailed under Ecosystem Health in Appendix 1A (a)	Shift this objective to form part of existing 3.16(1) Amend 3.17(1) to read (or similar): Every regional council must make or change its regional plan to include an objective to require: Efficient and safe upstream and downstream passage of all aquatic organisms and life stages resident in a waterway with minimal delay or injury, except where existing barriers are important for the protection of indigenous fish and kōura populations. If 3.17 retains the term "aquatic life", add a definition as per the attribute detailed under Ecosystem Health in Appendix 1A (a)
(2) Objective must identify: a. Valued species b. Undesirable species Streams where passage of undesirable species to be impeded	Support but consider that this information is too detailed to be required "When preparing the objective" but is actually part of the work required to implement the objective e.g., this is critical information required to consider applications in step 3 and to inform the work programme detailed in 5.	Amend wording "~~When preparing~~ <u>To achieve</u> the objective, regional councils must …
(3) Consent considerations for new consents	Support the intent of this information being provided as part of the consenting process.	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	(b) the term 'adjacent" is unclear – could be taken to mean streams next to; rather than upstream/ downstream or adjoining reaches. Regardless we disagree with this clause as existing barriers may be remediated in future and therefore should be not used as a reason to not address an existing impediment. (d) target this to the fish species that are present or for which the habitat is suitable.	Delete (b) Amend (d) to read …. leading to ~~a high diversity of~~ passage opportunities for fish species that are present or for which the habitat is suitable.
(4) Work programme to improve fish passage	Strongly support this provision but add more details as to how, when and by whom. Ideally this work programme should be developed in collaboration with key stakeholders, such as major infrastructure owners or managers.	Add how, when, who: - How - using an appropriate fish passage assessment tool) (preferably the one created by NIWA), - When (add a timeframe by when the work programme must be initiated) - By who. E.g. Regional councils, in conjunction with major infrastructure owners,
(5) Matters to be included in work programme	Support - These are important steps to address the fish passage issues associated with existing structures. In (c) add in liaison with other parties to recognise that this needs to be a collective, interagency work programme for each region, rather than the responsibility falling solely on regional councils as there are other major asset owners who need to play an important role in addressing fish passage of existing structures e.g. Wellington Water, TLA's etc. It will be others who will do the actual remediation.	(c) Add 'in liaison with other parties'
(6) Records	Support – Suggest that regional councils should be required to use	Clarify whether records should be kept using the NIWA fish

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	the NIWA fish passage assessment tool to record data.	passage assessment tool
Section 3.18 Primary contact sites		
Section 3.18 Primary contact sites	GW supports the identification and management of primary contact sites for both risk to human health and aesthetic factors. The PNRP includes water clarity, sediment cover and heterotrophic growths. GW supports the use of representative sampling sites. The proposed monitoring regime is not feasible with current resources and communicates the risk to the public after a samples has been collected. At GWRC we are shifting from the surveillance monitoring approach to a modelling approach based on a relationship with rainfall/riverflow and E.coli levels using several years of data. Warnings are placed on the GW recreational water quality website and give an indication of real time risk to the public.	Amend section 3.18(3) to allow for the use of a predictive risk based model to communicate the human health risk of contact with water in real time.
Appendices		
General comments		
Appendix 1A: Compulsory values		
3. Threatened species This refers to the extent to which an FMU that supports a population of threatened species has the conditions necessary to support the continued presence and survival of the threatened species. The basic conditions relate to aquatic habitat, water	We strongly support a new compulsory value for threatened indigenous species to ensure that regional planning identifies and manages their habitat. It is important to clarify that this provision applies to all threatened species that rely on freshwater systems, not just freshwater fish, e.g. river nesting birds and wading species, as well as freshwater plants and invertebrates.	Add a clause to the definition for 'threatened species' to clarify that this value includes all threatened species that rely on freshwater habitat.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
quality, and flows or water levels, but may also include specialised habitat or conditions needed for only part of the life-cycle of the threatened species.		
Appendix 1B Other values		
List of other values -	Wetlands (especially peatlands) have significant values for carbon sequestration. Natural form and character: (v) clarify that it is culturally significant species that are indigenous to the area that reflect natural form and character	Add new value 'Carbon sequestration' – The freshwater management unit provides (or has the potential to provide) significant value for climate change mitigation. Under Natural form and character: Amend v. to read: the presence of culturally significant species indigenous to the FMU/place.
Table 1 - Phytoplankton	No Comment	
Table 2 – Periphyton (trophic state)	In periphyton guidance documents it clearly states a regional model is more desirable and accurate than a national model. How should regional periphyton classes for river types be taken into account? The current periphyton attribute states don't correct for reference state or rec class With the addition of DIN and DRP as compulsory attributes for ecosystem health nutrient criteria are now redundant and should be removed. Presumably, DIN and DRP attributes are designed to manage for all aspects of ecosystem health not just macroinvertebrates.	Amendments to allow for the use of regional models. Remove the requirement to development nutrient criteria where DIN and DRP attributes have been identified.
Table 3 – Total nitrogen	No comment	
Table 4 – Total phosphorous	No comment	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
Table 5 – Dissolved inorganic nitrogen	It is not clear how the attribute state numbers were generated or where they come from. How do they relate to ecosystem health, are they robust? Were they benched marked against multiple indicators of ecosystem health or just macroinvertebrates? Are macroinvertebrate indices the correct indicator to relate DIN too? Why does the attribute not account for natural variability (i.e. sediment attribute).	
Table 6 – Dissolved reactive phosphorous	As above with dissolved inorganic nitrogen. GWRC's Wainuiomata River at Manuka Track is an untouched, fully forested catchment site located in a water reserve. It is in a reference state, however, under this ecosystem health attribute it would be classified as a 'C' attribute state. The narrative for the 'C' attribute does not align with actual ecosystem health at this site. The attribute is clearly not robust and needs to be corrected for geology.	
Table 7 – Ammonia toxicity	No comment	
Table 8 – Nitrate toxicity	This attribute is now redundant as to achieve the bottom line for DIN it would mean that each river and stream nation-wide would be in the A band for nitrate toxicity.	Remove this attribute.
Table 9 – Dissolved oxygen	No comment	
Table 10 – Suspended fine sediment	GWRC strongly support that this attribute corrects for REC class. However, we question why has this been based on turbidity and not suspended sediment concentration? Turbidity has been shown to be a poor measure of suspended sediment and not scientifically robust. Readings can differ between turbidity metres. The units are also FNU and many turbidity metres read in NTU. Variability between metres means sites will be assigned to incorrect bands. Suspended sediment concentration (SSC) and visual clarity (black disc) have been demonstrated to	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	have greater accuracy and reproducibility than turbidity. Three years of nation-wide SSC data collection followed by attribute development would have been a much better approach.	
Table 11 – E.coli	No comment	
Table 12 – Cyanobacteria	No comment	
Table 13 – MCI (1 of 2)	How is an assessment made when QMCI is in one band and MCI in another? Pick the lowest band? This has occurred with some of our sites. How should regional MCI classes for rivers types be taken into account? For example at GWRC we have river type classification for MCI and some our sites change class when compared to the national classification in this table. Should this be taken into account when investigating the deterioration? If this is the case it may cause confusion for the public because on the national table would be saying it isn't good, but then using a more accurate classification it actually isn't as bad. Keen to discuss this more	Clarification
Table 14 – MCI (2 of 2)	EPT should be excluding hydroltylidae as these are tolerant taxa.	Confirmation should be added to this effect
Table 15 – Fish	It is very pleasing to see fish specifically mentioned as an ecosystem health attribute and the Fish-IBI shows promise as an indicator of the state of fish communities. However, since its inception, the Fish-IBI has rarely been used as indicator in NZ and it has not undergone a robust validation process to analyse its usefulness and determine its, if any, limitations. Such a validation process, using data collected in a standardised manner, is greatly needed to justify the usefulness of this indicator at both regional and national scales. Further documentation and guidance is required to ensure that	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	national and regional IBI calculators are used in appropriate way and how/why certain decisions were made, e.g., in regards to indigenous fish values, why is the presence of salmonids excluded from the introduced species impact score within the multi-metric IBI? How have the thresholds proposed been developed? Thresholds proposed nationally are significantly different from thresholds developed regionally. Similar to the comment for MCI above, how do we take into account differences in outputs from regional and national IBIs. In particular, should this be taken into account when investigating the deterioration? If this is the case it may cause confusion for the public because on the national table would be saying it isn't good, but then using a more accurate classification it actually isn't as bad. Keen to discuss this more In the footnotes for the table it is noted that sites should be sampled at least annually. Could more justification be provided for this approach? It's likely in many streams that fish communities won't changes within a year unless there is a change to landuse or habitat. Given this tri-biannual monitoring may be more appropriate and then state if built up over time to detect trends across monitoring cycles. **Note – the same could be said for all ecosystem health reporting attributes. This is the approach used in the sustainable river audit in Australia which uses a similar ecosystem health approach** Currently the Fish-IBI is stated as only applying to wadeable rivers and stream – which reflects that the only standardised method	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	document is for wadeable rivers and streams. Fish are also components of non-wadeable rivers and also lakes and wetlands. While standardised monitoring and reporting methods are not available for these habitat types, inclusion of some sort of state (potentially a narrative) is important to provide guidance for regional councils who are developing monitoring methods for these habitat types.	
Table 16- submerged plants (native)	GWRC is concerned that this attribute will be difficult to monitor as there is currently only one provider and approx. 500 lakes nation - wide that could be classified as needing an action plan.	
Table 17 – Submerged plants (invasive species)	No comment	
Table 18 – Deposited fine sediment	No comment	
Table 19 – Dissolved oxygen	From Dec – March temperature will influence dissolved oxygen levels. How will this be taken into account when setting a limit? If it is just an action plan would the effect of temperature be explored during an investigation related to the action plan?	
Table 20 – Lake bottom DO	No comment	
Table 21 – Mid-hyolimnetic DO	-Greater clarity is needed, is this to be done for all stratifying lakes or just those over a certain depth?	
Table 22 – Ecosystem metabolism	No comment	
Table 23 – E.coli during bathing season at Primary contact sites	As the table is based on surveillance monitoring it isn't fit for purpose or models which are used to communicate risk to the public (e.g. Auckland safeswim and GWRC model which are validated with survey data to make predictions of health risk). A model approach is more appropriate for communicating risk as it lets the public know the risk before going swimming. Based on our first year trial of the	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Provision	Support or Concern	Amendment requested
	model in GW it has performed well with minimal false results As more models are being used an action plan table should be created related to model data to manage primary contact site rec water quality. We are happy to work with MfE on this.	

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Feedback on proposed NES for Freshwater (specifically, Part 2 Wetlands, rivers and fish passage)

Provision	Support or Concern	Amendment requested
Subpart 1 - Wetlands		
4 Definitions for subpart 1 (consistent with feedback on definitions for the draft NPS-FM		
Constructed wetland	We support the exclusion of constructed wetlands in areas where a natural wetland does not already exist from the definition of a natural wetland, but this should not extend to wetlands constructed for conservation or biodiversity offsetting. These areas should be treated as 'natural wetlands' as their purpose is to provide habitat for valued biodiversity, and they do not require the management activities (e.g. occasional vegetation clearance) that are contrary to the objectives of a natural wetland. Constructed wetlands provide one of the primary mechanisms for extending natural wetland area, and associated ecological and biodiversity values, around the country. Wetlands that have been constructed as an offset requirement associated with a resource consent should be subject to regulatory control to ensure that they continue to provide the agreed offset values. We note that Information Note (pg17) provides a list of examples of constructed wetlands. We consider that these should be specified in the definition for constructed wetland, but excluding wetlands constructed for conservation or biodiversity offsetting.	Specify the constructed wetland types to be excluded from the definition of a natural wetland, but not including wetlands constructed for conservation or biodiversity offsetting. Refer to the PNRP definition for 'natural wetland' clause (b) for possible wording (i) water storage ponds for a) public water supply, or b) hydroelectric power generation, or c) firefighting or d) irrigation, or e) stock watering or (ii) water treatment ponds for f) **wastewater**, or g) **stormwater**, or h) nutrient attenuation, or i) sediment control, or j) **animal effluent**, or (iii) beautification, landscaping, amenity,
Natural wetland	Exclusions (a) and (b) are similar to exclusions in the PNRP	Amend a) to read: wet pasture or paddocks where water

	natural wetland definition a) We have found that the terms 'wet pasture' and 'dominated by pasture' lack sufficient definition and we are constantly being questioned/ challenged as to whether wet pastoral areas are 'natural wetlands' or not. Usually the contention is that they are not. We have developed guidance that the determination is that more than 50% pasture species must be present using the nationally recognised pasture species text Pasture and Forage Plants for NZ. Stewart et al, 2014. We recommend adding this detail to the NPS to provide clarity, ensure a consistent interpretation across NZ, and reduce the time and resources used in debating whether an area is a natural wetland and therefore subject to the plan provisions. For this reason we also recommend deleting the clause "or that contains patches of exotic sedge or rush species" as this is very difficult to apply in wetland identification. How big is a patch? This is very hard to assess at a paddock scale. We have found that using the % pasture determination will remove patches of rushes anyway. We note that the exceptions in the definition (for wet areas or 'pasture wetlands' cause some confusion as many of these areas are functioning wetlands as defined by the RMA, providing important ecosystem services (e.g. retention of water, nutrient attenuation). There should be recognition of the values of these areas in the NPS to promote appropriate management of these areas, even if they are not subject to regulatory controls. We note that the intent of excluding 'pasture wetlands' from the PNRP natural wetland definition was to provide for ongoing pastoral farming, however this also enables complete loss of pastoral wetlands for urban use, with no requirement to recompense for the ecosystem services and biodiversity	temporarily ponds after rain in places dominated by pasture, ~~or that contains patches of exotic sedge or rush species.~~ 'Wet pasture' and 'dominated by pasture' means that more than 50% pasture species (as listed in Pasture and Forage Plants for NZ. Stewart *et al*, 2014) are present. Provide recognition of the ecosystem values of 'pastoral wetlands' (wetlands that meet the Clarkson criteria as 'wetland' but are dominated by pasture) and promote appropriate management to sustain their values. Consider adding a provision so that if a 'pasture wetland' is to be developed for urban use, there is a need to "offset" the lost ecosystem values. b) change the definition for constructed wetland as suggested above Delete c) geothermal wetlands and provide a different policy approach to manage or exempt geothermal wetlands from management.

	values lost. Consideration should be given to closing this loophole. b) Note our comments on the definition of constructed wetlands above c) It is not clear why there is a blanket exclusion for all geothermal wetlands. Perhaps this is due to the use of these systems for geothermal energy generation? If this is the case, a better approach may be to provide a rule framework for certain activities within these particular systems, or through an exception clause (as provided for large hydro schemes in the NPS). In principle we do not support a blanket exclusion for this wetland type.	
Vegetation destruction	The definition for vegetation destruction is unclear. Given longstanding debates around the interpretation of 'significant' under the RMA we would advise against reusing this ambiguous term. The controls should relate to the destruction of any indigenous vegetation that is appropriate for the wetland type. Our suggested replacement is consistent with the PNRP; we have developed guidance as to what 'typical of the area and wetland type' means by providing species lists for each wetland type, where appropriate tailored to specific parts of the Wellington Region.	Replace with… means 'clearance, damage or modification of indigenous vegetation that is typical of the area and wetland type'.
5 Standard wetland monitoring obligation		
	(1) Support the importance of requiring monitoring; this should be compulsory for all activities requiring a consent, thus remove 'If" from the beginning of the sentence. (a) some of the attributes listed as minimum requirements may	Add to (1) The consent holder must prepare and implement a monitoring plan to: Reword (a) monitor the condition and extent of the wetland using attributes that are relevant to the conditions and risks

	not be relevant to the activity that the consent is being granted for (e.g construction of a vehicle track would not obviously lead to a change in nutrient status. This is a costly thing to measure therefore inappropriate to require its monitoring). Remove the brackets and leave attributes to the discretion of the regional council. Also add 'extent' as an attribute to be monitored along with condition. (b) annually is too onerous a requirement for smaller activities for both the applicant and for the council to manage the data. Also this is an open-ended requirement – these details are better determined by requiring preparation of a council approved monitoring plan as part of the consent. (c) the monitoring plan should include thresholds of concern for ecological decline which when triggered require the consent holder to advise a specified regional council contact and implement a remediation plan. Also add in a requirement to do some remediation if damage is identified.	associated with the consent application (b) provide the results of monitoring to the consent authority ~~at least annually, or~~ in accordance with the time frame stipulated in the monitoring plan (c) advise the regional council if the monitoring triggers a threshold of concern identified in the monitoring plan and carry out remediation actions in response *(or similar words)*
6 Standard conditions for nationally significant infrastructure		
6(a)	We strongly support the direction to require offsets that redress the effects of significant national infrastructure on wetlands to achieve a net gain outcome. This is required to achieve NPS-FM Policy 8. This should also relate to effects of activities on rivers and fish passage.	Extend this provision to also apply to subparts 2 and 3. Amend standards to include 'rivers' and 'fish passage' as matters, alongside wetlands, to which offsets must achieve a net gain outcome.
Add provision 7A Activities associated with wetland restoration		
Add a new section supporting and providing for wetland restoration where this is carried out according to a council approved restoration management plan	The PNRP provides for wetland restoration where this is carried out according to a council approved restoration management plan (Rule R106), with provision to waive consent fees. GW has developed guidance and support for this rule. This provision provides a strong incentive for people to undertake restoration, removing barriers associated with the resources required to apply for discretionary/non-complying consents. This is consistent with Policy 3.15(7) in the NPS-FM	Add an extra section to support wetland restoration where this is carried out in accordance with a council approved restoration management plan. E.g. Activities for the purpose of restoring a wetland are controlled activities provided the activities are stipulated in and carried out in accordance with an approved wetland restoration management plan.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

	to provide for and encourage restoration. If provision isn't made in the NES then PNRP Rule R105 will no longer apply.	
7 Vegetation destruction – discretionary		
a)	Request that the small-scale removal or control of pest plants should be enabled as a permitted activity, subject to good practice conditions, recognising the importance of this activity and something councils wish to enable without unnecessary constraint. Rule R105 of the PNRP allows for the control of plant species that are not typical of the area and wetland type as a permitted activity, subject to conditions such as using only hand-held machinery. It will not be helpful if the NES overrides this provision. Also as part of the hearing process for the PNRP we fielded requests to enable the selective removal of a plant or part of a plant from a wetland for the purpose of Māori customary use or the reasonable use of an individual (e.g. flax weaving or medicinal use).	Provide a new category to provide for vegetation destruction in the following circumstances as permitted activities: (a) for the purpose of restoring or maintaining the natural wetland when carried out in accordance with a restoration plan that has been approved by the regional council or a specific rule in a regional plan. (b) the selective removal of a plant or part of a plant for the purpose of Māori customary use or the reasonable and non-commercial use of an individual.
8 Vegetation destruction – non-complying		
Support		
9 Earth disturbance – meaning		
Earth disturbance	Recognise the impact of vehicle compaction on wetlands Provide for some limited disturbance to enable scientific investigations and monitoring clause (b) excludes earth disturbance associated with planting of indigenous plants for restoration purposes, installing fence posts or removing pest or weed vegetation using handheld tool. Does this mean that these disturbances are permitted	add to 9(a) including by '<u>vehicle compaction</u>' 9(b) add new <u>iv. carrying out scientific investigations and monitoring</u> Add some clarity around the status of earth disturbances associated with planting indigenous plants for restoration purposes, installing fence posts or removing pest or weed vegetation using handheld tool.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

	under NES?	
Earth disturbance for drainage	Controls for earth disturbance for drainage should also apply to widening existing drainage ditches	..involves making new drainage ditches or deepening or widening existing drainage ditches
10 General earth disturbance – discretionary activity		
	Support the 10m set back – this is consistent with the setback required by the NES-Plantation Forestry Make provision for archaeological and scientific investigations and monitoring	Add a new sub-clause to 10(1) e) for the purpose of archaeological and scientific investigations and monitoring
11 General earth disturbance – non-complying activity		
	Support the activity status of non-complying for these activities We note that the exceptions in the definition for natural wetland (for wet areas or 'pasture wetlands') means that many areas that are functioning wetlands as defined by the RMA, with important ecosystem services (e.g. retention of water, nutrient attenuation), have no protection under the NES. We note that the intent of excluding 'pasture wetlands' from the PNRP natural wetland definition was to provide for ongoing pastoral farming, however our experience is that this also enables complete loss of pastoral wetlands for urban use, with no requirement to recompense for the ecosystem services and biodiversity values lost. Extension of the earth disturbance controls to apply to any wetland would provide protection of these areas and their associated values from being totally lost.	Add a new clause that applies to any wetland as defined by the RMA to protect their ecosystem services
12 Earth disturbance for drainage – discretionary activities		
(a) Establishment of natural hydrological regime of a wetland as a consent condition	It is important that qualified wetland ecologists and /or hydrologists are employed to carry out the necessary evaluations of the effects of an activity as part of a resource consent application, however this is not something that forms a condition of a consent.	Change this to a requirement for applications for a resource consent rather than a condition of consent.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

(2)	Incorrect references here?	(2) Any resource consent granted for ~~general~~ earth disturbance for drainage (c) ..for the duration of the ~~land~~ earth disturbance …before the start of the ~~land~~ earth disturbance
(3)(b)(i) result in a greater than 0.1m change beyond the wetland's annual median water level	In many cases there will be no information readily available on annual median water levels within a wetland. How will this be assessed? This also applies to other sub clauses(10(2)(a), 13(b)(i)) .	
13 Earth disturbance for drainage – non-complying activity		
Support		
14 Earth disturbance for drainage – prohibited activity		
Support		
Subpart 2 – River bed infilling		
18 Infilling bed of river		
(1) Infilling for specified activities (restoration, NSI, flood prevention or erosion control) is **discretionary**	(b) amend the wording to be consistent with the wording in NPS 3.16(5)(b) Add a further clause to enable infilling for the purpose of forming a reasonable crossing point as a discretionary activity (if infilling includes culverts) The following is **critical -** Clause (d) should be an 'and' not an 'or' so that for these activities to be discretionary there must be no other practical option. This is required to be consistent with NPS 3.16(5). As drafted, this policy applies to **any** activity for which there is no practical alternative.	Amend (b) as follows: ~~done for the purpose of building, maintaining, or operating~~ necessary to enable the development, operation, maintenance, or upgrade of new or existing nationally significant infrastructure (c) required for the purposes of flood prevention or erosion control; ~~or~~ and* *retain 'or' if new (d) is added as requested below Add new (d) required to form a reasonable crossing point; and Amend existing (d) (possibly new e) to read: "in respect of (a) to (c) *(possibly d)* ~~for which~~ there are no ~~practical~~ practicable alternative methods of ~~enabling the activity to take place~~ providing for the activity"

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

	Hopefully this is a drafting error, if not then the intent of NPS-FM Policy 9 will not be realised as this is a large loophole that will be readily exploited. Also note the slight difference in wording with NPS-FM which refers to no other practicable alternative method of providing for the activity. Amend for consistency.	
(2)(a)offset to achieve a no net loss	Amend to match the sequential order of terms as GWRC has requested for the definition of "effects management hierarchy" Specify what 'no net loss' applies to. The NPS-FM 3.16(1) refers to extent and ecosystem health of rivers and streams, and associated freshwater ecosystems. Offsetting for large developments (e.g. projects of the likely scale associated with nationally significant infrastructure) should be required to achieve a 'net gain' to provide more confidence of a good environmental outcome in the face of the uncertainty/risk associated with the application of any offset and the time lag between impact and the positive outcomes anticipated. We note that NES 6(a) 'Standard conditions for nationally significant infrastructure' requires offsetting for residual adverse effects on a natural wetland associated with nationally significant infrastructure must achieve a net gain. This should be a consistent requirement in NES subpart 2. We note that a number of countries, such as the UK, are moving away from the no net loss (NNL) objective of offsetting, and focusing on net gain for a range of environmental values. Demonstrating ecological net benefit as part of economic activity aims to address cumulative losses over time and space.	Amend (2)(a) as follows: a) to the extent that the adverse effects cannot be avoided, <u>minimised, or</u> remedied,~~ mitigated,~~ any residual adverse effects on the <u>extent and ecosystem health of the</u> river must be offset to achieve a no net loss<u>, and preferably a net gain. Offsets associated with nationally significant infrastructure must achieve a net gain.</u>
(2)(b) monitoring	Monitoring is required of 'condition' in (i) and 'ecological condition' in (ii). There is no definition provided for either of	Redraft 18(2)(b) (i) monitor the ~~condition~~ <u>ecosystem health</u> of the

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

	these thus there is a lack of clarity about what needs to be monitored. NPS-FM includes a definition for ecosystem health in Appendix 1a, therefore we suggest using this term in both (i) and (ii)	river… (ii) ….demonstrates that the ~~ecological condition~~ <u>ecosystem health</u> of the river is declining
(3) Infilling is **non-complying**	Support	
Subpart 3 – Fish Passage		
(19) Application	The NES requirements for fish passage for existing structures should be consistent with those of the Freshwater Fish Regulations (i.e., all culverts and fords built post 1 January 1984 must not impede fish passage without a permit and regulation. S44(2) requires that all culverts and fords built before and after 1983 must be maintained to prevent the development of fish passage barriers). This subpart should also apply to existing structures when consent expires – to ensure upgrade. Provisions should be added to encourage remediation of existing fish barriers, including provision of easier consenting pathways for activities that aim to restore instream aquatic habitat, such as remediation of fish barriers. 19(2) We question whether the minimum standards for structures should apply to ephemeral watercourses.	Request that MFE carries out further discussion with DOC to ensure that the NES requirements are aligned with changes being proposed as part of the Indigenous Freshwater Fish Amendment Bill regarding management of existing fish barriers. Clarify that this subpart also applies to existing structures when consent expires (to ensure remediation) or when structures which might not be consented are being upgraded. Add a clause to enable use of a controlled activity for activities associated with fish barrier remediation which are to be carried out in accordance with an approved fish passage management plan (by either the Minister of Conservation or the regional council) (see Proposed Natural Resources Plan Rule R106 as an example). Consider adding a sentence that Clauses 21 and 22 do not apply to ephemeral watercourses. 19(2)(a) Clarify what the standard fish passage information is.
(20) Definitions	Culvert – We question use of the term 'culvert' as defined as the definition does not correlate with the way culvert is defined	Reconsider use of the term culvert to describe the pipes and structures referred to in (a) and (b) of the definition and ensure

	by Greater Wellington – we consider a culvert to be a pipe associated with forming a reasonable stream or river crossing point.	that the term and definition are consistent with the use of the term culvert in the NZ Fish Passage Guidelines.
(21) Culverts	Support (1) as it seems to have some consistency with the minimum standards for culvert design as set out in the NZ Fish Passage Guidelines referred to in the NPS. (3)(a) is not a condition that would be put on a consent but is a critical matter that would be considered in evaluating whether or not a consent should be granted. Add a standard provision for all discretionary activities that the asset owner must maintain the structure to provide for fish passage at all times. It is important that the information required in 3(b) is captured for use by the NZ Fish Passage Assessment Tool national data base, and not just lodged with regional councils. Note that Greater Wellington Regional Council does not currently require notification when a permitted structure is constructed and therefore it would require a lot of resources to set up and maintain a system and data base to ask or receive information on permitted activity instream structures. Similarly, it would be very difficult for us to identify existing permitted structures and ensure that they meet the new fish passage requirements or make people get a consent. This would be a significant task.	We recommend that the permitted activity rule uses the exact wording of the minimum standards for culverts, weirs, flap gates dams etc as written in the NZ Fish Passage Guidelines and note that many clauses are missing: e.g. Appendix G (2)(a)(b)(e)(f)(h)(i)(j) 21(3)(a): Delete 21(3), 22(3), 23(2): Add a standard provision for all discretionary activities that the structure shall be maintained to provide for fish passage at all times. Add a clause to specify that it is the role of the consent holder to enter the information required by 3(b) into the NZ Fish Passage Assessment Tool national data base. (and repeat this clause for the following activity sections)
(22) Weirs	Support (1) as seems to have some consistency with the	Replicate wording in NZFPG. Note missing equivalent clauses

Greater Wellington's submission on NPSFM discussion documents
October 2019

	minimum standards for weir design as set out in the NZ Fish Passage Guidelines referred to in the NPS. (1)(c) We consider that <4m is too large a fall height for a permitted activity. Under the PNRP the limit is <0.5m. The effects of this scale of structure should require assessment through a consenting process and not be a permitted activity.	from NZFPG Appendix G 3(a)(c)(f)(g)(h) (c) Reduce the fall height to <0.5m Add a clause requiring information to be added to the NZFP national data base
(23) Passive flap gates	(2)(a) is unnecessary as compliance with all regional rules is something that will form part of the consent's substantive evaluation and in itself is inappropriate as a 'condition'	Replicate wording in NZFPG. Add clause requiring information to be added to the NZFP national data base
(24) Dams, fords, non-passive flap gates	This provision is seriously lacking in detail – dams and fords are the structures that have the greatest risk of forming barriers to fish passage and therefore should be non-complying activities There is no reference to size – does this provision apply equally to small or large dams? Add consent status as for the other structure types.	Add a consent status Replicate wording in NZFPG. Add clause requiring information to be added to the NZFP national data base

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Appendix A

Map showing illogical stock exclusion requirements on a farm in the Wairarapa – Attached to question 65.

Attachment 1 to Report 20.316

Greater Wellington's submission on NPSFM discussion documents
October 2019

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

Greater Wellington lodged a submission to the Ministry for the Environment on 29 October 2019. We raised a number of key submission points and made specific provision comments on the changes to the National Policy Statement for Freshwater Management (NPSFM), the new National Environmental Standards for Freshwater (NESFM), new Resource Management (Stock Exclusion) Regulations 2020, revised Resource Management (Measurement and Reporting Water Takes) Regulations 2010 and amendments to the Resource Management Act 1991.

'Wins' - Key points that were taken up:

- The overarching intent of the proposals remain strong and mostly clear giving national direction needed for many years.
- The proposed framework for managing nitrogen and its reliance on OVERSEER has been removed as has the list of nitrogen heavy Schedule 1 catchments (which included Parkvale).
- Mandatory farm plans are not immediately required.
- Te Mana o te Wai and the introduction of a hierarchy for water management has been retained and an objective to give effect to Te Mana o te Wai is now possible at the catchment-level via the regional policy statement, instead of a high-level vision across the whole region.
- A new centralised water planning hearing process has been retained.
- Requirements to manage nitrogen and phosphorus as needed to achieve desired outcomes for other ecosystem health attributes, such as macroinvertebrates has been maintained.
- The effects management hierarchy is now consistent with the PNRP.

