Attachment A: Porirua Wastewater Consenting Programme – Integrated wastewater management strategy

PORIRUA WASTEWATER CONSENTING PROGRAMME

Integrated Wastewater Management Strategy

VISION

A healthy and protected harbour, catchment and coastal environment supported by infrastructure that sustains healthy communities minimises adverse effects and facilitates growth.

PROBLEMS

1. The wastewater network and treatment plant have capacity and condition problems which contribute to poor water quality in the catchment.
2. The discharge consents from the Porirua wastewater treatment plant expire in 2020 and need to be re-consented.
3. The overflows from the wastewater network are currently not consented and new consents must be applied for.

OBJECTIVES

a) The public health protection and other benefits of the wastewater scheme are recognised and associated risks reduced.

b) Wastewater management solutions that:
   (i) Are sustainable, enduring and resilient.
   (ii) Minimise adverse effects on water quality.
   (iii) Are affordable and value for money.
   (iv) Take an integrated approach to supporting a healthy catchment, waterways, the harbour and wider coastal environment.
   (v) Progressively adress wastewater network overflows.

c) Decision making processes are evidence based.

d) Wastewater management solutions are developed in partnership with Ngati Toa Rangatira.

e) The community and key stakeholders are actively involved in developing wastewater management solutions.

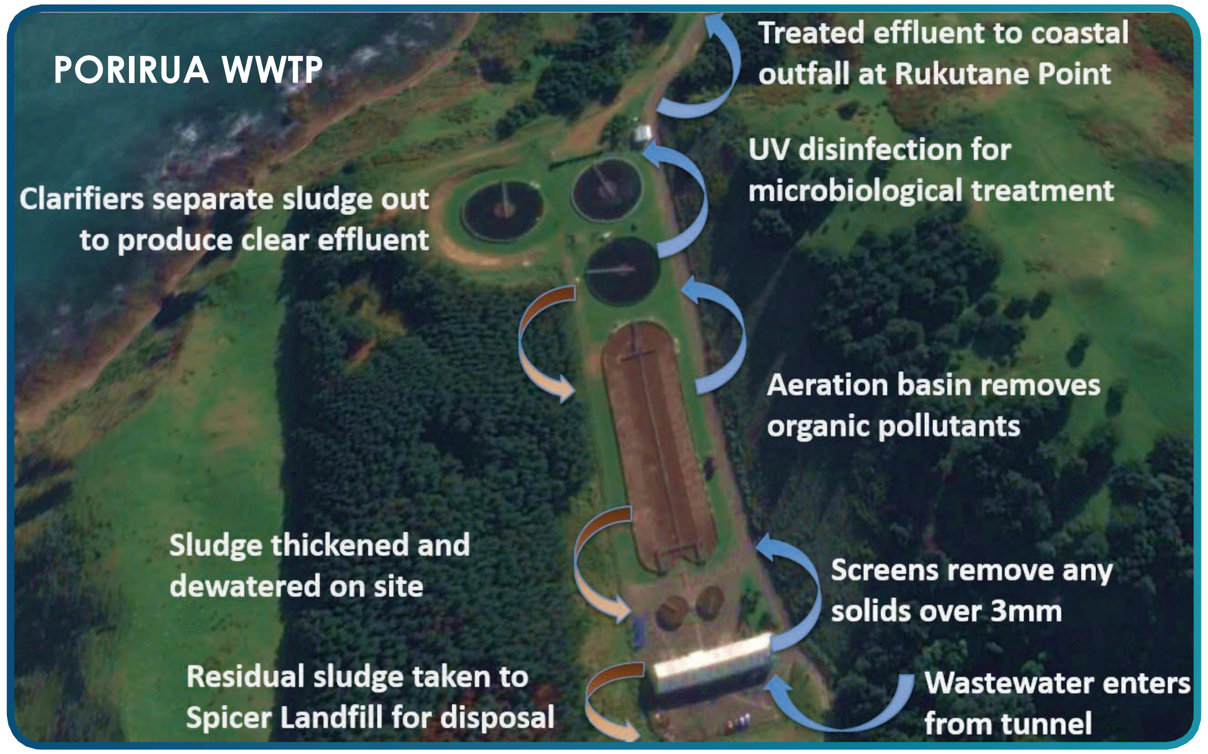
f) Wastewater management solutions support long term growth and investment and the economic development of the city and sub-region.

g) A best practicable option (RMA definition) approach for the management of the wastewater scheme is adopted.

ISSUES

- Poor existing **water quality** in the Porirua Catchment
- Frequent wet weather wastewater **network overflows** into freshwater and coastal water and WWTP overflows into coastal water
- **Inflow and infiltration** of stormwater into the wastewater network
- **Aging network** prone to failures and under capacity to accommodate future growth
- Treatment plant **capacity and performance**
- The **interconnected** nature of the wastewater network and treatment plant
- The **regulatory framework** at a local, regional and national level is undergoing significant change, including through the Porirua Whaitua
- Consenting an **integrated solution** under the emerging regulatory framework will be challenging
- Obtaining support from **stakeholders** and the community for a preferred solution
- The complex and detailed nature of **information** to support resource consent applications
- **Limited funding** to bring forward network and treatment plant improvements

PORIRUA WWTP



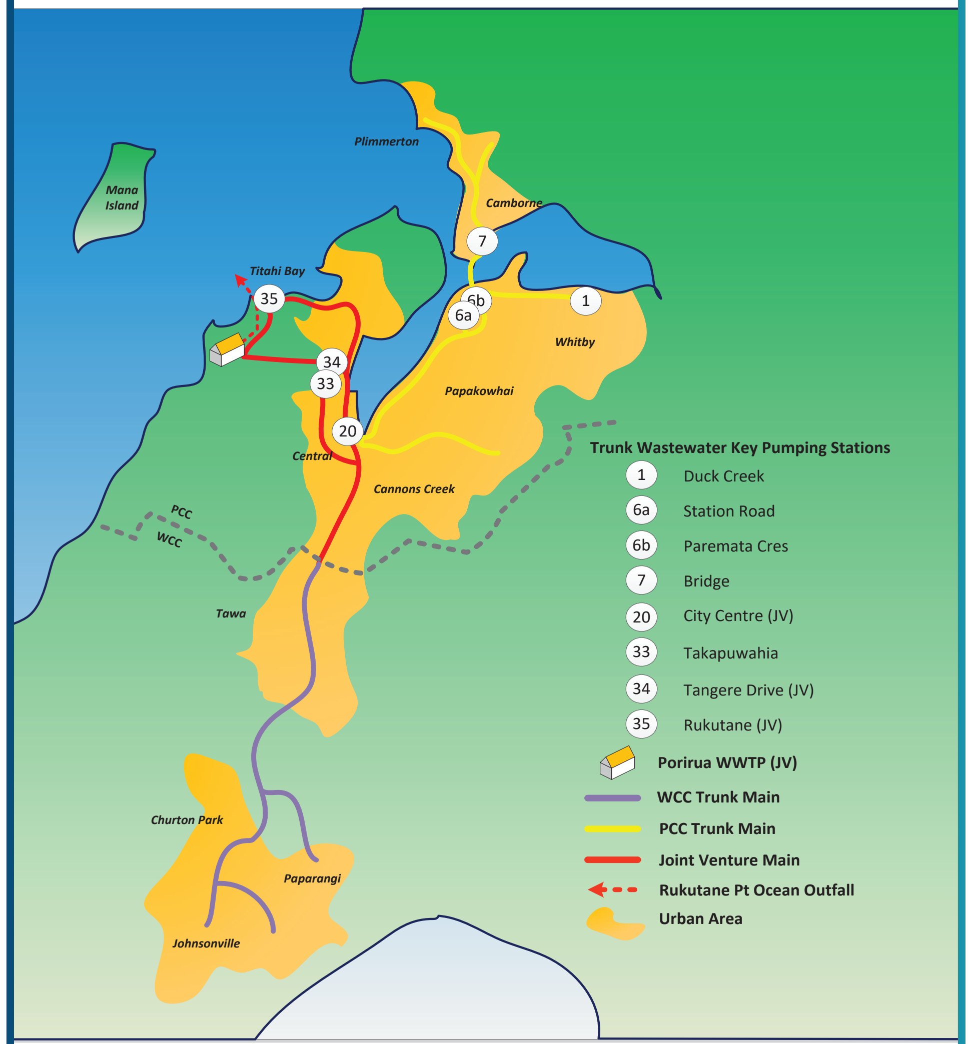
INFORMATION GAPS

- Monitoring information relating to wastewater network overflows including volume and contaminant loading
- Targeted wet weather network overflow monitoring in relation to freshwater and coastal water ecology
- Confirmation of future wastewater flows and loads that will need to be treated by the WWTP
- Dispersion modelling for the existing and alternative WWTP discharge locations for marine discharge options
- Micro/emerging contaminants and pathogens
- Survey of benthic ecology for the open coast

CONSENT STRATEGY KEY COMPONENTS

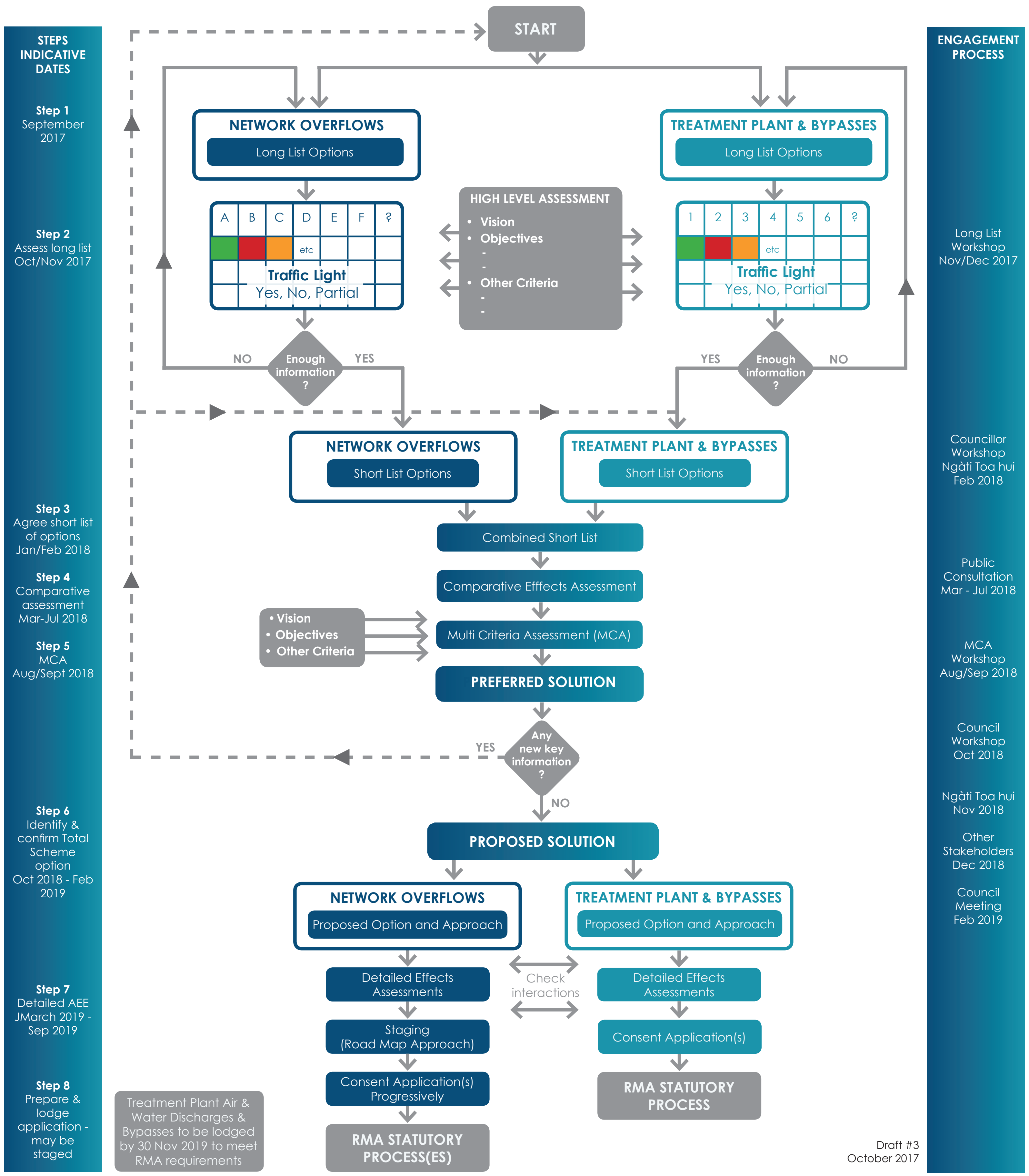
- A single comprehensive wastewater network story
- A single integrated option assessment and engagement process
- Multiple separate resource consent processes
- A collaborative approach to consenting with Greater Wellington and Ngati Toa
- A road map approach for long term reduction in network overflows
- Maximum duration consent for WWTP discharges
- Optimised network and treatment solution
- Comprehensive assessment of wastewater management alternatives

PORIRUA WASTEWATER NETWORK OVERVIEW



Wellington Water

IDENTIFYING A PREFERRED WASTEWATER SOLUTION

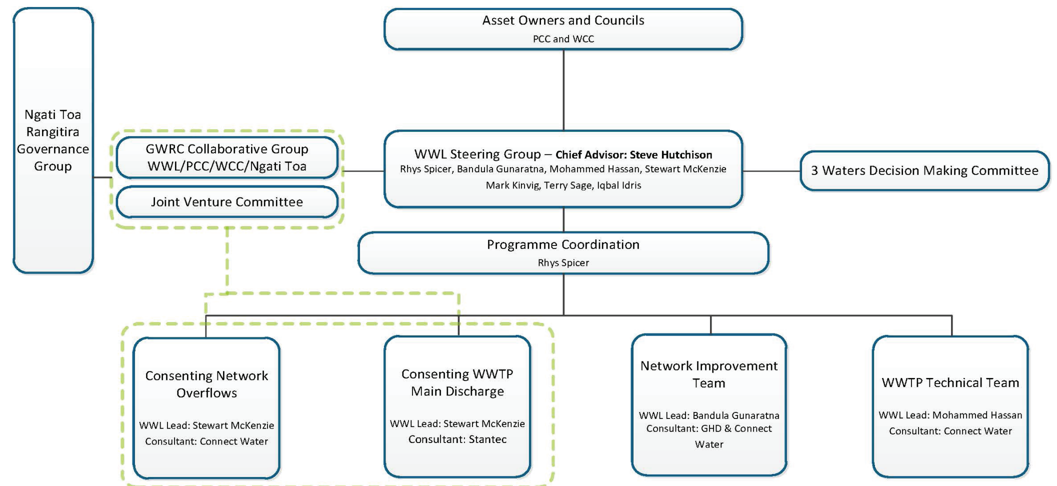


Draft #3
October 2017

ENGAGEMENT PRINCIPLES

Reputation Management	WWL's engagement and communication actions meet a high standard and seek to enhance partner, stakeholder, customer and community trust and confidence in WWL's management and delivery of 3 W services, relationship management and stakeholder and community engagement processes.
Effective Partnerships	WWL works alongside its partners, in the true spirit of partnership, and develops engagement and communication actions that: • support WWL's MoP with Port Nicholson Trust and Te Rūnanga o Toa Rangātira Inc, and • are coordinated with the communication and engagement activities of its client councils.
Proactive Engagement	WWL is proactive with its engagement, communication and information sharing with partners, key stakeholders, customers and its communities, supporting informed, active and constructive engagement in and feedback on its programmes and projects.
Understanding and Awareness	WWL's engagement and communication processes enhance partner, stakeholder, customer and community awareness and understanding of the region's 3W services, and key management and delivery issues, challenges and opportunities facing the planning and delivery of water services. WWL's engagement and communication actions recognise and provide for the differing needs and requirements of its partners, stakeholders, customers and communities of interest.
Accessibility	WWL ensures that information relating to its water services, including its engagement and communication activities, is easily accessible and readily available to its partners, stakeholders, customers and communities of interest, supporting active engagement with WWL in its planning, delivery and management of 3W services.
Clarity	WWL's engagement and communications activities and supporting materials are clear, engaging and are appropriately tailored to meet the needs and requirements of its partners, stakeholders, customers and local communities.