"Losses" - Key points that remain a challenge:

- Concern remains about the speed of change on rural communities and the imbalance of these new requirements on urban and rural communities.
- The timeframes while pushed out by a year will still be difficult to achieve without significant extra resource.
- Potential disparity in capacity of iwi to fully partner in the implementation of Te Mana o te Wai remains as a significant barrier to delivery.
- The extensive monitoring requirements to 'measure everything everywhere' will be a significant challenge rather than a focus on monitoring by need.
- Remaining concerns about the workability and enforceability of some of the stock exclusion regulations.
- The NESFM, at this stage, will not regulate water use for water bottling.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

National Policy Statement for Freshwater Management 2020

	Greater Wellington submission	Initial officer commentary
Timeframe for full implementation has been lengthened (from the proposals) by one year to 31 December 2024. The NPSFM must be fully implemented everywhere by this time. While this timeframe has been removed from the NPSFM 2020, it is now set in the RMA (s80A).	We stated that the timeframes to achieve an increased workload to meet the requirements of the NPSFM are unrealistic. The regional sector submission sought an ability to prioritise areas for implementation.	While a one year extension of the timeframe is welcome, the 2024 deadline will still be a significant challenge to achieve, particularly given the increased scope and content of the NPSFM. Additional planning, consultation, monitoring and reporting requirements will be required to meet this timeframe, meaning it would not be available for our current NPSFM implementation programme (Whaitua programme).
Te Mana o te Wai framework has been strengthened. The hierarchy of obligations prioritises the health and wellbeing of water bodies and freshwater ecosystems first, then the health needs of people, then the ability of people and communities to provide for their social, economic, and cultural wellbeing, now and in the future.	We supported clarifying the Te Mana o te Wai framework and introducing a hierarchy for water management. We support the further strengthened approach. We also questioned the workability of a single 'vision' in the Regional Policy Statement (RPS) which would be sitting at a too high a level to be useful. We recommended a vision be articulated at the *catchment* or *sub-catchment* scale and sit as an objective in the RPS to carry appropriate statutory weight.	The new hierarchy for water management has been retained which will be a welcome step change for Greater Wellington. We support the change that extends the vision to require multiple long term visions (at FMU, part of an FMU, or catchment level) to be set as objectives in the RPS.
Expectations and **direction about involving Māori has been strengthened**. Council must work collaboratively with, and enable tangata whenua to identify Māori freshwater values, and to be	We highlighted the disparity in availability and ability of iwi to partner in implementation of Te Mana o te Wai, and suggested that participation equity needs to be addressed.	Increased emphasis on requirement for mana whenua relationships is welcome however it remains for the Council to implement through Treaty principles as per the Act. Greater Wellington lack a Treaty framework which is a significant impediment.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
actively involved in decision-making processes relating to Māori freshwater values when implementing the National Objectives Framework. Regional councils must work with tangata whenua to investigate the use of mechanisms available under the Act (e.g., transfer of powers, joint management agreements, Mana Whakahono ā Rohe). In relation to this (and to preparing action plans) Council must make decisions, record matters considered and reasons for decision, and publish this as soon as practicable.		The new requirement to work with tangata whenua to investigate mechanisms under the Act will need to be worked in to work programmes and resourcing.
Policies require the health and wellbeing of water bodies and freshwater ecosystems to be **maintained or improved.** A target must be set for each attribute, and this must be at or above a baseline state at a specified time.	Our submission outlined that a number of attributes are likely to have strong correlation between them and therefore likely to require the same responses in order to achieve condition improvement. We sought an ability to focus on critical attributes that help describe current conditions, desired changes and most clearly support/justify the management response. This would also be a more efficient way to deploy council resources and reduce complexity for communities.	The ability to focus on critical attributes was not provided, which means that we will have to set targets for all attributes.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	**Initial officer commentary**
New compulsory values include; threatened species habitat, mahinga kai, and five elements of ecosystem health have been added (water quality, water quantity, habitat, aquatic life and ecological processes). Human Contact is also still a compulsory value.	We supported these and also requested that this apply to all threatened species that rely on freshwater systems, not just freshwater fish e.g. river nesting birds and wading species, as well as freshwater plants and invertebrates. We supported the new compulsory values.	Knowledge and resources to manage some new compulsory values (e.g. threatened species) will need to be increased. Recognition of mahinga kai as a compulsory value is a significant challenge for Council requiring mana whenua partnership in monitoring and attendant resourcing.
New and broadened monitoring and analysis required for objective and limit setting and action planning is extensive.	We recommended focussing efforts towards monitoring those attributes that are issues for an FMU. The new NPSFM requires monitoring of **all** attributes in **all** FMUs.	Te Mana O te Wai requires that freshwater planning reflects mana whenua values. Mana whenua monitoring of FMU-scale values is required to meet PNRP and compulsory NPSFM values. We consider that the monitoring requirements are onerous and out of date. The requirements will significantly increase the resource requirements in this area and potentially have less impact than more targeted monitoring for greater impact.
Identification of new attributes that trigger **action planning requirements** (rather than limit setting), include: *macroinvertebrates (previously required an action plan if below 80 MCI, now there are attribute tables)*, *submerged plants in lakes, dissolved oxygen in lakes and rivers, fish species, ecosystem metabolism (gross primary production and respiration), DRP, deposited fine sediment, E. coli (primary contact)*	We supported the use of action plans to achieve target attributes states and their location outside of the regional plan. Action plans will allow for adaptive management without amending the PNRP through a Schedule 1 process. Our submission sought guidance on how action planning might occur; this has not been provided to date.	The extent of monitoring and planning required by this direction (alongside other monitoring needs driven by the NPSFM) will require careful planning and prioritisation.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	**Initial officer commentary**
New attributes in italics		
Strengthens existing national bottom lines for nitrate and ammonia toxicity attributes in order to protect 95% of species from toxic effects (i.e., 2.4mg/L for Nitrate).	Not in the draft documents.	This change provides greater protection for streams in relation to toxicity conditions. There are likely a small number of streams in the region that fail to meet the new bottom line. Further monitoring of spring-fed streams may be needed.
Requires regional councils to manage nitrogen and phosphorus as needed to achieve desired outcomes for other ecosystem health attributes, such as macroinvertebrates. No attributes table has been included for DIN. Government will review nutrient management requirements in a year.	Not in the draft documents.	This is a welcome change sought by Local Government NZ (LGNZ) and supported by Greater Wellington. In our region, the state of sensitive estuarine (e.g. Te Awarua-o-Porirua Harbour) and lake receiving environments (e.g. Lake Wairarapa) are often be key drivers for water quality improvements, as has been recognised in our Whaitua processes. The proposed review in 12 months unfortunately creates further uncertainty about national policy changing the goals for regional councils.
Government has indicated making improvements to **OVERSEER** rather than relying on the information it provides at this stage.	We opposed a heavy reliance on OVERSEER to calculate nitrogen caps of any proposal as the most efficient and effective means of achieving ecosystem health.	This has been taken up.
Limits must be set for a new *suspended fine sediment attribute*.	Greater Wellington sought that this attribute was changed to better reflect ecosystem outcomes and regional variation.	We support the change away from turbidity to the new clarity measurement. This measure is more meaningful to ecosystem outcomes and has the benefit of being able to be robustly monitored through citizen science.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
A new **deposited sediment attribute** will not apply in naturally soft-bottomed streams. Freshwater habitat monitoring will be required.	Not in the draft documents.	This is a new attribute, the impact of which is yet to be assessed. This attribute may be valuable as a monitoring tool in some streams, though downstream receiving environments (e.g. lakes and estuaries) may often be the drivers for reducing sediment rather than this attribute.
Mapping, monitoring and managing wetlands. Council must map (within 10 years), monitor and maintain an inventory for wetlands >500m^2, and must have methods in place to respond if loss of wetland extent or values is detected.	We strongly supported this in our submission as it aligns with our existing approach for wetland management and sought supportive policy pathways for activities benefiting wetlands in the NES. We acknowledged the need to expand our wetland monitoring programme, develop a new programme to respond to degradation, and undertake further identification and mapping of wetlands greater than 0.05ha. Supported monitoring for all activities requiring a consent in wetlands.	Requirements to expand wetland monitoring and respond to degradation as well as mapping will require new resources and careful prioritisation.
Identification of all barriers to fish passage across the region and prioritisation/action plans for remediation	We supported this policy. We are starting to map barriers across the region.	More resources will be required to complete this and undertake prioritisation and action planning.
Impact on rural communities	We were concerned about the speed of change and burden on rural communities and recommended considering a	This imbalance has not been fully addressed, but our Whaitua programme will go some way to amend this for our region.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
	rebalancing between rural and urban requirements.	
Effects management hierarchy requires avoidance of adverse effects, then remedy, then mitigate, followed by offsetting and compensation.	We sought an amendment to the proposed effects management hierarchy so it would become avoid, minimise then remedy, offset and lastly compensate adverse effects. This ensures that effects are reduced before repairs are considered.	This has been taken up and now matches PNRP.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

National Environmental Standards for Freshwater Management 2020

	Greater Wellington submission	Initial officer commentary
Wetland protection, stream loss and fish passage. There are comprehensive requirements for activities in or near wetlands and in the beds of streams to protect them from any further degradation. Policies in the NPSFM support consenting requirements. Consent requirements with stringent conditions will apply to activities such as infilling and diversion that lead to the loss of wetlands and streams. Policies will direct consenting decisions and require regional plans to avoid further loss of these habitats and to maintain condition into the future. Structures that create barriers to fish passage must be identified across the region and new structures must ensure connectivity.	Largely supported in our submission and followed through in the PNRP.	More detailed analysis will be needed to work through the individual provisions that deal with wetlands to see if our individual submissions points have been included.
There is a significant change to the regulatory mechanism for mandatory **Freshwater Farm Plans (FW-FP)**. A change to the RMA enables the Minister for the Environment to prioritise and roll out requirements over time via regulations.	We opposed mandatory farm plans across all FMUs and all regions.	Freshwater Farm plans are not required immediately with detailed requirements, formats etc. developed over the next 12 months with primary sector and local government. Government has indicated phasing in mandatory Freshwater Farm Plans (FW-FP) regulations over time. Nitrogen impacted catchments are likely to be highest priority for

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
		FW-FPs and it is unclear whether there will be further opportunity to advise on which catchments should be first required to have them.
A **national synthetic nitrogen-fertiliser cap** of 190kg N/ha/year has been set for all pastoral farms in New Zealand by: • making the application of more than 190kg N/ha/year as synthetic nitrogen fertiliser a non-complying activity for dairy, dairy-support, sheep, beef, and deer farms, and • requiring dairy farmers to report annually to councils the weight of nitrogen applied per hectare as synthetic nitrogen fertiliser to enable compliance monitoring. Regulations will apply from 1 July 2021.	This is a new regulation that was not in draft package. The provision will be reviewed in 2023 to see if further interventions are necessary.	The cap and reduction requirements in Nitrogen impacted catchments (Schedule 1 catchments e.g. Parkvale) are not being included in the package. This is consistent with our message in our submission that we believe that our Whaitua implementation Programme is a better approach with our communities. Regional councils will be required to set up systems to receive and monitor levels of synthetic nitrogen fertiliser use reported by dairy farms, and to assess consent applications for fertiliser use above a new cap of 190 kg N/ha/year.
High risk land use -Intensive winter grazing on forage crops and land use intensification restrictions are similar to the September 2019 draft with some changes to conditions and consent thresholds. Standards for feedlots will apply from 3 September 2020. The standards required for stock holding areas such as loafing pads, stand-off pads, and	Our submission supported developing national standards to control intensive winter grazing with industry support. We also made a number of comments on the individual provisions.	There are no feedlots operating in the Wellington region. Many suggestions in our submission have been included in the NES including exempting sacrifice paddocks from being stock holding areas. Many of the proposed controls on intensification of land use and been retained and are consistently with the direction of the

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
feed pads differ depending on the age and size of the cattle. They include substrate permeability, separation from water sources and contaminant collection and disposal. However, "sacrifice paddocks", wintering barns, milking sheds and shearing sheds are exempt from the requirements. Agricultural intensification requirements come into force on 3 September 2020. Agricultural intensification applies to farm land used for arable, pastoral or horticultural purposes above certain area thresholds. Resource Consent (Discretionary Activity) is required for changes to dairy (>10 ha), woody vegetation to pastoral (>10 ha), irrigated pasture to dairy (>10 ha), winter forage cropping (increase over greatest amount 2014/15-2018/19), and dairy support (increase over greatest amount 2014/15-2018/19). Notably, increase in irrigated area for horticulture will not be captured by the intensification regulations. Standards for Stock-holding Areas and for Intensive Winter Grazing of Fodder Crops, will apply from 1 July 2021 and 1 May 2021 respectively.		Ruamāhanga Whaitua Implementation Programme. However, the provisions for intensive winter grazing and our suggested changes have largely not been taken up. The proposals will not capture smaller scale intensive winter grazing which has the potential for significant environmental effects particularly around hot spots (small highly intensive areas of cropping). The pugging conditions will be very difficult to monitor and enforce and the slope average determination will be difficult and time consuming. The re-sowing timeframe (by 1 October) could result in heavy machinery in sodden soils with the potential for significant runoff into nearby waterways. However, our farm environment plans, PNRP and Whaitua implementation programmes will likely address many of these issues at the farm scale. Since the NESFM was released, Cabinet has agreed to make some adjustments to the document to make them clearer. These adjustments changed the definition of pugging to penetration of soil of more than 5cm and that the maximum pugging depth (20cm) does not apply around fixed structures such as gateways and water troughs.

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	**Initial officer commentary**
Intensive Winter Grazing of Fodder Crops has conditions for area of cropping (less than 50 ha or 10% of property – whichever is greater), land slope (average of 10 degrees or less), setback distance from the bed of steams or lake (5 metre), soil disturbance by pugging (<20 cm deep and covering <50% of the paddock), and re-sowing with grass. Otherwise a consent is required from Council. There are requirements on farmers in terms of providing "reasonable" information requirements by Council. Regional councils have the ability to recover costs via s.36 charges.		

Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

Resource Management (Stock Exclusion) Regulations 2020

	Greater Wellington submission	Initial officer commentary
Dairy and beef cattle, pigs and deer must be excluded from wetlands, lakes and rivers with a bed greater than or equal to one metre wide by specified dates. Applies to grazing dairy cattle and pigs on all terrain, intensive stock activities on all terrain, and beef cattle and deer on low slope land only (intensive stock activities are land anywhere used for fodder-cropping, break-feeding, or grazing on irrigated pasture of dairy and beef cattle and deer). Exclusion is defined as being any effective means of preventing access.	The changes we sought were: • Simplification of the regulations for stock access to waterbodies and raised concerns with the low-slope map produced by MFE. • That all cattle should be managed in the same way in terms of access to waterbodies and with the same time limits as deer and pigs. We also raised concerns with the costs of a 5m setback and significant maintenance requirements as well as minimum requirements being imposed on existing fences.	The regulations have been relaxed somewhat from those proposed in September 2019, and the changes have largely addressed our concerns. The key changes are that existing fences are exempt and the 5m setback has been reduced to 3m. Exemptions are identified for stock crossing of waterways to recognise the impracticability of putting in structures in some circumstances. Regional plans can contain more stringent rules, as can FW-Farm Plans (when they come into being). Regulations apply from September 2020 for any new operations, and in 2023 or 2025, depending on the type of stock, land slope, or presence of a natural wetland. This is an extension of time for activities, compared to the September 2019 draft proposals. MFE have also released a 'low slope land' area to assist with determining where the regulations apply. However as these maps have been determined at a very high level, there has been much concern about their

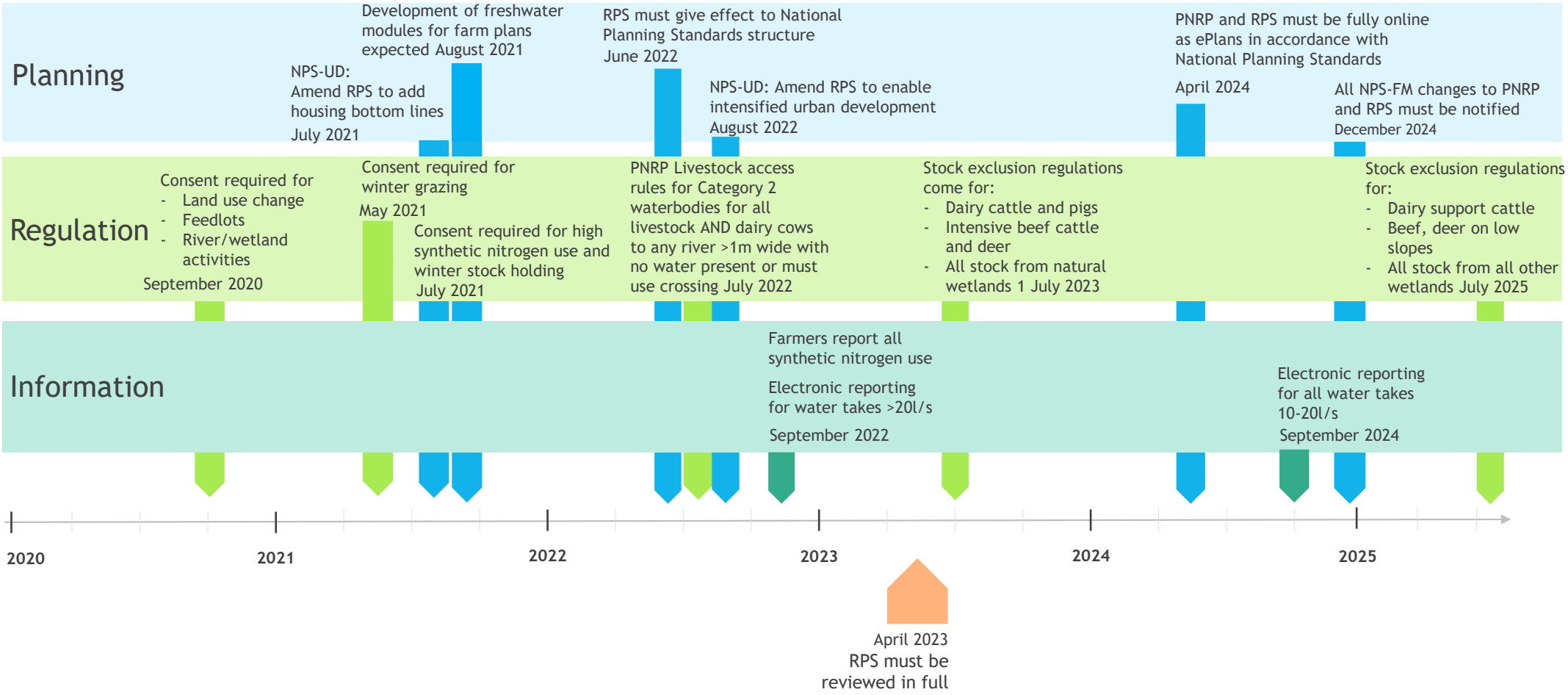
Attachment 2 to Report 20.316

Analysis of GW Submission on Action for Healthy Waterways and the Freshwater Package announcement August 2020

	Greater Wellington submission	Initial officer commentary
		accuracy at a local level which the ministry is aware of.

Attachment 3 to Report 20.316

Implementing major national policy direction to 2025



Environment Committee
10 September 2020
Report 20.275

For Information

FLOODPLAIN MANAGEMENT PLAN IMPLEMENTATION ANNUAL REPORT TO JUNE 2020

Te take mō te pūrongo
Purpose

1. To advise the Environment Committee (the Committee) of progress made to June 2020 in implementing the Hutt, Ōtaki, Waikanae, Pinehaven and Te Kāuru Upper Ruamāhanga Floodplain Management Plans (FMP) and the Lower Wairarapa Valley Development Scheme (LWVDS).

Te tāhū kōrero
Background

2. This is the eighteenth (18) annual report on the implementation of the Western Floodplain Management Plans and the thirteenth (13) annual report on the Wairarapa capital works.

Western Floodplain Management Plans – implementation

3. The Hutt River, Pinehaven Stream, Waikanae and Ōtaki Floodplain Management Plans (western Floodplain Management Plans) were completed in 2001, 2016, 1997 and 1998 respectively. They recommended structural, non-structural and environmental measures to reduce the flood risk to the respective floodplains and improve the environment. Greater Wellington Regional Council (Greater Wellington) has adopted a 40-year time frame to fully implement the four Floodplain Management Plans (FMP). Implementation of the FMPs commenced in 2000. The Porirua Scheme structural works were completed in 1996 and no further works are programmed apart from maintenance.

Hutt River Floodplain Management Plan

4. Projects being completed within the managed extent of Te Awa Kairangi/Hutt River are outlined in the Hutt River FMP, and Te Awa Kairangi/Hutt River Environmental Strategy.

5. An Environmental Strategy Action Plan update was completed in August 2018, superseding the 2001 version. The Action Plan component was included to more clearly prioritise environmental and community outcomes.

6. Currently, the focus area for project delivery is RiverLink, the length of river between Kennedy Good Bridge and Ewen Bridge near to the Hutt City Central Business District. The projects in this section have been combined into the RiverLink project, three

separate but interdependent projects comprising Flood Protection, Making Places, and Melling Transport Improvements. The RiverLink project is a collaboration between Greater Wellington, Hutt City Council and Waka Kotahi NZ Transport Agency (Waka Kotahi). Waka Kotahi joining the RiverLink partnership was a major milestone for the project, as their joining significantly enhances the transport and resilience benefits of the combined project.

7. The project supports the Long Term Plan (LTP) priority outcome of Regional Resilience for Greater Wellington, and also supports or has positioned itself to be able to support delivery across several of Greater Wellington's other LTP priorities, Freshwater Quality and Biodiversity, Regional Leadership and Public Transport.

8. The construction phase of this project is currently forecast for commencement in late 2021. However, programme alignment with Hutt City Council and Waka Kotahi will determine the final construction programme. Land purchase for the RiverLink project and strategic land purchase at other critical locations in Te Awa Kairaingi/Hutt River are continuing.

9. The benefits in terms of flood damages saved are estimated at 35 percent of the total benefits the Hutt River FMP will deliver. The benefits on the basis of flood damages saved will be 66 percent when the flood protection upgrade and Melling Bridge replacement components of the RiverLink project are completed.

Pinehaven Stream Floodplain Management Plan

10. The Pinehaven Stream FMP was completed in 2016 with a range of structural and non-structural flood risk management measures proposed. These measures will guide the long term management of the catchment. The implementation of the plan is being led by Upper Hutt City Council (UHCC). UHCC has appointed Wellington Water Limited as its agent to complete the physical work on behalf of both Councils. Funding for this FMP has been established through a Memorandum of Understanding with a 50/50 allocation between Greater Wellington and UHCC being confirmed.

Waikanae Floodplain Management Plan

11. The Waikanae FMP provides a co-ordinated plan to upgrade existing historic infrastructure, provide new infrastructure, and adopt a range of other non-structural measures to provide improved flood risk management.

12. The Waikanae FMP was reviewed and updated between 2009 and 2012, and the FMP republished in 2013. It provides the basis for the current development and operational work programmes managed by the Flood Protection Department.

13. The Waikanae FMP also includes an Environmental Strategy which identifies actions to reduce any adverse effects that may result from flood mitigation works, and to preserve and enhance the landscape, heritage, ecological and recreational values on the floodplain.

14. Implementation of the Waikanae FMP has continued with work to progress and close outstanding items with the Jim Cooke Park Stopbank Project. These works are primarily around land, grass cover and planting, and track repairs.

Ōtaki Floodplain Management Plan

15. The Ōtaki FMP provides a co-ordinated plan to upgrade existing historic infrastructure, provide new infrastructure, and adopt a range of other non-structural measures to provide improved flood risk management.

16. The Ōtaki FMP objective was to reduce losses from flooding in a sustainable manner, and protect and enhance the natural and cultural values of the river system. The FMP includes an Environmental Strategy. A review of the Ōtaki FMP is currently taking place. Work on this review is expected to be completed in mid-2021, at which point implementation of projects will be recommenced. Exceptions to this, which have continued, are the Waitohu Stream channel and Convent Road stopbank project.

Wairarapa capital works

Lower Wairapa Valley Development Scheme

17. A major review of the LWVDS, completed in 2006, recommended a structural upgrade programme to improve the security of the flood defences in the lower Wairarapa valley. The original programme was for implementation over eight years, commencing in 2007/08. Generally the work involved strengthening river bank protections and upgrading stopbanks on the Ruamāhanga and Tauherenikau Rivers. In 2011, Council approved the extension of the programme of works until 2021.

Te Kāuru Upper Ruamāhanga Floodplain Management Plan

18. The Te Kāuru Upper Ruamāhanga FMP (Te Kāuru FMP) was adopted by Council on 25 June 2019. Implementation of the Te Kāuru FMP has commenced.

19. The flood hazard maps for the urban reach of the Waipoua were left unconfirmed at the adoption of the Te Kāuru FMP. Work on the Waipoua flood hazard maps is continuing with a community led project team.

20. There was no requirement for structural implementation works during 2019/20 in the Te Kāuru FMP.

Summary of progress

Implementation progress

21. Table 1 shows the FMP structural measures implemented as a percentage of progress of the recommendations within the respective FMP and LWVDS.

Table 1: Implementation progress

FMP or Scheme	Actual % Complete to June 2019	Target % Complete 2019/2020	Actual % Complete to June 2020	Outcome
Hutt	33%	33%	33%	Achieved
Pinehaven	0%	33%	0%	Not achieved
Waikanae	56%	56%	56%	Achieved
Ōtaki	47%	47%	47%	Achieved

LWVDS	90%	99%	94%	Partially Achieved
Te Kāuru FMP	0%	0%	0%	No requirement

22. Table 2 outlines the financial summary of the implementation of the FMPs. Note that Te Kāuru FMP is excluded in this table as there have been no capital expenditure implementation works for this FMP.

Table 2: Financial summary

FMP or Scheme	Original FMP Total 40 year estimate ($M) - Adjusted for Inflation[1]	Expenditure to June 2020($M)[2]	Total Budgeted to 2028 ($M)[2]	Total expenditure forecast to 2028 ($M)[2]
Hutt	120.3	99.0	91.7	190.8
Pinehaven	5.4	2.5	4.2	6.7
Waikanae	13.6	8.2	6.2	14.4
Otaki	18.6	8.5	12.8	21.4
Total western FMPs	**157.9**	**118.3**	**115.0**	**233.3**
LWVDS	11.1	8.6	9.2	17.9
Total Wairarapa	**11.1**	**8.6**	**9.2**	**17.9**
Total	***169***	***126.9***	***124.2***	***251.1***

Notes:

1. Hutt 1999 (estimate $78.00M), Otaki 1998 (estimate $12.07M), Waikanae 1997 (estimate $8.69M) and LWVDS 2007(estimate $8.8M), Pinehaven 2014 (estimate $5M).
2. All figures have been indexed to 2020 dollar values using reserve bank CPI calculator. (Index value based on 30 June of year. No inflation included for year estimate originated. General CPI values have been used.)

Key deliverables 2019-2020

Western Floodplain Management Plans – implementation

Hutt River Floodplain Management Plan

23. Progress on the key deliverables for the Hutt River FMP are listed in Table 3.

Table 3: Hutt River FMP key deliverables and other work

Item	Progress	Forecast
Strengthening our relationships with mana whenua partners through our	RiverLink Project Management Board established inclusive of membership Taranaki Whanui and Ngati Toa Rangitira as board members with full voting	Achieved

Item	Progress	Forecast
implementation projects	powers.	
RiverLink - Full commitment of Waka Kotahi as a project partner	Funding secured, project partnership agreement signed and Waka Kotahi actively involved in discussions	Achieved
RiverLink - Continue property acquisition (willing buyer/willing seller approach) for project in alignment with property strategy	86 of 118 properties acquired	Achieved
Other work		
RiverLink - Establishment of Project Office	The RiverLink Project board recruited a project director to deliver RiverLink. The project director recruited two project managers and a communications manager for project delivery.	Achieved
RiverLink - Geotechnical Ground Investigations	Investigations of subsurface geology have been carried out to inform the design and consenting stage. This is a contract that delivers information required for Waka Kotahi, HCC and Greater Wellington design components	Completed
Summer Engagement Programme 2019/20	The engagement programme aims to connect RiverLink with the communities of Lower Hutt and to showcase Te Awa Kairangi as a treasure at the heart of Hutt City. It covered everything from toxic algae to the riverbank market to transport linkages and city growth in a fun, family friendly environment. The summer programme was curtailed due to COVID-19.	Completed
Hutt River Erosion Sites	During the COVID-19 lockdown, work was undertaken to obtain funding from the Crown Infrastructure Partnership (CIP) for Covid-recovery projects. We were successful in obtaining funding from CIP for a total of $9.83 million over	In progress

Item	Progress	Forecast
	2 years with a 36 percent contribution expected from Greater Wellington. This funding will be used to bring forwards work on eight Hutt River erosion sites and the Port Road Erosion protection work below.	
Port Road Erosion Protection	Greater Wellington and HCC have together worked towards addressing erosion concerns of businesses and property owners in the Seaview area near Port Road, Lower Hutt. In the 2018/19 year, HCC completed temporary (10 year estimated life) repair work to a section of the erosion protection at this location. Further protection work, which is the responsibility of Greater Wellington, is currently forecast to commence in 2031. However this work is included in the CIP funded projects above, so is likely to be bought forward.	In progress
Te Awa Kairangi/ Hutt River Environmental Strategy Action Plan	Design work has commenced to address trail connection improvements at identified points along the Te Awa Kairangi/Hutt River Trail. This includes consideration of stream crossings at Hulls Creek, Whakatikei Stream (in conjunction with UHCC), and at Manor Park.	In progress

Pinehaven Stream Floodplain Management Plan

24. The objective of the planned Pinehaven Stormwater Improvements project is to improve flood level protection by increasing the capacity of the watercourse and drainage to provide a 1 percent Annual Exceedance Probability (AEP) level of protection.

25. The project has been split into three distinct sections:

    a Upgrading culverts (an UHCC roading renewal project)

    b stream capacity and environmental improvements works - widening the stream, planting, bank stabilisation, retaining walls, earthworks and replacement bridges

    c enabling works – includes house removal, service relocation and stormwater drain construction.

26. This programme will result in clear public benefits in the areas of property protection, reduced damage to community infrastructure such as roads, and reduction in the disruption from flood events.

27. Progress on the key deliverables for the Pinehaven FMP is listed in Table 4.

Table 4: Pinehaven FMP key deliverables

Item	Progress	Forecast
Stream capacity and environmental improvement works	The estimated budget for the channel works to allow for more stream capacity increased to a figure that was not viable for the project. On 4 June 2020 a Value Engineering workshop was undertaken to review the budget. The outcomes from this workshop are still being processed.	Progressing
Upgrading culverts	Culvert upgrades at two points – Sunbrae Drive and Pinehaven Road have been consented in March 2020, and work is to proceed later in 2020. Consents have been lodged for completing remaining channel and culvert improvements and the first stages (culvert upgrades) of work are programmed to commence in October 2020.	Progressing
Enabling works	The enabling works fall within the Value Engineering process, which is continuing.	Progressing

Waikanae Floodplain Management Plan

28. Progress on the key deliverables and other work for the Waikanae River FMP are listed in Table 5.

Table 5: Waikanae River FMP key deliverables and other work

Item	Progress	Forecast
Jim Cooke Park stopbank reconstruction project	• Grass cover to the stopbank continues to improve. • Mid 2019 native planting (established in response to consent conditions), damaged by rabbits. • Legal and surveying aspects of the land exchange and easement with Kāpiti Coast District Council (KCDC)	Outstanding items and consent conditions (reporting on planting success etc.) are expected to be closed

Item	Progress	Forecast
	progressed. • Removal of public walking track from the Equestrian Centre Lease area. • Minor walking track defect resolved.	out by end of 2022.
Waikanae River Environmental Strategy Implementation - Items associated with the Jim Cooke Park stopbank reconstruction project	• Three of six native planting sites planted. • The track through Jim Cooke Park and along the equestrian centre has been upgraded. • Horse stile installed at the old SH1 true left bank entrance to the river track.	The remaining 3 native planting sites to be planted by the end of 2023
Addendum of Action Plan to the Waikanae River Environmental Strategy to establish project programme that will delivery strategy outcomes	Resources for this work were diverted into the Waikanae ki Uta ki Tai project initiated by Department of Conservation and Civil defence support relating to COVID-19	Not Achieved This is expected to start this FY
Strengthening our relationships with mana whenua partners through our implementation projects	Te Atiawa ki Whakarongotai is seeking quite detailed engagement with GW across all parts of the business (governance, management and operations).	Working to improve engagement with Te Atiawa ki Whakarongotai through implementation projects.
Other work		
Waikanae River Erosion – Cross Section 255	• The erosion has impacted the main river track to the point we have closed the track at this point, and diverted the public onto a secondary track. • Negotiations are underway to acquire more land adjacent to the erosion site.	The additional land may take a further two years to acquire.

Item	Progress	Forecast
Waikanae River ki Uta ki Tai project	Department of Conservation has initiated development of a 'ki Uta ki Tai - Mountains to Sea' Plan. Resources allocated to the development of an addendum to the Waikanae River Environmental Strategy have been diverted into supporting this project	Ongoing

Ōtaki Floodplain Management Plan

29. Progress on the key deliverables and other work for the Ōtaki FMP are listed below in Table 6.

Table 6: Ōtaki River FMP key deliverables and other work

Item	Progress	Forecast
Progressing with land entry negotiations for the lower Waitohu Stream channel works and review of the designs for channel and stopbank upgrades	• No additional land entry negotiations were advanced • The Waitohu hydraulic modelling has been progressed and alternative design options have been explored • Cross section surveys have been carried out for of the Mangapouri Stream and part of a tributary • Survey results have been incorporated into the hydraulic model.	Partially Achieved Next Financial Year (FY) exploration of options is expected to continue.
Strengthening our relationships with mana whenua partners through our implementation projects	Established and ongoing support provided for regular operational and project delivery discussions with Nga Hapu o Ōtaki (NHoŌ) in line with Joint Management Agreement principles.	Improved engagement and partnership outcomes
Otaki Lakes Management Plan	• Decision was made to develop a joint Greater Wellington, KCDC and NHoŌ vision for the Ōtaki Lake area. • A joint Greater Wellington, KCDC and NHoŌ scope statement is currently with the project partners to comment on.	Next FY we hope our project partners can agree the scope. Then identification of stakeholders will progress.

Item	Progress	Forecast
Other work		
Support for Greater Wellington led Mahi Waiora Project	Mahi Waiora project seeks to improve freshwater quality outcomes for the Waitohu Stream.	In Progress
Chrystalls Stopbank upgrade	• Contract finalised between Greater Wellington and Fletcher Construction for the stopbank works • Construction started 2 March 2020 • Construction is underway.	Practical completion is expected to be awarded by the end of 2020. A two year defects period will follow Practical Completion.

Wairarapa capital works

Lower Wairarapa Valley Development Scheme

30. Progress on the key deliverables and other work for the LWVDS are listed in Table 7 below.

Table 7: LWVDS key deliverables and other work

Item	Progress	Forecast
Pukio East Stopbank Realignment	The existing stopbank at Pukio East was identified as having a high risk of failure from erosion. Works to shift the stopbank further from the river edge commenced in 2017/18. The stopbank has now been completed and the remaining work is to remove the old stopbank and plant an area of the berm, which is being completed in the 2020/21 year. This work would have been completed within this financial year, however Covid19 prevented it from occurring.	Ongoing

Whakawhiriwhiri Stream Upgrade	Progress on implementing the Whakawhiriwhiri Stream project has been slow. Improvement works at the downstream end have been completed, but we have been unable to gain full landowner access to the Barton or the Hedley properties to undertake works on those properties. The drains upstream of Barton's lagoon have been cleared and are reported to be providing some relief to upstream land owners. Replacement of the Simmonds Culvert is currently underway as part of this work.	Ongoing
Geoffrey Blundell Barrage Gates	The Flood Protection team have been supported by Calibre Consulting to implement the structural repairs on the Barrage Gates. The works tendered for included the replacement of 24 steel corbels as well as concrete spalling repairs to the piers and abutments. Concrete Solutions Ltd were awarded the contract in Nov 2019 and works began on-site January 2020. Works have now been completed.	Achieved

Te Kāuru Floodplain Management Plan

31. Progress on the key deliverables and other work for the Te Kāuru FMP are listed in Table 8.

Table 8: Te Kāuru FMP key deliverables and other work

Item	**Progress**	**Forecast**
Governance changes	12 December 2019 – Establishment of the Upper Ruamāhanga River Management Advisory Committee (URRMAC) Process of obtaining elected and non-elected members for the URRMAC was stalled due to COVID-19 (however were completed in time for the 20 August 2020 Council meeting).	Completed Ongoing

Item	Progress	Forecast
Funding changes	Consultant (Cardno) engaged to undertake GIS work to confirm the Te Kāuru FMP catchment boundary and land parcels. This project is on schedule to be completed by November 2020. A legal opinion has been sought regarding whether the funding changes could be carried out without reviewing the Revenue and Financing Policy (RFP).	Ongoing Ongoing
Waipoua River – urban	Hydrological and hydraulic modelling for the flood hazard maps through the urban section of the Waipoua River are due to be completed by June 2021. Updated flood hazard is then expected to be included in a review of the Wairarapa Combined District Plan.	Ongoing
Shovel Ready and Jobs for Nature funding	During the COVID-19 lockdown, work was undertaken to obtain funding from two sources: Ministry for the Environment and the Crown Infrastructure Partnership (CIP). We were successful in obtaining funding from Ministry for the Environment (MfE) for Major Rivers – Riparian Management, which will assist in riparian planting of the Te Kāuru buffers. A total of $5 million was sought over a 5 year period, with a 50 percent contribution expected from Greater Wellington. We were also successful in obtaining funding from CIP for a total of $2 million over two years with a 36 percent contribution expected from Greater Wellington. This funding will be used to undertake the River Road project within the Kāuru FMP.	Ongoing

Long Term Plan Priorities

32. LTP priorities include:

- RiverLink
- Implement outcomes of the Hutt, Pinehaven, Ōtaki, Waikanae and Te Kāuru FMPs and the LWVDS.