PROGRAMME GOVERNANCE & MANAGEMENT STRUCTURE



Director of Ngati Toa Rangitira Inc., Sir Matiu Rei, and Chief Executive of Wellington Water, Colin Crampton, signing the Memorandum of Partnership between the two organisations at Takapuwahia Marae

Attachment B: Long List Identification Workshop Meeting Record

Porirua Wastewater Programme

Long List Identification Workshop – Meeting Record

9 October 2017, 1 – 5.30 pm

Present:

Stewart McKenzie – WWL (SM)
Anna Hector – WWL (AH)
Paul Gardiner – WWL (PG)
Nathan Baker – Connect Water (NB)
David Cameron – Stantec (DC)
Paula Hunter – Stantec (PH)
Steve Hutchinson – WWL (SH)
Kara Dentice – WWL (KD)
Matt Trlin – Connect Water (MT)
Graeme Jenner – Connect Water (GJ)
Jim Bradley – Stantec (JB)
Richard Peterson – Stantec (RP)

Introduction

The workshop commenced with introductions.

The purpose of the workshop was then discussed. This was to:

1. Establish a preliminary long list of options for both the wastewater network and the wastewater treatment plant (WWTP)
2. Identify a method and criteria for the assessment of the long lists.

It was noted that project partners and key stakeholders would be engaged on the outcomes of the workshop and that the long lists and criteria would be finalised in collaboration with them.

Progress Recap

The workshop introduction was followed by a brief recap of progress to-date on the Porirua Wastewater Programme (the Programme) and an introduction of the draft Engagement Strategy. The recap covered the contents of the two-page Consent Strategy and noted that sitting behind the Strategy is the detailed Scoping Document, Objectives Paper and Information Gaps Analysis. It was noted that this workshop sits right at the top of the process set out in the Consent Strategy for identifying the preferred option (see Figure 1).

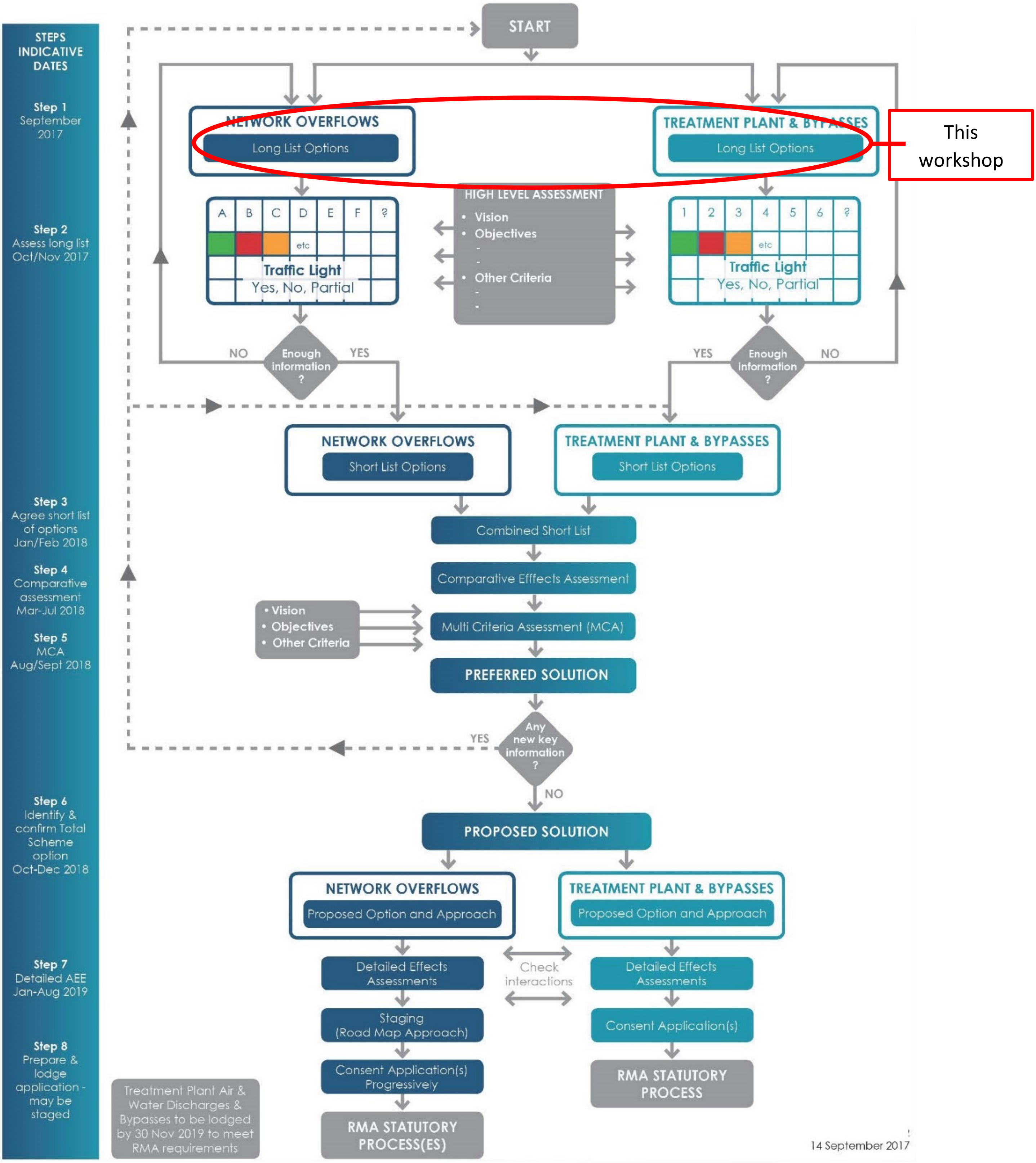
The evolving regulatory context for the Programme was also discussed, focussing on WWL's on-going involvement in the Proposed Natural Resources Plan (PNRP) hearings and the work of the Te Awarua-o-Porirua Whaitua committee (Whaitua Committee). It was noted that the Whaitua Committee is due to release its Whaitua Implementation Programme (WIP) in mid-2018. The timing of this needs to be factored into the options assessment process for the Programme, and may require earlier decisions in the options assessment process to be re-visited.

The discussion also covered, as general context, the limited financial resources of the asset owner.

MT introduced the draft Engagement Strategy, noting that the principles underlying it relate to:

- Reputation management
- Effective partnerships
- Proactive and early engagement
- Understanding and awareness
- Accessibility and clarity.

These principles will be applied to a range of risks to determine the engagement approach through the Programme. Lastly the Engagement Strategy would include a work programme aligned with the option assessment process.


STEPS INDICATIVE DATES
Step 1 September 2017
Step 2 Assess long list Oct/Nov 2017
Step 3 Agree short list of options Jan/Feb 2018
Step 4 Comparative assessment Mar-Jul 2018
Step 5 MCA Aug/Sept 2018
Step 6 Identify & confirm Total Scheme option Oct-Dec 2018
Step 7 Detailed AEE Jan-Aug 2019
Step 8 Prepare & lodge application - may be staged
START
NETWORK OVERFLOWS
Long List Options
TREATMENT PLANT & BYPASSES
Long List Options
This workshop
HIGH LEVEL ASSESSMENT
Vision
Objectives
Other Criteria
Traffic Light
Yes, No, Partial
etc
NO
YES
Enough information ?
NETWORK OVERFLOWS
Short List Options
TREATMENT PLANT & BYPASSES
Short List Options
Combined Short List
Comparative Effects Assessment
Multi Criteria Assessment (MCA)
PREFERRED SOLUTION
Any new key information ?
PROPOSED SOLUTION
NETWORK OVERFLOWS
Proposed Option and Approach
TREATMENT PLANT & BYPASSES
Proposed Option and Approach
Detailed Effects Assessments
Check interactions
Staging (Road Map Approach)
Consent Application(s) Progressively
Consent Application(s)
RMA STATUTORY PROCESS(ES)
RMA STATUTORY PROCESS
Treatment Plant Air & Water Discharges & Bypasses to be lodged by 30 Nov 2019 to meet RMA requirements
14 September 2017

Approach to identifying the preliminary long list

The discussion on the approach that should be applied to the identification of the preliminary long list covered two matters:

1. The broad principles that should guide the approach (and the broader option assessment process)
2. The criteria that should be applied in establishing a long list.

With respect to the broad principles, PH presented 5 principles as a starter for discussion. These were that the approach should be:

- Simple
- Transparent
- Evidence based
- Documented
- Fit for purpose.

Following discussion the group agreed to add two other principles being that the approach should also be:

- Consistent with good practice under the RMA
- Collaborative.

The inclusion of the 'collaborative' principle was to reflect the key focus of Consent Strategy on partnerships and collaboration.

The discussion on the principles noted that the 'evidence based' principle needs to incorporate more than just traditional scientific evidence. It should also enable the incorporation of a Māori world view and evidence related to this. There was also some discussion on the intent of the 'Documented' principle. It was agreed that there needs to be a clear and transparent audit trail / record keeping throughout the process.

Following the discussion on principles, the group considered the approach it should take to the identification of a preliminary long list and in particular the 'criteria' that it should apply to this task.

PH set out a suggested approach to the long list identification. This approach is to start with all possible options on the table and then use coarse sifting based on 'fatal flaws' to create the preliminary long list. The suggested criteria for defining 'fatal flaws' were:

1. Significant increase in public health risk
2. Significant increase in adverse effects on natural environment
3. Absolutely unpalatable to Māori
4. Unavailability of technical or natural resource
5. Significant constraint on growth
6. Absolutely cost prohibitive
7. Absolutely un-consentable.

There was some discussion about whether the group was able to assess fatal flaws based on the 'absolutely unpalatable to Māori' criterion. It was agreed that this could be done provided the assessment is well documented and the opportunity is provided for Ngāti Toa Rangatira to review and comment on the long list.

There was also some discussion on whether palatability to the wider community should be included in the fatal flaw criteria. This led to agreement that the community perspective could be encapsulated in a criteria focused on the performance of the wastewater scheme, i.e. the group considered that there is a clear understanding that the community expects an improvement in the performance of the wastewater scheme. The group considered that the community view on the performance of the wastewater treatment plant (WWTP) is less clear at this point. Therefore it was agreed that the following fatal flaw criteria should be added, bringing the number of criteria to eight:

8. No improvement in the performance of the wastewater scheme.

Preliminary Long List Discussion

The group's discussion on the long list focussed initially on the options relating to the wastewater network and then considered the options relating to the WWTP.

In both instances the group first identified all possible options on a white board, and then eliminated those that were considered to contain fatal flaws with relevance to the 8 identified criteria.

Network options

Before the listing of network options, the group discussed whether it is possible to mix and match options for different parts of the network, rather than being restricted to applying a single option across the entire network. It was agreed that it was possible to mix and match, and that this would need to be taken into account during the assessment of the long list and again during the short list assessment in 2018.

There was also some discussion on whether the long list should be focused on outcomes (e.g. a specified contaminant level in the discharge or receiving environment) or on infrastructure options. The discussion noted that setting outcomes is the role of the Whaitua process which would be establishing broad community outcomes for the catchment in the form of Objectives, Targets and Limits. The role of the Programme is to identify options which both contribute to the achievement of these outcomes, over time, and are able to be consented.

It was also noted that step 4 in the options assessment process, the comparative effects assessment (see Figure 1), will in effect encompass 'outcome' assessments of the options.

Table 1 sets out the list of all options identified by the group, whether the option is considered to be fatally flawed and the criteria under which it is considered that the option is fatally flawed.

Table 1 - Identification of preliminary long list: wastewater network

Fatal Flaw Criteria:

1. Significant increase in public health risk
2. Significant increase in adverse effects on natural environment
3. Absolutely unpalatable to Māori
4. Unavailability of technical or natural resource
5. Significant constraint on growth
6. Absolutely cost prohibitive
7. Absolutely un-consentable
8. No improvement in the performance of the wastewater scheme

Potential Options	Fatal Flaw	Reasons for fatal flaw assessment
Do nothing – no improvements	Y	Criteria 3, 5, 7 and 8
Business as usual improvements	N	Assumes BAU investment is sufficient to meet growth needs and small incremental improvements
Conveyance of all wastewater to the WWTP (no overflows)	Y	Criterion 6 – significant network and WWTP upgrades required
Conveyance of a greater level of wastewater to the WWTP than currently occurs (reduced overflows)	N	
Construction of the cross harbour pipeline	N	
Overflow treatment (partial) of peak wet weather flows at pump stations using fine screens and ultra-violet disinfection before discharge to local receiving water	N	
A second WWTP to treat all (or some) wastewater from the northern and eastern suburbs (with local disposal/reuse).	Y	Criterion 6 - Significant cost and consenting issues

Potential Options	Fatal Flaw	Reasons for fatal flaw assessment
Satellite / decentralised WWTPs at key points on the network which treat all flows and discharge to local receiving environment	Y	Criterion 6 - Significant cost for the satellite WWTPs.
Satellite / decentralised WWTPs at key points on the network which treat all flows and discharge to local receiving environment in wet weather but otherwise convey treated wastewater to the main WWTP	Y	Criterion 6 - Significant cost for the satellite WWTPs.
Satellite / decentralised WWTPs at key points on the network which treat all flows and convey all treated wastewater to the main WWTP	Y	Criterion 6 - Significant costs associated with the satellite WWTPs and the network upgrades.
Additional storage of untreated wastewater (in-line) with no local discharge	N	
Additional storage of untreated wastewater, off-line at one centralised points on the network with no local discharge	N	
Additional storage of untreated wastewater, off-line at various decentralised points on the network with no local discharge	N	
Land based disposal of wet weather flows from one or more points along the network	Y	Criterion 4 – no land resource available. Any land would be unsuitable in wet weather.
Conveyance of wastewater from Tawa and Johnsonville into the Wellington City network	Y	Criterion 6 - requires significant upgrades to the capacity of the Wellington City network
Beneficial re-use	Y	Criterion 4 – no re-use option
Air discharge (evaporation)	Y	Criterion 4
Upgrade of private laterals	N/A	Considered 'core asset management'. Will be part of any option.
Upgrade of public mains	N/A	Considered 'core asset management'. Will be part of any option.
I & I / stormwater reduction / Water Sensitive Design	N/A	Considered 'core asset management'. Will be part of any option.
Trade waste management	N/A	Considered 'core asset management'. Will be part of any option.
Grey water recycling	N/A	Considered an 'add on'. Could be part of any option.
Urine separating systems	Y	Criterion 8
Water conversation / demand management	N/A	Considered 'core asset management'. Will be part of any option.
Waterless toilets	N/A	Considered an 'add on'. Could be part of any option.
A low pressure system	N/A	Considered an 'add on'. Could be part of any option.
Zero population growth	Y	Criterion 5
Growth strategies	N/A	Considered an 'add on'. Could be part of any option.
Combinations of the above	N	

Table note: 'N/A' has been applied to options which were considered by the group to neither be fatally flawed nor be a main option to resolve the network issues. Options marked 'N/A' are either considered to be part of core asset management or a possible 'add-on' to any of the main options on the preliminary long list.

Based on this assessment the preliminary long list identified by the group for the network is:

1. Business as usual improvements

2. Conveyance of a greater level of wastewater to the WWTP than currently occurs
3. Construction of the cross harbour pipeline to convey untreated wastewater from northern suburbs to the Titahi Bay trunk main to the WWTP, by-passing overloaded sections of the network.
4. Treatment of peak wet weather flows at pump stations using milliscreens and Ultra-violet disinfection
5. Additional storage of untreated wastewater (in-line)
6. Additional storage of untreated wastewater, off-line at one centralised point on the network
7. Additional storage of untreated wastewater, off-line at various decentralised points on the network
8. Combinations of the above

Noting that various other options identified will be or could be included in any of the options as 'core asset management' or 'add ons'.