33. Implement outcomes of the Hutt, Ōtaki, Waikanae, and Pinehaven Environmental Strategies and support community groups to enhance river environments.

Specific planned work for 2020/21

34. The following table includes key work planned for 2020/21. It is not a complete listing of all work being carried out across the region, and does not include work that may be required to address storm and flood damage.

River/FMP	Details
Te Awa Kairangi/Hutt River FMP	• RiverLink consenting design and consent preparation. • Lodge RiverLink resource consent and designation application. • Progress RiverLink property purchase and increase efforts with remaining owners • Maintain planting and monitoring of Belmont wetland. • Complete pocket edition of Hutt River Environmental Strategy Action Plan • Complete Taita area safety improvements. • Procurement and construction of Hulls Creek Crossing and trail connection • Complete publication of planting and revegetation guidelines for river edges for Region. • Work with partner organisations to create a trail connection through Manor Park and across the Hutt River at the Silverstream Bridge. • Gauging and monitoring improvements • Progress CIP-funded work on n 8 Hutt River erosion sites and the Port Road Erosion protection work.
Pinehaven Stream FMP	• Stream capacity and environmental improvement works • Culvert upgrades
Waikanae FMP	• Jim Cooke Park Stopbank reconstruction project completion and environmental works • Waikanae River erosion - Cross Section 255 land acquisition

	• Waikanae River Environmental Strategy review
Ōtaki River	• Waitohu stream convent road flooding issues design and consents • Otaki Lakes management plan outline • Mahi Waiora project support, Waitohu Stream • Completion of Chrystalls stopbank upgrade works
Te Kāuru and Lower Wairarapa Valley Development Scheme	• Recruitment for FMP implementation delivery officer • Te Kāuru FMP Implementation programme development • Development of LWVDS 10 year programme (2021-2031) • Whakawhiriwhiri stream works • Pukio East Dairy Ltd completion works

Ngā hua ahumoni
Financial implications

35. For this reporting period, projects are within the current flood protection budgets.

36. MfE and CIP projects require part funding from Greater Wellington, and Officers are currently working through the implications of bringing LTP funding forward.

Ngā āpitihanga
Attachments

Number	Title
1	Hutt Floodplain Management Plan summary progress table
2	Waikanae Floodplain Management Plan summary progress table
3	Ōtaki Floodplain Management Plan summary progress table
4	Lower Wairarapa Valley Development Scheme development work summary progress table

Ngā kaiwaitohu
Signatories

Writer	Sharyn Westlake – Team Leader, Floodplain Management Plan Implementation
Approvers	Graeme Campbell – Manager, Flood Protection Wayne O'Donnell – General Manager, Catchment Management

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or Committee's terms of reference The Committee's specific responsibilities include overseeing the development and review of Council's environmental strategies, policies, plans, programmes and initiatives in the areas of river control and flood protection.
Implications for Māori There are no known implications for Māori.
Contribution to Annual Plan / Long term Plan / Other key strategies and policies The projects contained within this report deliver on Greater Wellington's strategic priority area of te tū pakari a te rohe/regional resilience, and support delivery of Greater Wellington's strategic priority area of te oranga o te wai māori me te rerenga rauropi/freshwater quality and biodiversity.
Internal consultation Specific projects consult with groups and departments across Greater Wellington where relevant to that project.
Risks and impacts: legal / health and safety etc. The purpose of implementation floodplain management plans is to reduce the risk to communities and improve the region's resilience.

Attachment 1 to Report 20.275

Hutt Floodplain Management Plan summary progress table

Updated 28 August 2020

TOTALS IMPLEMENTATION HUTT FMP				Date AMP	COST $M 2001 FMP	Target % at completion			Percent Complete to date	
				2000-2051	$77.76	100.00%			33.01%	

REACH 1 : River Mouth to Estuary Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	4.69%	STAGE	% Complete (0 = not complete, 0.5 Part complete, 1 = complete)	0.00%	HRFMP (Page #)
River Mouth Channel Works	1	6	after 2010	2032-2035	$3.65	4.69%			0.00%	52

REACH 2 : Estuary Bridge to Ava Rail Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	17.16%	STAGE		6.71%	HRFMP (Page #)
Shandon golf course (RB) stopbank	2	2	after 2010	Ava Woolen Mills [2028-2034]	$1.72	2.21%			0.00%	54
Light rock protection works (Estuary to Ava rail bridge)	2	2	after 2010	Ava Woolen Mills [2028-2034]	$0.43	0.55%	Partial Work	0.5	0.28%	54
Woolen mills (Estuary to Ava LB) stopbank	2	6	after 2010	Ava Woolen Mills [2028-2034]	$3.99	5.13%			0.00%	54
Relocation and rock lining (Estuary to Ava LB)	2	6	after 2010	Ava Woolen Mills [2028-2034]	$2.20	2.83%			0.00%	54
Ava rail bridge investigations	2	1	2000-2002	Alicetown Strand Project [2000-2010]	$0.23	0.30%	Complete	1	0.30%	54
Ava rail bridge waterway improvements	2	1	2003-2008	Alicetown Strand Project [2000-2010]	$4.77	6.13%	Complete	1	6.13%	54

REACH 3 : Ava Rail Bridge to Ewen Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	38.14%	STAGE		12.35%	HRFMP (Page #)
Strand park (Ava to Ewen RB) river realignment and land purchase	3	3	2000-2005	Alicetown Strand Project [2000-2010]	$4.48	5.76%	Complete	1	5.76%	56
Strand park stopbank upgrade (Ava to Ewen LB)	3	1	2000-2010	Alicetown Strand Project [2000-2010]	$2.64	3.40%	Complete	1	3.40%	56
Tama Street stopbank upgrade (Ava to Ewen RB)	3	3	2000-2010	Alicetown Strand Project [2000-2010]	$2.48	3.19%	Complete	1	3.19%	56
Melling Bridge investigations	3	3	2001-2002	RiverLink [2015-2028]	$0.06	0.08%	In Design		0.00%	56
Daly Street (Ewen to Melling RB) stopbank upgrade and land purchase	3	1	2008+	RiverLink [2015-2028]	$4.61	5.93%	In Design		0.00%	56
Marsden Bend (RB) channel works	3	3	after 2010	RiverLink [2015-2028]	$1.91	2.46%	In Design		0.00%	56
Pharazyn St (Ewen to Melling RB) stopbank	3	3	after 2010	RiverLink [2015-2028]	$3.70	4.76%	In Design		0.00%	56
Riverside car park channel works (LB) and light protection works (Ewen to Melling LB)	3	1	after 2010	RiverLink [2015-2028]	$1.78	2.29%	In Design		0.00%	56
Land for Melling Bridge Upgrade	3	14	after 2010	RiverLink [2015-2028]	$8.00	10.29%	In Design		0.00%	56

REACH 4 : Melling Bridge to Kennedy Good Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	11.75%	STAGE		9.99%	HRFMP (Page #)
Melling to Kennedy Good Bridge channel works	4	1	after 2010	RiverLink [2015-2028]	$1.11	1.43%	In Design		0.00%	58
Melling Bridge (RB) stopbank upgrade	4	3	after 2010	RiverLink [2015-2028]	$0.26	0.33%	In Design		0.00%	58
Boulcott Golf Course (LB) stopbank upgrade and land compensation	4	1	after 2005	Boulcott [2010-2013]	$5.44	7.00%	Complete	1	7.00%	58
Connolly Street (LB) stopbank and land purchase	4	1	after 2010	Boulcott [2010-2013]	$2.33	3.00%	Complete	1	3.00%	58

REACH 5 : Kennedy Good Bridge to Pomare Rail Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	5.61%	STAGE		0.91%	HRFMP (Page #)
Kennedy Good Bridge to Pomare (LB) stopbank upgrade	5	4	after 2010	KGB Pomare [2037-2042]	$0.86	1.11%			0.00%	60
Vegetation at Kennedy Good Bridge to Pomare rail bridge (LB/RB)	5	14	after 2010	KGB Pomare [2037-2042]	$1.63	2.10%			0.00%	60

Hutt Floodplain Management Plan summary progress table

House Raising at Belmont to 1900	5	8	after 2010	KGB Pomare [2037-2042]	$0.45	0.58%			0.00%	60
Rock protection at Belmont, Nash St. and Pomare Rail Bridge (LB/RB)	5	4	after 2010	KGB Pomare [2037-2042]	$1.42	1.83%	Partial Work	0.5	0.91%	60

REACH 6 : Pomare Rail Bridge to Silverstream Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	2.98%	STAGE		0.00%	HRFMP (Page #)
Pomare rail bridge to Silverstream Bridge channel works (LB/RB)	6	13	after 2010	Manor Park Pomare [2041-2051]	$1.34	1.72%			0.00%	62
Manor Park stopbanks to 2300	6	13	after 2010	Manor Park Pomare [2041-2051]	$0.98	1.26%			0.00%	62

REACH 7 : Silverstream Bridges to Moonshine Bridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	5.85%	STAGE		0.60%	HRFMP (Page #)
Moonshine Bridge investigations	7	10	2001-2002	Trentham to Whakatikei [2032-2036]	$0.06	0.08%			0.00%	64
Moonshine bridge waterway upgrade	7	10	after 2010	Trentham to Whakatikei [2032-2036]	$3.31	4.26%			0.00%	64
Whirinaki Crescent stopbank to 2300	7	5	2004-2006	Trentham to Whakatikei [2032-2036]	$0.47	0.60%	Complete	1	0.60%	64
Trentham to Whakatikei stopbank (part)	7	8	after 2010	Trentham to Whakatikei [2032-2036]	$0.71	0.91%			0.00%	64

REACH 8 : Moonshine Bridge to Whakatikei River

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	2.89%	STAGE		0.00%	HRFMP (Page #)
Trentham to Whakatikei (LB) stopbank (part)	8	8	after 2010	Trentham to Whakatikei [2032-2036]	$2.00	2.57%			0.00%	66
Moonshine to Maoribank (LB) channel works (part)	8	10	after 2010	Trentham to Whakatikei [2032-2036]	$0.25	0.32%			0.00%	66

REACH 9 : Whakatikei River to Norbert St. Footbridge

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	8.31%	STAGE		0.00%	HRFMP (Page #)
Totara park stopbanks to 2300	9	10	after 2010	NOT IN AMP	$1.42	1.83%			0.00%	68
Elbow park channel upgrade	9	10	after 2010	NOT IN AMP	$1.41	1.81%			0.00%	68
Whakatikei to Maoribank (LB) stopbank	9	10	after 2010	NOT IN AMP	$0.28	0.36%			0.00%	68
Moonshine to Maoribank channel works (part)	9	10	after 2010	NOT IN AMP	$3.35	4.31%			0.00%	68

REACH 10 : Norbert St. Footbridge to Gemstone Drive

WORK REQUIREMENT	REACH	PRIORITY	DATE 2001 FMP	DATE AMP	COST $M 2001 FMP	2.61%	STAGE		2.45%	HRFMP (Page #)
Norbert Street footbridge to Akatarawa Channel works	10	14	2004-2005	2037-2042	$0.34	0.44%	Complete	1	0.44%	70
Akatarawa Road (LB) floodwall at 1900	10	12	2004-2005	2037-2042	$0.72	0.93%	Complete	1	0.93%	70
Gemstone Drive channel works to 1900	10	12	2005-2006	2037-2042	$0.64	0.82%	Complete	1	0.82%	70
Gemstone Drive (LB) stopbank to 1900	10	12	2005-2006	2037-2042	$0.15	0.19%	Complete	1	0.19%	70
Bridge Road House Raising to 1900	10	7	2003-2007	NOT IN AMP	$0.18	0.23%	Partial Work	0.3	0.07%	70

Attachment 2 to Report 20.275

Waikanae Floodplain Management Plan summary progress table

Updated 29 August 2020

STRUCTURAL IMPLEMENTATION WAIKANAE FMP				COST $M FMP	Target % Complete			Percent Complete to Date
				$3.63	100.00%			63.68%

WORK PLANNED IN FMP	REACH	PRIORITY	DATE AMP	COST $M FMP	100.00%	STAGE	% Complete	63.68%	Waikanae FMP (Page #)
Otaihanga House Raising 1	2			$0.40	11.03%	COMPLETE	1	11.03%	120
Otaihanga Road Raising	2		2027-2028	$0.14	3.86%			0.00%	120
Otaihanga House Raising 2	2			$0.13	3.45%	COMPLETE	1	3.45%	120
Otaihanga Domain Stopbank	2			$0.18	5.07%	COMPLETE	1	5.07%	120
Kauri Puriri Stopbank	3			$0.89	24.66%	COMPLETE	1	24.66%	120
Greenaway Road - Lodge Relocation	2			$0.12	3.42%	COMPLETE	1	3.42%	120
Greenaway Road - Road Raising	2			$0.04	0.99%	COMPLETE	1	0.99%	120
Chillingworth Stopbank	2			$0.23	6.29%	COMPLETE	1	6.29%	120
Jim Cooke Park Stopbank Upgrade	3			$0.14	3.94%	COMPLETE	1	3.94%	119
Jim Cooke Park - Retaining Wall	3			$0.18	4.83%	COMPLETE	1	4.83%	119
Waikanae Beach - Lengthen Fieldway Bridge	0	1	2021-2025	$0.43	11.83%			0.00%	121
Waikanae Beach - Golf Course Stopbank	0	2	2025-2032	$0.72	19.72%			0.00%	121
Jim Cooke Park - Ring Bank Lion Park	2	3	2033-2034	$0.03	0.91%			0.00%	121

***Note** - house raising was excluded from LTP measure for the Waikanae FMP structural measures implemented. House raising is not considered a structural implementation measure.*

Attachment 3 to Report 20.275

Ōtaki Floodplain Management Plan summary progress table

UPDATED 28 August 2020

TOTALS IMPLEMENTATION OTAKI FMP					COST $M FMP	Target % at Completion			Percent Complete to date	
					$6.58	100.00%			46.53%	

REACH 1 : Mouth to SH1

WORK REQUIREMENT	NAME IN LTP BUDGETS	REACH	PRIORITY	DATE AMP	COST $M 1997 FMP	48.04%	STAGE	% Complete	13.58%	Otaki FMP (Page #)
Rangiuru - Floodgates Kapiti Lane		1	IN REVIEW	IN REVIEW	$0.12	1.82%	COMPLETE	1	1.82%	36
North bank stopbank - minor reconstruction	North Stopbank Improvements (Mouth to SH1)	1	IN REVIEW	IN REVIEW	$0.03	0.38%			0.00%	36
North bank stopbank - deferred maintenance	North Stopbank Improvements (Mouth to SH1)	1	IN REVIEW	IN REVIEW	$0.14	2.05%			0.00%	36
Seaward Stopbank Extension - Atkinson Ave		1	IN REVIEW	IN REVIEW	$0.01	0.20%			0.00%	36
Rangiuru House Raising		1	IN REVIEW	IN REVIEW	$0.65	9.82%			0.00%	36
Lethbridge House Raising		1	IN REVIEW	IN REVIEW	$0.05	0.83%			0.00%	36
Southbank stopbank - deferred maintenance	Otaki South Stopbank Land and Otaki South Stopbank Improvements	1	IN REVIEW	IN REVIEW	$0.60	9.17%	COMPLETE	1	9.17%	36
Mangapouri House Raising		1	IN REVIEW	IN REVIEW	$0.32	4.87%			0.00%	36
Mangapouri Stream - Culvert and channel works		1	IN REVIEW	IN REVIEW	$1.07	16.31%			0.00%	36
Katihiku Floodgates		1	IN REVIEW	IN REVIEW	$0.17	2.58%	COMPLETE	1	2.58%	36

REACH 2 : Chrystalls to Gorge

WORK REQUIREMENT		REACH	PRIORITY	DATE AMP	COST $M 1997 FMP	37.10%	STAGE		32.95%	Otaki FMP (Page #)
Chrystalls Stopbank		2	IN REVIEW	IN REVIEW	$0.33	5.03%	COMPLETE	1	5.03%	36
Chrystalls Extended Stopbank		2	IN REVIEW	IN REVIEW	$1.03	15.60%	COMPLETE	1	15.60%	36
Harpers Stopbank		2	IN REVIEW	IN REVIEW	$0.27	4.15%			0.00%	36
Lower Lutz and Upper Hughes Stopbank		2	IN REVIEW	IN REVIEW	$0.81	12.32%	COMPLETE	1	12.32%	36

REACH 3 : Waitohu Stream

WORK REQUIREMENT		REACH	PRIORITY	DATE AMP	COST $M 1997 FMP	14.86%	STAGE	% Complete	0.00%	Otaki FMP (Page #)
South Waitohu - House Raising		3		2018-2034	$0.15	2.26%			0.00%	36
Old Coach Road - bridge raising and deflector stopbanks		3		2018-2021	$0.40	6.02%	In Design		0.00%	36
South Waitohu Stopbank - Tasman Road		3		2022-2030	$0.43	6.58%			0.00%	36

Attachment 4 to Report 20.275

Lower Wairarapa Valley Development Scheme summary work progress table

LWVDS Percent Complete - Aug 2020 (Does not include rebudgets and adjustments for 20/21 FY)																		
Item	Location	Work	Spent to date					Revised Schedule									Forcast	Total
			2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	for 6 yrs	for 11 years
	Reach 1- Tauherenikau River																0	
1		Upgrade of stopbanks	73,580	119,776													0	193,356
2		Rock groynes(Xs 20-21RB)															0	0
3		Boulder groynes (RC - LB)															0	0
4		Boulder groynes (Donald - LB)															0	0
5		Bufferzone planting				47,696											0	47,696
6		Delta Investigation												50,000	50,000		100,000	100,000
	Reach 2- Tributary Rivers																0	
7	Turanganui	Stopbank upgrade							402,000	470,000							872,000	872,000
8	Taunui	Fencing & planting		19,325		2,554											0	21,879
9		Land/stopbank/fencing			446,266			71,500					335,000				406,500	852,766
	Reach 3 - Waiohine to Waihenga																0	
10		Planting			3,520												0	3,520
11		Fencing			1,218												0	1,218
12		Rock/boulder groynes/retards		172,617	180,827	98,600											0	452,044
13		Boulder groynes U/s Shelton						4,500									4,500	4,500
14		Boulder groynes Wildes						35,000									35,000	35,000
15		Boulder groynes Guscott															0	0
		Clumps/boulders Tuckers						60,000		30,000							90,000	90,000
16		Boulder groynes Herricks					14,827										0	14,827
17		Upgrade S/B Kershaw															0	0
		Boulder groynes Handyside							9,000								9,000	9,000
		Boulder groynes Ashton							10,500								10,500	10,500
18		Develop Tawaha Spilway															0	0
	Reach 4 - Waihenga to Tuhitarata																0	
19	A Herrick's – LB	S/b setback 20m	25,500														0	25,500
	Tawaha Spillway Culvert	Culvert upgrade									70,000						70,000	70,000
20	X-sect 126ti 121 – RB – L B Osborne	Remove overburden															0	0
21	X-sect 120 – RB – L B Osborne	Boulder groynes															0	0
22	X-sect 122 – LB – SWDC	Boulder groynes		20,952													0	20,952
	X-sect 119/120 – RB – Alpe	Battering/Boulders						20,000		15,000							35,000	35,000
	X-sect 119 – RB – Alpe	Flood Gate						20,000									20,000	20,000
	X-sect 113/114 – RB – Alpe	W.Cabling/Boulder								50,000							50,000	50,000
23	X-sect 114 to 109 – LB – Colton	Remove overburden															0	0
24	X-sect 113 – RB – B L George	Boulder groynes															0	0
25	X-sect 111 – RB – A J Barton	S/b setback 20m or b/groynes				8,636											0	8,636
26	X-sec 108 - P Smith	Boulder groynes															0	0
27	X-sec 107 to 104 - P Smith	Remove overburden															0	0
28	X-sect 101 – LB - Tim Wall	S/b setback 20m + b/groynes	103,250	75,127		36,172											0	214,549
29	X-sect 100 – LB- Tim Wall	Boulder groynes	60,350														0	60,350
30	X-sect 96 – RB – John Bargh	Boulder groynes	65,000						11,000								11,000	76,000
31	X-sect 94 – RB – Leo Vollebregt	Boulder groynes	51,420														0	51,420
32	X-sect 92 – LB – Tim wall	Boulder groynes	83,950					10,000									10,000	93,950
33	X-sect 87- RB – Morris Edwards	Boulder groynes	81,200														0	81,200
	X-sect86- 87- RB – Wilson	Purchase property									430,000						430,000	430,000
34	X-sect 84 – RB – Owen Butcher	Rock berm (rip rap)	98,750	144,209	21,305												0	264,264
35	X-sect 80 to 81– LB – Bill Herrick	Remove overburden															0	0
36	X-sect 80 to 81– RB – Pahautea Road	Remove overburden															0	0
37	X-sect 74 to 78 - Tobin	S/b setback				481,549	909,574										0	1,391,123
38	X-sect 77 – RB – Florus Bosch	Boulder groynes	130,650														0	130,650
39	X-sect 72 to 75 – LB – Bill Herrick (Pukio)	S/b setback 20m												364,005	323,798	250,000	937,803	937,803
40	X-sect 72 to 68– LB – Bill Herrick	Remove overburden									60,000						60,000	60,000
41	X-sect 82 to 68–RB – G Vollebregt	Remove overburden									40,000						40,000	40,000
42	X-sect 66 – LB – Bill Herrick	Benching/groynes		35,854													0	35,854
43	X-sect 42 – RB – Land Corp	Boulder groynes			31,571												0	31,571
44	X-sect 36 – RB – Parkinson	Benching/groynes		36,168													0	36,168
	Scott Simmonds	Scour protection									95,000	20,000					115,000	115,000
	Ruamahanga	Boulder Protection															0	0
45	Whakawhiriwhiri Stream upgrade	Regrade, remove trees, culverts						55,000	231,000	170,000	120,525	50,000				380,000	1,006,525	1,006,525
	Reach 5 - Tuhitarata to Onoke																0	

LWVDS Percent Complete - Aug 2020 (Does not include rebudgets and adjustments for 20/21 FY)																		
Item	Location	Work	Spent to date					Revised Schedule									Forcast	Total
			2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21	for 6 yrs	for 11 years
46	Ranking 1	Boulder rip rap	101,850	82,640	68,137	57,680	69,045	52,000	92,000	10,000	60,000						214,000	593,352
47	Ranking 3	Planting the slope		1,690	26,813	32,197	18,915	35,000	20,000	7,000		0					62,000	141,615
48	Puals Bank	boulder rip rap					27,691	60,000									60,000	87,691
49	Upgrade stopbanks							21,000									21,000	21,000
	Barrage Control Upgrade										230,000						230,000	230,000
50	Barrage downstream	Remove build up		44,270													0	44,270
		Total cost	**875,500**	**752,628**	**779,657**	**765,084**	**1,040,052**	**444,000**	**775,500**	**752,000**	**1,105,525**	**70,000**	**335,000**	**414,005**	**373,798**	**630,000**	**4,899,828**	**9,112,749**
	% Work Programme for Year		**9.61%**	**8.26%**	**8.56%**	**8.40%**	**11.41%**	**4.87%**	**8.51%**	**8.25%**	**12.13%**	**0.77%**	**3.68%**	**4.54%**	**4.10%**	**6.91%**		**1.00**
	Cumulative % for Work Programme		9.61%	17.87%	26.42%	34.82%	46.23%	51.10%	59.61%	67.87%	80.00%	80.77%	84.44%	88.98%	93.09%	100.00%		

Environment Committee
10 September 2020
Report 20.315

For Information

FLOOD HAZARD MODELLING STANDARD

Te take mō te pūrongo
Purpose

1. To inform the Environment Committee (the Committee) of the development of a Flood Hazard Modelling Standard (FHMS) and inform of the proposed next steps.

Te tāhū kōrero
Background

2. Flooding is a significant hazard in the Wellington Region that poses a risk to both life and property. Many of our communities are considered to be at risk – including urban areas within the Hutt Valley, townships on the Kāpiti Coast, Masterton and Greytown in the Wairarapa and rural areas throughout the Welligton Region. The 2004 flood in the Waiwhetu Stream that caused major flooding to residential properties along Riverside Drive, the Hutt Park raceway and the industrial area in Gracefield is a recent reminder of the damage that flooding can cause.
3. Flood hazard modelling is a critical process carried out by the Flood Protection Department (the Department) to identify areas at risk of flooding. There is currently no standardised process across New Zealand for developing flood hazard mapping.
4. The development and publishing of flood hazard maps can meet resistance from the community. The information presented is perceived by the community to have a negative impact on insurance premiums and property value. This perceived impact, coupled with the lack of national guidelines makes the development of robust and widely accepted flood hazard mapping problematic.
5. In recent years the Department has encountered issues when issuing flood hazard information to the community. Notably in:
   a Pinehaven, where the hydraulic modelling continues to be questioned
   b Waiohine, which led to the creation of the Waiohine Action Group and the subsequent community led River Plan
   c Waipoua, which led to the Waipoua urban flood hazard mapping being withdrawn and a process to redevelop the hazard mapping with the community is currently underway.
6. Flood hazard modelling consists of three key elements: the collection of input data; hydrological modelling (rainfall and runoff characteristics); and hydraulic modelling

routing flow down the channel and across floodplains). The flood hazard modelling outputs are the flood levels and maps that inform district plans, provide the technical basis for the Department's Floodplain Management Plans, and inform civil defence and emergency management actions. This is considered a critical process of the Flood Protection department. Figure 1 provides an overview of the activity flow of the department and indicates the pivotal role flood hazard modelling fulfils.

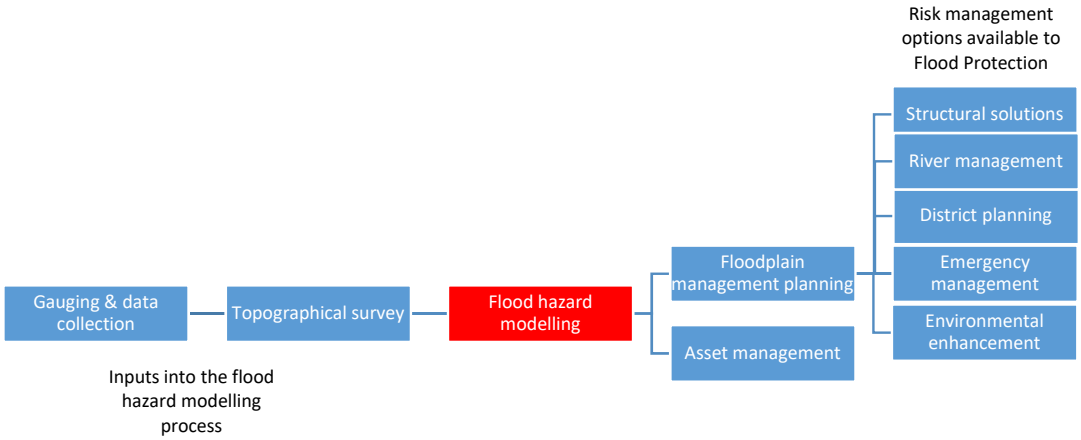


Figure 1- Flood protection activities

7. The accuracy of flood hazard maps is dependent on the availability and accuracy of the data that is used to create them. This data includes topographical survey information, hydrological data from gauges (river flow and rainfall), and high flow gaugings. The flood hazard mapping process therefore relies on data being collected and recorded as accurately as possible.

Te tātaritanga
Analysis

8. In response to these pressures, the Flood Protection department has developed the FHMS (**Attachment 1** – Flood Hazard Modelling Standard) to outline the process to be followed by any person or organisation working on Greater Wellington flood hazard modelling projects. The FHMS process should be followed for flood hazard modelling projects particularly where they lead to District Plan maps.

9. The protocols in the FHMS have been developed to ensure that flood hazard modelling projects are undertaken in a robust and consistent way that is in line with accepted industry practice, while still allowing for flexibility around catchment- or project-specific factors.

10. The FHMS is made up of seven procedures, seven specifications, and a number of templates and supporting documents. The procedures, specifications and templates have the following functions:

    - **Procedure:** a procedure outlines the tasks required to be undertaken within each step of the FHMS process, and describes any technical detail or methodology to be prescribed. A procedure also outlines how the work undertaken at that step of the FHMS process should be documented.
    - **Specification:** a specification is tied to a procedure and forms part of a request for proposal for works to be undertaken by a consultant or contractor. Specifications are typically a brief schedule of requirements with the majority of the technical detail located within the relevant procedure to prevent duplication.
    - **Template:** a number of templates are provided as part of the FHMS process. Each template is tied to a procedure that outlines how these templates should be used. Templates are provided where a consistent format is required to document a process or finding. Templates outline the minimum documentation requirements for these elements. Additional detail should be provided where needed.

11. Figure 2 shows the core components of the FHMS.

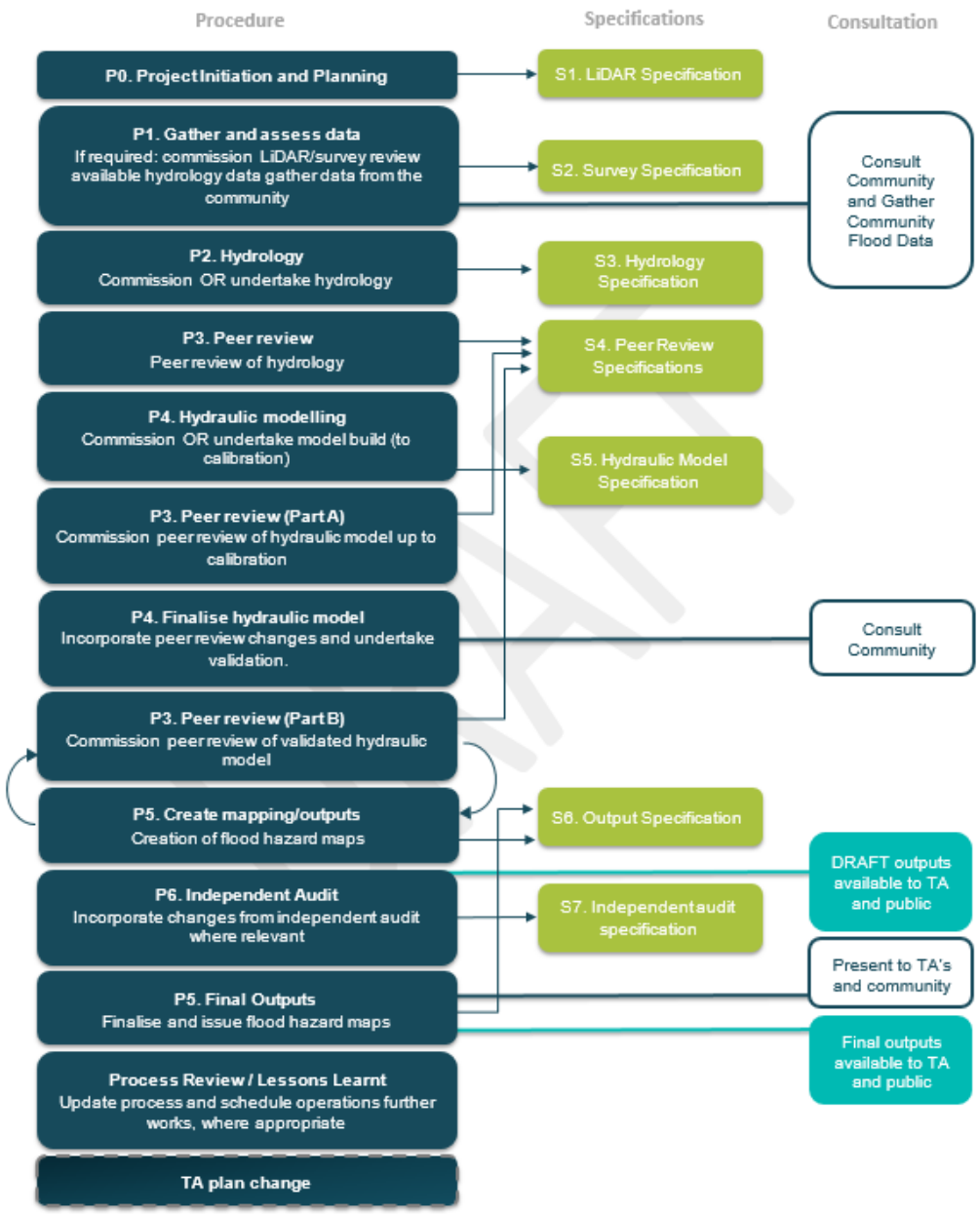


Figure 2 - FHMS process diagram

12. The FHMS has been developed through a series of facilitated workshops which has brought in specialists across the region. . It has brought together internal experience, industry best practice, and lessons learnt on recent projects.

13. The following considerations have been made through the development of the FHMS:

- **Importance of community engagement –** this is identified as crucial to the success of developing flood hazard mapping. The community should be engaged at key points, including the inception of the process to provide important historic flood information to aid model development, and prior to the development of final mapping outputs.
- **Modular –** the FHMS is designed to be modular. This is to provide a tool for Greater Wellington, and others delivering modules on behalf of Greater Wellington, to be able to navigate to the component they require and use it to guide work.
- **Living document –** the FHMS is intended as a living document that can be updated following each project. This allows Greater Wellington the flexibility to learn lessons and adapt our process in response to changes in technology, feedback from suppliers, and feedback from the community.
- **Embedded peer review –** peer reviews have been embedded through the modelling process. This means that the modeller and peer reviewer will be working side by side to identify and rectify issues in the modelling process to reduce the risk of incorrect flood hazard maps being produced.
- **Clear scope expectations –** The FHMS is intended to be used for the procurement of specialist consultants. It is also intended to provide a clear guide of Greater Wellington's expectations for survey, hydrological modelling, hydraulic modelling, peer review and independent audit to improve quality and efficiency throughout the process.
- **Publically available –** It is Greater Wellington's intention to make the FHMS publically available through our website so that territorial authorities (TAs), consultants and the wider community are able to see the process followed by Greater Wellington**.** The Department will also provide support to other regional councils and TAs who wish to use the FHMS for their own modelling processes.

Te whakatūtakitaki
Engagement

14. External engagement to date has been with industry specialists.
15. Officers have engaged with TAs, and Wellington Water Limited on the FHMS concept and they are supportive of our approach.
16. Officers plan, as a next step, to engage with TAs, key stakeholders including the Wairarapa Community project teams and suppliers on the detail in the FHMS and on the link to district planning and stormwater modelling processes. This engagement is planned to take place over the remainder of the 2020/21 financial year. We have appended the draft FHMS to this report as it will be released to our stakeholders as such for initial review and feedback.
17. It is officers' intention for this process to be a living document that can be easiliy updated as we complete projects, learn lessons and receive feedback.

Ngā tūāoma e whai ake nei
Next steps

18. Following adoption of the FHMS, the Department intend to carry out the following actions.

    - Engage with TAs and other partners (including WREMO and Wellington Water Limited) to explore the links between the Greater Wellington flood hazard modelling standard and their own flood hazard modelling processes.
    - Share the FHMS through the Greater Wellington website and with the wider flood protection sector.
    - Test the FHMS on a project in this year's work programme and adapt the FHMS as required. The Investigations, Strategy and Planning team is currently delivering the Hutt River Flood Hazard Model update and is intending to use elements of the FHMS.

Ngā āpitihanga
Attachment

Number	Title
1	Draft Flood Hazard Modelling Standard

Ngā kaiwaitohu
Signatories

Writer	Andy Brown – Team Leader, Investigations Strategy & Planning
Approvers	Graeme Campbell – Manager, Flood Protection Wayne O'Donnell – General Manager, Catchment Management

He whakarāpopoto i ngā huritaonga Summary of considerations
Fit with Council's roles or with Committee's terms of reference The FHMS is a matter for the Environment Committee to consider because it: • Relates to a Flood Protection process that identifies flood hazard; and • Relates to regional resilience and the subsequent delivery of plans, programmes and activities for Flood Protection.
Implications for Māori There are no known implications for Māori.
Contribution to Annual Plan / Long Term Plan / Other key strategies and policies This process supports the delivery of Flood Protection's long term plan activities.
Internal consultation Internal consultation has been conducted with Hydrology and the wider Flood Protection Department. Further engagement will continue in the next stages of the FHMS development.
Risks and impacts - legal / health and safety etc. The risks associated with this project are; - Interface with stormwater modelling and district planning proceses carried out by the Terratorial Authorities. - Terratorial Authorities being supportive of the FHMS.

Attachment 1 to Report 20.315

Flood Hazard Modelling Standard

20 August 2020

Prepared for Greater Wellington Regional Council

Greater Wellington
Te Pane Matua Taiao

Attachment 1 to Report 20.315

Foreword

Attachment 1 to Report 20.315

Table of Contents

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

Flooding is a significant hazard in the Wellington Region that poses a risk to both life and property. A number of communities within the region are considered to be at risk – including urban areas within the Hutt Valley, townships on the Kapiti Coast, Masterton and Greytown in the Wairarapa and rural areas throughout the region. The 2004 flood in the Waiwhetu Stream that caused major flooding to residential properties along Riverside Drive, the Hutt Park raceway and the industrial area in Gracefield is a recent reminder of the damage that flooding can cause.

Flood hazard modelling is considered a crucial activity in understanding flood risk as it provides the basis for investment and emergency management decisions by the GWRC. Flood hazard modelling involves the use of hydrological and hydraulic models to estimate the range of possible floods that could occur in a catchment and the hazard associated with these events. The output produced from flood hazard models is a series of flood hazard maps and tabulated data for each scenario modelled.

Having a good understanding of the flood hazard in an area enables informed decisions to be made about the best ways to manage risk. This may be through managing or reducing the risk to existing development, and future planning decisions such as excluding sensitive land uses (i.e. residential development, hospitals and schools) from higher hazard areas.

1.1 What is the Flood Hazard Modelling Standard?

The GWRC have developed this **Flood Hazard Modelling Standard** (FHMS) to outline the protocols to be followed by any person working on the GWRC's flood hazard modelling projects. The FHMS process should be followed on all new flood hazard modelling projects.

The protocols in the FHMS have been developed to ensure that flood hazard modelling projects are undertaken in a robust and consistent way that is in line with accepted industry practice, while still allowing for flexibility in approach in recognition that the optimal approach may be dependent on catchment or project specific factors. The protocols require that every stage of the process is well documented in reports or spreadsheet logs and registers.

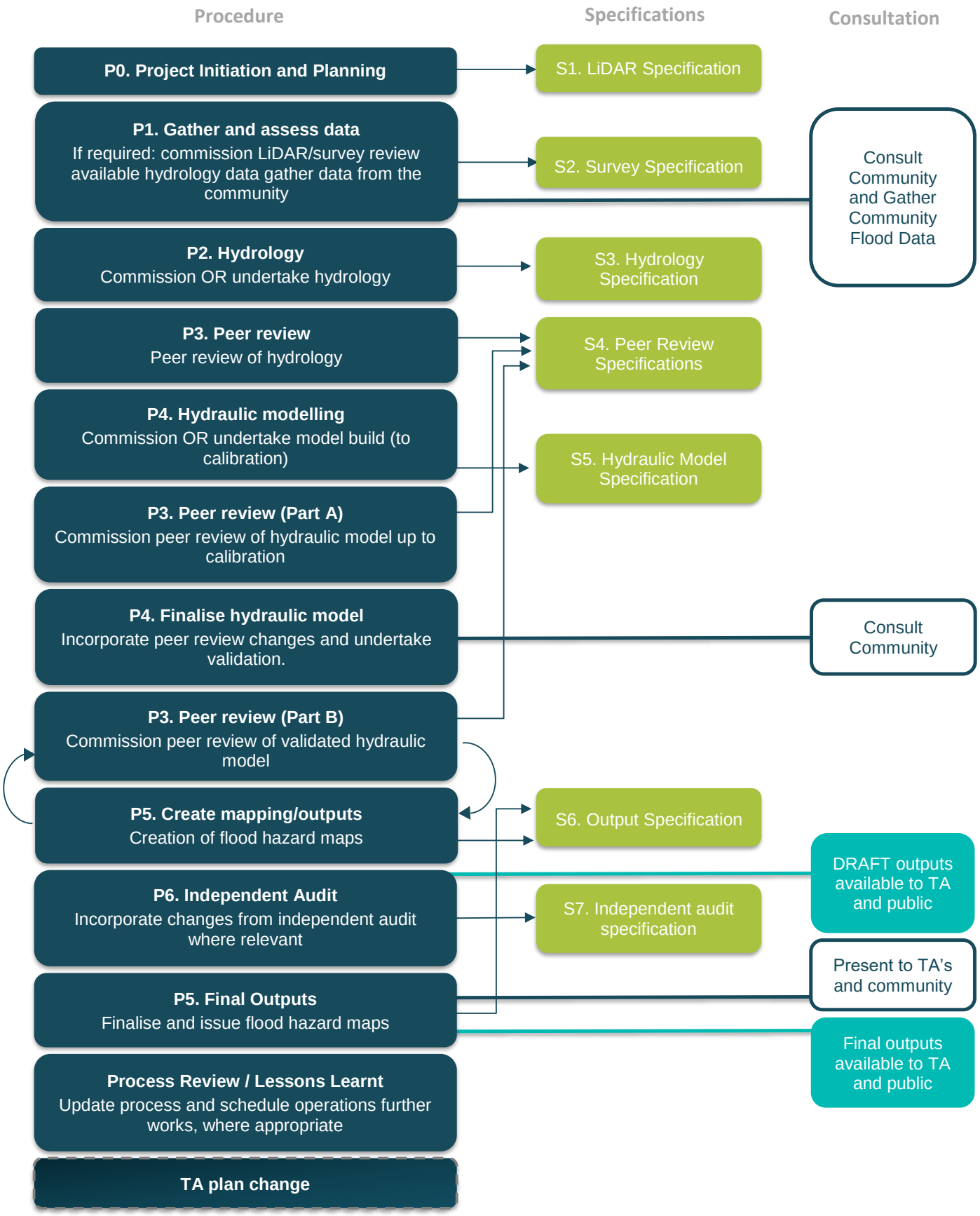
The FHMS is made up of 7 Procedures and 7 Specifications, and a number of templates and supporting documents. The Procedures, Specifications and Templates have the following functions:

- **Procedure:** a Procedure outlines the tasks required to be undertaken within each step of the FHMS process, and describes any technical detail or methodology to be prescribed. The procedure also outlines how the work undertaken at that step of the FHMS process should be documented.
- **Specification:** a Specification is tied to a Procedure and forms part of a request for proposal (RFP) for works to be undertaken by a consultant or contractor. Specifications are typically a brief schedule of requirements with the majority of the technical detail located within the relevant procedure to prevent duplication.
- **Template:** a number of templates are provided as part of the FHMS process. Each template is tied to a Procedure that outlines how these templates should be used. Templates are provided where a consistent format is required to document a process or finding. Templates outline the minimum documentation requirements for these elements. Additional detail should be provided where needed.

The FHMS process is summarised in Figure 1-1 below.

Attachment 1 to Report 20.315

Figure 1-1 FHMS process



Each of the elements of the FHMS process are described below:

- **Procedure 0: Process** – this document. This procedure outlines the flood hazard modelling process, and provides an overview of the protocols to be followed during planning of flood hazard modelling projects.
- **Procedure 1: Gather and Assess Data**. Outlines the process for the collection of all available data to inform model build, calibration and validation. This includes the collection of hydrometric data, topographic and bathymetric data, and information about historical floods. All collected information is to be reviewed to determine its quality, its suitability for inclusion in flood hazard models, and any limitations that the quality of the data may place on the outputs of the FHMS process. The review should also identify whether any further data collection is required.
  - **Data Register**. A spreadsheet template for the data register is provided in Appendix A of Procedure 1. The data register is to be used to record the source and quality of all information gathered and used in the flood hazard model project. The data register will provide an audit trail for the peer reviewer, and assist in ensuring all aspects of the project are documented.
- **Procedure 2: Hydrology**. Outlines the protocols to be followed when undertaking hydrological modelling for flood hazard modelling projects. This includes hydrological model build, calibration, validation, sensitivity analysis and preparation of outputs from the hydrological model for input to the hydraulic model.
  - **Model log template**. A spreadsheet template for recording final model runs including model naming convention, details of all inputs, and calibration and validation runs.
  - **Feedback form**. A form to provide feedback on the GWRC's hydrometric stations to the GWRC's Hydrology team. On completion of both the hydrometric data review undertaken as part of Procedure 1 and the hydrological model (Procedure 2) the modeller is likely to have a good understanding of the quality of the hydrometric data available for the study catchment, the suitability of the distribution of hydrometric stations, and how the quality of the data has impacted on confidence in the hydrological modelling results. The feedback form is used to capture this information and to provide recommendations for improvements to the hydrometric network within the study area for the consideration of the GWRC's Hydrology team.
- **Procedure 3: Peer Review**. Peer review is undertaken at three stages in the FHMS process: on completion of the hydrological model, following build and calibration of the hydraulic model, and following validation, completion of the design runs and sensitivity analysis of the hydraulic model. Procedure 3 outlines the protocols to be followed when undertaking peer review at each of these stages.
  - **Peer review spreadsheet template**. A template is provided to assist the peer reviewer to undertake the peer reviews and to provide an audit trail and clear record of changes to the model during the peer review process. The peer review spreadsheet should be updated by both the peer reviewer and the modeller at each iteration of comments and changes to the model. All peer review comments are to be closed off by the peer reviewer and modeller.
- **Procedure 4: Hydraulics**. This procedure outlines the protocols to be followed when undertaking hydraulic modelling on flood hazard modelling projects. This includes model build, calibration, validation, design runs and sensitivity analysis.
  - **Model log template**. A spreadsheet template for recording final model runs including model naming convention, details of all inputs, and calibration and validation runs.
  - **Example hydraulic modelling report table of contents**. An example table of contents is provided to assist the hydraulic modeller to understand the level of detail to be provided in the hydraulic modelling report.
- **Procedure 5: Outputs**. Outlines the outputs to be prepared and delivered to the GWRC including raster grids of flood level, depth, velocity and hazard for all events run, geospatial files, tabulated results and .pdf maps. The procedure also includes the methodology for the calculation of freeboard.
- **Procedure 6: Independent Audit**. An independent audit is undertaken following close out of the final peer review of the hydraulic modelling. The independent audit reviews the entire FHMS process to confirm whether the process has been followed appropriately.
  - **Audit spreadsheet template**. A spreadsheet template is provided to assist the independent auditor to undertake the audit and to provide a record of recommendations made by the auditor and subsequent changes made. The spreadsheet should be filled in by the independent auditor and the modeller(s). All independent audit comments are to be closed off by the auditor and modeller(s).

A number of specifications have been prepared to assist with the tendering of works associated with Procedures 1 – 6 of the FHMS. These specifications include:

- Specification 1: LiDAR
- Specification 2: Survey
- Specification 3: Hydrology
- Specification 4: Peer Review
- Specification 5: Hydraulic Model
- Specification 6: Outputs
- Specification 7: Independent Audit

1.2 When is flood hazard modelling undertaken?

The GWRC's flood protection team undertake on-going flood management and hazard planning in catchments across the greater Wellington Region. Flood management plans and flood hazard models have been prepared for a number of catchments where there is a history of flooding in urban areas, or where significant flooding has occurred in rural areas or across key transport routes.

Where a flood hazard model has been prepared, it may be revised within 5-10 years of the initial model development. Models are revised over time due to:

- Increased data availability – over time longer rainfall and river flow records become available. These records allow for better estimates of the frequency of large floods and storms, and whether this is changing over time (eg, due to climate change).
- Improved data quality – river flow gauging is undertaken to confirm the relationship between flow and levels measured by automatic river level sensors. Over time, more gauging (particularly high flow gauging) can improve the understanding of this relationship.
- More floods – data from actual floods is used to calibrate and validate flood hazard models. When a new flood occurs, this data can be used to test or improve a current model, or may be a trigger for the creation of a new model.
- Catchment changes – over time catchments experience changes to land use, natural and human processes cause changes to river geomorphology (eg, bed aggradation or degradation), and structures are constructed in rivers and floodplains. These changes may affect the validity of previous models.
- Technological changes – technology is continually developing. When new methods of data collection become available or the technology in hydrological and hydraulic models improves existing models may become out of date.
- Changes to industry accepted practice – like all scientific methods, the methods used to estimate rainfall and floods are continually improving. When industry accepted practice changes, existing models should be reviewed to determine whether revision is needed.

1.3 Community engagement

The GWRC recognise the importance and value of the community's knowledge and experiences of flooding in their area. Consultation, and in some cases collaboration, will be undertaken in an effort to develop the most accurate flood information. Community consultation is undertaken at a minimum of three stages in the FHMS process as shown in Figure 1-1. Additional consultation can be undertaken if required. The minimum consultation stages include:

- In the initial stages of the FHMS process under **Procedure 1: Gather and Assess Data**. At this stage the community should be notified that flood hazard modelling is being undertaken in their community. Information about historic flood events should also be sought from the community to help inform calibration and validation of the hydraulic model. The protocols for gathering this information from the public are outlined in Procedure 1.

- The community should be consulted when finalising the hydraulic model, after the initial (Part A) peer review. The purpose of this consultation is to update the community on the progress to date, the process that has been undertaken and the next steps.
- The community should also be consulted at the end of the project following the independent audit and preparation of the final outputs. The purpose of this consultation is to show the community and explain the results of the flood hazard modelling, and to explain the independent auditors' findings and recommendations.

The FHMS does not provide protocols on how community engagement is to undertaken, other than for the collection of historical flood information from the community. All community consultation should be undertaken in conjunction with the GWRC and in line with their protocols and policy.

1.4 Event frequency descriptor

The FHMS uses the percentage Annual Exceedance Probability (% AEP) terminology as the descriptor for the frequency of flood events. This terminology is preferred over the Average Recurrence Interval (ARI) terminology which can be misinterpreted by the community as an event that will only occur every given number of years, rather than the probability of occurrence in any given year. The AEP terminology and how this equates to ARI is outlined in Table 1-1 below. Modellers and reviewers undertaking work under the FHMS should maintain consistency and reference event frequency using the AEP terminology.

Table 1-1 Event frequency terminology

Frequency	AEP	ARI
Very frequent	39% AEP	1 in 2-year ARI
Frequent	20% AEP	1 in 5-year ARI
	10% AEP	1 in 10-year ARI
Rare	5% AEP	1 in 20-year ARI
	2% AEP	1 in 50-year ARI
	1% AEP	1 in 100-year ARI
Very rare	0.1% AEP	1 in 1000-year ARI

2 Project Planning

Each flood hazard modelling project will be managed by a GWRC staff member as project manager. The project manager will develop a project plan during the project initiation to outline the objectives of the project, project background, key tasks and programme. The project plan should include the following elements:

- Outline of the objectives of the study. Flood hazard modelling projects should generally aim to understand the flood extent, hazard and behaviour that may affect the study area for a range of current, future climate and residual hazard scenarios. The outputs will generally need to be prepared to a sufficient level of detail and quality in order to inform district planning and emergency management.
- Project team structure including project manager, internal team members and identification of which tasks will be undertaken by third parties (i.e. consultants).
- Definition of the extent of the study area, including approximate extents for the hydrological and hydraulic models.

- Background to the project including a summary of any previous work undertaken within the study area including previous modelling. The summary should include any discussions the GWRC has had with the community or territorial authority related to flood hazard in the study area.
- Identification of linkages or dependencies with other GWRC or external projects (i.e. Wellington Water or territory authority projects).
- Any proposed departures from the FHMS and justification for this.
- Any project specific tasks or runs to be undertaken, additional to the FHMS requirements.
- Identification of key stakeholders including the relevant territorial authority.
- Outline of the community engagement approach, noting minimum requirements of the FHMS. The media/communications approach should also be outlined for potentially controversial projects.
- Plan for procurement of FHMS tasks (i.e. direct appoint, closed contest or open tender).
- Budget allocated to the FHMS project and breakdown of budget for each key task.
- Programme addressing all steps in the FHMS project, and allowing time for reiterations of the modelling following peer review and independent audit. Key milestones should be identified.
- Method for reporting (i.e. monthly progress reports). Detail of how consultants will report to the GWRC project manager.
- The location where all project information including communication (emails) will be stored.
- A register of potential risks and how these are proposed to be managed. An example risk register is provided in Table 2-1.

Table 2-1 Example risk table

Risk Category	What can go wrong?	Likelihood (H/M/L)	Mitigation
Quality	Quality of deliverables is poor	Low	Selection of experienced consultant, with track record of producing high quality work. Provide sufficient time to undertake work.
Time	Project delivered late	Medium	On-going communication with consultants to identify and address issues early. Ensure timeframes at start of project are realistic.
Community dis-satisfaction	Community unhappy with results	Medium	Early and on-going community engagement. Ensure transparency of process and decision making. Independent audit.

The project plan should be updated as the project evolves, with all key decisions recorded.

2.2 Procurement approach

As outlined in Section 1.1 the flood hazard modelling process requires a multi-disciplinary approach incorporating surveying and data capture, hydrological and hydraulic modelling, independent peer review and audit, and mapping of final outputs. It is envisaged that a team of internal and external specialists will be required to complete these works.

The following specialists are likely to be procured for FHMS projects, however it is noted that some works may be undertaken in house on some FHMS projects:

- Procedure 1: Gather and Assess Data – surveyor, hydrological modeller, hydraulic modeller.
- Procedure 2: Hydrology – hydrological modeller.
- Procedure 3: Peer review – peer reviewer (expertise in hydrological and/or hydraulic modelling as applicable).

- Procedure 4: Hydraulics – hydraulic modeller.
- Procedure 5: Outputs – hydraulic modeller.
- Procedure 6: Independent Audit – auditor (expertise in hydrological modelling, hydraulic modelling and/or auditing).

2.3 Process review/lessons learnt

The FHMS is intended to be a living document. As such, the final step in the FHMS process is to undertake a review of both the flood hazard modelling project and the FHMS process to determine whether any improvements can be made to the process.

The review should address:

- Whether the FHMS addresses all steps in the flood hazard modelling process?
- Whether the FHMS was flexible enough to cover catchment/watercourse specific factors?
- Whether the requirements in the FHMS were clear enough?
- Whether there were any items that are listed in the FHMS for discussion or workshopping with the GWRC that could be formalised in a procedure for implementation in future FHMS projects?
- Whether the specifications were clear enough to the bidders (i.e. were the proposals received consistent enough for comparison? Did tenderers ask questions seeking clarification of the process?)
- Whether enough community engagement is included in the FHMS?
- Whether any issues with the FHMS process were raised by the peer reviewer or independent auditor?
- Whether the order of tasks in the FHMS flow chart is appropriate?
- Any issues that arose during the project, and whether they could they be addressed by the FHMS?
- Any changes to accepted industry practice since the FHMS was prepared, and whether the FHMS needs to be updated.
- Any changes to the GWRC's policy or preferences eg, use of new modelling software or new modelling approach that should be included in the FHMS.
- Whether the territorial authority or community provided any feedback that should be incorporated into the FHMS.

Proposed changes to the FHMS should be discussed and agreed with the GWRC's flood protection investigations team prior to updating the FHMS.

3 Documentation

All steps in the FHMS must be fully documented. This will ensure an audit trail for the peer reviewer and independent auditor. It will also ensure that the process is transparent, and that the modelling can be replicated if needed.

The required documentation is summarised in Table 3-1, and provided in more detail in each of the procedures. Documentation must be provided in report and spreadsheet format.

Table 3-1 Required documentation

FHMS step	Required documentation
Procedure 1: Gather and Assess Data	▪ Data register ▪ Summary of data review in hydrological modelling report and hydraulic modelling report as relevant to each.
Procedure 2: Hydrology	▪ Hydrological modelling report ▪ Model log ▪ Hydrometric feedback form
Procedure 3: Peer review	▪ Peer review spreadsheet – hydrology, Part A hydraulic model and Part B hydraulic model ▪ Peer review report - hydrology, Part A hydraulic model and Part B hydraulic model
Procedure 4: Hydraulics	▪ Hydraulic modelling report ▪ Model log
Procedure 5: Outputs	▪ Methodologies used described in hydraulic modelling report
Procedure 6: Independent audit	▪ Independent audit spreadsheet ▪ Independent audit report

All model files and the required outputs listed in **Procedure 5: Outputs** must also be provided.

4 Procedure review

This procedure is intended to be a living document that can be revised as technology advances and best-practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the ‘process review / lessons learnt’ checkpoint on the FHMS flow chart.

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 1** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person gathering and assessing data for GWRC flood hazard modelling projects.

This document should be read in the context of the wider FHMS. It has a particular relationship to **Specification 1: LiDAR** and **Specification 2: Survey**.

1.1 Data collection and assessment in the FHMS Process

Confidence in flood hazard model results is significantly improved where high quality input and calibration data is available. A comprehensive process of data collection, and the assessment of the quality of collected data, are important for ensuring that all flood hazard models are built and calibrated using all available reliable information.

Data collection should be undertaken prior to commencing modelling to prevent delays and re-work associated with discovering new information after modelling has commenced. The assessment of the quality of the data should also be undertaken at this stage to ensure that any limitations of the gathered data are understood prior to undertaking the modelling.

As such, the collection and assessment of all available data is the first step in the Flood Hazard Modelling process. The stages of the FHMS process that are related to the gathering and assessment of data for flood hazard modelling projects are outlined in red in Figure 1-1 below.

1.2 What types of information should be collected?

Data collection efforts should focus on the collection of:

- **Hydrometric data.** For example, flow and rainfall data in the study area, and details of conditions that may have affected hydrometric records and quality of the data collection (eg, stream bed aggradation, date of most recent gauging, recorded rainfall aligning with check gauge).
- **Catchment data.** For example, land use data, current and historical aerial photography, records of changes in the catchment that may invalidate historical evidence in a current scenario model validation (eg, new bridges, construction of flood protection structures).
- **Historical flooding information.** For example, community recollections, photographs, flood marks on structures, flood records, newspaper or social media articles, details of conditions that may have affected flood extent and behaviour and flood incident reports.
- **Topographic and Bathymetric data**. For example, survey of river cross sections, and LiDAR of the catchment.
- **Details of structures**. For example, survey of structures within the river channel or floodplain that may affect flood levels and behaviour.

The types of data to be collected are described in more detail in the following sections. Following collection, the quality of the data must be assessed to determine:

- Whether the collected data is suitable for inclusion in the flood hazard modelling.
- What level of confidence can be applied to the collected data.
- Whether the quality of the data, or lack of data, is likely to result in limitations being placed on the use of the final model results.
- Whether additional data should be collected prior to commencing the modelling. For example, additional survey.

1.3 Why is it important to gather information from the community?

Local communities, particularly residents who have lived in the study area for a long time, may hold historic flood information that is unknown to the GWRC. This information may be in the form of photographs, recollections, flood

marks on buildings or other private structures, or records of damage or disruption. Access to this information could assist with calibration and/or validation of flood hazard models.

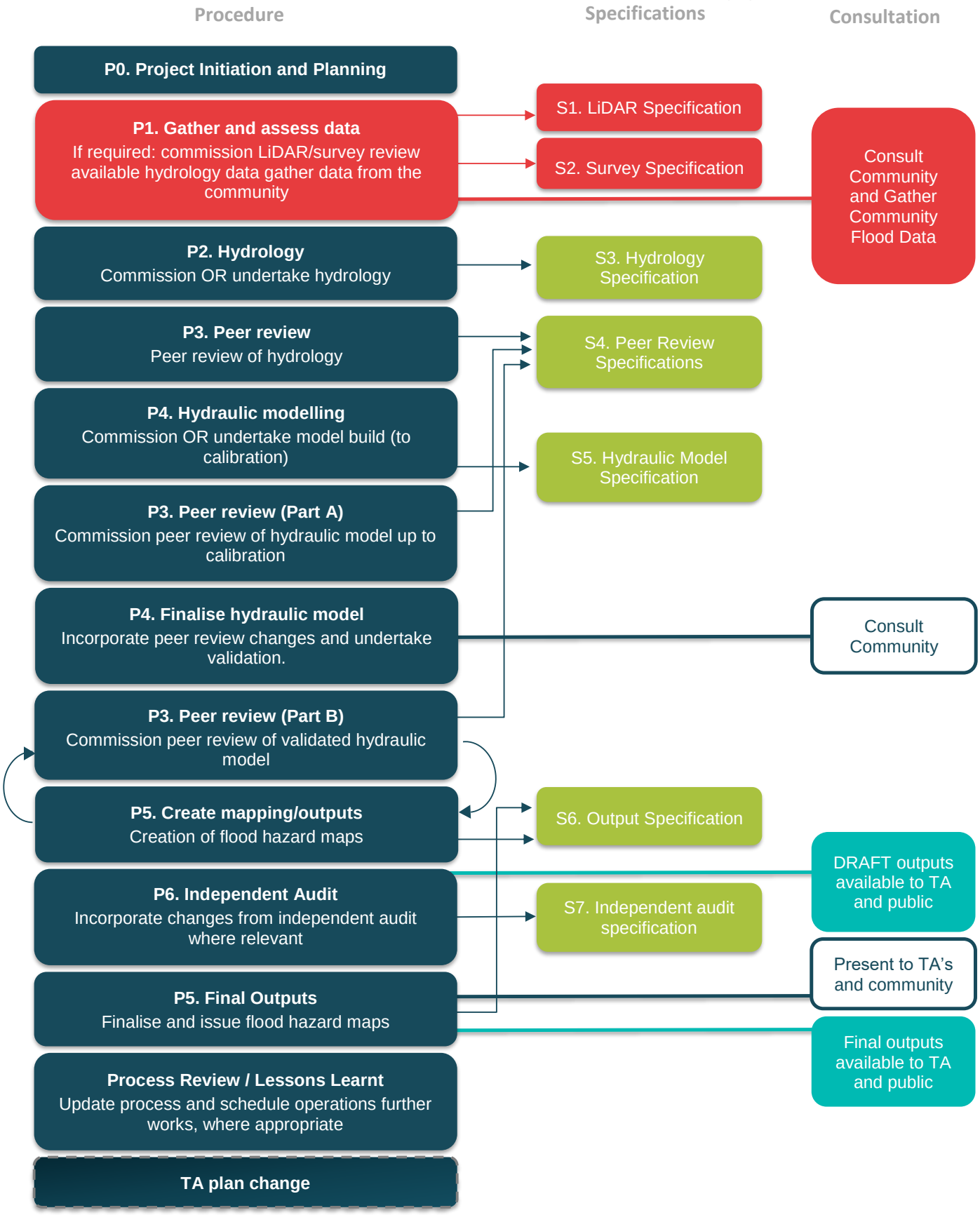
Collection of historic flood information from communities may also assist with community engagement in the flood hazard modelling process, and may increase community confidence in the final model results.

1.4 Who undertakes data gathering and assessment?

Initial data gathering and review should be undertaken by the hydrological and hydraulic modellers undertaking the flood hazard modelling, where the modellers collect and assess the information relevant to their component of the modelling. For example, the project hydrologist would gather and assess rainfall and flow data prior to commencing the hydrological model, while the hydraulic modeller would be required to gather and review data relating to structures in the river channel, and any existing survey cross-sections.

The GWRC may assist with data collection through the provision of data, records and technical reports and will lead any community consultation and data gathering required.

Figure 1-3 FHMS process showing stages where gathering and assessment of data is undertaken (red)



2 Hydrometric Data

The GWRC holds a significant volume of hydrometric data across a number of locations in the Wellington Region. This data includes rainfall, water level in rivers, streams, lakes, and known floodways, and flow in some rivers and streams. This hydrometric data is publicly available through the GWRC's Hilltop database.

Hydrometric data may also be available from sources external to the GWRC such as NIWA (i.e. via the Cliflo database), MetService, forestry or Fire Service gauges, or private gauges.

At the majority of the GWRC's hydrometric monitoring sites, hydrometric data is supported by comment files and in some cases, technical reports. These documents provide additional information relating to the history of the site. This information may include details of known issues or constraints to the collection of accurate data at the site, details of site conditions that may affect the validity of the rating curve for specific events (such as large volumes of scour of the riverbed during a flood event), and details of the types of recording equipment installed at the site over its history.

The GWRC's hydrometric data and the associated site information can be provided by the GWRC Hydrology team and is critical to understanding the limitations of the data (if any).

2.1 Data collection

The GWRC maintains a geospatial database of the locations of all existing and closed hydrometric stations it operates, or has operated within the Wellington Region. This database should be reviewed to identify existing and closed hydrometric sites located within or near to the study catchment. The availability of hydrometric data from other sources should also be investigated.

Stations outside the catchment should be included in the analysis based on the professional judgement of the modeller, based on factors such as presence or absence of data within the study catchment, distance of the sites from the study catchment, catchment similarities and geographic orientation to weather systems.

The GWRC's data can be collected by requesting data for the identified sites from the GWRC Hydrology team. The Hydrology team should be provided with the project background to ensure that all relevant data can be collected.

The minimum requirements for the collection of hydrometric data (where available) is listed in Table 2-1 below.

Table 2-1 Minimum requirements for hydrometric data gathering

Data type	Data to be collected (where available)	Who to contact for data request
River level and flow	Locations of all existing and historical gauges within the GWRC and external networks, complete record of gauge data for current and historical gauges within the catchment, history of the gauges, comments files, confidence limits, rating curve and gaugings. Flood flows from historical events (pre-gauge) should also be collected.	The GWRC Hydrology team External data sources (eg, NIWA, MetService)
Rainfall	Locations of all existing and historical GWRC and external gauges within the network, complete record of the rainfall data for current and historical gauges within and near to the study catchment, history of the gauges, comments files, and confidence limits.	The GWRC Hydrology team External data sources (eg, NIWA, MetService)
Known watercourse information	Information on the watercourse conditions that may affect hydrometric data i.e. bed degrading.	The GWRC Hydrology and Flood protection teams
Technical reports	GWRC technical reports relating to hydrometric data in the region, eg, • Flow gauge network review (Cardno, 2020)	The GWRC Hydrology and

	• Hydrological statistics for surface water monitoring sites in the Wellington Region (GWRC, 2016) • Ratings and gauging priority assessment (GWRC, 2015) • Hydrology network review (GWRC, 2015) External technical reports (eg, NIWA, Ministry of Works and Development)	Flood protection teams External data sources (eg, NIWA, Ministry of Works and Development)

2.2 Assessment of hydrometric data

Collected hydrometric data should be reviewed and analysed in order to determine the suitability of the data for inclusion in flood hazard modelling. This assessment should include a determination of whether the quality of the data is likely to limit confidence in the model results.