WWTP options

The same process was followed by the group in identifying the preliminary long list for the WWTP.

Table 2 sets out the list of all options identified by the group, whether the option is considered to be fatally flawed and the criteria under which it is considered that the option is fatally flawed.

Table 2 - Identification of preliminary long list: WWTP

Fatal Flaw Criteria:

1. Significant increase in public health risk
2. Significant increase in adverse effects on natural environment
3. Absolutely unpalatable to Māori
4. Unavailability of technical or natural resource
5. Significant constraint on growth
6. Absolutely cost prohibitive
7. Absolutely un-consentable
8. No improvement in the performance of the wastewater scheme

Potential Options	Fatal Flaw	Reasons for fatal flaw assessment
Discharge to the coastal marine area (CMA) from the existing outfall (do minimum)	N	
Discharge to the CMA from a new coastline outfall	N	
Discharge to the CMA from an offshore, ocean outfall	N	
Discharge to land (land application)	N	Land is possibly available near to the existing WWTP
Discharge to groundwater	Y	Criterion 4 – no groundwater resource available
Aquifer re-charge	Y	Criterion 4 – no aquifer available
Discharge to freshwater	Y	Criteria 2, 3, 4, 6 and 7
Tidal discharge with coastal or offshore outfall	N	
Satellite treatment plant, which treats the wastewater from part of the city	Y	Criterion 6 - Significant cost for the satellite WWTPs.
Shift the WWTP to another location	Y	Criterion 6 – the existing WWTP is well sited and appropriately designated. It represents a large sunk investment
Make use of another City's WWTP (a 'sub-regional' plant)	Y	Criterion 6 – significant conveyance cost and cost to upgrade plant to capacity for additional wastewater
Upgrade (or new) wastewater treatment at the existing WWTP	N	Can be added to any discharge option. Nature of the upgrade will depend on the receiving environment for the discharge
Outfall diffuser options	N/A	Considered an 'add on'. Could be part of any outfall option (see above).

Potential Options	Fatal Flaw	Reasons for fatal flaw assessment
Address WWTP bypasses and overflows through additional storage	N/A	Considered an 'add on'. Could be part of any option.
Address WWTP bypasses and overflows through upgrade screening capacity	N/A	Considered an 'add on'. Could be part of any option.
Address WWTP bypasses and overflows through upgraded UV treatment capacity	N/A	Considered an 'add on'. Could be part of any option.
Address WWTP bypasses and overflows through high rate side stream or other treatment facilities	N/A	Considered an 'add on'. Could be part of any option.
Reduce and reuse – potable water	Y	Criterion 6
Reduce and reuse – other	N/A	Considered an 'add on'. Could be part of any option.
Air discharge consent options	N	The existing air discharge consent is due to expire in May 2020. Effects from this air discharge will need to be addressed in all options.
Combination of the above	N	

Table note: 'N/A' has been applied to options which were considered by the group to neither be fatally flawed nor be a main option to resolve the WWTP consent issues. Options marked 'N/A' are considered to be a possible 'add-on' to any of the main options on the preliminary long list.

Based on this assessment the preliminary long list identified by the group for the WWTP is:

1. Discharge to the coastal marine area (CMA) from the existing outfall (do minimum)
2. Discharge to the CMA from a new coastline outfall
3. Discharge to the CMA from an offshore ocean outfall
4. Discharge to land (land application)
5. Tidal discharge for options 1,2 and 3 above
6. Upgrade (or new) treatment process at the existing WWTP
7. Air discharge consent options
8. Combination of the above.

Noting that various other options identified could be included in any of the options as 'add-ons'.

Assessment Method

To begin the discussion on how the long lists should be assessed, the group re-visited the assessment principles that it had agreed earlier. These are that the option assessment process should be:

- Simple
- Transparent
- Evidence based
- Documented
- Fit for purposes
- Consistent with good practice under the RMA
- Collaborative.

Following this PH introduced the following options for the assessment of the long lists:

- A traffic light approach – i.e. colouring each option green, orange or red against agreed assessment criteria
- A high level MCA – i.e. scoring options against criteria, and weighting the criteria
- A 'Smart Investment' approach – i.e. applying WWL's service goals
- The Better Business Case (BBC) approach
- A combination of the above.

The group agreed to apply the traffic light approach to the long lists. The reasons for this conclusion were that:

- both the Smart Investment and BBC approach are not well aligned with a collaborative process reflecting community values
- These options are also not well aligned with good practice under the RMA and would result in a narrow range of criteria being applied
- The high level MCA approach could be aligned with RMA good practice and a collaborative approach reflecting community values
- However, given the number of long list options applying even a high level MCA would become very complex. This complexity could undermine the transparency of the outcomes and make it difficult to communicate the outcomes to stakeholders and the public
- All options can be evidence based and well documented
- Overall it was considered that the traffic light approach is most 'fit for purpose', and would provide an appropriate level of detail.

Long list assessment criteria

To begin the discussion on which criteria should be used in the traffic light assessment of the long lists PH presented the following preliminary criteria:

1. Public Health – clearly demonstrates public health benefits, reduces public health risk
2. Natural environment – minimise adverse effects on water quality, integrated approach to supporting a healthy catchment waterways, the harbour and wider coastal environment
3. Consentability – alignment to statutory requirements
4. Tangata whenua – effects on mauri, kai moana, relationships
5. Growth – supports long term growth and investment, and economic development of city and sub-region
6. Financial implications / affordability – considers affordability, value for money in terms of capital, operational, whole-of-life costs, and any opportunity costs for the asset owners
7. Social & community – amenity values, recreation, food gathering
8. Technology – considers whether options are enduring (a long term solution), resilient – (in relation to engineering / natural hazard / operations), able to be staged, reliable, proven and robust, able to be constructed (considering ground conditions & fault lines), and able to be part of an integrated scheme approach

The consentability criterion was discussed by the group at some length. It was agreed that inclusion of this criterion would result in undue double counting of several factors. It was therefore agreed by the group that this criterion should not be included.

The group also considered that resilience should be a criterion on its own, rather than being part of the 'technology' criterion. Being part of 'technology' under-emphasises resilience, which is a particularly important consideration for significant infrastructure projects such as this.

Otherwise it was agreed that these criteria were appropriate based on their alignment with RMA good practice, Programme objectives and the groups knowledge of iwi and community expectations.

It was agreed therefore that eight (8) criteria would be applied to the traffic light assessment of the long list. These criteria along with the options will be tested with iwi and stakeholders along with the preliminary long lists.

Information availability

The group briefly discussed whether there was sufficient information available to proceed to the assessment of the long lists, once the lists have been confirmed with partners and stakeholders.

It was considered that the collective knowledge of the group, combined with that of the partners / stakeholders who will be invited to participate in the assessment of the long list, would in most instances be sufficient for the purposes of the long list assessment. Notwithstanding this, the group accepted that there would likely be some gaps in knowledge identified during the long list assessment workshop. It is considered that there will be the opportunity backfill such gaps following the long list assessment workshop, and if necessary a second workshop could be held early in 2018 to revisit the assessment based on newly obtained information.

Long List Assessment Participants

It was agreed that the following groups would be invited to the long list assessment workshop:

- WWL staff
- Project team members
- WCC & PCC = Asset owners
- Ngāti Toa Rangatira
- the GWRC Collaborative Group
- Regional Public Health
- Department of Conservation
- John Gibb from the Whaitua Committee
- A representative from the Porirua Harbour and Catchment Community Trust.

Next Steps

Key next steps following the meeting are:

1. Confirm that groundwater and / or an aquifer is not available as a receiving environment for the WWTP discharge
2. Seek feedback on the preliminary long lists and the traffic light assessment criteria from the project partners / stakeholders (Asset Owners, Ngāti Toa Rangatira, GWRC) and Collaborative Group
3. Confirm a date for the assessment of the long lists (suggested week beginning 27th November)
4. Circulate briefing material to participants in advance of the long list assessment workshop.

Post Meeting Note

(Note author: Richard Peterson - 10 November 2017)

Feedback on the draft meeting record questioned whether in hindsight the fatal flaw analysis at the October 9 workshop had consistently applied criterion 6 'Absolutely cost prohibitive'. This concern was raised specifically in relation to the satellite WWTP options.

At the October 9 workshop the following network options were identified as not being fatally flawed:

- Satellite / decentralised WWTPs at key points on the network which treat all flows and discharge to local receiving environment
- Satellite / decentralised WWTPs at key points on the network which treat all flows and discharge to local receiving environment in wet weather but otherwise convey treated wastewater to the main WWTP.

This contrasted with how the 'second WWTP' option and the other satellite option had been assessed, both of which were assessed as being fatally flawed in relation to criterion 6.

Similarly at the October 9 workshop when the options for the WWTP were assessed the following option was not identified as being fatally flawed:

- Satellite treatment plant, which treats the wastewater from part of the city.

In response to these concerns a phone meeting was convened on 10 November 2017. This involved Steve Hutchinson of WWL, Ron Haverland of Beca, Graeme Jenner of Beca, Matt Trlin of Beca and Richard Peterson of Stantec. This group re-considered the full list of options for both the network (Table 1 above) and the WWTP (Table 2 above). The group concluded that not fatally flawing the satellite treatment plant options in both tables was <u>inconsistent</u> with how criterion 6 had been applied in relation to other options. The group therefore concluded that the satellite WWTP options are fatally flawed in relation to criterion 6 and should not be included on either the long list for the network or for the WWTP.

Tables 1 and 2 above and the resulting long lists have been amended accordingly in these notes.

Attachment C: Long List Comparative Assessments

Stantec **Memo**

To:	Richard Peterson Wellington	From:	David Cameron (Stantec) & Graeme Jenner (Connect Water)
File:	Porirua WWTP Options	Date:	January 17, 2018

Porirua Wastewater Network & WWTP – Preliminary scoring of public health risk and adverse effects on the natural environment

Introduction

This memo presents a preliminary scoring of each of the Porirua wastewater network and wastewater treatment plant long listed options against the following two assessment criteria;

- public health risk associated with contact recreation activities and shellfish collection, and
- adverse effects on the natural environment (water quality and aquatic ecology).

The long list includes ten network options for the management of wet weather overflows, and eight WWTP treatment/discharge options. A traffic light approach (red, orange, green) has been used to score these options against the assessment criteria, using the definitions provided in **Table 1**.

Table 1: Scoring approach for Porirua Wastewater Programme Long List Assessment

Criteria	Red	Orange	Green
Public Health Risk –associated with contact recreation and shellfish gathering	No significant reduction in public health risks anticipated, recreational water quality guidelines not achieved, significant uncertainty and /or significant information gaps.	Moderate reduction in public health risks anticipated, recreational water quality guidelines partially achieved, moderate uncertainty and some information gaps.	Significant reduction in public health risks anticipated, and/or recreational water quality guidelines achieved, little uncertainty or further information required.
Natural environment – adverse effects on water quality and aquatic ecology (streams, harbour and the wider coastal environment)	Significant adverse effect in relation to the criterion, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, little uncertainty or further information required

Current state – microbiological water quality

The Greater Wellington Regional Council (GWRC) recreational water quality monitoring programme, which is specifically designed to inform the public about the suitability of various sites across the region for swimming and other recreational activities, includes three Porirua Harbour sites and seven coastal sites to the west and north of the harbour, which are monitored once each week during the bathing season between mid-November and 31 March. Water samples taken at these sites are analysed for Enterococci which is a bacteria commonly found in human and animal guts and is used as an indication of faecal contamination in marine and estuarine water bodies. Enterococci are distinguished by their ability to survive in salt water and in this respect, more closely mimic disease-causing microorganisms (pathogens) than other bacterial indicators. Enterococci are typically more human-specific than the larger faecal streptococcus organisms.

The recreational water quality guidelines for marine waters (MfE/MoH, 2003) state that a 95-percentile value of enterococci greater than 500 cfu/100ml indicates a "significant risk of high levels of minor illness transmission" (shown in red in **Table 2**), which is generally considered to be an unacceptable level of risk. The 95-percentile says that for 95% of the time, the numbers are below a certain value. Conversely, 5% of the time, numbers are higher. Enterococci 95-percentile values for the period 2011/15-2015/16 are summarised in **Table 2**.

Table 2: Enterococci 95%ile values from 2011/15-2015/16 (data from Morar and Greenfield, 2016)

Porirua Coast		Porirua Harbour	
Site	Enterococci 95th %ilevalue(cfu/100ml)	Site	Enterococci 95th %ile value (cfu/100ml)
Titahi Bay; south, centre, north	680; 255; 235	Onepoto Rowing Club	820
Onehunga Bay	82	Paramata Bridge	175
Plimmerton Beach; south & north	825; 530	Pauatahanui Water Ski Club	205
Karehana Bay	125		

Porirua City has more than than 20 confirmed wastewater overflow locations which typically operate during periods of sustained wet weather when stormwater inflows or groundwater infiltration into the wastewater collection system cause flows to exceed the capacity of pipelines and pumping stations. The resulting overflows discharge either directly to Porirua Harbour or to stormwater drains and streams that discharge to the harbour, contributing to the increased public health risk indicated by the Enterococci concentrations in **Table 2**.

Wellington Water (WW) has developed a targeted wet weather overflow monitoring plan aimed at characterising the water quality of contributing streams and Porirua Harbour during and immediately after wet weather events, but has not yet not captured any significant overflow events. GWRC monitoring in support of its microbial forecast model has captured a series of wet weather events in March and April 2017. Some of the results from that monitoring are summarised in **Table 3**. The recreational water quality guidelines for marine waters (MfE/MoH, 2003) indicate that a single sample greater than 280 Enterococci/100ml indicates a potential public health problem, triggering a series of management responses.

The very high Enterococci concentrations recorded close to the Porirua Stream mouth are likely to be assocated with a constructed wastewater overflow to Porirua Stream, located immediately upstream of the City Center Pump Station, as well as overflows at other locations in the Porirua/Kenepuru stream catchment.

Table 3: Wet weather monitoring in Porirua Harbour during March and April 2017 (GWRC data)

Site	Sample size	Enterococci (cfu/100ml)	
		median	*maximum*
Porirua Harbour at Wi Neera Drive Boat Ramp	8	18,000	490,000
Porirua Harbour at Te Hiko Street	6	8,600	28,000
Porirua Harbour at Rowing Club	8	1,430	20,000
Porirua Harbour at Browns Bay	8	30	2,100
South Beach at Plimmerton	8	405	49,000

GWRC has developed a microbiological water quality forecast model for Porirua Harbour, which WW hopes to be able to adapt for use in the option assessment process.

WW also monitors the quality of coastal waters in the vicinity of the Porirua WWTP during wet weather conditions when inflows exceed the capacity of the WWTP resulting in bypass discharges. A total of 50 bypass events occurred in the two and a quarter year period from September 2014 to November 2016, at an average frequency of just over 22 events per year. These discharges were nearly always associated with heavy rainfall events in the catchment and occurred most often in the winter months from May to September; seldom occurring during January, February or March. Summary statistics for Enterococci and Faecal coliform counts at seven shoreline monitoring sites during bypass discharges from July 2014 to November 2016 are shown in **Table 4.**

At all sites except the northern control and the southern-most site at Te Korohiwa Rocks, the 95th percentile value for Enterococci exceeded 500 cfu/100ml indicating a "significant risk of high levels of minor illness transmission" for contact recreation users, although it is noted that the recreational use of these waters is likely to be low during heavy rainfall events.

The faecal coliform results indicate that the northern control site would very likely comply with the MfE (2003) recreational shellfish-gathering guideline values[1], the Mt Couper and Te Korohiwa sites are marginal, while sites at Titahi Bay and 200m either side of the WWTP would not comply. WW has commissioned modelling

[1] The median faecal coliform content of samples taken over the shellfish gathering season shall not exceed 14 FC/100ml, and not more than 10% of samples should not exceed 43 FC/100ml.

consultants DHI to prepare a dispersion model for waters off the west coast of Porirua, which will improve the understanding of the existing discharge plume behaviour.

Table 4: Summary statistics for indicator bacteria at shoreline monitoring sites during bypass discharges (over the period 1 July 2014 to 1 Nov 2016).