Where appropriate, the assessment of hydrometric data should include, but is not limited to:

- Rainfall sites:
  - Assessment of the appropriateness of the gauge sites in relation to the catchment.
  - Review of the completeness of the hydrometric record, including length of record, and number and length of gaps.
  - Consideration of whether there is sufficient data to determine a temporal pattern of rainfall.
  - Consideration of whether there is more than one dominant synoptic pattern that generates flooding in the catchment, for example frontal systems vs. tropical lows.
  - Review of rain gauge comment files and notes on data quality, and assessment of the level of confidence in the rainfall data.
  - Comparison of rainfall frequency data to HIRDS, where rainfall record lengths are less than half the maximum recurrence interval to be modelled.
  - Patching of rainfall records where needed. Patched data should be supplied to the GWRC for their records.
  - Consideration of whether the recorded rainfall data is likely to have been impacted by snow.
- Water level and flow sites:
  - Review of rating curve and gaugings, particularly during high-flow events and assessment of the confidence in the high flow portion of the rating curve.
  - Review of gauge control conditions, eg, is the control stable, and how does this affect confidence in the data.
  - Review of any limitations or issues associated with the use of the flow data for calibration and validation.
  - Review of the suitability of the data for frequency analysis, including the length of the record relative to the largest recurrence interval to be modelled.
  - Confirm whether the gauge is likely affected by tides or backwater.
  - Confirm the bankfull level at the gauge, and whether flows above the bankfull level are realistic?
  - Confirm whether the data quality is similar throughout the record, or whether there are events that affect this eg, change of recording equipment, installation or wash-out of a weir.

It is noted that flow data recorded before the 1970s should be treated with caution due to the limitations of the data collection methods at the time. The GWRC's statistics for flow sites are calculated from the mid-70s onwards.

3 Catchment Information

Catchment information is an important input to both hydrological and hydraulic modelling. Catchment information may include:

- Details of current land use, and historical land use changes. Details of future (planned) land use changes may also be of interest, such as where large-scale urban development is planned for the catchment, or land use changes permitted under district plan zones. This information may be obtained from a range of sources such as current and historical aerial photography, catchment reports, and GIS datasets.
- Details of structures located on the watercourse being modelled such as bridges, culverts and flood protection structures (i.e. stopbanks), the design standards for these structures, and when they were built relative to historic floods.
- Historic river channel information and details of modifications to stream banks, i.e. erosion protection works.
- Geological information, to assist with understanding of infiltration and runoff rates.
- Previous modelling and associated technical reports.

It is noted that the collection and review of survey and LiDAR data is discussed in Section 5. The minimum requirements for the collection of catchment data (where available) is listed in Table 3-1 below.

Table 3-1 Minimum requirements for gathering catchment data

Data type	Data to be collected (where available)
Aerial photography	Current and historical aerial photography showing catchment land use
Technical reports	Catchment studies or watercourse studies
Land use	Geospatial datasets of land use, records of land use change
Buildings	Geospatial dataset of buildings within the catchment that may affect flow paths
River structures	Records of bridges, stopbanks or other flood control structures etc. Data verifying losses across structures, where available.

It is noted that the GWRC's Guide to Flood Protection Advisory Responses may assist with locating catchment specific flood information.

The quality of all gathered catchment information, and the applicability of the data to the required model scenarios should be assessed.

4 Historic Flood Data

Historic flood information is required for calibration and validation of flood hazard models. Historic flood information can be gathered from both the GWRC and public records, and the private records of the community.

The minimum requirements for the collection of historic flood information from the GWRC and public records is listed in Table 4-1.

Table 4-1 Minimum requirements for collection of historic flood data from the GWRC and public records

Data type	Data to be collected (where available)
Photography	Photographs of previous flooding. It is noted historical flood photography and levels can be found on the GWRC's Flood Protection WebApp on the GWRC website.

Technical reports	Previous flood studies and modelling reports.
Flood records	Recorded levels, incident reports, flood marks, damage reports, newspaper articles, CCTV footage, TV news footage.

The quality of the collected data should be assessed, including:

- Whether photographs have been time and date stamped, and if not, whether the timing can be verified.
- Whether the location and direction that the photos were taken from is clear, and correct.
- The source of historic level data and how this was measured i.e. was the level surveyed?
- Whether the recorded flood extents and levels may have been affected by other factors, such as blockage.

4.2 Community Data

The community, in particular residents who have lived in an area for a long time, may have information about historical floods that is unknown to the GWRC, and could be useful for model validation.

In accordance with the FHMS flow chart in Figure 1-1, community consultation should be undertaken at a number of stages within the FHMS process. The first consultation session should be commenced early in the process to enable the collection of community flood information to inform flood hazard model validation.

4.2.1 Role of the Territorial Authority

The local Territorial Authority (TA) should be consulted prior to undertaking community consultation. The role of the TA in the on-going community consultation associated with the flood hazard modelling project should be agreed during this consultation, noting that different levels of involvement are preferred at different TAs.

The TA may also have information on consultation methods that have been found to be effective or ineffective within their local government area.

4.2.2 Notifying the community of upcoming consultation and data collection

Effective communication of upcoming consultation and data collection is required to ensure that:

- The community is aware that consultation relating to flood hazard modelling that may affect their community is being undertaken.
- The community is aware of when and where this consultation will happen.
- The community has sufficient notice of the consultation to enable them to make arrangements to attend.
- The community is aware that the consultation involves the gathering of historic flood information from the community, why this type of information is being gathered, and types of information they should bring to the session.

Notification of the consultation and data collection should be undertaken by methods that are targeted to the demographics of the community. Methods could include:

- Letter drop in mailboxes. Previous GWRC experience indicates that personal letters can be more effective than flyers which could be mistaken for advertising.
- Notices in public areas, such as the local library.
- Notices in the local newspaper.
- Posts on social media. It is noted that sponsored posts may reach a larger audience.

Methods that are correctly targeted to the demographics of the community are likely to be more effective. For example, a notice in the local newspaper or letter drops may be most effective in communities with a high proportion of older people, whereas social media may be more effective in younger communities. A range of methods could be applied to capture the entire demographic.

4.2.3 Gathering Data

Data may be gathered from the community via a number of avenues including:

- In person drop-in sessions – these sessions can be used to tell the community about the flood hazard modelling project and seek community flood knowledge.
- Community walk-arounds – a walkover of a property previously affected by flooding with the landowner.
- Website – a form or hub could be set up on the GWRC website for people to upload photos and flood information.
- Email address – an email address could be provided for community members to send their flood information to.

Where in-person sessions are held, it is important that the hydraulic modeller attends to ensure that details of reported flood events are correctly captured.

4.2.3.1 Drop-in sessions

Drop-in sessions can be used to obtain flood information from the community and to share information about the flood hazard modelling project. The benefits of this in-person approach include the opportunity for both sides to ask questions, reducing the likelihood of misunderstanding.

During these sessions, the GWRC should provide the following information:

- Description of the flood hazard modelling work being undertaken by the GWRC.
- What the process for flood hazard modelling is (i.e. this FHMS process), and how seeking historic flood information from the community fits in.
- What types of flood information are sought from the community.
- When the next consultation session will be.

The format of drop in sessions should be determined on a project by project basis, suited to the demographics of the particular community. Some options include:

- Running a presentation on a regular basis throughout the session (i.e. every 15 minutes).
- Displaying visual aids, such as newspaper articles of flood events to help jog memories, and previous flood maps as a starting point for discussion.
- Printing a large map of the study area to allow members of the community to identify previous flood locations, and tell the story of the event. The contact details of each contributor should be recorded to allow for clarification at a later date, if needed.

Attendees should be encouraged to bring materials such as photos to the drop in sessions to confirm and clarify flood locations and behaviour. Previous GWRC experience indicates that it is more difficult to obtain photos after the session.

4.2.3.2 Community walk-arounds

Where significant flooding has occurred on a property, a walk-over with the landowner can be used to observe and map where flooding occurred during both large and regular flood events. During the walk around the landowner should be asked about flood depth, locations of ponding and flow, and factors that may have affected flooding such as blockage of structures.

4.3 Types of data

The types of data that can be collected from the community are outlined in Table 4-2.

Table 4-2 Data to be collected from the community

Data type	Data to be collected (where available)
Photography	Photographs of recent and historical flooding, including where the river has not broken its bank. Photos that are time and date stamped and where the location and direction the photo is taken is known are preferred where available.

Marks on structures	Locations of marks on buildings or private structures indicating the level that flood waters reached, and the date the flooding occurred.
Recollections	Information on flood depth, information on flood behaviour such as areas of ponding and flow, timing (eg, this area floods first), information on structures that blocked, and events that may have affected flood behaviour eg, sandbagging. Any changes in flood behaviour due to changes in the river morphology. Members of the community may also share information about how they were impacted by flooding (such as which roads became blocked) which may help to tell the story of the flood event and assist with calibration.

4.4 Quality Control

The quality of the data gathered from the community should be assessed to confirm its likely accuracy. A number of approaches can be applied, such as:

- Community members can be asked to 'self-rate' their level of confidence in the information they have provided.
- Comparison to hard evidence such as photos.
- Comparison to recollections from other members of the community, to identify contradictions.
- Modellers estimate of reliability based on modelling results and hard evidence.

It is noted that inconsistencies in the information provided by community members may be a result of a communication error. Where contact details are provided during the collection of the information, the community member should be contacted to clarify or confirm understanding of the information. Other inconsistencies may be the result of a localised intense rainfall burst, blockage, or flooding caused by other factors such as a surcharged manhole. The information should be noted; however the modeller may choose not to incorporate it into the model validation.

4.5 New flood information

If a flood occurs during the flood hazard modelling process, then further collection of information from the community should be undertaken.

The GWRC may encourage members of the community to take photographs of flooding during the event if it is safe to do so.

Flood information may also be captured from social media and the news media during a flood event.

5 Topographic and Bathymetric Data

Spatial data, such as catchment topographic data and river bathymetry is a key input to flood hazard models. As these data define the river channel, top of bank elevations and floodplain morphology within the model, inaccuracies can have a significant impact on model results, including inaccuracies in the location, extent and depth of flooding.

As such, it is important that all available topographic and bathymetric data is gathered prior to commencing modelling, and that this data is thoroughly assessed to determine its quality and limitations. Where this assessment determines that additional data collection (i.e. further survey) is required then this should be undertaken prior to the commencement of modelling, where possible.

5.1 Data Collection – existing data

A review of existing data availability should be undertaken prior to the commencement of flood hazard modelling. The types of spatial data that should be collected to support flood hazard modelling are summarised in Table 5-1 below.

Table 5-1 Spatial data to be collected

Data type	Data to be collected (where available)
Catchment and floodplain topography	Digital elevation model of the catchment and/or floodplain. The model should exclude surface features such as buildings and vegetation.
Channel topography and bathymetry	Surveyed cross-sections at regular intervals along the river channel and major tributaries.

This information may be available from the GWRC and/or territorial authorities. These data types are described in more detail in the sections below.

5.1.2 Digital elevation model

A digital elevation model (DEM) is a 3D model of the elevation of a portion of the earth's surface. It may be created from topographic survey, photogrammetry or LiDAR data. In flood hazard modelling, a DEM may be used to inform inputs to hydrological modelling (i.e. catchment slope), to define the bank and floodplain elevations in a 1D-2D linked model or 2D hydraulic model, or to map the flood extents resulting from channel overtopping in a 1D hydraulic model.

When used for flood hazard modelling, it is important that surface features such as vegetation has been filtered out of the DEM such that the 3D-surface represented is the true ground surface. Insufficient filtering of dense vegetation or other surface features may result in an incorrect representation of flood extents and/or behaviour.

5.1.3 River channel survey

Cross-sectional surveys of river channels are used in hydraulic modelling to provide a representation of the river channel shape and volume at the cross-section location, and an interpolation of channel shape and volume between cross-sections. River cross-section surveys typically include river bank and bed levels, including levels below the water surface.

5.2 Assessment of data quality

The quality of available topographic and bathymetric data should be assessed to determine:

- Whether the data is of sufficient quality for inclusion in flood hazard modelling, given the purpose of the study (i.e. detailed study, or catchment wide model). The required data quality may vary throughout the catchment, for example a higher data quality may be required where a river passes through urban areas or there is a risk of flow breaking out of the channel compared to flow through confined gorges or catchment headwaters.
- Whether there are any gaps in the available data (i.e. is topographic data available for the whole catchment? Have cross-sections been surveyed at key tributaries?)
- The age of the data and whether it is still appropriate for use in modelling i.e. has there been channel aggradation or degradation since the data was collected?
- What limitations the quality of the existing data may place on the model results.
- Whether any additional data capture (survey or LiDAR) is required.

5.2.1 Digital Elevation Model

The quality assessment of the DEM should include (but is not limited to) a review of:

- Whether a DEM is available (or needed) for the entire study area.
- Whether unusual shapes are present in the DEM that may indicate insufficient filtering of structures and vegetation. For example, where a row of houses has not been sufficiently filtered out of a DEM a series of cone shapes may be apparent. This originates from the original data capture detecting true ground elevations around individual houses, while also detecting points on the roof of the house, which is interpolated as a cone or other raised shape.

Bridges may also be represented in a DEM by higher elevation within the river channel.

  - If the filtering undertaken is insufficient, the original cloud point data should be sourced for re-processing of the DEM, if possible.
  - The DEM may need to be edited to appropriately represent flow paths such as under bridges, tunnels and verandas/walkthroughs.

- Comparison of the DEM to other available topographic data, such as survey. For example, comparison of top of bank elevations between surveyed river cross sections and the DEM.
- Assessment of whether the spatial resolution is sufficiently fine for input into the hydraulic model. Note that the acceptable spatial resolution may vary across the catchment.
- Assessment of whether the vertical resolution of the DEM is suitable for the application.
- The age of the dataset, and whether works have been undertaken in the catchment since the data was captured (eg, new development) or whether features in the catchment may have been affected by natural processes such as stopbank subsidence, severe river erosion, or land shifting due to large earthquakes etc.

If the assessment determines that additional data collection is required, the data capture area and the required spatial and vertical resolutions should be determined and reported to the GWRC.

5.2.2 River channel cross-sections

It is noted that river cross-sections are available for the majority of the major rivers within the Wellington Region. In gravel bed rivers, surveys are undertaken on a regular schedule as part of gravel extraction works that are undertaken for flood management.

The quality assessment of river channel cross-sections should include (but is not limited to) a review of:

- Whether the spacing between cross-sections is sufficient, or whether more cross-sections need to be captured.
- Whether cross-sections for any tributaries are available or needed.
- Whether the length of the cross-sections is sufficient (i.e. do the cross-sections extend to the top of bank? Is information needed beyond top of bank?).
- Whether the spacing of collection points across the section are sufficiently dense.
- Whether the surveyed vertical accuracies are acceptable.
- The age of the cross-sections, and whether there have been any floods, severe bank erosion, channel aggradation or degradation since the cross-sections were captured.

If the assessment determines that additional data collection is required, the number, location and extent of cross-sections required should be determined and reported to the GWRC.

5.3 Data Capture

Where the findings of the data review indicate that additional data capture of topographic and bathymetric data is required, the protocols in Sections 5.3.1 and 5.3.2 should be applied.

5.3.1 LiDAR

LiDAR (light detection and ranging) is a technique used to capture topographic data through a device mounted to an aircraft or large drone that emits pulses of laser light and measures the time it takes for the reflected light to return to the sensor after bouncing off the ground, or other object (i.e. water, a building or vegetation) on the surface.

Where data collection by LiDAR is required, this work should be commissioned using **Specification 1: LiDAR**. This specification outlines how this work should be undertaken. A summary of key points is included here:

- Data should be captured in NZTM2000, vertical elevations should be in Wellington Vertical Datum 1953. Where the survey is undertaken in the Wairarapa, the vertical datum should be confirmed with the GWRC prior to commencement.

- The LiDAR should capture sufficient ground points to ensure that the ground elevation is captured. Additional points may be required in areas of dense vegetation. Ground verification should also occur.
- In areas with dense riverbank vegetation, LiDAR should be flown in winter when deciduous trees are not in leaf, to improve capture of ground points. LiDAR collection should not be undertaken when there is snow cover or when the ground is flooded, as this will prevent the capture of true ground levels. Near the coast, LiDAR should be flown at low tide.
- The spatial and vertical resolution should be agreed with the GWRC prior to commencement and may vary across the survey (i.e. with increasing detail near to the river channel).

5.3.2 Survey

Ground based survey may be undertaken to capture specific features such as stopbank elevations, or in areas where capture of accurate LiDAR is not possible (eg, under water or under dense vegetation). Survey may also be used to capture topographic features that are too fine to be picked up in LiDAR accurately, for example, narrow tributaries.

Ground survey may also be undertaken to capture additional or more up to date cross-sections of the river channels.

Additional ground survey work should be undertaken in accordance with **Specification 2: Survey** of the FHMS. This specification outlines how this work should be undertaken. A summary of key points is included here:

- Data should be captured in NZTM2000, vertical elevations should be in Wellington Vertical Datum 1953. Where the survey is undertaken in the Wairarapa, the vertical datum should be confirmed with the GWRC prior to commencement.
- For cross-section surveys:
  - Where existing cross-section locations exist, the survey is to be undertaken at these locations. Where new cross-section locations are to be surveyed, the locations are to be agreed between the GWRC and the hydraulic modeller.
  - Profile spot heights shall we taken at no more than 1 m intervals where the profile is even. Within the river flow, spot heights should be taken at no more than 0.5 m intervals.
  - The water level at the time of survey must be recorded for each cross-section. Where a river is braided a water level is required for each channel.

5.3.3 Other techniques

It is noted that alternative technologies, such as the use of a drone (using photogrammetry or LiDAR) or a drone boat with sounder may be appropriate in some cases.

Where proposed, the use of these technologies should be discussed with the GWRC and approved prior to undertaking the survey.

6 Structures

The as-built details of structures within the river channel and floodplain, such as bridges and culverts, are required to inform the hydraulic model. It is important that the details of these structures are accurate in order to allow the model to reliably estimate potential constrictions to flood flows, and to estimate hydraulic losses over the structures.

All available details of structures within the river channel and key structures within the floodplain should be gathered during the initial data collection phase prior to commencement of the hydraulic model build. This information may be obtained from as-built drawings or previous survey and should be requested from the GWRC, the territorial authority or the asset owner (eg, NZTA).

The quality assessment of the as-built drawings, and/or previous surveys should include (but is not limited to) a review of:

- The age of the as-built drawings or previous survey, and whether the structure could have been modified since this time.

- The condition of structure (i.e. has the structure washed out, been damaged by floods or is there long-term blockage/capacity reduction due to aggradation).
- Whether the existing data contains all of the details that are required.

Where as-built drawings are unavailable, do not contain all details required or are considered to be unreliable or not representative of current conditions, then new survey may be required. This should be confirmed with the GWRC on a case by case basis.

Where survey of structures is required, this work should be undertaken in accordance with **Specification 2: Survey** of the FHMS.

7 Documentation

7.1 Data Register

All data and documents gathered as part of the FHMS process should be recorded in a data register. The data register records the name and type of data, source, date collected, any limitations or licencing associated with the use of the data, and a summary of any assessment of the data quality, or key findings during analysis of the data or review of a document. A template for this register is provided in Appendix **Error! Reference source not found.**.

The purpose of the data register is to:

- Provide an audit trail that may be used during peer reviews and/or independent audit.
- Clearly identify all of the data that has been collected and reviewed.
- Clearly outline the quality of the data, or any issues identified.

The completed data register should be appended to the hydrology and hydraulic modelling reports.

7.2 Reporting

The data gathering and assessment undertaken under this procedure should be documented in the hydrology report (**Procedure 2**) and hydraulic modelling report (**Procedure 4**), where relevant to each.

8 Procedure Review

This procedure is intended to be a living document that can be revised as technology advances and best-practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the 'process review / lessons learnt' checkpoint on the FHMS flow chart.

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 2** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person undertaking hydrological modelling for the GWRC's flood hazard modelling projects.

The protocols in this procedure have been developed to ensure that hydrological modelling for flood hazard modelling projects is undertaken in a robust and consistent way, and is in line with accepted industry practice. This procedure has been prepared to allow for flexibility of approach, in recognition that the optimal modelling approach may be dependent on catchment and/or project specific factors, the availability and quality of input data, and the end use of the model.

This document should be read in the context of the wider FHMS, and in conjunction with **Specification 3: Hydrology**.

1.1 Hydrology in the FHMS process

Hydrological models are used to estimate runoff from catchments during storms of differing magnitude and duration. They are a critical component of the flood hazard modelling process, the outputs of which are a key input to the hydraulic model.

In the FHMS process, hydrological modelling is commenced on completion of the steps outlined in **Procedure 1: Gather and Assess Data**. Procedure 1 outlines the requirements for undertaking a comprehensive process of collection and review of all available data required to complete the FHMS process. The intention of Procedure 1 is to ensure that the hydrological and hydraulic models prepared under the FHMS are based on the best available information, and that the limitations of input data and resulting model results are well understood.

Data collected and reviewed under Procedure 1 may include hydrometric data (eg, flow and rainfall data), details of historic floods including recollections from the community, details that may have affected historical floods or hydrometric records (eg, blockage), changes in the catchment that may invalidate historical evidence in a current scenario model validation (eg, a new bridge, land use change), flood information from technical reports, flood incident reports, previous catchment studies, GIS datasets, and aerial photographs.

Procedure 2: Hydrology focuses on the development of the hydrological model including:

- Protocols for determining rainfall inputs, including event and design rainfall
- Protocols for hydrological method selection
- Design runs required for input to the hydraulic model
- Protocols for model calibration and validation
- Requirements for documentation.

On completion of the hydrological modelling, a peer review of the model and results will be undertaken. The peer review must be completed and closed out prior to inclusion of the hydrological model outputs in the hydraulic model. The process for peer review of the hydrological model is detailed in **Procedure 3: Peer Review**.

The stages of the FHMS process that are related to hydrological modelling are outlined in red in Figure 1-1 below.

1.2 Software

Hydrological modelling may be undertaken using any widely available, industry accepted software package. The ready availability of the software package is important to allow the model to be re-run or updated at a later date, if needed.

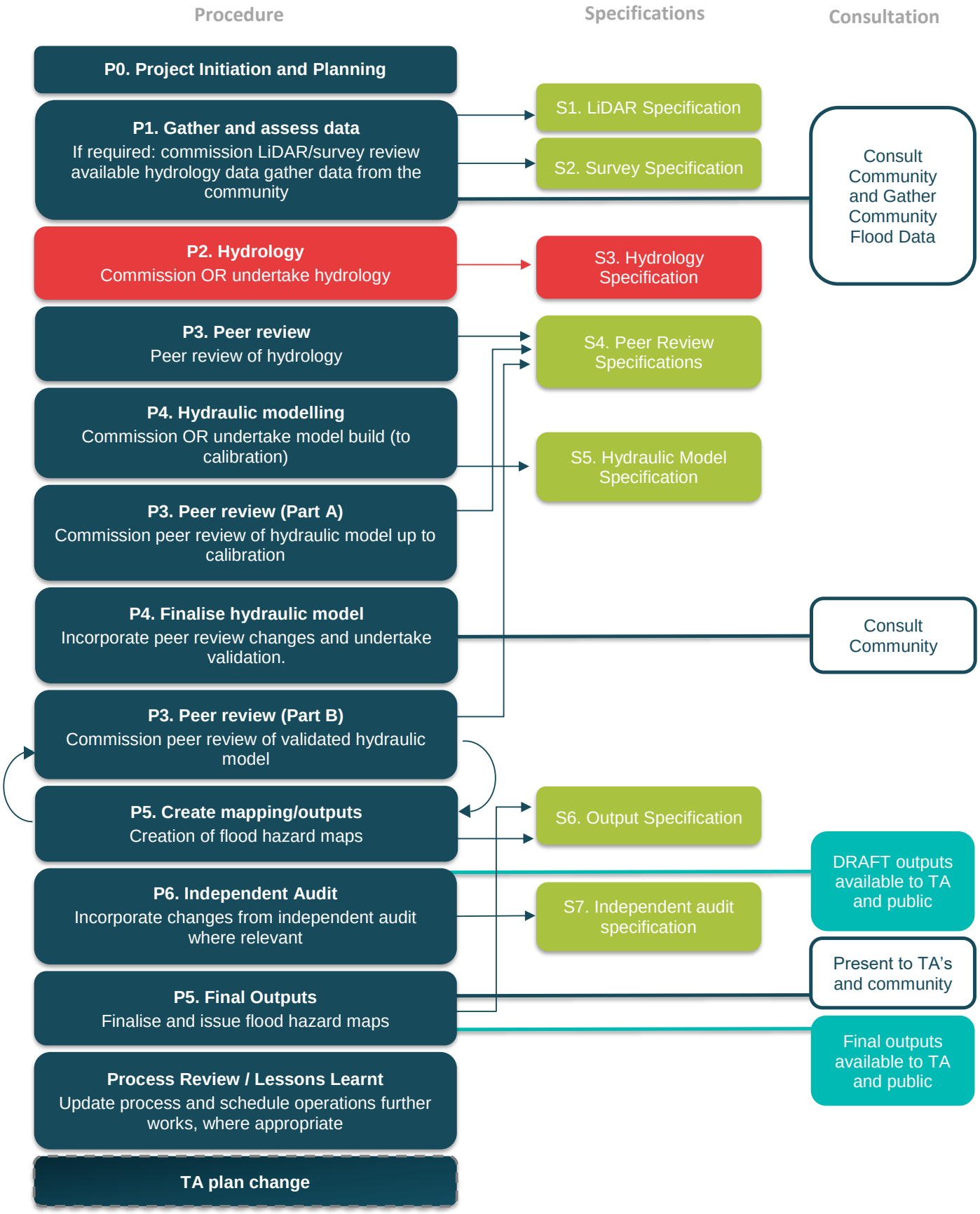
The modeller should confirm that the software package selected produces outputs that are easily converted or imported into the hydraulic modelling package used by the GWRC (likely to be DHI software).

1.3 Model extent

The model extent is to be provided by, or confirmed with the GWRC prior to commencing modelling.

Attachment 1 to Report 20.315

FHMS process showing stages where hydrology is undertaken (red)



1.4 Naming convention

A logical naming convention should be adopted for all hydrological models and output files. The naming convention should clearly outline the details of the model run and/or scenario.

It is acknowledged that the appropriate naming convention is likely to vary between software packages, due to differing methods of packaging versions and scenarios. The nomenclature used in the model file naming convention should be described in detail in the hydrological model report and model log, and should be broadly based on the naming convention for model outputs detailed below.

Outputs should follow the naming convention listed in Table 1-1, Table 1-2, Table 1-3 and Table 1-4 below. This naming convention has been adopted to ensure consistency between projects, for ease of use for the end user. The output naming convention shall be:

Project ID _RunTypeRunScenario_ Event_Version

For example,

For the first version of the hydrological model calibration (calibration event on 20 December 1976) for the Hutt River model, the output name would be:

HUTT_C19761220_001

For the final (peer reviewed) version of the design run of the 1% AEP event with allowance for climate change for the Hutt River the output name would be:

HUTT_D_1PCAEPCC_F

Table 1-1 Naming convention – run types

Code	Run Type	Run scenario	Description
W	Working	N/A	Outputs of working files during initial model build
C	Calibration	YYYYMMDD	Calibration scenario described by date of event in year month date format.
V	Validation	YYYYMMDD	Validation scenario described by date of event in year month date format.
D	Design Run	N/A	Design runs using the calibrated and validated model
S	Sensitivity Run	LUC-01	Sensitivity runs for Land Use Change. If multiple land use change scenarios are tested, a number (eg, 01, 02...) should be assigned to each scenario. The land use change applied for each scenario should be outlined in the modelling report.
		ANC-01	Sensitivity runs for antecedent conditions. If antecedent condition scenarios are tested, a number (eg, 01, 02...) should be assigned to each scenario. The conditions applied for each scenario should be outlined in the modelling report.
		LOS-01	Sensitivity runs for losses. If a number of loss scenarios are tested, a number (eg, 01, 02...) should be assigned to each scenario. The conditions applied for each scenario should be outlined in the modelling report.

Table 1-2 Naming convention - versions

Version codes	Version	Description
00X	Versions of model, eg, 001, 002…	Outputs of working versions of the model are distinguished by numbering.
F	Final	The final (peer reviewed and accepted) version of the model output.

Table 1-3 Naming convention – events

Recurrence Interval Code	Recurrence Interval/Event	Description
1PCAEP	1% AEP	Current scenario design runs
2PCAEP	2% AEP	
5PCAEP	5% AEP	
10PCAEP	10% AEP	
20PCAEP	20% AEP	
39PCAEP	39% AEP	
1PCAEPCC	1% AEP	Design runs with allowance for climate change
2PCAEPCC	2% AEP	
5PCAEPCC	5% AEP	
10PCAEPCC	10% AEP	
20PCAEPCC	20% AEP	
39PCAEPCC	39% AEP	
0pt1PCAEP	0.1% AEP	Residual hazard run
1900CUMEC	1,900 m^3/s flow	1% AEP flow for Hutt River only
2300CUMEC	2,300 m^3/s flow	Design flow for Hutt River only
2800CUMEC	2,800 m^3/s flow	Residual hazard flow for Hutt River only

Table 1-4 Naming convention – output types

Code	Output type	Description
MAXWSL	Water Surface Level	Outputs at maximum level, depth or velocity
MAXIND	Inundation depth	
MAXVEL	Velocity	

1.5 Provision of data

Final model files, input datasets, and outputs are to be provided to the GWRC on completion of the modelling.

2 Rainfall

Rainfall is the primary input parameter in almost all forms of hydrological modelling. Total rainfall depth, temporal distribution of rainfall throughout a storm, and spatial distribution of rainfall over a catchment have arguably the largest impact on model results of all input parameters.

Two broad types of rainfall data are required during hydrological modelling:

- Event rainfall from actual storm events. This data is used for calibration and validation of hydrological models where modelled runoff from actual storms is compared to flow data recorded during the event or flood information collected during or post the event.
- Design rainfall derived from probability analysis, used for estimating flows during design events (i.e. the events listed in Table 5-1).

These rainfalls are described further in Section 2.1 and 2.2 below.

2.1 Event rainfall

Event rainfall is actual rainfall data recorded during a real storm event. Event rainfall is primarily used for calibration and validation of hydrological models where rainfall from a real storm is run through the model to test the ability of the model to generate river flows or flooding similar to those observed.

Event rainfall should be selected from gauges within or close to the catchment. Gauges that record rainfall at high frequency (i.e. event or sub-5 minute) are considered to have more value than gauges with daily records only. The quality of available rainfall data should also be considered when selecting gauges. This data should be reviewed in line with **Procedure 1: Gather and Assess Data**.

Where multiple gauges exist, interpolation methods should be applied to obtain a representative estimate of rainfall over the spatial extent of the catchment. This is discussed further in Section 2.3.

2.2 Design rainfall

2.2.1 Frequent, Intermediate and Rare events (39% AEP to 1% AEP)

Design runs of hydrological models are undertaken to estimate catchment runoff during a range of storms of differing likelihoods. Under this procedure, design runs involve running a suite of storms with annual exceedance probabilities (AEP) between 39% and 0.1%. For the frequent, intermediate and rare events, design rainfalls can be derived from two sources:

1. Analysis of historical rainfall data from nearby gauge(s). This source should be used preferentially where it is available. Where multiple gauges are present, interpolation methods should be applied as discussed in Section 2.3.

   Gaps in the rainfall record should be patched based on data from nearby representative gauge(s). Direct patching of rainfall data from one gauge to another is unlikely to be appropriate given that rainfall is typically highly spatially variable. As such, the use of regression (or other) techniques should be considered to determine the relationship between the donor gauge and patched gauge, and to allow for adjustment of donor data accordingly. The methodology applied should be discussed and justified in the hydrological modelling report.

2. NIWA's High Intensity Rainfall Design System (HIRDS). This source should be used when:

   - There are no rain gauges within, or near to the catchment being modelled. The suitability of gauges outside the catchment should be determined based on distance from the catchment, gauge elevation and orientation to prevailing weather systems as compared to the catchment being modelled.

- Rain gauges within or near to the site do not have a sufficiently long record relative to the events being modelled. For example, 10 years of rainfall record is considered insufficient for estimation of rainfall depths and intensities during a 1% AEP event.
- Rain gauge data within or near to the site is not of sufficient quality for use in modelling. For example, the data is recorded at low frequency (eg, daily or hourly in small catchments), the record has been poorly maintained, or there are long and frequent gaps in the record.

2.2.2 Very rare events (0.1% AEP)

An estimate of design rainfall during the 0.1% AEP event is required to enable modelling of residual hazard during hydraulic modelling.

As estimation of these rare rainfalls is an extrapolation beyond recorded events, all estimates should be treated with caution. It is noted that as NIWA's HIRDS only provides estimates of rainfall intensities up to the 0.4% AEP event, extrapolation is required regardless of the rainfall data source for more frequent events.

One approach used for calculation of rainfall during rare events outlined in Book 2 of Australian Rainfall and Runoff (2019) is extrapolation of a frequency analysis using a GEV distribution fitted using LH-moments. This places more weight on larger rainfalls as opposed to L-moments used for more frequent rainfalls.

The approach selected should be discussed and justified in the hydrological modelling report.

2.2.3 Temporal patterns

Rainfall temporal patterns describe how the total rainfall depth is distributed across the duration of a storm. A wide range of temporal patterns can occur within a catchment. Temporal patterns may vary with storm duration, or with other factors such as type of weather system. For example, NIWA (2018) cites that frontal systems tend to generate peak rainfalls early in the storm, compared to tropical lows where peak rainfalls tend to occur towards the middle of the storm.