Site	Sample size	*Enterococci* (cfu/100ml)				Faecal coliforms (cfu/100ml)			
		Min	Median	95 percentile	Max	Min	Median	95 percentile	Max
Control	45	2	4	67	120	2	4	58	84
Mt Couper	68	4	8	738	3500	4	8	290	3000
Titahi Bay	68	4	18	566	4300	4	20	563	800
Titahi Bay South	68	4	34	761	8500	4	36	419	2300
200m E of Outfall	67	4	12	886	9900	2	16	2375	12400
200m SW of Outfall	68	4	4	1460	16000	4	16	2750	14400
Te Korohiwa Rocks	68	4	4	313	610	4	8	369	680

In summary, wet weather overflows from the wastewater network can have a major but intermittent effect on the microbiological water quality of the Onepoto Arm of Porirua Harbour, and a lesser but still significant effect on nearshore waters at Plimmerton Beach and Titahi Bay. Discharges from the Porirua WWTP, including wet weather bypass discharges, appear to have a relatively localised effect on nearshore coastal waters 200m either side of the outfall, and neglible effect beyond 700m from the outfall. WW has commissioned DHI to conduct dispersion modelling to more acurately characterise the zone of effect of discharges from the existing WWTP shoreline outfall.

Current state – natural environment

The Porirua Harbour is a large, shallow, well flushed "tidal lagoon" type estuary consisting of two shallow drowned river valleys, the southern Porirua or Onepoto Arm and the northern Pauatahanui Inlet, meeting at a deep narrow confluence which opens to the west coast of the lower North Island opposite Mana Island. Porirua Harbour at 807 ha (524 ha in the Pauatahanui Inlet and 283 ha in the Onepoto Arm) is moderate in size compared to other New Zealand estuaries but is the largest estuarine system in the Wellington region.

Stevens and Robertson (2008) observed that saltmarsh is virtually non-existent in the Onepoto Arm but occupied 51ha in the Pauatahanui Arm where it was dominated by wide beds of rushland (mostly searush and jointed wire rush) which, as the terrestrial influence increased, transitioned through areas dominated by saltmarsh ribbonwood and grassland (mostly tall fescue). Areas of seagrass were relatively extensive, 41.2ha in the Pauatanui Arm and 17.3ha in the Oneopoto Arm.

MacDiarmid, et al., (2012) identified Porirua Harbour as a site of signifcance for marine biodiversity. The authors noted that New Zealand's shallow harbours and estuaries are important centres of diversity for shore and wading birds, coastal fish and invertebrates, as well as a variety of marine algae and flowering plants such as seagrass and saltmarsh species. Harbours and estuaries are key breeding, nursery and foraging areas for many species. Porirua Harbour is typical in this general sense but because of the limited size of most estuaries within the Wellington region the biodiversity value of Porirua Harbour is considerably elevated.

That assessment is reflected in Schedule F2c of the PNRP which lists both arms of the Porirua Harbour as being one of only a handful of relatively large estuaries in the Wellington Region, and a regionally important stop-over for several migrant shorebird species such as the NZ pied oystercatcher and bar-tailed godwit. Schedule F3 identifies the tidal flats of Pauatahanui Inlet as significant natural wetlands.

The coastal area to the west of Porirua Harbour includes a large area of exposed rocky shore and shallow sub-tidal reef habitat which is expected to support a high biodiversity of animals and plants. Cameron (1993) noted that while paua (*Haliotis iris*) and kina (*Evechinus chloroticus*) are common in sub-tidal areas of the coast south of Titahi Bay, filter feeding shellfish such as mussels are rare or absent. Gardiner (2000) observed that mussels are absent from large stretches of the wave-exposed shoreline of Cook Strait including the southwest coast of Wellington and that the low quality seston (organisms and non living matter swimming or floating in water) along these shores might explain their absence.

Option Scoring

Preliminary scores for the ten networks options and eight WWTP options against the public health risk and natural environment are provided in Tables 5, 6, 7 and 8.

Table 5: **Wastewater network options for managing wet weather overflows – Public Health Risk**

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
1. Business as usual		Recreational water quality guidelines not achieved. No reduction in health risk anticipated.	Investment in network sufficient to meet population growth (and small incremental improvements in performance) at flows up to 1500 L/s	Full characterisation of microbial contaminant sources. Quantitative public health risk assessment.
2. Rapid treatment at northern and City Centre pump stations (all excess flows conveyed to two sites).		Treatment reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour however the frequency of discharge remains the same (at around 10 per year). Rapid treatment reduces the public health risk, but there is considerable uncertainty about the level of risk. Recreational water quality guidelines may be achieved.	Disinfection achieves at least 2-3 log reduction (median FC <1000/100ml); Discharges occur at about the current rate but they are treated.	Residual microbiological contamination from other sources in the harbour catchment. Quantitative public health risk assessment.
3. Greater conveyance across the whole network		Reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour at flows up to six months average recurrence interval, i.e., 2 per year on average, with consequent reduction in the public health risk. Recreational water quality guidelines may be achieved but there is considerable uncertainty about the level of risk. Increases flows to WWTP, which will receive some level of treatment.	WWTP upgrades to cope with additional flow (up to 1500L/s) and discharge quality will be at least as good as it is now. Conveyance of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
4. Greater conveyance in the north + wet weather storage at City Centre		Reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour at flows up to six months average recurrence interval, i.e., 2 per year on average, with consequent reduction in the public health risk. Recreational water quality guidelines may be achieved but there is considerable uncertainty about the level of risk. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	WWTP upgrades to cope with additional flow (up to 1500L/s) and discharge quality will be at least as good as it is now. Conveyance of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
5. Wet weather storage in north + greater conveyance from City Centre		Reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour at flows up to six months average recurrence interval, i.e., 2 per year on average, with consequent reduction in the public health risk. Recreational water quality guidelines may be achieved but there is considerable uncertainty about the level of risk. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	WWTP upgrades to cope with additional flow (up to 1500L/s); discharge quality will be at least as good as it is now. Conveyance of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
6. Northern diversion (cross harbour pipe) + wet weather storage at City Centre		Reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour at flows up to six months average recurrence interval, i.e., 2 per year on average, with consequent reduction in the public health risk. Recreational water quality guidelines may be achieved. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	WWTP upgrades to cope with additional flow (up to 1500L/s); discharge quality will be at least as good as it is now. Most population growth will occur in the north. Conveyance of all flows (no overflows) up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
7. Northern diversion (cross harbour pipe) + greater conveyance from City Centre		Reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour at flows up to six months average recurrence interval, i.e., 2 per year on average, with consequent reduction in the public health risk. Recreational water quality guidelines may be achieved. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	WWTP upgrades to cope with additional flow (up to 1500L/s); discharge quality will be at least as good as it is now. Conveyance of all flows (no overflow) up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
8. Northern diversion (cross harbour pipe) + rapid treatment at City Centre.		Treatment reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour however the frequency of discharge remains the same (at around 10 per year). Rapid treatment reduces the public health risk, but there is considerable uncertainty about the level of risk. Recreational water quality guidelines may be achieved. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	Disinfection achieves at least 2-3 log reduction (median FC <1000/100ml); WWTP upgrades to cope with additional flow (up to 1500L/s); discharge quality will be at least as good as it is now. All excess flows conveyed to City Centre PS for treatment. Conveyance and/or treatment of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
9. Rapid treatment in north + wet weather storage in City Centre		Treatment reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour however the frequency of discharge remains the same (at around 10 per year). Rapid treatment reduces the public health risk, but there is considerable uncertainty about the level of risk. Recreational water quality guidelines may be achieved. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	Disinfection achieves at least 2-3 log reduction, (median FC <1000/100ml); WWTP upgrades to cope with additional flow up to 1500L/s; discharge quality will be at least as good as it is now. All excess flows conveyed to City Centre PS for treatment. Conveyance and/or treatment of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
10. Greater conveyance in the north + rapid treatment at City Centre		Treatment reduces the microbiological load to the lower Porirua Stream and the Onepoto Arm of Porirua Harbour however the frequency of discharge remains the same (at around 10 per year). Rapid treatment reduces the public health risk, but there is considerable uncertainty about the level of risk. Recreational water quality guidelines may be achieved. Increases flows to WWTP, which will receive some level of treatment. At least as good quality as is achieved now.	Disinfection achieves at least 2-3 log reduction, (median FC <1000/100ml); WWTP upgrades to cope with additional flow up to 1500L/s; discharge quality will be at least as good as it is now. All excess flows conveyed to City Centre PS for treatment. Conveyance and/or treatment of flows up to six months ARI.	WWTP outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.

Table 6: **Wastewater network options for managing wet weather overflows – Natural environment**

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
1. Business as usual		Adverse effects of wet weather discharges of untreated, dilute wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows. Discharges generally occur into a well-flushed environment where the opportunity for adverse effects are low.	Investment in network sufficient to meet population growth (and small incremental improvements in performance).	Characterisation of ecological values and effects at discharge locations.
2. Rapid treatment at northern and City Centre pump stations		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
3. Greater conveyance across the whole network		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance).	Characterisation of ecological values and effects at discharge locations.
4. Greater conveyance in the north + wet weather storage at City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
5. Wet weather storage in north + greater conveyance from City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
6. Northern diversion (cross harbour pipe) + wet weather storage at City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
7. Northern diversion (cross harbour pipe) + greater conveyance from City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
8. Northern diversion (cross harbour pipe) +		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate	Investment in network sufficient to meet population growth (and small	Characterisation of ecological values and effects at discharge locations.

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
rapid treatment at City Centre.		because of the intermittent occurrence, short duration, and high stream flows.	incremental improvements in performance.	
9. Rapid treatment in north + wet weather storage in City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.
10. Greater conveyance in the north + rapid treatment at City Centre		Adverse effects of wet weather discharges of partially treated wastewater are probably slight to moderate because of the intermittent occurrence, short duration, and high stream flows.	Investment in network sufficient to meet population growth (and small incremental improvements in performance.	Characterisation of ecological values and effects at discharge locations.

Table 7: Porirua WWTP options – Public Health Risk

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
1. Discharge to CMA from existing shoreline outfall + existing standard of treatment		Monitoring shows increased indicator bacteria concentrations 200m either side of the outfall, but uncertainty about effects further afield (for instance in Titahi Bay). Recreational water quality guidelines may be achieved beyond 200m mixing zone, but there remains some uncertainty around the frequency of bypass flows (>1500 L/s) and the level of treatment they will receive.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s.	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
2. Discharge to CMA from existing shoreline outfall + higher standard of treatment		Higher standard of treatment will reduce the zone of effect either side of the outfall. But the overall impact on risk will depend on the level of treatment. Recreational water quality guidelines may be achieved beyond 200m mixing zone, but there is still some uncertainty.	Higher standard of treatment for flows to 1500L/s, partial treatment for flows above 1500 L/s	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
3. Discharge to CMA from new shoreline outfall + existing standard of treatment		Relocation of outfall further from the recreational bathing area at Titahi Bay may reduce the overall public health risk. Recreational water quality guidelines may be achieved beyond 200m mixing zone, but there remains some uncertainty around the frequency of bypass flows (>1500 L/s) and the level of treatment they will receive.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s.	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
4. Discharge to CMA from new shoreline outfall + higher standard of treatment	?	Higher standard of treatment and relocation of the outfall will reduce the zone of effect of bypass discharges. Recreational water quality guidelines likely to be achieved beyond 200m mixing zone.	Higher standard of treatment for flows to 1500L/s, partial treatment for flows above 1500 L/s	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
5. Discharge to CMA from new offshore ocean outfall + existing standard of treatment		Ocean outfall designed to achieve a higher initial dilution than for shoreline with increased separation from sensitive receiving environments. Recreational water quality guidelines likely to be achieved beyond 200m mixing zone.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s. >100:1 initial dilution as worst case.	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
6. Discharge to land + seasonal shoreline		Some reduction in the volume of wastewater discharged to the coast during the dryer (summer) months but no reduction through winter period or in wet weather.	The existing treated wastewater quality meets relevant land irrigation guidelines	Availability of suitable land within reasonable distance of WWTP.

outfall + existing standard of treatment		Recreational water quality guidelines may be achieved beyond 200m mixing zone, but there remains some uncertainty around the frequency of bypass flows (>1500 L/s) and the level of treatment they will receive.	for public health risk (for example, Department of Health 1992 guidelines).	
7. Storage of wastewater + discharge to CMA from existing shoreline outfall on outgoing tide + existing standard of treatment		No substantial reduction in public health risk anticipated as existing level of treatment will continue and system typically used in estuarine environments subject to strong tidal influences.	Tidal effects are only one of a number of factors which influence plume behavior, which is likely be predominantly wind driven.	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.
8. Storage of wastewater + discharge to CMA from new offshore ocean outfall on outgoing tide		No substantial reduction in public health risk anticipated as existing level of treatment will continue and system typically used in estuarine environments subject to strong tidal influences.	Tidal effects are only one of a number of factors which influence plume behavior, which is likely be predominantly wind driven.	Outfall dispersion modelling based on assumed flow and loads. Quantitative public health risk assessment.

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Table 8: Porirua WWTP options – Natural environment

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
1. Discharge to CMA from existing shoreline outfall + existing standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s.	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
2. Discharge to CMA from existing shoreline outfall + higher standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Higher standard of treatment for flows to 1500L/s, partial treatment for flows above 1500 L/s	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
3. Discharge to CMA from new shoreline outfall + existing standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s.	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
4. Discharge to CMA from new shoreline outfall + higher standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Higher standard of treatment for flows to 1500L/s, partial treatment for flows above 1500 L/s	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
5. Discharge to CMA from new offshore ocean outfall + existing standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight because of the open and exposed character of the receiving environment.	Existing standard of treatment up to 1500 L/s, partial treatment for flows above 1500 L/s. >100:1 initial dilution as worst case.	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment		Adverse effects of treated wastewater to land will be low and effects of discharges to coastal waters are probably localized and slight to moderate because of the open and exposed character of the receiving environment.		Characterisation of land and coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.

Option	Assessment (G, O or R)	Reasons	Assumptions	Information gaps / uncertainties
7. Storage of wastewater + discharge to CMA from existing shoreline outfall on outgoing tide + existing standard of treatment		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Tidal effects are only one of a number of factors which influence plume behavior, which is likely be predominantly wind driven.	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.
8. Storage of wastewater + discharge to CMA from new offshore ocean outfall on outgoing tide		Adverse effects of treated wastewater plus bypass discharges to coastal waters are probably localised and slight to moderate because of the open and exposed character of the receiving environment.	Tidal effects are only one of a number of factors which influence plume behavior, which is likely be predominantly wind driven.	Characterisation of coastal marine ecological values and effects of discharge. Outfall dispersion modelling based on assumed flow and loads.

Porirua Wastewater Programme Long List Options Assessment

Specialist memo relating to Growth Criterion

27/11/2017

Prepared by: Matt Trlin (Connect Water)

Reviewed by:

Introduction

The **Growth** criteria used to assess each of the long list options for the Porirua waste water network and treatment plant aims to consider:

> ***The extent to which the option supports long term growth and investment, and economic development of the city and sub-region.***

The criteria's reference to 'the city' refers to the territorial authority area covered by Porirua City Council.

The criteria's reference to 'sub-region' refers to the waste water drainage and treatment catchment serviced by the Porirua Waste Water Treatment Plant. This catchment area covers the entire Porirua City Council administrative area, along with the northern suburbs of Wellington City Council, covering all suburbs north of Johnsonville and Paparangi to Porirua City Council's southern boundary at Kenepuru.

The growth assumptions for the Porirua waste water drainage and treatment catchment area are documented by WWL within its draft Network Improvement Plan 2017 (NIP). These are largely tied to the key growth driver of population increase, and forecast population growth figures for the catchment developed for Porirua and Wellington City Council's by ID.

Overall it is assumed that the residential population within the catchment will change between 2017 and 2043 as follows:

- Porirua City + 18% (+9,800)
- Wellington City northern suburbs + 28% (+13,400)

Beyond 2043, projections are difficult to make. However for the purpose of network planning WWL's NIP currently assumes that growth beyond 2043 will be similar to the projected 2017-43 rates of growth.