Rainfall temporal patterns can be estimated using a number of techniques, including the average variability method proposed by Pilgrim *et al.,*(1969), and Pilgrim and Cordery (1975) and modified in Australian Rainfall and Runoff (1987). This method is commonly applied in New Zealand and is accepted by the GWRC. The average variability method assumes a single rainfall burst (i.e. no pre- or post-burst rainfall) and assumes that temporal patterns are independent of probability (i.e. the same temporal pattern applies for frequent and infrequent events).

Book 2 of Australian Rainfall and Runoff (2019) notes that there are a number of limitations with this method, and that it is most effective where there is a dominant temporal pattern. Alternative methods of temporal pattern generation may be applied where they are industry accepted and justified in the hydrological modelling report.

Where more than one temporal pattern is found to be dominant, hydrological modelling may be undertaken using up to two temporal patterns. However, this should be discussed with the GWRC prior to commencement.

It is noted that some international guidance, such as Australian Rainfall and Runoff (2016) recommends the use of an ensemble of temporal patterns. This practice has not been widely applied in New Zealand to date.

2.2.3.1 Nested storm

A nested storm is a type of temporal pattern that is most commonly applied in urbanised catchments where stormwater flooding is a key consideration.

A nested storm contains the peak rainfall intensities for each duration 'nested' within longer duration profiles. The peak intensities are typically nested at the centre of the storm, however this can he shifted where appropriate. For example, Wellington Water's reference guide for design storm hydrology found that nesting peak intensities at 67% of the duration was more suitable for small urban catchments in the Wellington Region (Cardno, 2018).

Caution should be applied where nested storms are used for the estimation of riverine flooding as peak flows in watercourses may be overestimated. Care should be taken to confirm whether modelled flows are comparable to gauged flows.

2.3 Interpolation between gauges

Where more than one rain gauge is located within or near to the catchment, methods of interpolation between these gauges should be undertaken to ensure that applied rainfall is spatially representative.

A common method of interpolation is the Thiessen Polygon method, which can be used to develop an area-weighted rainfall series for the catchment. The method applied should be discussed and justified in the hydrological modelling report.

2.4 Areal reduction factors

2.4.1 Design Rainfall

Design rainfalls are typically derived for a specific point in a catchment. In large catchments, HIRDS rainfall intensities generated for specific locations are unlikely to be representative of the rainfall intensities experienced over the entire catchment during a given storm.

To correct for this, areal reduction factors can be applied to adjust point estimates of rainfall intensities to the average rainfall intensity over the entire catchment. Areal reduction factors should be calculated based on industry accepted methods such as those in Book 2 of Australian Rainfall and Runoff (2019) or the guidance in Auckland Council's TP108. Recent research in the Journal of Hydrology (New Zealand) (Singh et al., 2018) and NIWA (2018) should also be considered.

2.4.2 Event Rainfall

As event rainfall is the recorded depth at a gauge it does not represent the maximum rainfall at a point. The effective mean rainfall depth across the catchment may be greater than or less than the recorded rainfall, although this is unknown. As such, an areal reduction factor is typically not applied.

2.5 Climate change

A number of design runs with allowance for climate change are required to be undertaken, as outlined in Table 5-1. Climate change is to be applied in line with current advice from the Ministry for the Environment (MfE), and should be in line with the GWRC's policy.

MfE climate change predictions (at the time of writing of this procedure) are outlined in *Climate Change Projections for New Zealand: Atmospheric Projections Based on Simulations from the IPCC Fifth Assessment, 2nd Edition* (Ministry for Environment, 2018), and equate to an approximate 20% increase in rainfall depth estimates to 2100 based on an 8% increase in peak rainfall for each degree of climate warming, and a 0.7 – 3.0 degree projected temperature increase.

Predictions of percentage changes to rainfall depths for a range of storm durations and recurrence intervals provided in NIWA (2018) should also be considered.

3 Hydrological methods

Hydrological modelling undertaken for flood hazard modelling projects must be undertaken using methods that estimate hydrograph shape, timing and magnitude, as opposed to methods which are limited to estimation of peak flows only.

A wide range of hydrological methods are available that meet this criterion, including:

- A range of conceptual models, such as the storage routing models used in Hydstra, XP-RAFTS, NAM and RORB.
- A number of empirical models, such as kinematic wave equation with Horton's loss model which is frequently used in stormwater modelling in Christchurch City; and the SCS curve number method used widely in stormwater modelling by Auckland Council, Bay of Plenty Regional Council and Wellington Water.
- Some physical models, such as MIKE-SHE.

Hydrological methods for flood hazard modelling projects should be selected on the basis of:

- Availability of method within the software being used. Software is to be selected based on the criteria outlined in Section 1.2.
- Applicability to the Wellington Region (i.e. is the method appropriate for the climate, soils etc.)

- Applicability to the specific catchment (for example, some methods are only applicable to catchments up to a certain size, and some methods are intended to be applied to urban or rural catchments).
- Applicability to the purpose of the modelling.
- Whether the method is industry accepted in New Zealand.
- Whether the method is widely used in New Zealand, with satisfactory results.

The selection of method should be discussed and justified in the hydrological modelling report. The discussions should include any known limitations with the application of the method.

4 Calibration and validation

4.1 Calibration

Calibration involves the adjusting of model parameters to alter model results to improve agreement between modelled and recorded hydrographs. Calibration should aim to match all aspects of the hydrograph, including hydrograph peak, volume and timing, where possible.

Calibration should be undertaken for all hydrological models developed under the FHMS where sufficient data is available. Ideally, calibration would utilise rainfall and flow records for at least three flood events of differing magnitudes, with at least one event being greater than a 2% AEP event to ensure that modelled parameters accurately represent catchment runoff behaviour, losses and routing across a range of events.

However, it is noted that data for calibration is often limited within the Wellington Region, and sufficient data for three events may not be available. It is also noted that the confidence in the recorded hydrograph should be considered during this process, particularly with regard to the upper end of rating curves. Calibration should also consider how the catchment may have changed since the calibration event, for example land use change.

The calibration process should be documented in full, including final parameters, and how data quality and changes in the catchment and any other factors were accounted for.

4.2 Validation

Validation is undertaken following model calibration and is used to verify that the model can acceptably reproduce events that are different to the calibration event. This ensures that the calibration parameters are representative of a wide range of possible events that could occur in the catchment.

Where possible, validation should be undertaken for a minimum of three events of varying magnitude. However, it is recognised that for the majority of watercourses in the region sufficient data is unlikely to be available.

4.3 Comparison to alternate methods

Alternative methods of peak flow estimation such as frequency analysis and the regional flood frequency method derived by Pearson and McKerchar (1989), should be used to provide an estimate of peak flow during design storms for comparison to modelled results.

4.3.1 Regional flood frequency method

Pearson and McKerchar (1989) developed a regional method for estimating peak flow for design floods of various magnitudes using contour plans of specific discharge and flood frequency factors. This method was updated with specific maps for the Wellington Region by Pearson in 1990.

If using the regional flood frequency method to validate peak flows, the Pearson (1990) method should be applied. A summary of this analysis should be provided in the hydrological modelling report.

4.3.2 Frequency analysis

Where available, frequency analysis of peak flows should be undertaken using at-site flow data. The results of this analysis should be compared to the modelling results, and reported in the hydrological modelling report.

Care should be taken when estimating peak flows for return periods that are double the flow record length. Consideration should also be given to the record length, level of confidence in the flow gauge and the high flow portion of the rating curve.

5 Design runs

A suite of design runs is required to inform the hydraulic model and the ultimate outputs of the flood hazard modelling process. These design runs include:

- A suite of runs across a range of event probabilities, based on current climate conditions.
- A suite of runs across a range of event probabilities with an allowance for climate change.
- An over-design event for calculation of residual flood hazard. It is noted that the 0.1% AEP event is used as the over-design event. The probable maximum flood is not applied.

The minimum requirements for these runs are listed in Table 5-1 below. Additional design runs may be requested by the GWRC on a project by project basis.

A range of storm durations should be run for each of the recurrence intervals listed in Table 5-1 to ensure that the critical duration of the catchment can be correctly determined for application to the hydraulic modelling undertaken under **Procedure 4: Hydraulic Modelling**.

Appropriate storm durations are likely to vary based on catchment size and level of urbanisation, with smaller and more urbanised catchments likely to have shorter critical durations than larger catchments with less impervious area. A range of storm durations should be selected based on the catchment characteristics, with at least 5-10 durations run for each scenario.

The shortest duration selected should be no less than 10 minutes in small catchments, and is unlikely to be greater than 72 hours in larger catchments within the region.

Table 5-1 Minimum design runs

Suite	Recurrence intervals
Current climate	• 39% AEP • 20% AEP • 10% AEP • 5% AEP • 2% AEP • 1% AEP (1,900 m^3/s for Hutt River only) • 2,300 m^3/s flow (Hutt River only)
Climate change	• 39% AEP with allowance for climate change • 20% AEP with allowance for climate change • 10% AEP with allowance for climate change • 5% AEP with allowance for climate change • 2% AEP with allowance for climate change • 1% AEP with allowance for climate change • 2,300 m^3/s flow (Hutt River only)
Residual hazard	• 0.1% AEP

	• 2,800 m^3/s flow (Hutt River only)

5.2 Sensitivity analysis

Sensitivity analysis is the adjustment of model parameters within realistic ranges to determine the impact on model results. Sensitivity analysis can be used as an indication of model uncertainty resulting from input parameters that are unsupported by data, particularly where minimal calibration and/or validation data is available.

Sensitivity analysis can also be used to investigate possible peak flows, hydrograph shapes and timing that could occur under conditions outside of those included in the base model run, for example, during wet or dry antecedent conditions, or where there is an increase in impervious area (i.e. urban development) in the catchment.

Sensitivity analysis of key parameters should be undertaken on all hydrological models prepared for flood hazard modelling projects. Sensitivity parameters should include, but are not limited to:

- Antecedent conditions
- Temporal pattern
- Losses
- Land use change, such as new urban development, where likely in the catchment.

Sensitivity analysis should be fully documented in the hydrological modelling report. Output hydrographs from the sensitivity scenarios should be provided to the hydraulic modeller to be included in the hydraulic model sensitivity testing, and for development of freeboard.

6 Outputs

The required outputs of the hydrological modelling are outlined in Table 6-1. These outputs are required to:

- Provide inputs for hydraulic modelling.
- Assist the peer reviewer to undertake the peer review.
- Keep records for future model updates and additional design runs if required.

Table 6-1 Hydrological model outputs

Element	Requirement
Hydrographs	All current climate, climate change and residual hazard runs. The hydrographs should be provided in a timeseries format for input into the hydraulic modelling.
Model files	All model files to be provided to the peer reviewer for review, and to the GWRC for records.
Model log	A detailed model log should be kept and provided on completion of the modelling. This is described in Section 7.2.
Geospatial files	All geospatial files used during modelling, eg, catchment boundaries, Thiessen polygons, etc.

7 Documentation

The hydrological modelling should be fully documented to:

- Provide background information, reasoning and assumptions for the peer review.
- Ensure that the model can be reproduced in another modelling software at a later date if required.
- Ensure transparency for the end users of the model results, including the community.

The methods of documentation outlined in the sections below are required for all hydrological models constructed under the FHMS.

7.1 Data register

A data register will be prepared for each flood hazard modelling project as part of works undertaken under **Procedure 1: Gather and Assess Data**. Details of the format of the data register is provided in Procedure 1, and a template is provided in Appendix A of Procedure 1.

The data register should be updated with any data gathered or reviewed as part of this procedure. On completion of this component of work the updated data register should be appended to the hydrology report, and provided in electronic format to the GWRC.

7.2 Model log

A detailed model log should be kept while undertaking the modelling. This log should be appended to the hydrological report, and should document the model build, assumptions made, and all inputs. The model log should assist with version control and will describe the model naming convention.

The model log should be provided to the peer reviewer to assist with the peer review. A model log template is provided in Appendix **Error! Reference source not found.**.

7.3 Report

A detailed technical report should be prepared to outline the hydrological modelling undertaken. The report should include, but is not limited to:

- Details of the software used
- Model extent
- Data availability and quality
  - Detailed summary of the analytical process and findings of the data collection and review undertaken as part of **Procedure 1: Gather and Assess Data**
- Details of the rainfall inputs, including:
  - Gauges located within and near to catchment, length of record, and quality of data
  - Method of interpolation between gauges, where undertaken
  - Any areal reduction factors applied
  - Development of design rainfall depths (i.e. frequency analysis or HIRDS)
  - Temporal pattern used, and details of method used to derive the temporal pattern
  - Details of how the rainfall is applied in the model
  - Details of how climate change has been applied to future climate scenarios
  - Storm events used in calibration and validation
- Hydrological methods
  - Summary of the method used, and discussion of suitability for the flood hazard modelling project
  - Summary and justification for all parameters used
- Calibration
  - Flood events selected for calibration

  - Results of calibration
- Validation
  - Flood events selected for validation
  - Results of validation
- Alternative methods of peak flow estimation
  - Description of application of alternative methods of peak flow estimation
  - Discussion and comparison to model results

7.4 Feedback form

It is anticipated that the work undertaken under **Procedure 1: Gather and Assess data** and this procedure will increase the understanding of the limitations of the hydrometric stations used in this assessment. As such, a feedback form has been prepared to provide this information to the GWRC for consideration for future data collection.

For example, the analysis undertaken under the FHMS may indicate that a flow gauge would be more useful if it was located in a different position in the catchment. This information can be provided in the feedback form.

The feedback form is provided in Appendix **Error! Reference source not found.**, and should be filled out and provided to the GWRC on completion of the hydrological modelling.

8 Procedure review

This procedure is intended to be a living document that can be revised as technology advances and industry accepted practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the 'process review / lessons learnt' checkpoint on the FHMS flow chart.

9 References

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Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 3** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person undertaking peer review of GWRC flood hazard modelling projects.

This document should be read in the context of the wider FHMS, and has a particular relationship to **Specification 4: Peer Review Specifications** which provide a template Request for Proposal for engaging external suppliers to undertake peer review.

A peer review template is provided in Appendix **Error! Reference source not found.** of this procedure. This template should be used as the basis of all peer reviews undertaken as part of the FHMS process.

1.1 What is a Peer Review?

In the context of this procedure, a peer review is an independent, thorough technical assessment of a hydrological or hydraulic model, or outputs of a hydraulic model. The review is based on a 'hands-on' interrogation of a model by a suitably qualified and experienced professional who uses their technical expertise, current best-practice and unbiased judgement to review the work.

The peer reviewer's role is to determine whether the work reviewed meets accepted industry standard, and is of suitable quality to proceed to the next step of the FHMS process.

The suitability of the model should be assessed in the context of the purpose of the model. For example, a model prepared for the purpose of providing flood hazard information to support district planning, may be able to proceed to next stage of the FHMS process even though it does not have sufficient detail for bridge design, given that bridge design is not the purpose of the model, and is not the responsibility of the GWRC.

It is noted that a peer review is distinct from an Independent Audit which is the subject of **Procedure 6** of the FHMS.

1.2 Peer Review in the FHMS Process

Peer review is undertaken at three stages within the FHMS process:

- Peer review of hydrological modelling, on completion of **Procedure 2: Hydrology**
- Peer review of the hydraulic model build and calibration, on completion of Part A of **Procedure 4: Hydraulic Modelling**
- Peer review of the hydraulic model validation, runs, sensitivity testing and draft outputs on completion of Part B of **Procedure 4: Hydraulic Model** and **Procedure 5: Outputs**.

These stages are outlined in red in the FHMS process flow chart provided in Figure 1-1 below.

Peer review should be undertaken for all new models that proceed through the FHMS process. Peer review may also be undertaken where changes are made to existing models that have the potential to result in changes to district plans or the GWRC's flood hazard advice.

Where changes are made to existing models, it is acceptable for the peer reviewer to only review the changes in the context of the model, provided that the model has previously been peer reviewed. If a peer review has not been previously undertaken, then a full peer review is required.

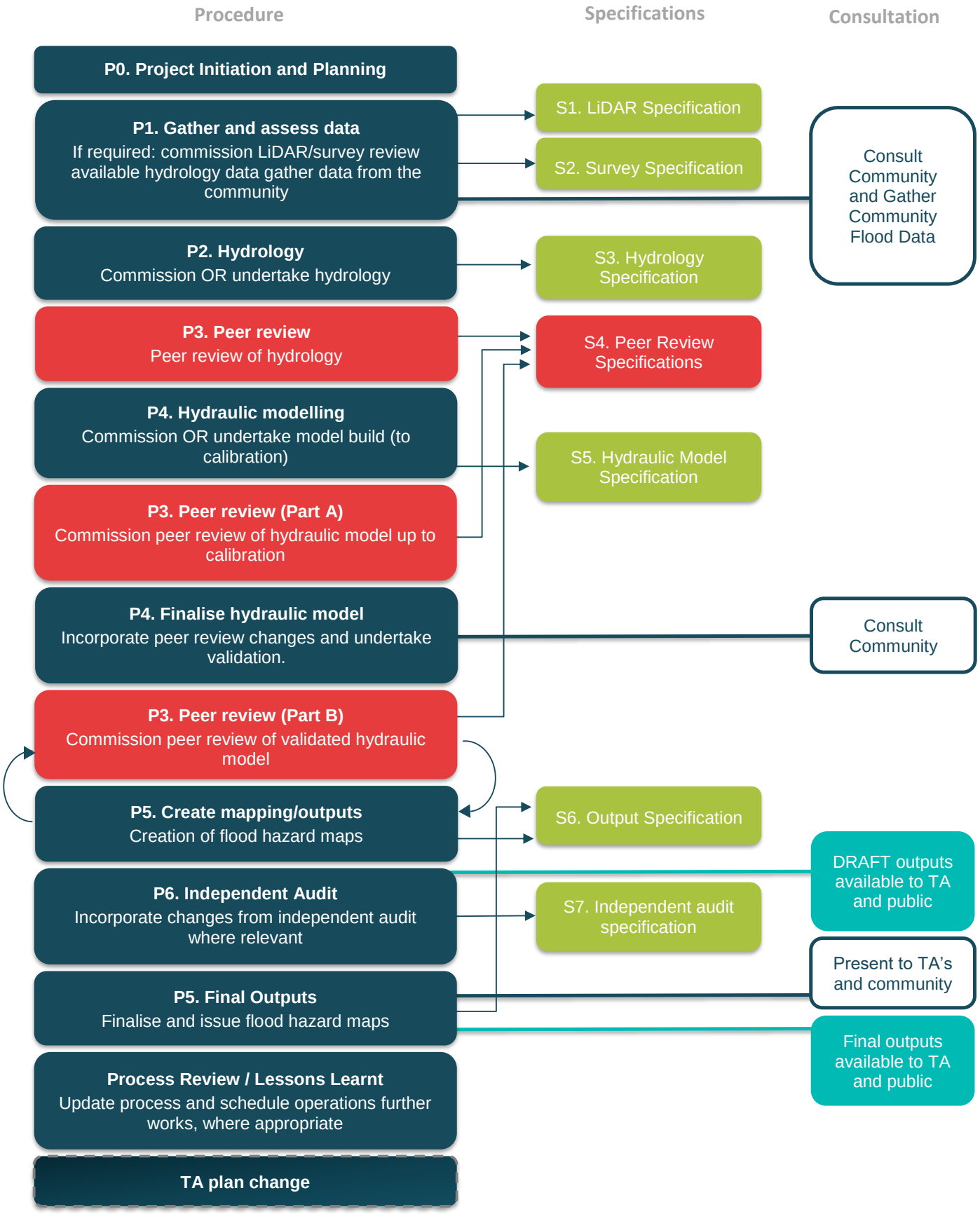
1.3 Who can be a Peer Reviewer?

Peer reviewers must meet the following criteria:

- Peer reviewers must be independent from the flood hazard modelling project. Independent means that the peer reviewer has not personally been involved with the project at any stage. However, it is acceptable for a peer reviewer to have previously undertaken work separate to the flood hazard modelling project within the catchment.

Attachment 1 to Report 20.315

FHMS process showing stages where hydrology is undertaken (red)



- The peer reviewer should be from a different organisation than the organisation that undertook the work being reviewed. A person is still eligible to undertake peer review of a model if their organisation was involved in another component of the flood hazard modelling project, as long the peer reviewer was not personally involved in that work. For example, if company A undertook the hydrological modelling, company A is not excluded from peer reviewing the hydraulic modelling, as long as the peer review is undertaken by a different member of staff.
- GWRC staff are not considered independent, and therefore are not eligible to peer review work undertaken under the FHMS process.
- The peer reviewer should not have any form of dependent relationship with the modeller and should have no conflicts of interest relating to the project or modellers organisation including financial or other interests.

1.4 How should a peer reviewer be engaged?

Peer reviewers should be engaged using the request for proposal template in **Specification 4: Peer Review Specification**.

1.4.1 Liability

Peer reviewers may be liable for damages jointly with the original modeller's organisation if claims against the work are upheld.

The level of liability will be agreed on as part of the contract between the GWRC and the reviewer's organisation. All peer reviewers should hold appropriate insurances.

2 Undertaking a Peer Review

When reviewing modelling, the peer reviewer should undertake a detailed hands-on interrogation of the model. The peer reviewer should also review any accompanying documentation such as the inputs (eg, hydrology report and peer review), model log and model report to assist with their understanding of the work undertaken and assumptions made.

The peer reviewer should also consider whether the modelling has been undertaken in accordance with the appropriate procedures of the FHMS (eg, **Procedure 2: Hydrology** or **Procedure 4: Hydraulic Modelling**). If there are departures from the FHMS the peer review is to assess whether these departures and the reasons for them have been recorded and are appropriate, technically correct, and to an industry accepted standard.

The peer review is expected to be an iterative process, and will involve on-going conversations between the modeller and peer reviewer. All comments and each iteration of the work is required to be documented, as outlined in Section 3 below.

It is noted that in undertaking the peer review, the peer reviewer or modeller may place limitations on the use of the model. For example, the peer reviewer may determine that the model is suitable for use for the next 5 years, while additional flow data is gathered, but that the model should be revised after this time.

The peer review is undertaken at three points in the FHMS process:

- Hydrology Peer Review
- Hydraulic Model Peer Review: Part A
- Hydraulic Model Peer Review: Part B and Outputs

The contents of each phase are detailed in the sections below.

2.1 Hydrology Review

A peer review of the hydrological model should be undertaken on completion of the modelling (including calibration, validation and sensitivity testing, and design runs).

The purpose of the review is to assess whether the inputs, assumptions and functioning of the model is technically correct, and has been built according to the requirements of the FHMS and industry accepted practice. The review should also consider the sensibility of the model results.

The peer reviewer should assess all aspects of the model including, but not limited to:

- Suitability of software
- Rainfall inputs, including the suitability of event rainfall used in calibration and validation, suitability of method used for design storm generation, and the suitability of the temporal pattern(s) and areal reduction factors applied.
- Input parameters such as time of concentration and catchment drainage parameters, with consideration given to historical and proposed changes within the catchment.
- Hydrological method
- Run parameters
- Calibration – including calibration data used and approach to calibration
- Review of validation and sensitivity testing
- Review and sensibility check of design storm results
- Review and sensibility check of sensitivity and optioneering results
- Model documentation is complete.

A more detailed list of review parameters is provided in the review template in Appendix **Error! Reference source not found.**. The peer reviewer may add items to the review template as needed.

The findings of each iteration of the peer review should confirm whether the reviewer's comments have been addressed sufficiently for the project to proceed to the next stage of the FHMS process (i.e. input to the hydraulic model). For the comment to be considered to be addressed sufficiently, the amendments or decision not to amend must be agreed between both the modeller and peer reviewer.

2.2 Hydraulic Model Review: Part A

The first peer review of the hydraulic modelling, referred to as Part A, should be undertaken following the initial hydraulic model build and calibration.

The purpose of this review is to assess the inputs, assumptions and functioning of the model to confirm that the model is technically correct, is stable, and has been built according to the requirements of the FHMS and industry best-practice. This review is undertaken prior to model validation, design runs, sensitivity testing and optioneering.

The peer reviewer should assess all aspects of the model including, but not limited to:

- Model schematisation
- Channel and floodplain modelling – topography (DEM), cross-sections, roughness, structures
- Boundary conditions
- Inputs
- 1D/2D connectivity
- Run parameters
- Model stability, convergence and mass balance
- Calibration – including calibration data used and approach to calibration
- Model results, including 1D long-sections
- Model documentation (model log and internal QA) is complete.

A more detailed list of review parameters is provided in the review template in Appendix **Error! Reference source not found.**. The peer reviewer may add items to the review template as needed.

The peer reviewer of the hydraulic modelling review is not required to review the hydrology as this will have been peer reviewed prior to the preparation of the hydraulic model. However, the peer reviewer should consider how the hydrology is impacting the hydraulic results and whether this is appropriate or requires further investigation.

For large models, it is acceptable for the peer reviewer to review a random sample of at least 25% of cross-sections, and a random sample of at least 25% of structures for correctness rather than reviewing every element. The sample should include sections and structures from every modelled watercourse within the model.

If a large number of errors are found in the random sample, the model should be returned to the modeller for correction prior to resuming the review. If the reviewer considers that cross-sections or structures in a certain reach are likely to have a larger impact on the results, then these should be reviewed in more detail. It is noted that the GWRC may specify areas to be reviewed in more detail, in addition to the random sample. The peer reviewer should confirm with the GWRC whether this is the case prior to commencing the review.

The findings of each iteration of the Part A peer review should confirm whether the reviewer's comments have been addressed sufficiently for the project to proceed to the next stage of the FHMS process. For the comment to be considered to be addressed sufficiently, the amendments or decision not to amend must be agreed between both the modeller and peer reviewer.

2.3 Hydraulic Model Review: Part B and Outputs

The Part B hydraulic model review commences following the completion of Part B of **Procedure 4: Hydraulic Modelling**. The purpose of this review is to:

- Review validation and sensitivity testing
- Review and sensibility check of design storm results
- Review and sensibility check of sensitivity and optioneering results
- Sensibility check of preliminary outputs.

The review should include a review of both the changes to the model set up and results as part of the validation, design runs, sensitivity testing and any optioneering.

A more detailed list of review parameters is provided in the review template in Appendix **Error! Reference source not found.**. The peer reviewer may add items to the review template as needed.

The Part B review includes a sensibility check of the preliminary outputs. After the peer reviewers Part B comments are addressed, the peer reviewer is required to undertake a further review of the revised outputs.

The findings of each iteration of the Part B peer review should confirm whether the reviewer's comments have been addressed sufficiently for the project to proceed to the next stage of the FHMS process.

3 Documentation

The initial peer review and subsequent iterations must be clearly documented. The following documents are required to be prepared to record the peer review, and subsequent revisions:

- Peer review spreadsheet (a template is provided in Appendix A).
- Peer review report
- Peer review close-out

These documents are detailed in the sections below. All correspondence between the reviewer and the modeller should be documented.

3.1 Peer Review Spreadsheets

A template of the peer review spreadsheets is provided in Appendix **Error! Reference source not found.**. A separate spreadsheet is provided for the hydrology and hydraulics (Part A and Part B) reviews. These spreadsheets must be

used to record the peer reviewer and modeller's comments for all peer reviews. The peer reviewer may add additional items to the template, as required.

The peer review template is made up of a number of tabs (blue/green) to record the peer reviewers' findings while interrogating the model. The time and date of issue of the reviewer's comments should be recorded in the spreadsheet to assist with version control.

Each of the comments in the summary table is then given a rating in line with the criteria in Table 3-1 below.

Table 3-1 Review rating table

Review ratings		Model suitable to move to next step in FHMS?
Ok	The element or parameter being used is modelled correctly	Yes
Minor	Issue is unlikely to significantly affect model results	Yes
Major	Issue compromises the model and should be rectified, but may be resolved by explanation or acceptance of model limitations.	?
Critical	Issue severely compromises the model and should be rectified before moving to the next step of the FHMS.	No
Other categories		
Future data collection	Identifies where additional future data collection could result in model improvements in the future.	Yes

Source: modified from Beca (2015). Pinehaven Stream Flood Mapping Audit.

The spreadsheet is then issued to the original modeller. The modeller will review each comment and amend the model as necessary. Any changes made to the model and/or responses to the reviewer's comments are recorded in a separate column in the review summary tab of the spreadsheet. The time and date of issue is to be recorded in the spreadsheet.

The peer reviewer is then required to review the comments and changes to the model made by the original modeller, and provide further comments (if necessary) and a further review rating for each comment in a separate column. This process continues until all of the issues have been resolved and the model is deemed suitable to continue to the next stage of the FHMS.

A review log is provided within the peer review spreadsheet. The reviewer and modeller should record the date and the overall outcome of each iteration of the review in this table. Outcome should be defined in accordance with the categories in Table 3-2 below.

Table 3-2 Outcome descriptors

Outcome categories	Description
Action Required	Issues have been identified within the model that are likely to affect the results and should be rectified before the model moves the next stage of the FHMS process.
Suitable to proceed	Issues identified in the model have been rectified (if any), and the model is considered to be of sufficient quality to move to the next stage of the FHMS process.

An example of a completed review log is provided in Table 3-3.

Table 3-3 Example review log.

Hydraulic Model - Part A Review	Date of review/comments	Outcome
Review V1	23 January 2020	Action Required
Modeler's comments V1	30 January 2020	
Review V2	5 February 2020	Suitable to proceed

3.2 Peer Review Report

A brief report should be provided by the peer reviewer following the initial peer review to accompany the review spreadsheet. The review spreadsheet should be appended to this report.

The report should be a clear and concise summary of the peer review process and findings. The peer review report should outline:

- The methodology used to undertake the peer review
- The version of the model and model log reviewed, and any other documents or files reviewed.
- A description of the issues identified. A clear summary of the issues should be provided as list in the executive summary.
- Clear section on data gaps or model improvements that should be filled in the future, where possible.

The report must include a history table that outlines any changes made to the report, and the reasons for those changes.

3.3 Peer Review Close Out

A close out document should be provided after all of the peer reviewer's comments have been addressed. The close out document can be in the form of a short letter or memo.

The close out document should include the following items:

- Confirmation that a peer review was undertaken.
- Confirmation that all of the peer reviewers' comments have been satisfactorily addressed and that the model is suitable to proceed to the next stage of the FHMS process.
- Any caveats or limitations that the reviewer has placed on the model.
- The peer review spreadsheet should be included as an appendix.

The close out document should be dated.

4 Procedure Review

This procedure is intended to be a living document that can be revised as technology advances and best-practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the 'process review / lessons learnt' checkpoint on the FHMS flow chart.

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 4** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person undertaking hydraulic modelling for GWRC's flood hazard modelling projects.

The protocols in this procedure have been developed to ensure that hydraulic modelling for flood hazard modelling projects is undertaken in a robust and consistent way, and is in line with accepted industry practice. This procedure has been prepared to allow for flexibility of approach, in recognition that the optimal modelling approach may be dependent on catchment and/or project specific factors, the availability and quality of input data, and the end use of the model.

This document should be read in the context of the wider FHMS, and in conjunction with **Specification 5: Hydraulic Model**.

1.1 Hydraulic modelling in the FHMS process

In the FHMS process, hydraulic modelling is undertaken in order to convert estimates of catchment runoff from hydrological modelling into flood levels and velocities by modelling the hydraulic behaviour of flow in the river channel and floodplain.

Results from hydraulic modelling are used to prepare the final outputs of the FHMS process including maps of flood extent, level, depth, velocity and hazard across various storm events.

Hydraulic modelling is undertaken at two stages in the FHMS process:

- **Part A: Hydraulic model build**

  Part A of the hydraulic modelling process is undertaken following close out of the hydrological model peer review. Under the FHMS, hydrological modelling is undertaken in accordance with **Procedure 2: Hydrology** while the peer review of the hydrological model is undertaken in accordance with **Procedure 3: Peer Review**. All aspects of **Procedure 1: Gather and Assess Data** should also be complete prior to commencing hydraulic modelling.

  Part A of the hydraulic modelling process includes the model build and calibration. On completion of Part A, a Part A peer review of the hydraulic model is to be undertaken in accordance with **Procedure 3: Peer Review**. This is likely to be an iterative process between the hydraulic modeller and peer reviewer, and may result in changes to the hydraulic model. The Part A peer review is closed out when the peer reviewer is satisfied that the model is suitable to progress to the next stage of the FHMS process.

- **Part B: Finalise hydraulic model**

  Part B of the hydraulic modelling process occurs following close out of the Part A peer review. Part B involves undertaking validation, sensitivity testing, design runs, and the preparation of preliminary outputs.

  Outputs should be prepared in accordance with **Procedure 5: Outputs**.

The stages of the FHMS process that are related to hydraulic modelling are outlined in red in Figure 1-1 below.