The draft NIP assumes that growth will drive a proportional increase in dry weather waste water flows.

Growth is not however expected to have a significant effect on overall peak wet weather flows. It is assumed that modern well-constructed subdivisions and building developments will be constructed with materials designed to minimise infiltration and inflow intrusions into the network. As such, an 18% increase in population in Porirua, for example, is not expected translate into an 18% increase in existing wet-weather flows. If the dry-weather flow increases by 18%, due to increased population, well designed and constructed developments supporting this growth are expected to result in an overall increase in wet weather flow of less than 5%.

Options assessed against the growth criteria have been graded as follows:

Criteria	Red	Orange	Green
Growth – Supports long term growth and investment, and economic development of city and sub-region	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 10-20 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 20-30 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 30-35 years

Assessment

Network Long List Options

All assessed long list options will be designed for:

- **Projected 30 year residential and business growth** (modelled to 2048), within the Porirua waste water treatment catchment area in line with the growth scenario's produced for Porirua and Wellington City by ID, and as outlined in the draft Porirua Network Improvement Programme;
- **Climate change**, and will include provision for sea level rise and additional rainfall intensity within the catchment due to climate change.

All options also involve an assumption that:

- **Business as usual network upgrades will keep pace with growth**: it is assumed that future network upgrades will, under a business as usual scenario, keep pace with growth and will not result in any increase in the volume and/or frequency of existing (2017) waste water overflows from the network by 2048.

Network Long List Assessment conclusions

Given that all longlist options will provide sufficient network capacity for network and catchment growth over a 30 year timeline to 2048 (aligned to the 30 year timeline of the PCC and WCC 2018-28 LTP 30 year infrastructure strategies), then all options have to have an assessed starting assessment evaluation of green.

The 'business as usual' option 1 does however stand apart from the nine other alternative options.

Option 1 while providing for network and population growth, won't result in any improvement to the rate, volume and quality of existing network overflow events (the current level of service).

In a scenario where PCC and WCC are required to address existing network overflow events, and make some improvement to existing levels of service associated with either overflow occurrences, volumes or quality, to secure long term consents for network overflow events, it is very likely that a BAU scenario will struggle to secure a long term (10 or 20 year+) consent.

In the absence of option 1 improving existing levels of service, option 1 could therefore act to constrain growth, where growth may be constrained until some improvement is made to the network to reduce overflow instances, volumes or improve overflow quality.

Option 1 although providing for the physical growth of the network and population, in the absence of improving existing levels service for network overflows, at best, should therefore be assessed as orange. Arguably a case could even be made to assess option 1 as red.

No other factors exist to provide for any differentiation between the remaining nine options in terms of how they are assessed against growth.

All nine alternative options to the BAU only scenario, not only provide for growth but also specifically target some improvement to the existing levels of service associated with overflow events, either through direct overflow reduction (using increased conveyance or storage) or through partial overflow treatment.

It should be noted that while all options are expected to provide for growth to 2048, insufficient detail currently exists within each of the options to be able to determine how effective each option will be in terms of tracking against growth- i.e. whether each option will remain fully ahead of growth, particularly where growth is variable, ensuring the network always has capacity to meet growth demands. It is expected that more detailed information will be developed to assess the staging of each option as part of the further assessment and evaluation of identified short list options.

WWTP Long List Options

Options with a new coastal or ocean outfall will enable the WWTP to receive and discharge (whether fully or partially treated) any increase in conveyance from the network.

All assessed options also involve an assumption that future WWTP upgrades will keep pace with growth and will be capable of processing modelled dry weather flow events to 2048 to at least existing levels of service. Wet weather events are also expected to be at least treated, partially treated or bypassed in line with existing levels of service.

Given that all options provide for growth over a 30 year timeline to 2048 (aligned to the 30 year timeline of the PCC and WCC 2018-28 LTP 30 year infrastructure strategies), then all options, similar to the network assessment, have to have an assessed starting assessment evaluation of green.

No differentiation therefore exists between the options in terms of how they are assessed against growth. However when assessed against other criteria differentiation will apply in terms of how each options performs in terms of the cost and performance against those criteria (i.e. environmental, social and community).

Table 1 Assessment of Network Long List option- GROWTH

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / significant uncertainties identified
Discharges to Harbour				
1. Business as usual *(current level of service with improvements to allow for growth)*		Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflows**: no decrease in existing overflow levels of service by 2048 (30 years). Option may not be capable of securing long term consents without some improvement in existing overflow levels of service (quantity or quality). NOTE: Option may not deliver optimal outcomes when assessed against other criteria, but it does provide for accommodating conveyance of waste water growth in the network to the WWTP.	Waste water network upgraded and/or managed to handle: • **30 yr growth:** increased dry weather waste water flows rates specifically associated with growth. No increase in the number and volume of existing overflow events at 2048, based on 2017 modelling of projected waste water flows. **Overflows will remain untreated.**	Detail and staging of network upgrade programme to manage growth.
2. Business as usual + rapid treatment at Paremata and City Centre Pump Stations		Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflows**: no increase in existing overflow rates at 2048 (30 years). • **Rapid treatment** of existing overflows improving the quality of discharge at 2 key overflow sites. NOTE: Option may not deliver optimal outcomes when assessed against other criteria, but it does provide for accommodating conveyance of waste water growth in the network to the WWTP.	Waste water network upgraded and/or managed to manage: • **6 month ARI** events (modelled at 2048) • **30 yr growth:** increased dry weather waste water flows rates specifically associated with growth. No increase in the number and volume of overflow events at 2048, based on 2017 modelling of projected waste water flows. Network upgraded to enable 6 month ARI wet weather volumes to be conveyed to Paremata and city pump stations. Existing Paremata and city pump stations include rapid treatment facilities capable of treating existing (2017) overflow instances and volumes up to 6 month ARI.	Detail and staging of network upgrade programme to manage growth.

			Wet weather events exceeding 6 month ARI will exceed network capacity and cause conveyance overflows across the network, however overflows at Paremata and City centre pump stations will still be subject to rapid treatment. This treatment may be only partially effective. It is assumed that rapid treatment of up to 6month ARI wet weather overflow events is accepted as an appropriate level of service capable of securing long term (30 year) discharge consents.	
Conveyance of a greater proportion of wastewater to the WWTP				
3. Greater conveyance across the whole network		Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflows**: increased network conveyance capacity (and level of service) developed across the entire network by 2048 to **convey 6 month ARI wet weather flows,** reducing existing 2017 instances and volumes of overflows.	Waste water network conveyance capacity upgraded and/or managed to handle: • **6 month ARI** events (by 2048) • **30 yr growth:** increased dry weather waste water flows rates specifically associated with growth. Conveyance upgrades result in a reduction in the number and volume of 2017 overflow events by 2048, based on 2017 modelling of projected waste water flows. Wet weather events exceeding 6 month ARI will exceed network capacity and cause conveyance overflows across the network. It is assumed that improving network conveyance capacity to manage 6month ARI wet weather events is accepted as an appropriate level of service capable of securing long term (30 year) discharge consents for overflow events exceeding 6 month ARI.	Detail and staging of network upgrade programme to manage growth.
4. Greater conveyance in the north **+** **wet weather storage at City Centre,** which allows conveyance to the WWTP overtime as network flows subside		Option performance is the **same as option 3**, with: • **Overflows**: wet weather storage increasing network capacity to **convey and/or store wet weather flows**, up to 6month ARI reducing existing (2017) overflow instances and volumes at 2048 (30 years).	Same as option 3, with waste water network conveyance capacity upgraded **by increasing conveyance capacity through developing network storage capacity** to handle 6 month ARI events and 30 year growth in dry weather flow, by 2048. Conveyance and/or storage upgrades result in a reduction in the number and volume of 2017 overflow events by 2048, based on 2017 modelling of projected waste water flows.	Same as **option 3.**

			Wet weather events exceeding 6 month ARI will exceed network capacity and cause conveyance overflows across the network. It is assumed that improving network conveyance capacity to manage 6month ARI wet weather events is accepted as an appropriate level of service capable of securing long term (30 year) discharge consents for overflow events exceeding 6 month ARI.	
5. **Business as usual** **+** **wet weather storage in north +** **greater conveyance from City Centre**		Option performance is the **same as option 4**.	**Same as option 4.**	Same as **option 3.**
6. **Northern diversion** (cross harbour pipe) **+** **wet weather storage at City Centre**		Option performance is the **same as option 4**.	**Same as option 4.**	Same as **option 3.**
7. **Northern diversion** (cross harbour pipe) **+** **greater conveyance from City Centre**		Option performance is the **same as option 3**.	**Same as option 3.**	Same as **option 3.**
8. **Storage in Wellington City** **+** **Storage in the north**		Option performance is the **same as option 4**.	**Same as option 4.**	Same as **option 3.**
9. **Northern diversion** (cross harbour pipe) **+** **rapid treatment at City Centre**		Option performance is the **same as option 3**, with: • **Overflows**: increased capacity to **either convey and/or treat wet weather flows**, and reduce existing (2017) overflow instances and volumes at 2048 (30 years), or quality of overflows.	**Same as option 3.**	Same as **option 3.**
10. **Business as usual** **+** **rapid treatment in north** **+** **wet weather storage in City Centre**		Option performance is the **same as option 3**, with: • **Overflows**: increased capacity to **either convey, store and/or treat wet weather flows**, and reduce existing (2017) overflow instances and volumes at 2048 (30 years), or quality of overflows.	**Same as option 4.**	Same as **option 3.**

11. Greater conveyance in the north + rapid treatment at City Centre		Option performance is the **same as option 8**.	**Same as option 3.**	Same as **option 3.**

Table 2 Assessment of WWTP Long List option- GROWTH

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / uncertainties
1. Discharge to the CMA from the existing shoreline outfall + existing standard of treatment.		Option provides WWTP capacity to handle and process: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, with existing standard of treatment, and existing outfall site. By pass events are expected to proportionally grow and be appropriately managed. NOTE: Option may not deliver optimal outcomes when assessed against other criteria, but it does provide for accommodating processing and/or bypass of growth in waste water conveyance to the WWTP.	WWTP is upgraded to provide for: • dry weather waste water treatment volume growth associated with projected growth in catchment to 2048 (30 years). By pass volume may proportionally increase. All by pass volumes are appropriately managed.	Detail and staging of WWTP upgrade programme to manage growth.
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment.		Option performance is the **same as option 1**, with: • Higher standard of treatment. By pass events are expected to proportionally grow and be appropriately managed. NOTE: Option may not deliver optimal outcomes when assessed against other criteria, but it does provide for accommodating processing and/or bypass of growth in waste water conveyance to the WWTP.	Same as **option 1**	Same as **option 1**
3. Discharge to the CMA from a new shoreline outfall		Option performance is the **same as option 1**	Same as **option 1**	Same as **option 1**

+ existing standard of treatment				
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment		Option performance is the **same as option 2**	Same as **option 1**	Same as **option 1**
5. Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment		Option performance is the **same as option 1**	Same as **option 1**	Same as **option 1**
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment		Option performance is the **same as option 1**	Same as **option 1**	Same as **option 1** **plus** Land discharge site and capability to accommodate growth related discharge.
7. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment		Option performance is the **same as option 1**	Same as **option 1**	Same as **option 1**
8. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide +		Option performance is the **same as option 2**	Same as **option 1**	Same as **option 1**

a higher standard of treatment				

Porirua Wastewater Programme Long List Options Assessment

Specialist memo relating to Financial implications /affordability / operational cost Criterion

Date 18 January 2018

Prepared by: Ron Haverland

Reviewed by: Steve Hutchison

Introduction

Factors to be considered are the capital and operating costs and the affordability of the options by comparing to the draft 30 year long term plan budgets.

Capital costs for the network are based on the high level costs provided in the Network Improvement Plan (March 2017).

Capital costs for the discharge and treatment plant options are based on historical costs for other New Zealand projects which are similar in concept and are only to give an indication of the order of magnitude of the costs. No design work has been carried out on these options so the scope of the work is uncertain.

Operating costs have not been determined however complex options involving high technology will have higher operating costs which are not currently provided for in the LTP.

Assessment

Network Long List Options

Options that convey higher flows to the WWTP have high capital costs but are generally allowed for the draft 30 year long term plan budgets proposed for the 2018-28 LTP infrastructure strategy.

Further work would be required to;

- Better define the scope of work and provide more detailed cost estimates
- Determine the receiving water quality parameters and UV dose required for rapid treatment options
- Carry out geotechnical investigations and assessment of liquefaction potential for treatment structures and storage tanks.

WWTP Long List Options

Upgrading the WWTP to provide a higher effluent quality similar to discharge standards required for fresh water discharges is cost prohibitive and is likely to provide little benefit to water quality based on historic understanding of dilution and dispersion.

Upgrading to attain a higher disinfection standard may be beneficial however should be considered in conjunction with outfall options.

Relocation or construction of an ocean outfall has some severe construction challenges due to poor access and the presence of rock.

Network overflows that are conveyed to the plant could be partially treated either by milliscreening or milliscreening plus UV disinfection. An assessment of the impact on water quality would be required to determine whether disinfection is warranted in addition to screening. Network overflows conveyed to the plant would vary depending on the network option selected but could be as high as approximately 3,000 L/s.

Further work would be required to;

- Determine the benefits to water quality from a new coastal outfall or ocean outfall from the results of updated dispersion modelling
- Determine the benefits of a higher disinfection standard.
- Carry out geotechnical and cost estimate investigations in relation to the construction a new coastal outfall or ocean outfall.

Table 1 Assessment of Network Long List options

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / significant uncertainties identified
Discharges to harbour				
1. Business as usual (current level of service with improvements to allow for growth)	Green	Low costs. Costs are within 30 yr Long term Plan (LTP) budgets.	All options allow for increased rainfall due to climate change	
2. Business as usual + rapid treatment at northern and City Centre pump stations	Green	Low costs. Costs are within 30 yr LTP budgets.	Allows for fine screening and UV disinfection. Assumes 2 log reduction with 1000 coliform/100 mL treated discharge. Treated discharges are to the Porirua Stream and Porirua Harbour.	UV dose required for rapid treatment to be confirmed, will depend on overflow transmittance.
Conveyance of a greater proportion of wastewater to the WWTP				
3. Greater conveyance across the whole network	Green	High costs but 30 yr LTP allows for this greater conveyance to the treatment plant.	All flows to 6 month ARI are conveyed to the WWTP and bypass flows in excess of 1500 L/s have basic treatment.	Cost estimates are currently provisional level only.
4. Greater conveyance in the north + wet weather storage at City Centre, which allows conveyance to the WWTP over time as network flows subside	Green	Lower cost than solely conveyance	Costs are sensitive on model accuracy for storage volume calculation	Storage requires geotechnical investigations and assessment of liquefaction potential. Mitigation works could be costly.

5. Business as usual + wet weather storage in north + greater conveyance from City Centre	Green	High cost butsimilar to 30 yr LTP.	Costs are sensitive on model accuracy for storage volume calculation	Storage requires geotechnical investigations and assessment of liquefaction potential. Mitigation works could be costly.
6. Northern diversion (cross harbour pipe) + wet weather storage at City Centre	Orange	The findings from the workshop scored this as Red however while this option has a high cost it is no greater than 50% of the 30 yr LTP.	Costs are sensitive on model accuracy for storage volume calculation	Storage requires geotechnical investigations and assessment of liquefaction potential. Mitigation works would be costly. Cross harbor pipe has higher consenting and construction cost risk than land based pipeline
7. Northern diversion (cross harbour pipe) + greater conveyance from City Centre	Orange	The findings from the workshop scored this as Red however while this option has a high cost it is no greater than 50% of the 30 yr LTP.		Cross harbor pipe has higher consenting and construction cost risk than land based pipeline
8. Storage in Wellington City + storage in the north	Green	Mid range costs. Costs are within 30 yr LTP.		Storage requires geotechnical investigations and assessment of liquefaction potential. Mitigation works could be costly.
9. Northern diversion (cross harbour pipe) + rapid treatment at City Centre	Orange	The findings from the workshop scored this option as Red however while it has a high cost it is no greater than 50% of the 30 yr LTP.		UV dose required for rapid treatment to be confirmed, will depend on overflow transmittance. Cross harbor pipe has higher consenting and construction cost risk than land based pipeline
10. Business as usual + rapid treatment in north + wet weather storage in City Centre	Green	Mid range costs. Costs are within 30 yr LTP.	Costs are sensitive on model accuracy for storage volume calculation	UV dose required for rapid treatment to be confirmed, will depend on overflow transmittance.

				Storage requires geotechnical investigations and assessment of liquefaction potential. Mitigation works would be costly.
11. Greater conveyance in the north + rapid treatment at City Centre	Green	Mid range costs. Costs are within 30 yr LTP.		UV dose required for rapid treatment to be confirmed, will depend on overflow transmittance.

Table 2 Assessment of WWTP Long List option

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / uncertainties
1. Discharge to the CMA from the existing shoreline outfall + existing standard of treatment.	Green	Capital cost is within 30 year LTP. This includes for partial treatment and discharge of flows >1500 l/s. Opex costs unchanged.	Partial treatment costs assumed to be $10 to $20M however flows to be treated are undefined. This applies to all options.	Assumes no major maintenance required for existing outfall
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment.	Red (nutrient and pathogens)	Very high cost and may exceed 30 year LTP.	Higher standard of treatment for nutrients will have significant capital costs; $30M to $60M; and associated significant opex costs.	Unknown discharge standard. Unknown extent of the WWTP upgrade.
	Orange (pathogens only)	Cost is not allowed for within 30 yr LTP although would be within LTP if rapid treatment of excess flows was not required.	Higher standard of treatment for disinfection by UV may require additional solids removal.	Assumes no additional treatment steps required to remove solids prior to disinfection (e.g. sand filters)

3. Discharge to the CMA from a new shoreline outfall + existing standard of treatment	Green	Cost is within 30 yr ISB.	Costs depend on the actual location however assumed to be within 500m from the WWTP circa $5M to 10M.	Best shoreline location close to plant. Outfall dispersion modelling results needed. Construction challenges.
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	Red (nutrient and pathogens) Orange (pathogens only)	Very high cost and exceeds 30 year infrastructure strategy budgets (ISB). Cost is not allowed for within 30 yr LTP although would be within LTP if rapid treatment of excess flows was not required.	Higher standard of treatment for nutrients will have significant capital and opex costs; likely $30M to $60M capex range; and associated significant opex costs. Higher standard of treatment for disinfection by UV may require additional solids removal.	Unknown discharge standard. Unknown extent of the WWTP upgrade.
5. Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	Red Red	5a. Very high cost and exceeds 30 year LTP. 5b. High cost and exceeds the 30 LTP.	Ocean outfall assumed to be 280m off the west coast to 10m depth, and total 1800m from plant; $50M to $70M probable cost range. Outfall assumed to be to the 300m off the coast and north of the plant; $15M to $25M probably cost range.	Outfall length and location. Outfall dispersion modelling results needed. Construction challenges around rugged coast would require feasibility investigation.
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment	Red	Very high cost and exceeds 30 year LTP.	Significant area of land 700 to 780 ha needed on rolling hills and elevated at 120 to 200m. Only 135ha available within 5km. Poorly draining loam clay loam soils. Significant opex costs similar to at least current pumping Tangere to the WWTP which costs $20K per month in power.	Availability / purchase of the land. Suitability of soils. Partial option only – relies on acceptability of discharging above average flows to coast

7. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	Orange	High cost but no more than 50% of 30 year ISB.	Assumes 11 ML of storage: $10M.	Site needed for the storage tank. Geotechnical constraints. Beneficial impact on water quality not certain.
8. Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	Orange	High cost but no more than 50% of 30 year ISB.	Assumes 11 ML of storage: $10M. New	Site needed for the storage tank. Geotechnical constraints. Impact on water quality.

Porirua Wastewater Programme Long List Options Assessment

Specialist memo relating to Social and Community Criteria Criterion

27/11/2017

Prepared by: Matt Trlin (Connect Water)

Reviewed by:

Introduction

The **Social and Community** criteria used to assess each of the long list options for the Porirua waste water network and treatment plant aims to consider:

> ***the extent to which the option improves or adversely effects social and community values including amenity values, recreation, food gathering.***

These may be values directly associated with waste water facility sites, adjoining areas or the wider environment (i.e. Te Awarua o Porirua Harbour).

Wellington Water's waste water network improvement and waste water treatment plant management programmes are both targeted at progressively improving the performance of the existing waste water network and treatment plant. Both programmes are targeted at reducing network overflows, providing adequate network conveyance and treatment capacity to appropriately manage waste water, including projected growth in waste water volumes, and securing consents required to support continued network and treatment plant operation.

The criteria's reference to 'social and community values' refers to amenity values and social and cultural activities, practices and perceptions that may be directly affected by waste water network improvement and treatment plant management options either through:

- Scientifically measureable degradation or improvement of identified social and community values. For example a scientifically measureable improvement in or worsening of water quality associated with and valued for bathing or recreation use, or an improvement in or worsening of the health of shell fish targeted for food gathering, and/or
- Social and/or cultural perceptions of degradation or improvement of identified values. For example the extent to which local communities perceive (scientifically or anecdotally) a measureable improvement in or worsening of water quality associated with and valued for bathing or recreation use, or an improvement in or worsening of the health of shell fish targeted for food gathering. As an example various communities within Porirua hold cultural views that waste water treated even to potable water standard will still be 'tainted'

as waste water and is not compatible with supporting or sustaining valued social and/or cultural activities and practices (i.e. contact recreation use or food gathering). An improvement in social and/or cultural perception of water quality may therefore only be associated with reduction in waste water discharges (regardless of the level of treatment that they are subject to) to environments valued for social and cultural activities and practices.

Options assessed against the **Social and Community** criteria are graded as follows:

Criteria	**Red**	**Orange**	**Green**
Social and Community – Amenity values, recreation, food gathering, including perception.	Significant adverse effect in relation to the criterion, **and/or** no significant improvement in addressing existing degraded social and community values, **and/or** significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, **and/or** moderate improvement in addressing existing degraded social and community values, **and** moderate uncertainty and some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, **and/or** significant improvement in addressing existing degraded social and community values, **and** little uncertainty or further information required

Assessment

Network Long List Options

Wellington Water's waste water network improvement programme is targeting a progressive improvement in the performance of the existing waste water network. This includes the provision of adequate network conveyance capacity to appropriately accommodate projected growth in waste water volumes.

All options will be designed for projected residential and business growth (assessed at 2017 out to 2048) within the Porirua waste water treatment catchment area in line with the growth scenario outlined in the Porirua Network Improvement programme.

All options also involve an assumption that future network upgrades will keep pace with growth and will not result in any increase in the volume and/or frequency of existing (2017) waste water overflows from the network by 2048.

All options while providing for growth over a 30 year timeline to 2048 (aligned to the 30 year timeline of the PCC and WCC 2018-28 LTP 30 year infrastructure strategies), will still involve discharges of overflow events (treated, partially treated and untreated) to harbour and stream environments affecting perceptions of stream and harbour health and related social and community values.

At best all options can only be assessed as orange, offering a moderate improvement in addressing existing degraded social and community values associated with existing overflows.

No one option offers a solution to remove or significantly reduce overflow events to 'infrequent' or 'rare' events (i.e. to a 1:5 or 1:10 year storm event), meriting a green assessment.

Option 1 by virtue of offering no significant improvement to existing network conveyance and overflow treatment performance, offers no prospect of improving existing degraded social and community values and must be assessed as red.

Option 2's offers some improvement to addressing degraded social and community values, associated with improved conveyance to rapid treatment sites and rapid treatment of up to 6 month ARI overflows, and partial treatment of larger events. However Option 2 will not act to remove or reduce the existing levels of waste water network overflows to the harbour environment. Option 2 does involve an 'acceptance of existing overflow discharges' and no significant improvement to reducing existing overflow events, even if these events are subject to rapid treatment. This is likely to be viewed in segments of the community as being socially and culturally unacceptable. On this basis the option is assessed as red. However acknowledging that the rapid treatment of existing overflow events could be deemed to offer an improvement to water quality and the health and safety of recreational users (irrespective of social and cultural perspectives applying to the overflows), the red assessment is tagged with a question mark.

Similar to Option 2, Options 10 and 11 also involve rapid treatment components, but also include some provision to partially increase the wet weather conveyance capacity of the waste water network, either through additional storage (option 10) or additional conveyance capacity (option 11). Overflow events will be reduced across the network, but not to the same extent as options 3, 4, 5 and 8. Acknowledging that both options 10 and 11 will deliver reduction in overflow events in some components of the network, but will also involve 'acceptance' of some existing overflow events with a recurrence of less than 6 month ARI in some parts of the existing network (regardless of its rapid treatment), both options are assessed as orange and are tagged with a question mark.

Further assessment of options 6, 7 and 9 at a multidisciplinary assessment workshop (Nov 2017) has identified that these options should be classified as being fatally flawed and not be considered for further assessment.

Representatives from Ngati Toa identified that the proposed option of constructing and using a new cross harbour pipeline through Te Awarua O Porirua Harbour (described as a northern diversion) to convey sewerage was culturally abhorrent and should be identified as a fatally flawed option. The activity of constructing and using a new sewerage pipeline through Te Awarua O Porirua Harbour was considered to be entirely inconsistent with the cultural values and significance attached to Te Awarua O Porirua Harbour by Ngati Toa.

In recognition of Ngati Toa's statutory status as Kaitiaki of Te Awarua o Porirua Harbour, and the cultural values and significance attached to the harbour by Ngati Toa, all options involving a new cross harbour pipeline have therefore been identified as being fatally flawed (F). It is noted that the cultural acceptability of these options was not previously understood in establishing the long list options put forward for this assessment.

WWTP Long List Options

All options provide for the continuation and maintenance of high quality dry weather effluent treatment and discharges from the existing WWTP, with some options proposing improvements to treatment, with variants for potentially improving wet weather treatment capacity and discharge quality.

All WWTP options involve either the continued utilisation of the existing WWTP shoreline outfall, and/or the development of a new shoreline or new ocean outfall to enable the WWTP to receive and discharge (whether fully or partially treated) any increase in conveyance from the network.

All options involve an assumption that future WWTP upgrades will keep pace with growth in the WWN and any increase in the conveyance capacity of the network. All options will be capable of full treatment processing of modelled dry weather flow events to 2048, and full or partial treatment of all wet weather events.

All options provide for waste water processing and discharge growth over a 30 year timeline to 2048 (aligned to the 30 year timeline of the PCC and WCC 2018-28 LTP 30 year infrastructure strategies), with the outcome that discharges of treated effluent or partially treated by pass events to either the existing and/or proposed new coastal shoreline discharge points, or to offshore environments will increase.

Due to community and cultural perceptions of treated and partially treated effluent discharges to coastal environments compromising social and community amenity values, recreational use, food gathering activity and other social and cultural activities and practices, all coastal shoreline discharge options can, at best, only be assessed as orange taking account of the WWTP's high quality treatment of dry weather flows, and proposals to maintain and improvement rapid treatment of bypass events. The increase in waste water discharge volumes (treated or partially treated) however requires that this assessment also receives a question mark as arguably no significant improvement is being offered to reduce waste water discharges to the coastal environment (regardless of treatment standard).

In the case of options 1, 2, 5, 7 and 8 it is assumed that proposed by pass events will discharge via the identified outfall sites (option 1 and 2 via the existing shoreline outfall; options 5 offshore outfall; and options 7 and 8 via the existing shoreline outfall). Should by pass events require a new shoreline discharge location then options 1, 2, 7 and 8 should be assessed as red. Option 5 should be assessed as orange (with a question mark) subject to the provisional assessment comments outlined below.

All new coastal shoreline discharge options offer (at best) a moderate improvement in addressing existing degraded social and community values if the new shoreline options involve relocating the discharge to what are viewed to be 'less sensitive areas'. At worst new shoreline discharge locations could be viewed as offering no significant improvement in addressing degraded social and community values. Further consultation and discussion with Ngati Toa as recognised Kaitiaki for Te Awarua O Porirua Harbour and the Cook Strait will be crucial to determining whether this is the case.

Option 5 by virtue of the proposal to locate the WWTP outfall further offshore, with continued high quality treatment of dry weather flows and processed rapid treatment of bypass flows, could be assessed (subject to finding a suitable outfall site that is less sensitive than the current shoreline location) as improving social and community values associated with the shoreline, by removing the current shoreline outfall coastal discharge and enabling the shoreline environment to be restored. This could enable the shoreline to be used for a wider range of recreational, food gathering and other social and cultural activities and practices, restoring or enhancing perceptions of its potential amenity and cultural value.

In recognition of this distinction Option 5 is therefore **provisionally assessed**, for the purpose of this high level long list assessment, as green potentially offering a significant improvement in addressing existing degraded social and community values. This assessment is provisional (and hence marked with a question mark) subject to:

- further consultation and discussion with Ngati Toa as recognised Kaitiaki for Te Awarua O Porirua Harbour and the Cook Strait,
- The selection a suitable outfall site that can be demonstrated to not adversely impact any established and/or popular fishing areas or areas that are deemed to be socially and/or culturally sensitive.

Other than the distinction of option 5, no significant differentiation can be drawn between the options within this social and community values criteria category in this high level long list options assessment.

Table 1 Assessment of Network Long List option- Social and community

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / significant uncertainties identified
Discharges to Harbour				
1. Business as usual *(current level of service with improvements to allow for growth)*		**Value effects:** • **Overflows remain**: Existing overflows remain at current levels. • **Overflows not treated**: Existing overflows remain untreated. • **Overflows constrain recreational use**: Overflows constrain opportunities for use of some areas following storm events, specifically swimming. • **No improvement to food gathering**: Overflows continue to compromise ability to take fish and harvest shell fish. • **Poor public perception of wet weather network performance:** Public perception of discharge impacts of network overflows on the harbor and stream environments environment will remain unchanged with existing overflow events continuing to occur. • **Perception of harbor, stream and amenity environment**: Public perceptions remain that network overflows actively discharge into harbour and streams permanently affecting perceived amenity values, water quality and recreational and social values associated the harbor and stream environments. **Assessment:** • Community expects conveyance system to convey all waste water events. • Notwithstanding the dry weather performance of the network, untreated overflows from the network continue to enter the harbour during wet weather events. • Option does not offer any significant improvement to address degraded social and community values associated with existing overflows, with continuation of existing untreated overflows from the network to 2048.	Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflows**: no increase and no change in existing overflow rates or quantity of overflows by 2048 (30 years).	Assessment of public perceptions of waste water management network, improvement options and option impact on social and community value sets.