1.2 Software

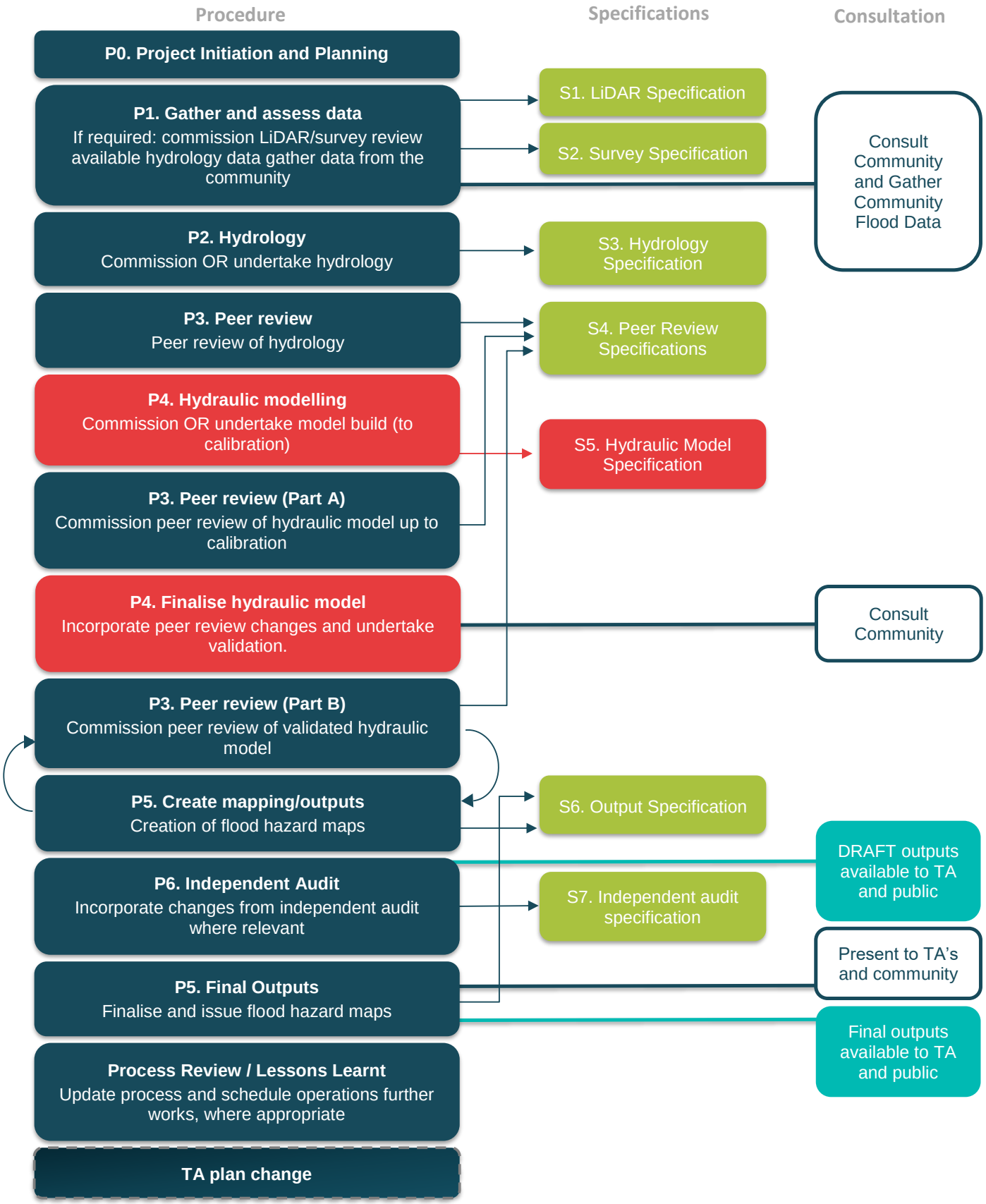
Hydraulic modelling should be undertaken using the software package nominated by the GWRC. The preferred software package is Mike by DHI, although consideration will also be given to TUFLOW.

1.3 Model extent

The model extent is to be provided by, or confirmed with the GWRC prior to commencing modelling.

Attachment 1 to Report 20.315

FHMS process showing stages where hydraulic modelling is undertaken



1.4 Naming convention

A logical naming convention should be adopted for all hydraulic models and output files. The naming convention should clearly outline the details of the model run and/or scenario.

It is acknowledged that the appropriate naming convention is likely to vary between software packages, due to differing methods of packaging versions and scenarios. The nomenclature used in the model file naming convention should be described in detail in the hydraulic model report and model log, and should be broadly based on the naming convention for model outputs.

Outputs should follow the naming convention listed in Table 1-1, Table 1-2 and Table 1-3 below. This naming convention has been adopted to ensure consistency between projects, for ease of use for the end user. The output naming convention shall be:

Project ID _RunType-RunScenario_ Event_Version

For example,

For the first version of the hydraulic model calibration (calibration event on 20 December 1976) for the Hutt River model, the output name would be:

HUTTRIVER_C-19761220_001

For the final (peer reviewed) version of the design run of the 1% AEP event with allowance for climate change for the Hutt River the output name would be:

HUTTRIVER_D_1PC-AEP-CC_F

Table 1-1 Naming convention – run types

Code	Run Type	Run scenario	Description
W	Working	N/A	Working files during initial model build.
C	Calibration	YYYYMMDD	Calibration scenario described by date of event in year month date format.
V	Validation	YYYYMMDD	Validation scenario described by date of event in year month date format.
D	Design Run	N/A	Design runs using the calibrated and validated model.
R	Residual Hazard Run	BRE-01	Stopbank breach run. If multiple breach scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The breach location and size applied for each scenario should be outlined in the modelling report.
		DWN-01	Stopbank down run. If multiple stopbank down scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The stopbank down locations applied for each scenario should be outlined in the modelling report.
		DEF-01	Areas benefiting from defences. If multiple scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The areas tested in each scenario should be outlined in the modelling report.
S	Sensitivity Run	BLK-01	Sensitivity runs for blockage. If multiple blockage scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The blockage applied for

			each scenario should be outlined in the modelling report.
		RGH-01	Sensitivity runs for roughness. If multiple roughness scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The roughness applied for each scenario should be outlined in the modelling report.
		BDY-01	Sensitivity runs for boundary conditions. If multiple boundary scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The details of the boundary condition applied for each scenario should be outlined in the modelling report.
		DEB-01	Sensitivity runs for debris loading. If multiple debris loading scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The details of the debris loading applied for each scenario should be outlined in the modelling report.
		SHP-01	Sensitivity runs for changes to channel shape to account for bank erosion or bed aggradation or degradation. If multiple scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The details of each scenario should be outlined in the modelling report.
		LUC-01	Sensitivity runs using the outputs of the hydrology sensitivity scenario for Land Use Change. If multiple land use change scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The land use change applied for each scenario should be outlined in the modelling report.
		ANC-01	Sensitivity runs using the outputs of the hydrology sensitivity scenario for antecedent conditions. If antecedent condition scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The conditions applied for each scenario should be outlined in the modelling report.
		LOS-01	Sensitivity runs using the outputs of the hydrology sensitivity scenario for losses. If a number of loss scenarios are tested a number (eg, 01, 02...) should be assigned to each scenario. The conditions applied for each scenario should be outlined in the modelling report.

Table 1-2 Naming convention – versions

Version codes	Version	Description
00X	Versions of model, eg, 001, 002…	Working versions of the model are distinguished by numbering.

F	Final	The final (peer reviewed and accepted) version of the model output.

Table 1-3 Naming convention – events

Recurrence Interval Code	Recurrence Interval/Event	Description
1PC-AEP	1% AEP	Current scenario design runs
2PC-AEP	2% AEP	
5PC-AEP	5% AEP	
10PC-AEP	10% AEP	
20PC-AEP	20% AEP	
39PC-AEP	39% AEP	
1PC-AEP-CC	1% AEP	Design runs with allowance for climate change
2PC-AEP-CC	2% AEP	
5PC-AEP-CC	5% AEP	
10PC-AEP-CC	10% AEP	
20PC-AEP-CC	20% AEP	
39PC-AEP-CC	39% AEP	
1900CUMEC	1,900 m^3/s flow	1% AEP flow for Hutt River only
2300CUMEC	2,300 m^3/s flow	Design flow for Hutt River only
2800CUMEC	2,800 m^3/s flow	Design flow and residual hazard for Hutt River only

Where scenarios not listed in these tables are run (for example, a catchment specific sensitivity test) then a new scenario code should be agreed with the GWRC and this procedure updated.

1.5 Provision of data

All final model files, input datasets, and outputs are to be provided to the GWRC on completion of the modelling. Working files developed as part of the model build do not need to be provided.

2 PART A: Hydraulic model build

2.1 Model schematisation

The most appropriate schematisation for flood hazard models within the Wellington Region is likely to be 1D-2D linked model. In this type of model schematisation, river channels, and some tributaries and major overland flow paths are represented in 1D, where river bathymetry is interpolated between a series of channel cross-sections. The floodplain is represented in 2D, and water is able to flow between the 1D and 2D model components.

Pure 1D models are generally considered to be insufficient to provide an accurate representation of out of bank flood risk in the majority of catchments where the GWRC undertake flood hazard modelling. As such, the GWRC should be consulted prior to undertaking any 1D modelling.

2D modelling is not currently widely used in the Wellington Region due to a lack of bathymetry data. However, 2D modelling may be undertaken more widely in future. Care should be taken to accurately reflect the bathymetry within modelled watercourses.

The proposed model schematisation should be discussed and agreed with the GWRC prior to commencing modelling, and should be determined on a project-by-project basis based on the purpose of the modelling, and the scale and level of detail required.

2.2 Grid

Grids are used to set the framework for model computation in 2D models and the 2D components of 1D-2D linked models.

As grid type and resolution may have a significant effect on model results, they should be determined by the modeller on a project-by-project basis based on the scale of the model and floodplain features to be captured (such as stopbanks and overland flow paths), while maintaining a practical model run time. Application of a variable grid may be appropriate for some projects, to allow a finer grid size to be applied around key features and flow paths.

The Flood Modelling Guidelines for Responsible Authorities prepared by the Scottish Environmental Protection Agency indicate that a minimum grid resolution of 3 to 4 cells across major flow paths may be appropriate. For example, a major flow path that is 10 m wide would require a grid cell size of 2.5 – 3 m. In 1D-2D linked models these overland flow paths may alternatively be modelled in 1D.

Minimum grid sizes may be limited by the resolution of the DEM as there is unlikely to be any benefit to using a finer grid size than the DEM, and computation times may be significantly increased.

The selected grid type and resolution should be outlined and justified in the hydraulic modelling report.

2.3 Model inputs

All model inputs should be listed and described in the data register prepared for the FHMS project. The function and use of the data register is described in **Procedure 1: Gather and Assess Data**.

All model inputs are also to be listed within the hydraulic model log. The model log is discussed further in Section 5.2.

2.3.1 DEM

As outlined in **Procedure 1: Gather and Assess Data**, a digital elevation model (DEM) is a 3D model of the elevation of a portion of the earth's surface. It may be created from topographic survey, photogrammetry or LiDAR data. The DEM may be used to define the bank and floodplain elevations in a 1D-2D linked model or 2D hydraulic model, or to map the flood extents resulting from channel overtopping in a 1D hydraulic model.

The quality of the DEM is assessed earlier in the FHMS process as part of Procedure 1. The requirements for this assessment are outlined in Section 5.2 of that procedure.

During the hydraulic model build, modifications may need to be made to DEM to ensure that features that are not well represented in the DEM (typically linear features such as small open drains or rail embankments) are included in the model. Similarly, where detailed modelling is undertaken in urban areas, kerbed roads may need to be burnt into the DEM to ensure runoff flows along kerbed roads rather than through properties, where this is unlikely to occur in practice.

Bridges, culverts, tunnels or awnings may appear as blockages or barriers to flow in the DEM. These features should be represented through the use of a 1D structure or modification of the DEM.

Buildings may be represented in the DEM by blocking out or creating voids in the DEM. An alternative approach is to increase roughness in building locations, as described in Section 2.3.5. The representation of building should be described and justified in the hydraulic modelling report.

2.3.2 Cross-sections

Where the river channel or tributaries are represented in 1D, surveyed cross-section data will be a key model input. This data is gathered and reviewed as part of **Procedure 1: Gather and Assess Data**. This review will usually be undertaken by the hydraulic modeller prior to the commencement of modelling.

Where additional cross-sections are required and this is discovered after modelling is underway, then this should be discussed with the GWRC and procured in accordance with Procedure 1 and Specification 2 of the FHMS.

2.3.3 Hydrology inputs

Hydrology inputs into the hydraulic model are derived from the outputs of the hydrological model. The outputs to be provided are described in **Procedure 2: Hydrology**.

Hydrology inputs will generally form the upstream boundary of the hydraulic model.

2.3.4 Climate change

Climate change should be accounted for in a number of hydraulic model design runs. The design runs where climate change is to be included are outlined in Table 3-1.

Climate change is incorporated into the hydrological inputs as part of the hydrological modelling and as such, input flows do not need to be adjusted further. Refer to **Procedure 2: Hydrology** for further information.

Within the hydraulic model, climate change is accounted for at the downstream boundary where tidal boundaries, river boundaries etc. should reflect future climate conditions in climate change runs. This is outlined further in Section 2.4.

2.3.5 Roughness

Surface roughness is a key input into hydraulic models and is used to represent energy losses due to frictional resistance to flow. Surface roughness is required at channel cross-sections in 1D models / 1D channel representations, and across 2D surfaces such as 2D river beds and floodplains.

Roughness is generally represented in hydraulic modelling using Manning's *n* coefficient. Channel and floodplain roughness should be estimated on the basis of the channel and floodplain conditions for the specific reach considering factors such as bed material, straightness of channel, vegetation type and density.

Table 2-1 provides some example ranges of manning's n roughness values for open channels and closed conduits. More detail is provided in Chow, 1959. Roughness may be derived from other sources such as the Roughness Advisor database within the CES/AES free software developed by the Environment Agency of the UK and others.

Manning's n roughness values used in hydraulic modelling should be stated and justified in the hydraulic modelling report.

Table 2-1 Example ranges of Manning's n roughness values. Source: Summarised from Chow, 1959

Description	Range (Mannings n)
Minor Streams (top width at flood stage <30 m)	
On a plain:	
– Clean to some weeds, straight, full stage	0.025 – 0.040
– Clean to some weeds, winding, some pools and shoals	0.033 – 0.050
– As above, but at lower stages with more ineffective slopes and sections, more stones	0.040 – 0.060
– Sluggish reaches, weedy, deep pools	0.050 – 0.080
– Very weedy reaches, deep pools or floodways with trees and underbrush	0.075 – 0.150

Attachment 1 to Report 20.315

Mountain streams:	
– Bottom: gravels, cobbles, few boulders	0.030 – 0.050
– Bottom: cobbles with large boulders	0.040 – 0.070
Major Streams (top width at flood stage > 30 m) *The n value is less than that for minor streams of similar description as banks offer less effective resistance*	
– Regular section with no boulders or brush	0.025 – 0.060
– Irregular and rough section	0.035 – 0.100
Floodplain	
– Pasture, no brush	0.025 – 0.050
– Cultivated – no crop	0.020 – 0.040
– Cultivated – mature crop	0.025 – 0.050
– Brush – scattered, heavy weeds	0.035 – 0.070
– Brush – light brush and trees	0.035 – 0.080
– Brush – medium to dense	0.045 – 0.160
– Trees – dense willows	0.110 – 0.200
– Trees – heavy stand of timber, little undergrowth, flood stage below branches	0.080 – 0.120
– Trees – heavy stand of timber, little undergrowth, flood stage reaching branches	0.100 – 0.160
Excavated or dredged channels	
– Earth, straight and uniform	0.016 – 0.033
– Earth, winding and sluggish	0.023 – 0.040
– Channels not maintained, weeds and brush uncut	0.050 – 0.140
Closed conduits	
– Concrete – culvert, straight and free of debris	0.010 – 0.013
– Concrete – culvert, with bends, connections and some debris	0.011 – 0.014

Where a hydraulic model is prepared for a watercourse that is within the same catchment as another hydraulic model (eg, Pinehaven Stream and the Hutt River), or within a nearby catchment with very similar catchment characteristics, consideration should be given to the manning's *n* roughness values used in the previous modelling. Where departures are made from the values used in this modelling this should be justified in the hydraulic modelling report.

2.3.5.2 Representation of buildings

Buildings can present significant barriers to flow, and may be represented by increasing roughness to very high levels to simulate the frictional resistance of flow passing through a building. Where it is known the buildings will present a complete barrier to flow (eg, concrete block buildings), buildings may be blocked out of the DEM.

The hydraulic modeller should determine the most appropriate method for representing buildings in the particular catchment based on model set up (eg, grid size) and catchment factors (eg, type of buildings – timber or concrete, whether basements or underground carparks are present).

The method of representing buildings should be detailed in the hydraulic modelling report.

2.3.6 Stormwater network

The inclusion or exclusion of the stormwater network from the hydraulic model should be discussed and agreed with the GWRC prior to model commencement. Where included, the stormwater network representation (i.e. a hydraulic model of the network versus an inflow point from the network to the watercourse) should be discussed and agreed with the GWRC.

2.3.7 Structures

Hydraulic structures such as bridges and culverts should typically be represented in 1D. However, there may be some situations where representation in 2D is appropriate. The hydraulic modeller should document in the model log how hydraulic structures are represented and justification for this.

The hydraulic modeller has discretion to choose which minor structures are represented in the model i.e. minor structures that only impact flows at low stages may be omitted, however all build decisions should be fully documented in the hydraulic modelling report. Structures should be included where they constrict flow under high flow conditions.

Structures should be modelled based on survey data or as-built drawings collected and reviewed as part of **Procedure 1: Gather and Assess Data**.

2.3.8 Initial conditions

Initial conditions are used to set the starting point for the model. The initial conditions used should be documented in the hydraulic modelling report. Care should be undertaken setting initial conditions where there are significant amounts of storage in the catchment.

2.4 Boundaries

2.4.1 Upstream boundary

Outputs from the hydrological model will be provided to the hydraulic modeller for use as the upstream boundary. This is discussed in Section 2.3.2.

2.4.2 Downstream boundary

Downstream boundary conditions should be applied at downstream model boundaries. The downstream boundary of the model is to be far enough downstream such that any hydraulic conditions that may affect model results are accounted for.

The type of downstream boundary selected should be determined on a project-by-project basis, but may be a tidal boundary, or a riverine boundary (eg, confluence with another watercourse). Downstream boundary conditions may be static or time-variable as appropriate, and should be set in a way that prevents the creation of artificial backwater at the outlet of the model.

Tidal boundaries should be based on mean high water springs. An oscillating tide should generally be used with the high tide timed to coincide with the flood peak.

2.4.2.1 Climate change

Where climate change design runs are being undertaken, downstream boundary conditions should be adjusted to the same time horizon as the climate adjusted design rainfall used in the hydrological model.

A 1 m allowance for sea level rise should be applied to tidal boundaries in climate change scenarios. Further information on expected sea level rises is provided in *Coastal Hazards and Climate Change. Guidance for Local Government* published by the Ministry for the Environment in 2017.

2.4.3 Joint probability assessment

A joint probability assessment is undertaken on the basis that extreme rainfall and events such as storm surge are statistically dependent, and are therefore may occur at the same time. Joint probability assessment is generally not required where factors are independent (i.e. not likely to be caused by, or occur under similar conditions) as the likelihood that a high magnitude low frequency event will occur simultaneously for both factors is low.

Downstream tidal and river boundaries should assume a joint probability scenario of a 5% AEP event at the downstream boundary during the 1% AEP rainfall event. Probabilities for more frequent events should be discussed and confirmed with the GWRC.

Joint probabilities applied at downstream boundaries should be described in the hydraulic modelling report.

2.5 Calibration

Calibration involves the adjustment of model parameters to alter model results to improve agreement between modelled and recorded flood extents, levels/depths, velocities and behaviours. Calibration should aim to match all aspects of the flood, including maximum levels, time to peak, inundation time and any known flood behaviours, where possible.

Calibration should be undertaken for all hydraulic models developed under the FHMS where sufficient data is available. Ideally, calibration would utilise flood records for at least three flood events of differing magnitudes, with at least one event being greater than a 2% AEP event to ensure that modelled parameters accurately represent catchment runoff behaviour, losses and routing across a range of events.

However, it is noted that data for calibration is often limited within the Wellington Region, and sufficient data for three events may not be available, and that confidence in available data may be limited. Calibration should also consider how the catchment may have changed since the calibration event, for example whether new development such as a new bridge may change flood levels or behaviour.

The calibration process should be documented in full, including final parameters, and how data quality and changes in the catchment and any other factors were accounted for. Parameter modifications for calibration should take care to remain within realistic ranges.

Calibration data should be gathered as part of **Procedure 1: Gather and Assess Data**, and may include aerial photography during a flood event (ideally at the peak), historical flood levels, surveyed flood extents or records of debris lines, photographs of the flood event, and anecdotal information provided by community members who witnessed the flood. Ideally data would be available to allow calibration of extent, level, timing and behaviour.

2.6 Mass balance

The model continuity error should be maintained at less than 5%. The continuity error measures the total water volume lost from the model by comparing to the total inflow and outflow volumes, and accounting for the volume stored in the model.

3 PART B: Finalise hydraulic model

As outlined in Section 1.1, Part B of the hydraulic modelling process will be undertaken following close-out of the Part A peer review. The Part A peer review is to be undertaken and documented in accordance with **Procedure 3: Peer Review**.

3.1 Validation

Validation is undertaken following model calibration and is used to verify that the model can acceptably reproduce events that are different to the calibration event. This ensures that the calibration parameters are representative of a wide range of possible events that could occur in the catchment.

Where possible, validation should be undertaken for a minimum of three events of varying magnitude. However, it is recognised that for the majority of watercourses in the region sufficient data is unlikely to be available.

Similarly to calibration, validation data should be gathered as part of **Procedure 1: Gather and Assess Data**, and may include aerial photography during a flood event (ideally at the peak), historical flood levels, surveyed flood extents or records of debris lines, photographs of the flood event, and anecdotal information provided by community members who witnessed the flood. Ideally data would be available to allow validation of extent, level, timing and behaviour.

Where no validation data is available, the sensibility of the calibration results should be reviewed to ensure that model results are within reasonably expected values.

3.2 Sensitivity analysis

Sensitivity analysis is the adjustment of model parameters within realistic ranges to determine the impact on model results. Sensitivity analysis can be used as an indication of model uncertainty resulting from input parameters that are unsupported by data, particularly where minimal calibration and/or validation data is available.

Sensitivity analysis of key parameters should be undertaken on all hydraulic models prepared for flood hazard modelling projects. Sensitivity parameters may include:

- Roughness – upper and lower manning's *n* roughness values should be tested.
- Blockage – the GWRC's operations team should be consulted to confirm whether and where blockages regularly occur within the study catchment.
- Downstream boundary conditions
- Debris loading
- Changes to input hydrology – this should be undertaken using the outputs from the sensitivity analysis of the hydrological model. Sensitivity parameters include antecedent conditions, temporal pattern, losses and land use change such as new urban development.
- Changes to channel shape (i.e. channel erosion, bed aggradation / degradation), where relevant.
- Catchment specific factors, where relevant
- Specific river characteristics, where relevant

The parameters selected for sensitivity analysis should be agreed with the GWRC and should be fully documented in the hydraulic modelling report.

3.3 Design runs

A suite of design runs is required to be undertaken. The required design runs are outlined in Table 3-1.

Table 3-1 Required design runs.

Risk type	Scenario
Current flood hazard	– 39% AEP (1 in 2-year Average Recurrence Interval (ARI)) – 20% AEP (1 in 5-year ARI) – 10% AEP (1 in 10-year ARI) – 5% AEP (1 in 20-year ARI) – 2% AEP (1 in 50-year ARI) – 1% AEP (1 in 100-year ARI) (1,900 m^3/s for Hutt River only) – 2,300 m^3/s flow (Hutt River only)
Future flood hazard (climate change)	– 39% AEP (1 in 2-year ARI) with allowance for climate change – 20% AEP (1 in 5-year ARI) with allowance for climate change

	– 10% AEP (1 in 10-year ARI) with allowance for climate change – 5% AEP (1 in 20-year ARI) with allowance for climate change – 2% AEP (1 in 50-year ARI) with allowance for climate change – 1% AEP (1 in 100-year ARI) with allowance for climate change
Residual flood hazard	– A series of breach runs with 1% AEP (1 in 100-year ARI) flow – An overtopping run with a 0.1% AEP (1 in 1000-year ARI) flow – 2,800 m^3/s flow (Hutt River only) with stopbank breaches
Areas benefiting from defences	– Stopbank-down runs for sections of stopbank. Locations and lengths to be determined on a project by project basis. • 1% AEP event • 1% AEP event with climate change • 2,300 m^3/s flow (Hutt River only) – Full stopbanks down run for economic analysis (all projects). • 1% AEP event • 1% AEP event with climate change • 2,300 m^3/s flow (Hutt River only)

3.3.1 Residual hazard runs

Residual hazard is the flood hazard that is present in areas that are protected by structural controls such as stopbanks. This hazard is present due to the potential for structural failure, such as stopbank breach (rupture) and events that are larger than the structure is designed to accommodate, such as in the case of stopbank overtopping. Three types of residual hazard runs are required to be undertaken, overtopping, stopbank breach runs and stopbank down runs. These are described in the sections below.

3.3.1.1 Overtopping runs

An overtopping run should be undertaken using the 0.1% AEP event to determine residual flood hazard. An overtopping run is not required for the Hutt River where residual hazard is determined using a large stopbank breach run.

3.3.1.2 Stopbank breach runs

Stopbank breach runs are undertaken to assess the flood extents and hazard of stopbank breaches. The locations of the breaches should be determined based on an assessment of locations likely to be vulnerable to breach (eg, on river bends or areas with known structural weaknesses). A workshop with the GWRC should be held to confirm and agree breach locations.

Stopbank breach runs are undertaken using the 1% AEP event. For the Hutt River stopbank breach runs are undertaken using the 2,800 m^3/s event.

3.3.1.3 Stopbank down runs

Stopbank down runs are undertaken to determine which areas benefit from stopbanks. Areas benefiting from defences are parcels of land located behind structural controls (such as stopbanks) that would become inundated during the 1% AEP or more frequent events (or the 2,300 m^3/s flow in the Hutt River) if the structural control was not in place. The identification of these areas informs asset management and cost-benefit analysis.

Areas benefiting from defences are identified by removing structural controls such as stopbanks from the hydraulic model, and mapping the resulting flood extents. The following scenarios should be modelled:

- Full removal of the structural controls from the hydraulic model.

- For stopbanks, removal of sections of the stopbank.

The lengths and locations of the stopbanks to be removed are to be workshopped and agreed with the GWRC.

3.4 Freeboard

Freeboard is to be determined based on the results of the hydraulic model sensitivity analyses. Sensitivity analysis is used to determine the level of uncertainty in the model results, and is undertaken by making changes to key model inputs or parameters, and observing the impact of these changes on the model results. The method of determining and mapping freeboard is outlined in **Procedure 5: Outputs**.

4 Outputs

The requirements for hydraulic model outputs are detailed in **Procedure 5: Outputs**. Preliminary outputs should be prepared as part of the hydraulic modelling process to assist with peer review. Outputs are finalised following close-out of the peer review and independent audit undertaken under **Procedure 6: Independent Audit**.

The required final outputs of the hydraulic modelling are outlined in Table 4-1. These outputs are required to:

- Assist the peer reviewer to undertake the peer review.
- Keep records for future model updates and additional design runs if required.
- Provide a visual representation of flood hazard to inform Floodplain Management Plans, provide information for the GWRC's advisory role and to feed into District Plan mapping.

Table 4-1 Hydraulic model outputs

Element	Requirement
Flood extents, depths, velocities, hazard	All current climate, climate change and residual hazard runs for a range of scenarios and events, as outlined in **Procedure 5: Outputs**.
Model files	All model files to be provided to the peer reviewer for review, and to the GWRC for records.
Model log	A detailed model log should be kept and provided on completion of the modelling. This is described in Section 5.2.
Geospatial files	All geospatial files used during modelling, eg, DEM

4.2 Confidence in results

An estimate of the confidence of the model results should be undertaken and presented for each flood hazard modelling project. Confidence may be estimated quantitatively or qualitatively.

Where qualitative estimation is undertaken, the criteria used and justification for the criteria should be provided in the hydraulic modelling report. An example of a qualitative assessment is provided in Table 4-2.

Table 4-2 Example qualitative assessment of model confidence.

Parameter	Qualitative Assessment	Confidence Score
Availability and quality of input data	DEM of high resolution, good correlation between top of bank elevations in DEM and cross-sections.	Medium

	Recent river channel cross-sections at regular intervals. Spacing between data points along cross-section is appropriate. Input hydrology calibrated based on 44 year flow gauge record. Hydrology report indicates good calibration fit, however gauge rating curve is not verified for high flow events greater than the 5% AEP.	
Availability and quality of calibration data	Flow and level data available for one recent event estimated to be approximately 5% AEP. Aerial photographs taken close to peak extent, and anecdotal evidence of flood behaviour are also available for this event. No other calibration events are available.	Medium
Availability and quality of validation data	Historic photographs and anecdotal evidence available for one event estimated to be 2% AEP. Photographs do not show full flood extent but assist with estimates of flood depth at a number of locations. No other validation events are available.	Medium
Calibration fit	Peak flow over-estimated by approximately 1%. Flood extent generally consistent with available aerial photography, although some minor differences at southern extent.	High
Validation fit	Modelled flood depths generally consistent with depths estimated from historical photos and anecdotal evidence. Unable to assess fit of extents due to lack of data.	Medium
Model sensitivity	Model sensitive to changes in manning's *n* roughness within potential ranges. Model also sensitive to blockage at one location known to block frequently during high flow events. As a result the increase in flood extent under this scenario is included in the flood sensitive area.	Medium as mitigated through flood sensitive area
Model performance and mass balance	Model mass balance is within acceptable ranges.	High
	Overall qualitative confidence level	**Medium**

5 Documentation

5.1 Data register

A data register will be prepared for each flood hazard modelling project as part of works undertaken under **Procedure 1: Gather and Assess Data**. Details of the format of the data register is provided in Procedure 1, and a template is provided in Appendix A of Procedure 1.

The data register should be updated with any data gathered or reviewed as part of this procedure. On completion of this component of work the updated data register should be appended to the hydraulic modelling report, and provided in electronic format to the GWRC.

5.2 Model log

A detailed model log should be kept while undertaking the modelling. This log should be appended to the hydraulic modelling report, and should document the model build, assumptions made, and all inputs. The model log should assist with version control and will describe the model naming convention.

The model log should be provided to the peer reviewer to assist with the peer review. A model log template is provided in Appendix A.

5.3 Report

A detailed technical report should be prepared to outline the hydraulic modelling undertaken. The report should be prepared as part of the Part A works, and issued to the GWRC and the peer reviewer. Following close out of the Part A peer review, the report should be updated to include to incorporate any changes or recommendations following the peer review, and the Part B works. The report should include, but is not limited to:

PART A:

- Details of the software used.
- Model extent.
- Model schematisation.
- Grid type and resolution.
- Data availability and quality.
  - Detailed summary of the analytical process and findings of the data collection and review undertaken as part of **Procedure 1: Gather and Assess Data.**
- Summary of and justification for input parameters including roughness.
- Representation of structures and justification for any structures not modelled.
- Initial conditions.
- Boundary conditions.
- Calibration, including details of the calibration events selected, parameters adjusted and calibration performance.
- Details of model performance, including numerical stability and mass balance errors.

PART B:

- Validation, including details of the validation events selected, parameters adjusted and validation performance.
- Sensitivity analysis including details of the sensitivity scenarios tested and results.
- Design runs.
- Application of freeboard.
- Details of model performance, including numerical stability and mass balance errors.

6 Procedure review

This procedure is intended to be a living document that can be revised as technology advances and industry accepted practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the ‘process review / lessons learnt’ checkpoint on the FHMS flow chart.

7 References

Chow, V.T. (1959). Open Channel Hydraulics. McGraw-Hill Book Co. Singapore.

Ministry for the Environment (2017). *Coastal Hazards and Climate Change. Guidance for Local Government*.

Scottish Environmental Protection Agency (2015). Flood Modelling Guidance for Responsible Authorities.

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 5** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person preparing outputs from hydraulic modelling on GWRC's flood hazard modelling projects.

This document should be read in the context of the wider FHMS, and has a particular relationship to **Specification 6: Outputs**.

1.1 What are outputs?

The outputs of the hydraulic modelling are the 'final product' of the flood hazard modelling process. Outputs include maps, tables of results, long-sections, and geospatial files such as raster and shape files. The outputs specified in this document are the minimum requirements for all flood hazard modelling undertaken under the FHMS.

The outputs are used by the GWRC for flood warning, floodplain management planning, asset management and advisory responses. The GWRC provide relevant sets of outputs to other parties such as Wellington Region Emergency Management Office (WREMO), Territorial Authorities (TAs), and the public for emergency planning and management, district planning, consenting, insurance and ownership information and decision making.

This procedure has been prepared to ensure that the outputs of flood hazard modelling projects meet the needs of their end users, and are clear and consistent for ease of interpretation.

1.2 Outputs in the FHMS Process

Preliminary outputs are created following finalisation of the hydraulic model. The review of these preliminary outputs is included in the Part B hydraulic model peer review.

The Part B hydraulic model peer review is an iterative process where the model runs, validation and sensitivity analysis will be reviewed and modified. Due to the iterative nature of this process, the preliminary outputs will also be updated iteratively at this time. The peer review is described in more detail in **Procedure 3: Peer Review**. Following close-out of the peer review, the preliminary outputs may be issued to interested parties such as WREMO, TAs and the public as drafts.

Final outputs are prepared and issued following the independent audit of the flood hazard modelling process, which is the subject of **Procedure 6: Independent Audit**.

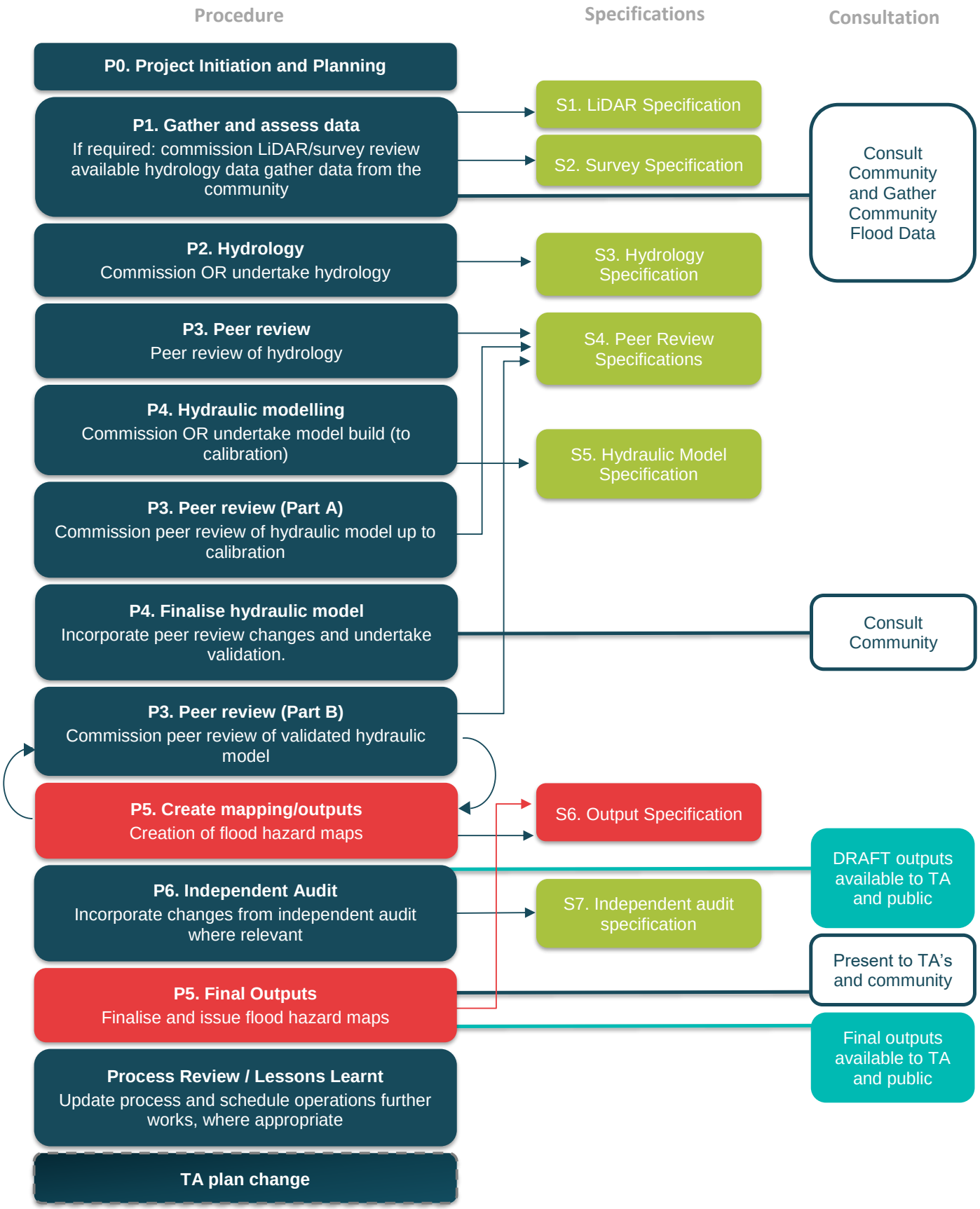
The stages of the FHMS process that are related to the preparation of outputs are outlined in red in the Figure 1-1 below.

1.3 Who produces the outputs

The outputs should be prepared by the hydraulic modeller as part of the hydraulic modelling scope.

Attachment 1 to Report 20.315

FHMS process showing stages where outputs are prepared (red)



2 Schedule of outputs

A standard suite of outputs is to be prepared for all flood hazard modelling projects. These outputs are listed in Table 2-1 below. Details of the output types are described in Section 2.2.

Table 2-1 Outputs

Output format	Output type	Scenario
Hydraulic modelling report	See **Procedure 4: Hydraulic Model** for reporting and documentation requirements.	
Raster grids (2D)	Level	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific
	Depth	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific
	Velocity	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific
	Hazard	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific Flood sensitive area for 1% and 2% AEP event and the 1% and 2% AEP event with climate change
Maps (PDF)	Extent	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific Flood sensitive area for 1% and 2% AEP event and 1% and 2% AEP event with climate change
	Hazard	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2 Alarm levels – project specific Flood sensitive area for 1% and 2% AEP event and 1% and 2% AEP event with climate change
Tabulated in-channel (1D) results	Level	All current and future flood hazard scenarios in Table 2-2
	Velocity	All current and future flood hazard scenarios in Table 2-2
Shape files	Extent	All current and future flood hazard scenarios in Table 2-2 All residual flood hazard scenarios in Table 2-2

	Flood sensitive area	1% and 2% AEP event 1% and 2% AEP event with climate change
	Areas benefiting from defences	1% AEP event 1% AEP event with climate change
Tabulated emergency management data	Discharge and key inundated features (eg, access roads) at alarm levels	To be determined on a project by project basis.
	Time to inundation and duration of inundation	All current and future flood hazard scenarios in Table 2-2
	Areas likely to become isolated (islands)	1% AEP event 1% AEP event with climate change
Optional outputs		
Animations	Extent over time	1% AEP event 1% AEP event with climate change

Table 2-2 Scenarios

Risk type	Scenario
Current flood hazard	– 39% AEP (1 in 2-year Average Recurrence Interval (ARI)) – 20% AEP (1 in 5-year ARI) – 10% AEP (1 in 10-year ARI) – 5% AEP (1 in 20-year ARI) – 2% AEP (1 in 50-year ARI) – 1% AEP (1 in 100-year ARI) – 2% AEP (1 in 50-year ARI) with freeboard – 1% AEP (1 in 100-year ARI) with freeboard Hutt River only: – 1,900 m^3/s flow – 2,300 m^3/s flow
Future flood hazard (climate change)	– 39% AEP (1 in 2-year ARI) with allowance for climate change – 20% AEP (1 in 5-year ARI) with allowance for climate change – 10% AEP (1 in 10-year ARI) with allowance for climate change – 5% AEP (1 in 20-year ARI) with allowance for climate change – 2% AEP (1 in 50-year ARI) with allowance for climate change – 1% AEP (1 in 100-year ARI) with allowance for climate change – 2% AEP (1 in 50-year ARI) with allowance for climate change, with freeboard

	– 1% AEP (1 in 100-year ARI) with allowance for climate change, with freeboard
Residual flood hazard	– A series of breach runs with 1% AEP (1 in 100-year ARI) flow – An overtopping run with a 0.1% AEP (1 in 1000-year ARI) flow Hutt River only: – 2,800 m^3/s flow with stopbank breaches.
Areas benefiting from defences	– Stopbank-down runs for sections of stopbank. Locations and lengths to be determined on a project by project basis. • 1% AEP event • 1% AEP event with climate change • Hutt River only: 2,300 m^3/s flow – Full stopbanks down run for economic analysis (all projects). • 1% AEP event • 1% AEP event with climate change • Hutt River only: 2,300 m^3/s flow

2.2 Output types

2.2.1 Extent

Flood extent is the area of land to be inundated under a particular scenario, such as a 1% AEP event. Flood extent does not include land that becomes inundated after freeboard is applied, which is displayed separately as a flood sensitive area. This is discussed further in Section 2.2.4.

Flood extents include all land inundated during a particular scenario, and are **not** adjusted to remove areas with very shallow inundation.

2.2.2 Level, depth and velocity

Flood level is the maximum elevation of flood water during a particular scenario at a particular location. Flood level does not include freeboard.

Flood depth is the difference between the maximum flood level and ground elevation at a particular location, during a particular scenario. Flood depth also does not include freeboard.

Velocity is the maximum velocity of flood waters at a particular location during a particular scenario. Velocity may be used to differentiate flow paths from ponding areas.

2.2.3 Hazard

Hazard is a function of the depth and velocity of flood waters at a particular location. It informs the likely risk to people and property as a result of flooding. Hazard is low in shallow slow-moving waters, and increases with increasing depth and velocity.

Hazard raster grids are to be prepared based on the general flood hazard classification from Book 6: Flood Hydraulics of Australian Rainfall and Runoff (2016), unless otherwise requested by the GWRC and external stakeholders. The Australian Rainfall and Runoff hazard classification is provided in Figure 2-1 below.

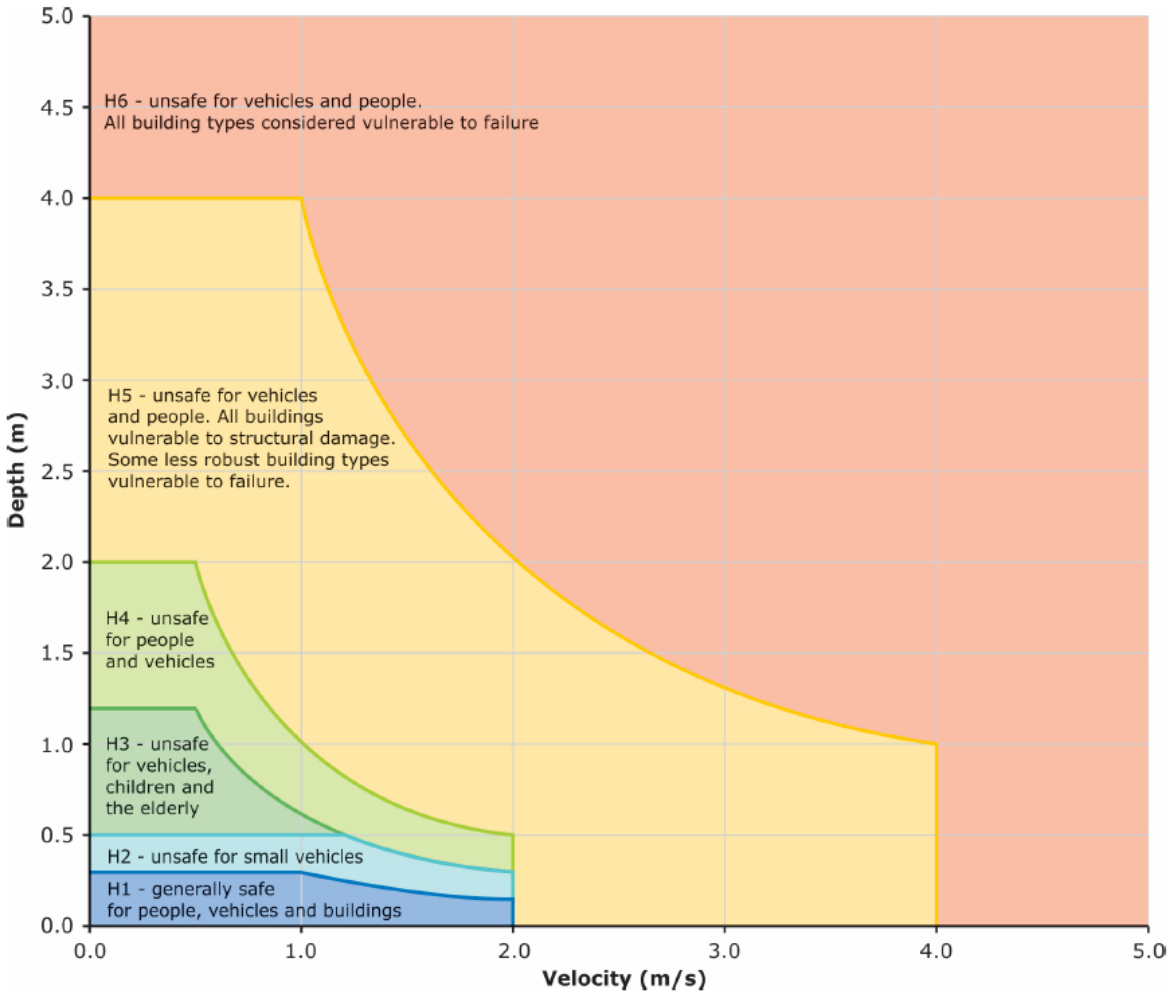


Figure 2-2 Hazard Classification. Source: Australian Rainfall and Runoff – Book 6 Flood Hydraulics (2016), after Smith et al., 2014.

Hazard extents should match the flood extent (i.e. flood sensitive areas are excluded from hazard grids).

2.2.4 Flood sensitive area

Flood sensitive area (FSA) is the additional extent that occurs when freeboard is applied to flood levels for a particular scenario. The development of freeboard is described in Section 3.

2.3 Residual hazard

Residual hazard is the flood hazard that is present in areas that are protected by structural controls such as stopbanks. This hazard is present due to the potential for structural failure, such as stopbank breach (rupture) and events that are larger than the structure is designed to accommodate, such as in the case of stopbank overtopping.

The following outputs are required to address residual hazard:

- Flood extents and hazard resulting from a series of stopbank breach runs. The locations of the breaches should be determined based on an assessment of locations likely to be vulnerable to breach (eg, on river bends or areas with known structural weaknesses). A workshop should be held to confirm and agree breach locations.
- Flood extents and hazard resulting from over-design events (i.e. overtopping of stopbanks). A 0.1% AEP event (approximately a 1 in 1000-year ARI event) will be applied in this scenario. In this scenario protection structures such as stopbanks are modelled as remaining intact.

2.4 Emergency management outputs

2.4.1 Time to inundation

Time to inundation is the time taken for particular features (i.e. access roads) within the modelled catchment to become inundated. Time is measured from the exceedance of the first alarm level in the catchment, or as determined by the GWRC, in consultation with WREMO. This information is used for emergency planning and management, such as determining evacuation timeframes and routes.

The alarm levels and features of interest that time to inundation should be provided for are to be determined by the GWRC in consultation with WREMO, and may be developed iteratively as preliminary flood levels and extents become available.

An example of the alarm levels and features of interest for calculation of time to inundation is provided in Table 2-3.

Table 2-3 Example of alarm levels and features of interest for calculation of time to inundation

Gauge Height Hutt River at Birchville (m)	Recurrence Interval	Flow (m^3/s)	Description
3.5			First alarm level
4.0	63% AEP	400	Block Road floods
4.3	63% AEP	460	HCC carpark floods
5.0			Second alarm level

2.4.2 Duration of inundation

Duration of inundation is the amount of time that an area or a feature of interest (i.e. an access road) is inundated. The areas or features that duration of inundation should be measured for are to be determined by the GWRC in consultation with WREMO, and may be developed iteratively as preliminary flood levels and extents become available.

2.4.3 Areas likely to become isolated

Developed areas that are likely to become isolated (i.e. areas that may become islands) can be hazardous during a flood event, due to:

- The risk of water levels rising further and drowning the island, which may result in stranded people entering the flood waters.
- The risk of stranded people self-evacuating through the flood waters.
- The risk to emergency services when rescuing stranded people.

Developed areas that are likely to form islands during the development of the flood should be identified and mapped to assist emergency services to evacuate these areas while hazard is low. A series of maps should be produced to show the development of the island and the point at which the island becomes cut off from evacuation routes.

2.5 Areas benefiting from defences

Areas benefiting from defences are parcels of land located behind structural controls (such as stopbanks) that would become inundated during the 1% AEP or more frequent events (or the 2,300 m^3/s flow in the Hutt River) if the structural control was not in place. The identification of these areas informs asset management and cost-benefit analysis.

Areas benefiting from defences are identified by removing structural controls such as stopbanks from the hydraulic model, and mapping the resulting flood extents. The following scenarios should be modelled:

- Full removal of the structural controls from the hydraulic model.

- For stopbanks, removal of sections of the stopbank. The lengths and locations of the stopbanks to be removed are to be determined by the GWRC.

3 Freeboard

Freeboard is an allowance that is added to modelled flood levels to account for:

- The effects of real factors that cannot be modelled, such as bow waves from vehicles moving through flood waters.
- Uncertainties in model inputs and assumptions.

Freeboard does not include an allowance for climate change, as this is modelled as part of the design run scenarios.

Freeboard as applied to hydraulic modelling is separate from freeboard applied during the design of structures, which accounts for the passage of debris under the structure (in the case of bridges), or long-term settling (in the case of stopbanks).

Freeboard should be applied to the 1% AEP, 1% AEP with climate change, 2% AEP and 2% AEP with climate change scenarios. For the Hutt River, freeboard should be applied to events greater than or equal to the 2% AEP event. Freeboard may be applied to more frequent events on a case by case basis.

3.1 Calculating freeboard

Freeboard is to be determined based on the results of the hydraulic model sensitivity analyses. Sensitivity analysis is used to determine the level of uncertainty in the model results, and is undertaken by making changes to key model inputs or parameters, and observing the impact of these changes on the model results. Sensitivity analysis of the hydraulic modelling is described in more detail in **Procedure 4: Hydraulic Modelling**.

The method of determining freeboard from the findings of the sensitivity analysis should be workshopped with the GWRC on a case by case basis. The method is likely to involve:

1. Determining the likely worse case of each sensitivity test, based on professional judgement and expertise. Sensitivity parameters may include a selection of:
    - Manning's *n* roughness
    - Downstream boundary conditions
    - Structure blockage
    - Debris loading
    - Changes to input hydrology, such as increased flow, modified hydrograph shape, and changes to the level of development in the catchment
    - Bed level changes
    - Changes to channel shape due to erosion, such as erosion of the bank in a key overflow area
    - Other catchment specific factors, or variations in river/stream characteristics.
2. Preparing hazard raster grids of the likely worst case from each sensitivity test.
3. Workshopping with the GWRC which of the sensitivity scenarios to include in the calculation of freeboard. Sensitivity scenarios may be selected based on risk, or the community may be consulted for their input.
4. Combining the selected hazard grids into a single map by taking the highest hazard at each location from across all likely sensitivity scenarios. Scenarios are not added together, but rather the highest hazard across all likely worse case scenarios is selected at each point in the map.
5. Application of a small allowance for wave action and factors that cannot be modelled to the combined results by routing a block of water through the hydraulic model of a selected sensitivity scenario. The increase in flood extent should be mapped on the combined hazard map.

6. The resulting hazard grid is used by the GWRC to determine flood hazard categories including river corridors, overflow paths, and ponding areas to support district planning.
7. The extent of the combined hazard grid is mapped as a flood sensitive area.

This approach to calculating freeboard is considered to be more appropriate than the traditional approach of a fixed freeboard depth to the hydraulic model results (eg, applying 500 mm across the entire flood extent), as:

- A fixed freeboard depth does not account for the topography of the floodplain, and may be overly conservative in wide floodplains where an unrealistically large volume of water is required to raise flood levels to the freeboard level. Similarly, fixed freeboard depths may be under-conservative in gorges or areas prone to extensive blockage.
- The approach allows for locations that are less sensitive to local effects such as blockage to have a lower freeboard.

3.1.1 Mapping freeboard

The additional flood extent after freeboard is applied is to be mapped as a flood sensitive area. The format and style of this mapping is described in more detail in Section 4.2 below.

4 Output formats

All outputs should be developed in accordance with the styles and formats outlined in this procedure. This requirement is to ensure that all outputs are clear and consistent for ease of interpretation.

4.1 Terminology and units

Annual Exceedance Probability (AEP) should be used to describe recurrence intervals on all outputs.

Results should be provided in appropriate SI units. Recommended units are listed in Table 4-1.

Table 4-1 Recommended units

Parameter	Unit
Velocity	Metres per second (m/s)
Flow / discharge	Cubic metres per second (m^3/s)
Depth	Metres (m)
Area	Square kilometres (km^2), square metres (m^2)
Level (elevation)	Metres above mean sea level (m aMSL)

4.1.2 Projection

All geospatial data should be projected in New Zealand Transverse Mercator 2000 (NZTM2000).

The Wellington Vertical Datum (1953) should be used as the height datum for projects within Kapiti Coast, Hutt Valley, Porirua and Wellington City.

For projects in Wairarapa, the GWRC should be consulted on whether the GWRC Wairarapa Datum should be used. This datum is an unofficial datum based off the Wellington Vertical Datum (1953) +9.22 m.

4.2 Mapping

Flood maps should be prepared and provided in pdf format. Maps should be clearly labelled with the location, event and scenario details. All maps should be dated. Maps should include a north arrow and scale.

Maps should use the colour scheme provided in Table 4-2 below.

Table 4-2 Map style guide

Category	Style Description			
Extent	Discrete colours. 50% transparency. Overlaid over aerial imagery.			
	39% AEP	R251 G212 B167	39% AEP with climate change	R255 G153 B51
	20% AEP	R255 G255 B147	20% AEP with climate change	R255 G255 B0
	10% AEP	R206 G150 B252	10% AEP with climate change	R140 G76 B234
	5% AEP	R146 G208 B80	5% AEP with climate change	R51 G204 B51
	2% AEP	R189 G231 B255	2% AEP with climate change	R98 G233 B230
	1% AEP	R33 G160 B255	1% AEP with climate change	R0 G112 B192
Depth* *Depth bands may be altered on a case-by-case basis if the range is outside of, or within a small number of bands on this scale.	Discrete colours. 50% transparency. Overlaid over aerial imagery.			
	0 m			R0 G0 B0
	0-0.05 m			R193 G211 B239
	0.05 – 0.1 m			R0 G176 B240
	0.1 – 0.3 m			R0 G112 B192
	0.3 – 0.5 m			R146 G208 B80
	0.5 – 1.0 m			R51 G204 B51
	1.0 – 1.5 m			R255 G255 B0

	1.5 – 2.0 m	R255 G153 B51
	2.0+ m	R255 G51 B0
Velocity	Arrows overlaid over depth mapping, arrow size should increase with increasing velocity. A clear scale should be provided.	→
Hazard	H1	R143 G170 B255
	H2	R189 G231 B255
	H3	R117 G213 B142
	H4	R194 G229 B155
	H5	R255 G255 B147
	H6	R255 G176 B137
Flood sensitive area - extent	1% AEP	R255 G255 B153
	1% AEP with climate change	R255 G204 B0

4.2.2 Geospatial files

Raster grids and shape files (or similar), should be provided in a file format that is compatible with ArcGIS.

4.3 Animations

Animations may be used to communicate the development and behaviour of a flood event. The use of animations will be determined on a case by case basis for individual flood hazard modelling projects. Where possible, the animations should use similar colours to those specified in Table 4-2 above.

Animations should be provided in a format suitable for playing on standard PC video playing software.

4.4 District plan mapping

Outputs of the flood hazard modelling process are frequently used to inform district planning. The GWRC supply depth, velocity and hazard mapping to TAs for the preparation of District Plan maps.

5 Procedure review

This procedure is intended to be a living document that can be revised as technology advances and best-practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the 'process review / lessons learnt' checkpoint on the FHMS flow chart.

Attachment 1 to Report 20.315

Attachment 1 to Report 20.315

1 Introduction

This document forms **Procedure 6** of the Greater Wellington Regional Council's (GWRC) **Flood Hazard Modelling Standard** (FHMS). This procedure has been prepared to outline the protocols to be followed by any person undertaking independent audits of the GWRC's flood hazard modelling projects.

This document should be read in the context of the wider FHMS, and has a particular relationship to **Specification 7: Independent Audit Specifications** which provide a template Request for Proposal for engaging external suppliers to undertake independent audits.

An independent audit template is provided in Appendix A of this procedure. This template should be used as the basis of all independent audits undertaken as part of the FHMS process.

1.1 What is an Independent Audit?

In the context of this procedure, an independent audit is an independent review of an entire flood hazard modelling project from project initiation to the production of the modelling outputs. The audit is focused on determining whether the FHMS process has been followed and whether any deviations from the process are reasonable and appropriate. The independent audit provides an additional layer of scrutiny to give confidence that the outputs of the process are suitable for their intended uses.

It is noted that an independent audit is distinct from a peer review which is a hands-on technical review of the hydrological and/or hydraulic modelling, and the subject of **Procedure 3** of the FHMS.

1.2 Independent Audit in the FHMS Process

Independent audit is undertaken following the production and peer review of the modelling outputs. This stage is outlined in red in the FHMS process flow chart provided in Figure 1-1 below.

Independent audit should be undertaken for all new models that proceed through the FHMS process. Independent audit may also be undertaken where changes are made to existing models that have the potential to result in changes to district plans or the GWRC's flood hazard advice.

1.3 Who can be an Independent Auditor?

Independent auditors must meet the following criteria:

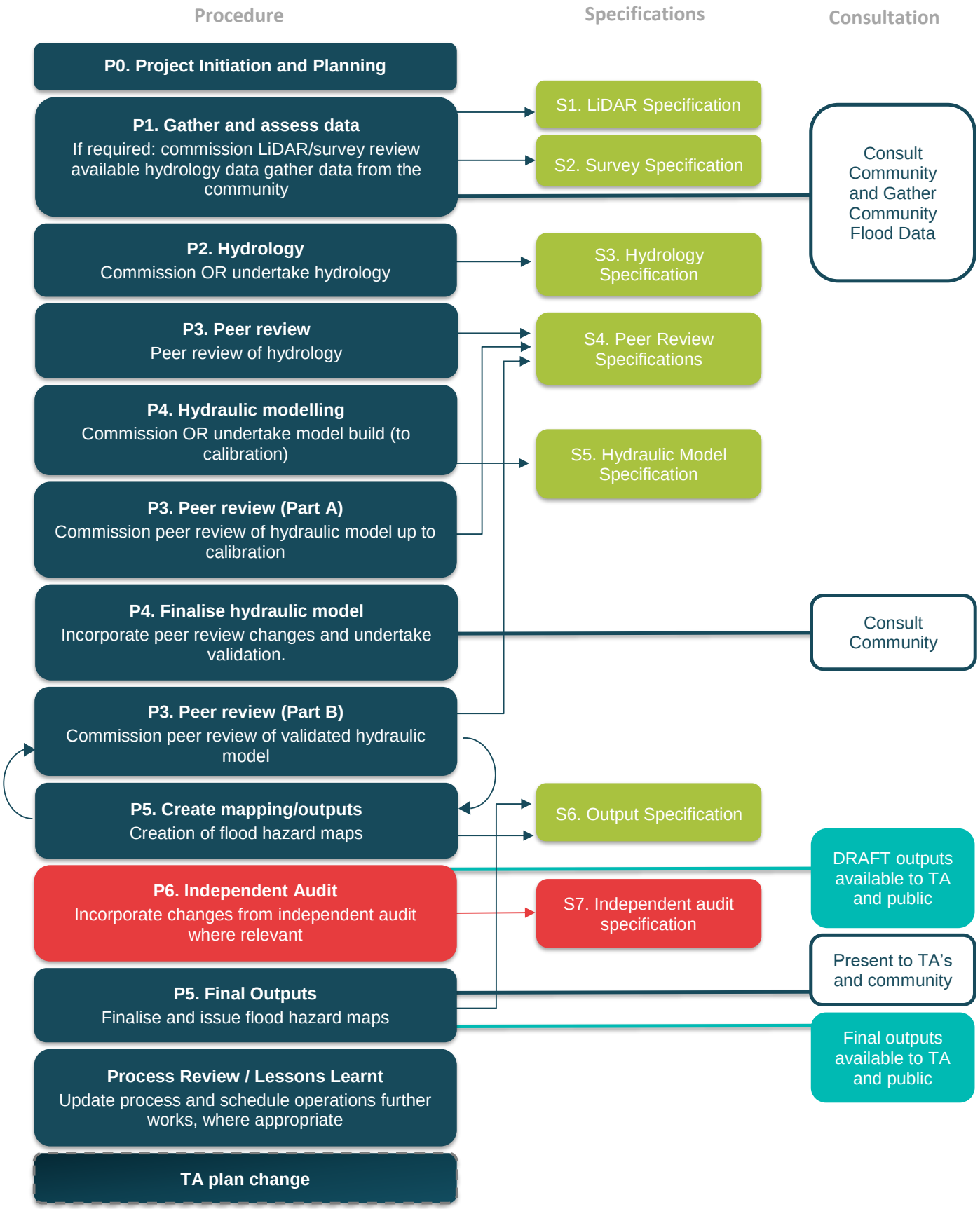
- Independent auditors must be completely independent from the flood hazard modelling project. Independent means that they, or their organisation, have not been involved in the process at any stage.
- The GWRC's staff are not considered independent, and therefore are not eligible to undertake independent audits of work undertaken under the FHMS process.
- The independent auditor should not have any form of dependent relationship with the modellers or peer reviewers who undertook work on the project, and should have no conflicts of interest relating to the project or modellers/peer reviewers' organisations including financial or other interests.
- The independent auditor should be familiar with the development of hydrological and hydraulic models.
- There is no requirement for an independent auditor to be based in the Wellington Region, however the independent auditor should be familiar with the mechanisms of flooding with the region, or in similar environments.
- Territorial authorities may assist the GWRC to determine additional criteria for independent auditors for specific projects, if necessary.

1.4 How should an Independent Auditor be engaged?

Independent auditors should be engaged using the request for proposal template in **Specification 7: Independent Audit Specification**.

Attachment 1 to Report 20.315

FHMS process showing stages where independent audit is undertaken



1.4.1 Liability

Independent auditors may be liable for damages if claims against the flood hazard modelling are upheld. The level of liability will be agreed as part of the contract between the GWRC and the auditor's organisation, and will generally be limited to a multiple of the contract value.

All independent auditors should hold appropriate insurances.

2 Undertaking an Independent Audit

The independent audit should assess whether the FHMS process has been correctly applied at all stages. The auditor should assess:

- Whether all steps of the FHMS process have been undertaken, and have been undertaken in accordance with the requirements of the relevant procedures of the FHMS. If there is deviation from the FHMS process, the independent auditor should determine whether the deviation has been documented, the reasons for the deviation and whether the deviation is reasonable and appropriate.
- Whether peer reviews of the hydrology, hydraulic modelling (both part A and part B reviews) have been undertaken, whether all items raised by the reviewer have been addressed, and the reviews closed out.
- Whether all of the required outputs have been prepared in accordance with requirements of the FHMS process.
- Whether community consultation has been undertaken, and whether this consultation was undertaken at the appropriate stages in the FHMS process (at minimum).
- The auditor should undertake a sensibility check of the peer reviewed outputs.
- The auditor should determine whether the documentation prepared to support the process (eg, modelling reports, peer review reports, peer review close-out documents) are clear.
- The auditor should determine whether the modelling and peer reviews are robust and defendable.
- The auditor should confirm whether community queries and concerns raised through the consultation undertaken have been addressed, or whether further work is required.

A more detailed list of audit parameters is provided in the independent audit spreadsheet template in Appendix A.

It is noted that the auditor is not required to assess the technical detail of the models, as a detailed technical review is undertaken during the peer review. The auditor is encouraged to liaise with the project team (i.e. the modeller and peer reviewers) for clarification, where needed. All correspondence should be recorded.

The independent audit may be an iterative process involving on-going conversations with the project team.

3 Documentation

The initial audit and subsequent iterations must be clearly documented. The following documents are required to be prepared to record the audit, and subsequent revisions:

- Independent audit spreadsheet (a template is provided in Appendix A).
- Independent audit report
- Independent audit close-out

These documents are detailed in the sections below. All correspondence between the auditor and members of the project team should be documented.

3.1 Independent Audit Spreadsheet

A template of the independent audit spreadsheet is provided in Appendix A. The spreadsheet must be used to record the auditors and project teams' comments for each iteration of the audit. The auditor may add additional items to the spreadsheet as required.

Each item on the audit spreadsheet is to be given a rating in line with the criteria in Table 3-1 below.

Table 3-1 Audit rating table

Review ratings	
Ok	The FHMS process has been correctly applied, or deviations are reasonable and appropriate.
Minor	Issue has been identified that is unlikely to affect the robustness of the final model outputs.
Major	Issue has been identified that compromises the integrity of the final outputs and should be rectified, but may be resolved by explanation or acceptance of limitations.
Critical	Issue severely compromises the integrity of the final outputs and should be rectified.
Other categories	
Future data collection	Identifies where additional future data collection could result in improvements in the future.

Source: modified from Beca (2015). Pinehaven Stream Flood Mapping Audit.

The spreadsheet is then issued to the GWRC project manager. The project manager will arrange for the action items to be addressed as necessary. Any changes made and/or responses to the reviewer's comments are recorded in a separate column in the spreadsheet. The time and date of issue is to be recorded in the spreadsheet.

The auditor is then required to review the comments and changes made, and provide further comments (if necessary) and provide a further review rating for each comment in a separate column. This process continues until all of the issues have been resolved and the outputs of the FHMS process are deemed suitable for their intended uses.

An audit log is provided within the independent audit spreadsheet. The auditor and GWRC project manager must record the date and the overall outcome of each iteration of the audit in this table. Outcome should be defined in accordance with the categories in Table 3-2 below.

Table 3-2 Outcome descriptors

Outcome categories	Description
Action Required	Issues have been identified that are likely to affect the integrity of the final outputs and should be rectified.
Suitable for Use	Issues identified in the model have been rectified (if any), and the assessment is considered to be of sufficient quality for use.

An example of a completed audit log is provided in Table 3-3.

Table 3-3 Example audit log

Independent Audit	Date of review/comments	Outcome
Audit V1	14 April 2020	Action Required
GWRC PM's comments V1	28 April 2020	

Audit V2	5 May 2020	Suitable for Use

3.2 Independent Audit Report

A brief report should be provided. The audit spreadsheet should be appended to this report.

The report should be a clear and concise summary of the audit process and findings. The audit report should outline:

- The methodology used to undertake the audit.
- The documents reviewed as part of the audit.
- A description of the issues identified. A clear summary of the issues should be provided as list in the executive summary.
- A section on any community concerns raised, and how these have been addressed.
- Clear section on data gaps that should be filled in the future, where possible.

The report must include a history table that outlines any changes made to the report, and the reasons for those changes.

3.3 Independent Audit Close Out

A close out document should be provided after all of the auditor's comments have been addressed. The close out document can be in the form of a short letter or memo.

The close out document should include the following items:

- Confirmation that an independent audit has been undertaken.
- Confirmation that all of the auditor's comments have been satisfactorily addressed and that final model outputs are suitable for their intended use.
- Any caveats or limitations that the auditor has placed on the work.
- The independent audit spreadsheet should be included as an appendix.

The close out document should be dated.

4 Procedure Review

This procedure is intended to be a living document that can be revised as technology advances and best-practice evolves.

The need for review of the procedures within the FHMS, including this one, will be determined at the end of each modelling project at the 'process review / lessons learnt' checkpoint on the FHMS flow chart.

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