2. Business as usual **+** **Rapid treatment at Paremata Pump station** **+** **Rapid treatment at City Centre Pump Stations**	**?**	**Value effects:** • **Overflows remain**: Existing overflows remain at current levels. • **Overflows treated**: Overflows subject to rapid treatment- screening and UV. • **Overflows constrain recreational use**: Overflows continue to constrain opportunities for use of some areas following large storm events that exceed treatment capacity. Cultural perceptions of contamination remain, regardless of rapid treatment performance. • **No improvement to food gathering**: Overflows continue to compromise ability to take fish and harvest shell fish after large storm events that exceed rapid treatment capacity. Cultural perceptions of contamination remain, regardless of rapid treatment performance. • **Poor public perception of wet weather network performance:** Some public perceptions of discharge impacts of network overflows on the harbour and stream environments are improved, however poor perception continues to remain with retention of overflows- whether subject to full or partial rapid treatment, or untreated. • **Perception of harbor, stream and amenity environment**: Public perceptions remain that network overflows still actively discharge into harbour and streams (regardless of treatment) permanently affecting perceived amenity values, water quality and recreational and social and cultural values associated the harbour and stream environments. **Assessment:** • Community expects conveyance system to convey all waste water events. • Notwithstanding the dry weather performance of the network, treated and partially treated overflows continue to enter the harbour during wet weather events. • Option offers some improvement to addressing degraded social and community values, with improved conveyance to rapid treatment sites, and rapid treatment of up to 6 month ARI overflows, and partial treatment of larger events. • Option does involve acceptance of existing overflow discharge to sensitive environment, even if subject to rapid treatment. This may not be socially and culturally favoured, with a preference to	Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflow quantity and frequency**: no increase and no change in existing overflow rates or quantity and frequency by 2048 (30 years). • **Overflow quality**: significant improvement in existing overflow quality for all events less than 6 month ARI, and moderate improvement in events greater than 6 months ARI to 2048 (30 years).	Assessment of public perceptions of waste water management network, improvement options and option impact on social and community value sets.

		see a reduction in overflow events (as opposed to treatment or partial treatment of overflows) • Events larger than 6 month ARI continue to involve discharge of partially treated and untreated overflows to streams and harbour.		
Conveyance of a greater proportion of wastewater to the WWTP				
3. Greater conveyance across the whole network		**Value effects:** • **Overflows events reduced**: Existing overflows events reduced with increase in network conveyance capacity, with overflows occurring only during events exceeding 6 month ARI. • **Overflows not treated**: Overflows from events >6 month ARI continue and are not treated. • **Overflows constrain recreational use**: Overflows continue to constrain opportunities for use of some areas following large storm events. Cultural perceptions of contamination remain, due to overflows from events exceeding 6month ARI. • **No improvement to food gathering**: Overflows continue to compromise ability to take fish and harvest shell fish after large storm events. Cultural perceptions of contamination remain, due to overflows from events exceeding 6 month ARI. • **Poor public perception of wet weather network performance:** Public perception of discharge impacts of network overflows improved associated with reduced frequency of overflow events, however poor perception continues to remain with retention of overflows for larger events (greater than 6 month ARI). • **Perception of harbor, stream and amenity environment**: Public perceptions remain (although improved) that network overflows actively discharge into harbor and streams permanently affecting perceived amenity values, water quality and recreational and social and cultural values associated the harbour and stream environments. **Assessment:** • Notwithstanding the dry weather performance of the network, and increased network conveyance capacity and reduced wet weather overflows, overflows remain for events exceeding 6 month ARI	Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflow quantity and frequency**: improvement in existing overflow quantity and frequency by 2048 (30 years), associated with increased wet weather conveyance capacity and reduced overflow frequency to 2 events per annum. • **Overflow quality**: no improvement in overflow quality.	Assessment of public perceptions of waste water management network, improvement options and option impact on social and community value sets.

		• Option offers a moderate improvement to addressing degraded social and community values, with improved conveyance reducing instances of wet weather overflows. • Events larger than 6 month ARI continue to involve discharge of untreated overflows to streams and harbour.		
4. Greater conveyance in the north **+** **wet weather storage at City Centre,** which allows conveyance to the WWTP overtime as network flows subside		Option performance is the **same as option 3**.	**Same as option 3.**	**Same as option 3.**
5. Business as usual **+** **wet weather storage in north** **+** **greater conveyance from City Centre**		Option performance is the **same as option 3**.	**Same as option 3.**	**Same as option 3.**
6. Northern diversion (cross harbour pipe) **+** **wet weather storage at City Centre**	**F**	Option performance is the **same as option 3**. However this option will require the placement of new a sewerage pipeline through Te Awarua O Porirua Harbour. This activity has been identified as being entirely inconsistent with the cultural values and significance attached to Te Awarua O Porirua Harbour by Ngati Toa, who as recognised Kaitiaki, have identified that this proposal would be considered to be culturally abhorrent. On this basis this option is identified as being **fatally flawed**.	**Same as option 3.**	**Same as option 3.**
7. Northern diversion (cross harbour pipe) **+**		Option performance is the **same as option 6**.	**Same as option 3.**	**Same as option 3.**

greater conveyance from City Centre	**F**			
8. Wet Weather storage in Wellington City + Wet weather storage in north		Option performance is the **same as option 3**.	**Same as option 3.**	**Same as option 3.**
9. Northern diversion (cross harbour pipe) **+ rapid treatment at City Centre**	**F**	Option performance is the **same as option 11**. However this option will require the placement of new a sewerage pipeline through Te Awarua O Porirua Harbour. This activity has been identified as being entirely inconsistent with the cultural values and significance attached to Te Awarua O Porirua Harbour by Ngati Toa, who as recognised Kaitiaki, have identified that this proposal would be considered to be culturally abhorrent. On this basis this option is identified as being **fatally flawed**.	**Same as option 11.**	**Same as option 3.** Unknown change to overflow frequency and volumes at City City Centre associated with northern diversion
10. Business as usual + rapid treatment in north + wet weather storage in City Centre	**?**	**Value effects:** • **Overflows events reduced**: Existing overflows events reduced in southern catchment with wet weather storage in city centre and occur only during events exceeding 6 month ARI. Potential for some reduction in overflow events at Paremata (associated with increased conveyance capacity at city centre) • **Some overflows treated**: rapid treatment applied to northern catchment overflows up to 6 months ARI. Events exceeding 6 months ARI partially treated. • **Overflows constrain recreational use**: Overflows continue to constrain opportunities for use of some areas following large storm events. Cultural perceptions of contamination remain, regardless of reduced overflow occurrence and rapid treatment performance. • **No improvement to food gathering**: Overflows continue to compromise ability to take fish and harvest shell fish after large storm events. Cultural perceptions of contamination remain, regardless of reduced overflow occurrence and rapid treatment performance. • **Poor public perception of wet weather network performance:** Public perception of discharge impacts of network overflows	Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflow quantity and frequency**: improvement in existing overflow quantity and frequency by 2048 (30 years), associated with storage and increased wet weather conveyance capacity at city centre. • **Overflow quality**: some improvement in overflow quality with rapid treatment at Paremata for all events less than 6 month ARI, and moderate improvement in events greater than 6 months ARI to 2048 (30 years).	**Same as option 3.** Unknown change to overflow frequency and volumes at Paremata associated with city centre wet weather storage.

		improved associated with reduced overflow events, and partial treatment of overflows, however poor perception continues to remain with continued overflows (although treated) at Paremata, and retention of untreated overflows for larger events (greater than 6 month ARI) at City Centre. • **Perception of harbour, stream and amenity environment**: Public perceptions remain that network overflows actively discharge into harbour and streams permanently affecting perceived amenity values, water quality and recreational and social and cultural values associated the harbour and stream environments. **Assessment:** • Notwithstanding the dry weather performance of the network, and increased network conveyance capacity of wet weather flows and reduced overflows at City Centre, overflows remain for events exceeding 6 month ARI, and regular overflows remain at Paremata although these are subject to treatment. • Option offers a moderate improvement to addressing degraded social and community values, with improved conveyance of wet weather flows, reducing instances of overflows, and rapid treatment of existing overflows at Paremata. • Option does involve acceptance of existing overflow discharge to sensitive environment, even if subject to rapid treatment. This may not be socially and culturally favoured, with a preference to see a reduction in overflow events (as opposed to treatment or partial treatment of overflows). • Events larger than 6 month ARI continue to involve discharge of untreated overflows to streams and harbour.		
11. Greater conveyance in the north + rapid treatment at City Centre	**?**	Value effects: • **Overflows events reduced**: Existing overflows events reduced in northern catchment and occur only during events exceeding 6 month ARI. Some reduction in overflow events at city centre (associated with reduced loading from northern area) • **Some overflows treated**: rapid treatment applied to city centre overflows up to 6 months ARI. Events exceeding 6 months ARI partially treated. • **Overflows constrain recreational use**: Overflows continue to constrain opportunities for use of some areas following large storm events. Cultural perceptions of contamination remain, regardless of reduced overflow occurrence and rapid treatment performance.	Option provides for: • **30 yr growth**: 30 year modelled residential and commercial growth in the catchment, and • **Dry weather flows**: 30 year modelled growth in dry weather waste water flows, • **Overflow quantity and frequency**: improvement in existing overflow quantity and frequency by 2048 (30 years), associated with increased wet weather conveyance capacity in the north, and some reduction in wet weather overflows at city centre. • **Overflow quality**: some improvement in overflow quality with rapid treatment at City Centre for all events	**Same as option 3.** Unknown change to overflow frequency and volumes at City Centre associated with increased Paremata conveyance. Prospect of increased overflow events and magnitude.

		• **No improvement to food gathering**: Overflows continue to compromise ability to take fish and harvest shell fish after large storm events. Cultural perceptions of contamination remain, regardless of reduced overflow occurrence and rapid treatment performance. • **Poor public perception of wet weather network performance:** Public perception of discharge impacts of network overflows improved associated with reduced overflow events, and partial treatment of overflows, however poor perception continues to remain with continued overflows (although treated) at City Centre, and retention of untreated overflows for larger events (greater than 6 month ARI) in northern catchment area. • **Perception of harbour, stream and amenity environment**: Public perceptions remain that network overflows actively discharge into harbour and streams permanently affecting perceived amenity values, water quality and recreational and social and cultural values associated the harbour and stream environments. **Assessment:** • Notwithstanding the dry weather performance of the network, and increased conveyance of wet weather flows and reduced overflows in northern catchment and possible reduced overflows at city centre, overflows remain for events exceeding 6 month ARI, and regular overflows remain at city centre although these are subject to some form of treatment. • Option offers a moderate improvement to addressing degraded social and community values, with improved conveyance of wet weather flows, reducing instances of overflows, and rapid treatment of existing overflows at city centre • Option does involve acceptance of existing overflow discharge to sensitive environment, even if subject to rapid treatment. This may not be socially and culturally favoured, with a preference to see a reduction in overflow events (as opposed to treatment or partial treatment of overflows). • Events larger than 6 month ARI continue to involve discharge of untreated overflows to streams and harbour.	less than 6 month ARI, and moderate improvement in events greater than 6 months ARI to 2048 (30 years).	

Table 2 Assessment of WWTP Long List option

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / uncertainties
1. Discharge to the CMA from the existing shoreline outfall **+** **existing standard of treatment.**	**?**	**Value effects:** • **High quality dry weather treatment**: high quality treatment of dry weather flows provided to 2048, with an increase in treated effluent and partially treated by pass discharge volumes. • **By pass events remain**: Reduced number of bypass events but by pass events remain and are appropriately managed • **Discharges constrain recreational use**: discharge and by pass events at outfall site continue to provide some constraint on opportunities for use of area in vicinity of outfall site. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **No improvement to food gathering**: discharge and bypass activities continue to compromise ability to take fish and harvest shell fish in vicinity of outfall. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges regardless of treatment performance. • **Public perception of WWTP wet weather performance:** Public perceptions of WWTP treated discharges and effects of partially treated or untreated bypass events on coast environment remain unchanged and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Perception of coastal amenity environment**: Public perceptions of WWTP treated discharge and bypass effects on coastal environment remain, and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance, with perception of impacts on amenity values, water quality, food gathering and recreational values and sensitive cultural values.	Option provides for: • **30 yr growth**: Continued high quality treatment of dry weather waste water flows with capacity improvements for processing, treating and discharging growth in waste water volumes associated with 30 year modelled residential and commercial growth in the catchment, and • **By pass**: By pass events remain, and are expected to be appropriately managed. • **By pass location**: By pass events occur through existing coastal shoreline outfall. • If bypass events are taken to a new additional shore line discharge site, then it would be reasonable to assess this option as red, with additional shoreline environments being subject to received partially treated effluent discharges.	

		Assessment: • Notwithstanding the high quality dry weather performance of the WWTP, discharge of treated effluent to the coast environment continues and increases, along with continued discharges of partially treated by pass flows following wet weather events • Option does not involve removal or reduction of discharges of treated effluent or by pass or overflow events from coastal environment. No significant improvement offered resolve degraded social, community and cultural values associated with high quality treated effluent discharge to coastal environment.		
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment.	**?**	Value effects: • **Higher quality dry weather treatment**: higher quality treatment of dry weather flows provided to 2048 with an increase in treated effluent and partially treated by pass discharge volumes. • **By pass events remain**: reduced number of bypass events, but bypass events remain and are appropriately managed. • **Discharges constrain recreational use**: discharge and by pass events at outfall site continue, notwithstanding higher quality treatment, and provide some constraint on opportunities for use of area in vicinity of outfall site. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **No improvement to food gathering**: discharge and bypass activities continue to compromise ability to take fish and harvest shell fish in vicinity of outfall. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Public perception of WWTP and wet weather performance:** Public perception of WWTP performance improves associated with higher quality treatment of standard WWTP dry weather discharge, and improved treatment of wet weather flows. However cultural perceptions of contamination remain, and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Perception of coastal amenity environment**: Public perceptions of WWTP discharge and bypass effects on coastal environment remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of	Option provides for: • **30 yr growth**: Continued and improved higher quality treatment of dry weather waste water flows with capacity improvements for processing, treating and discharging growth in waste water volumes associated with 30 year modelled residential and commercial growth in the catchment, and • **By pass**: By pass events remain, and are expected to be appropriately managed. • **By pass location**: By pass events occur through existing coastal shoreline outfall. • If bypass events are taken to a new additional shore line discharge site, then it would be reasonable to assess this option as red, with additional shoreline environments being subject to received partially treated effluent discharges.	

		treatment performance, with perception of impacts on amenity values, water quality, food gathering and recreational values and sensitive cultural values. **Assessment:** • Notwithstanding the higher quality dry weather performance of the WWTP, discharge of treated effluent to the coast environment continues and increases, along with continued discharges of partially treated by pass flows following wet weather events • Option does not involve removal or reduction of discharges of treated effluent or by pass flow events from coastal environment. No significant improvement to address perceptions of degraded social, community and cultural values associated with high quality treated effluent discharge to coastal environment.		
3. Discharge to the CMA from a new shoreline outfall + existing standard of treatment	**?**	**Value effects:** • **High quality dry weather treatment**: high quality treatment of dry weather flows provided to 2048 with an increase in treated effluent and partially treated by pass discharge volumes. • **By pass events remain**: reduced number of bypass events but by pass events remain and are appropriately managed • **Discharges constrain recreational use**: discharge and by pass events at new outfall site continue to provide some constraint on opportunities for use of area in vicinity of outfall site. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **No improvement to food gathering**: discharge and bypass events continue to compromise ability to take fish and harvest shell fish in vicinity of new outfall. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Public perception of WWTP wet weather performance:** Public perceptions of WWTP treated discharges and effects of partially treated or untreated bypass events on coast environment remain unchanged and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance.	**Same as option 1.** That new shoreline outfall is not in a more sensitive site than the present site. Existing shoreline discharge point is fully decommissioned and restored.	Outfall site selection needs to be known to ensure that a more sensitive site location is not being picked. Outfall site needs to be accurately known to be able to assess effects. Understanding required of the location of popular fishing areas, and culturally sensitive areas to be avoided.

		• **Perception of coastal amenity environment**: Public perceptions of WWTP discharge and bypass effects on coastal environment remain, and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance, with perception of impacts on amenity values, water quality, food gathering and recreational values and sensitive cultural values. **Assessment:** • Notwithstanding the high quality dry weather performance of the WWTP, discharge of treated effluent to the coast environment continues, along with continued discharge of partially treated by pass flows following wet weather events • Option does not involve removal or reduction of discharges of treated effluent or by pass flows from coastal environment. No significant improvement to address perceptions of degraded social, community and cultural values associated with high quality treated effluent discharge to coastal environment.		
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	**?**	Option performance is the **same as option 2**.	**Same as option 2.** That new shoreline outfall is not in a more sensitive site that the present site. Existing shoreline discharge point is fully decommissioned and restored.	Outfall site selection needs to be known to ensure that a more sensitive site location is not being picked. Outfall site needs to be accurately known to be able to assess effects. Understanding the location of popular fishing areas, and cultural sensitive areas to be avoided.
5. Discharge to the CMA from a new offshore ocean outfall		Value effects: • **High quality dry weather treatment**: high quality treatment of dry weather flows provided to 2048 with an increase in treated effluent and partially treated by pass discharge volumes.	**Same as option 1.** That new offshore outfall is not in a more sensitive site than the present site.	Outfall site selection needs to be known to ensure that a more

+ **existing standard of treatment**	**?**	• **By pass events remain**: Reduced number of bypass events, but bypass events remain and are appropriately managed • **Recreational use**: discharge and by pass events at new outfall site continue to provide some constraint on opportunities for use of area in vicinity of outfall site, however offshore location and prospect of greater dilution of discharge and removal from sensitive shoreline environment potentially improves (subject to site selection) perceived effects on recreation values (regardless of increase in discharge volumes and treatment performance). • **Food gathering**: discharge and bypass continue to compromise ability to take fish and harvest shell fish in immediate vicinity of new outfall, however offshore location removes discharge from more accessible shoreline location. Offshore location offers potential (subject to site selection) for enhanced dilution and reduced impact on food gathering (fishing). • **Public perception of WWTP wet weather performance:** Public perception of WWTP bypass events on coast environment improves associated with placement of outfall site further offshore and away from sensitive shoreline environment (regardless of increase in discharge volumes and treatment performance). • **Perception of coastal amenity environment**: Public perceptions of WWTP discharge and bypass effects on coastal environment improved, with perception of reduced impacts on local amenity values, local water quality, food gathering and recreational values. Cultural perceptions of contamination likely to remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of discharge location and treatment performance. Assessment: • Option removes treated effluent and by pass flows from coastal shoreline environment to an offshore ocean outfall. • Option has potential to significantly improve social and community values (and perceptions) associated with decommissioned shoreline outfall site. . • Cultural perceptions of coastal environment contamination likely to remain and could potentially worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of discharge location and treatment performance. To be determined in consultation and discussions with Ngati Toa as	By pass events also discharged to offshore outfall site, and are removed from shoreline. If bypass events still occur to shore line discharge site, then it would be reasonable to assess this option as red with a question mark, with shoreline environments being subject to received partially treated effluent discharges.	sensitive site location is not being picked. Outfall site needs to be accurately known to be able to assess effects. Understanding the location of popular fishing areas, and cultural sensitive areas to be avoided. Confirm that by pass events also discharged to offshore outfall and not shoreline environment.

		recognised Kaitiaki for the Te Awarua O Porirua Harbour and Cook Strait.		
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment	**?**	**Value effects:** • **High quality dry weather treatment**: a full land based discharge option would result in perceived higher quality treatment of dry weather flows. Proposed option is however significantly constrained by significant limitations in the area and location of available suitable land for land based discharge, and the potential sensitivity of available land based sites.. • **By pass events remain**: reduced number of bypass events associated with increase in treatment plant capacity. Bypass events remain into coastal shoreline environment but are appropriately managed. • **Discharges constrain recreational use** : discharge and by pass events at outfall site continue to provide some constraint on opportunities for use of area in vicinity of outfall site. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **No improvement to food gathering**: discharge and bypass continue to compromise ability to take fish and harvest shell fish in vicinity of outfall. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Public perception of WWTP and wet weather performance:** Public perception of WWTP performance may improve associated with partial use of land based treatment options. However existing perceptions of treated discharges and effects of partially treated or untreated bypass events on coast environment remain unchanged and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Perception of coastal amenity environment**: Public perceptions of WWTP discharge and bypass effects on coastal environment remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance, with perception of impacts on amenity values, water quality, food gathering, recreational values and sensitive cultural values.	Option provides for: • **30 yr growth**: Continued and improved high quality treatment of dry weather waste water flows with introduction of additional land based discharge improvement for receiving **some** treated effluent discharges. Option still requires frequent discharge of treated effluent to either the existing or a new shoreline outfall • **By pass**: By pass events remain, and are expected to be appropriately managed. Insufficient suitable land is readily available to receive year around treated effluent discharge. It is assumed that areas of Mana Island while potentially suitable (in terms of soil type and drainage characteristics) for receiving treated effluent are highly unlikely to be available for receiving treated effluent discharges. Option viability is questionable.	Availability of suitable land In sensitive areas.

		Assessment: • Option potentially reduces discharge of treated effluent to the coastal environment, however constraints on available land mean that a significant proportion of treated discharges will still discharge at shoreline outfall. • Available land discharge locations involve a mix of sites, some of which have highly sensitive social and cultural values. Use of sensitive areas may be considered to be abhorrent, further limiting available land for land based treated effluent disposal. • Option with lmited land available for land based disposal offers very limited removal of treated discharges from coastal shoreline environment. No significant improvement to address perceptions of degraded social and community values at shoreline outfall site associated with high quality treated effluent discharge to coastal environment.		
7. **Storage of wastewater** **+** **discharge to the CMA from the existing shoreline outfall on outgoing tide** **+** **existing standard of treatment**	**?**	Value effects: • **High quality dry weather treatment**: high quality treatment of dry weather flows provided to 2048 with an increase in treated effluent and partially treated by pass discharge volumes. • **By pass events reduced**: reduced number of bypass events, but bypass events remain and are appropriately managed. • **Discharges constrain recreational use**: discharge and by pass events at outfall site continue, notwithstanding higher quality treatment of wet weather flow events and reduced number of bypass events, and provide some constraint on opportunities for use of area in vicinity of outfall site. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance, by pass reduction and use of outgoing tide to convey discharges. • **No improvement to food gathering**: discharge and bypass continue to compromise ability to take fish and harvest shell fish in vicinity of outfall. Cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance. • **Public perception of WWTP and wet weather performance:** Public perception of WWTP performance may potentially improve associated with reduced bypass events and conveyance of treated stored wet weather flows on outgoing tide. However	Option provides for: • **30 yr growth**: Continued high quality treatment of dry weather waste water flows with capacity improvements for processing, treating and discharging growth in waste water volumes associated with 30 year modelled residential and commercial growth in the catchment, and • **By pass**: By pass events remain and are expected to be appropriately managed. • **By pass location**: By pass events occur through existing coastal shoreline outfall. • If bypass events are taken to a new additional shore line discharge site, then it would be reasonable to assess this option as red, with additional shoreline environments being subject to received partially treated effluent discharges.	Effectiveness of outgoing tide to convey dispersal of treated and partially effluent discharges, versus other factors (currents, wind effects etc). Coastal modelling of dispersal.

		cultural perceptions of contamination remain and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance and enhanced bypass management. • **Perception of coastal amenity environment**: Public perceptions of WWTP discharge and bypass effects on coastal environment likely to remain, and may worsen with increased volume of treated effluent and partially treated by pass discharges, regardless of treatment performance, with perception of impacts on amenity values, water quality, food gathering and recreational values and sensitive cultural values. **Assessment:** • Notwithstanding the high quality dry weather performance of the WWTP, discharge of treated effluent to the coast environment continues, along with discharge of treated or partially treated by pass wet weather flows on outgoing tides following wet weather events. • Option does not involve removal or reduction of discharges of treated effluent or by pass flows from coastal environment. No significant improvement to address perceptions of degraded social and community values associated with high quality treated effluent discharge to coastal environment.		
8. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + a higher standard of treatment	**?**	Option performance is the **same as option 7**. •	**Same as option 7.**	**Same as option 7.**

Porirua Wastewater Programme Long List Options Assessment

Specialist memo relating to Technology Criterion

Date 18 January 2018

Prepared by: Ron Haverland

Reviewed by: Steve Hutchison

Introduction

Factors to be considered are that the technology proposed is an enduring, long term solution, able to be staged, reliable, proven and robust, able to be constructed, and an integrated scheme approach.

Assessment

Network Long List Options

Conveyance and pump stations are proven technology and long term solutions that are reliable. They have the capacity for future upgrades by the provision of additional pumps and pipelines.

Storage options for wastewater overflows are proven and there are a number of examples in use in NZ. Modular storage would have challenges depending on the site limitations, but could be achieved.

Rapid treatment uses the basic building blocks of screening and UV disinfection which are well proven technologies. Rapid treatment for storm overflows is currently is used at Hatea in Whangarei and another plant is currently being constructed in Picton.

WWTP Long List Options

Ocean outfalls are widely used with many cities in New Zealand discharging to outfalls. Outfall length will vary depending on the wastewater quality and the sensitivity of the receiving environment. Outfalls in NZ typically range from 500 to 2000 metres long. A multiport diffuser improves mixing and dilutions of 1:100 are typical. For Porirua, previous studies indicated that the west coast would be a suitable environment. Kaumanga A, 280m offshore was identified as an option at a depth of 10m and at a total length of approximately 1400m from the WWTP.

Activated sludge processes are well proven in NZ and overseas and produce a high quality effluent. The Porirua WWTP generally provides single figures BOD and low suspended solids effluent and is configured for nitrogen reduction. Activated sludge plants can be upgraded to provide a higher standard of treatment with the addition of process such as sand filters or membranes, while becoming more complex the technology is still proven.

Table 1 Assessment of Network Long List options

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / significant uncertainties identified
Discharges to harbour				
1. Business as usual (current level of service with improvements to allow for growth)	Green	Conveyance systems are proven technology and suitable for the physical context and modular to accommodate increasing flows.		
2. Rapid treatment at northern and City Centre pump stations	Orange	While screening and UV disinfection are well proven technologies on their own, there are only a few examples of rapid treatment of overflows in NZ.	Allows for fine screening and UV disinfection. Assumes 2 log reduction with 1000 coliform/100 mL treated discharge. Treated discharges are to the Porirua Stream and Porirua Harbor.	UV dose required for rapid treatment.
Conveyance of a greater proportion of wastewater to the WWTP				
3. Greater conveyance across the whole network	Green	Conveyance is proven.	Partial flows to 6 month ARI are conveyed to the WWTP and bypass flows in excess of 1500 L/s are treated. Overflows in excess of 6 month ARI are untreated.	Quantify the flows to be conveyed to the WWTP. Confirm the feasibility of treatment of bypass flows at the WWTP. Confirm how the balance of flows in the network are stored/treated/or discharged.
4. Greater conveyance in the north + wet weather storage at City Centre, which allows conveyance to the WWTP over time as network flows subside	Green	Conveyance and storage are proven.	As above	Quantify the flows to be conveyed to the WWTP. Confirm the feasibility of treatment of bypass flows at the WWTP.

5. Wet weather storage in north + greater conveyance from City Centre	Green	Conveyance and storage are proven.	As above	As above
6. Northern diversion (cross harbour pipe) + wet weather storage at City Centre	Green	Conveyance and storage are proven.	As above	As above
7. Northern diversion (cross harbour pipe) + greater conveyance from City Centre	Green	Conveyance is proven.	As above	As above
8. Storage in Wellington City + storage in the north	Green	Conveyance and storage are proven.	As above	Confirmation of the location of the overflows in the Wellington catchment and possible storage tank locations.
9. Northern diversion (cross harbour pipe) + rapid treatment at City Centre	Orange	While screening and UV disinfection are well proven technologies on their own, there are only a few examples of rapid treatment of overflows in NZ.	As above for rapid treatment.	UV dose required for rapid treatment.
10. Business as usual + rapid treatment in north + wet weather storage in City Centre	Orange	As above for rapid treatment.	As above for rapid treatment.	UV dose required for rapid treatment.
11. Greater conveyance in the north + rapid treatment at City Centre	Orange	As above for rapid treatment.	As above for rapid treatment.	UV dose required for rapid treatment.

Table 2 Assessment of WWTP Long List options

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / uncertainties
1. Discharge to the CMA from the existing shoreline outfall + existing standard of treatment.	Green	Activated sludge process is well proven. Ocean outfalls are widely used in NZ.		
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment.	Orange	Activated sludge plants can be upgraded to provide a higher standard of treatment, while becoming more complex the technology is still proven.		Upgrade nutrient removal or disinfection standard.
3. Discharge to the CMA from a new shoreline outfall + existing standard of treatment	Green	Outfalls proven in NZ.		Location of the discharge and dispersion modelling.
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	Green	Outfalls proven in NZ. Activated sludge plants can be upgraded to provide a higher standard of treatment, while becoming more complex the technology is still proven.		Upgrade nutrient removal or disinfection standard.
5a & b. Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	Green	Outfalls proven in NZ.	Constructability is assumed possible – working area on the coast is limited	
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment	Red	Land treatment is proven in NZ but suitable area of land of 700 to 780ha of land is not practical. Only 135ha is available within 5km radius.	Application rate of 4mm/day for loam to clay loam soils.	

7. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	Green	Storage is proven. Outfalls proven in NZ.		
8. Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	Green	Storage is proven. Outfalls proven in NZ. As above for WWTP.		Upgrade nutrient removal or disinfection standard.

Porirua Wastewater Programme Long List Options Assessment

Specialist memo relating to Resilience – natural hazards / operational resilience criterion

Date 18 January 2018

Prepared by: Ron Haverland

Reviewed by: Steve Hutchison

Introduction

Factors to be considered are the risks to infrastructure from natural hazards including proximity to fault lines, ground shaking, liquefaction, climate change, flooding, and tsunami inundation.

The information presented is based on hazard maps and no on-site investigations have been made.

Assessment

Network Long List Options

Major pump stations are located close to fault lines, liquefaction zones, and are likely to have high ground shaking. Pump stations should be unaffected by flooding.

All options will be designed for sea level rise and additional rainfall intensity due to climate change.

Options that have rapid treatment only will not have an increase in operation resilience as the discharge locations will not be appropriate for dry weather.

Typically options that provide storage will result in an improvement in operational resilience as storage can be used during short term outages.

Typically options that provide conveyance upgrades will result in an improvement in operational resilience due to duplication of the pumps and rising mains.

WWTP Long List Options

Typically options with a new coastal or ocean outfall will result in an improvement in operational resilience as they provide an additional discharge location. The ocean outfall will also provide enhanced dilution.

Typically options with storage on the outgoing tide will result in no improvement in operational resilience as treated effluent can be stored for short periods when the outfall is out of service.

Table 1 Assessment of Network Long List options

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / significant uncertainties identified
Discharges to harbour				
1. Business as usual (current level of service with improvements to allow for growth)	Orange	Moderate risk for hazards. Some major pump stations close to fault lines, liquefaction zones, high ground shaking. No improvement in operational resilience.	Upgraded facilities will have mitigation against natural hazards.	
2. Rapid treatment at northern and City Centre pump stations	Orange	New treatment facilities will be close to fault lines, liquefaction zones, high ground shaking. No improvement in operational resilience.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.
Conveyance of a greater proportion of wastewater to the WWTP				
3. Greater conveyance across the whole network	Green	Provides operational resilience as a result of duplication of pump stations and rising mains.	Major pump station and rising mains are duplicated. New facilities can have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.
4. Greater conveyance in the north + wet weather storage at City Centre, which allows conveyance to the WWTP over time as network flows subside	Green	Provides operational resilience as a result of storage that could be used during outages.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.
5. Wet weather storage in north + greater conveyance from City Centre	Green	Provides operational resilience as a result of storage that could be used during outages and duplication of rising main from City Centre.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.

6. Northern diversion (cross harbour pipe) + wet weather storage at City Centre	Green	Provides operational resilience as a result of storage that could be used during outages and resilience from the conveyance through the cross harbour pipeline.	New facilities will have mitigation against natural hazards. Cross harbour pipeline crosses the fault line and requires mitigation against movement.	Geotechnical information. Faulting information and mitigation methods.
7. Northern diversion (cross harbour pipe) + greater conveyance from City Centre	Green	Provides operational resilience as a result of conveyance from the cross harbour pipeline and duplication of rising main from City Centre.	New facilities will have mitigation against natural hazards. Cross harbour pipeline crosses the fault line and requires mitigation against movement.	Geotechnical information. Faulting information and mitigation methods.
8. Storage in Wellington City + storage in the north	Green	Provides operational resilience as a result of storage that could be used during outages.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.
9. Northern diversion (cross harbour pipe) + rapid treatment at City Centre	Green	Provides operational resilience as a result of conveyance from the cross harbour pipeline. New treatment facilities will be close to fault lines, liquefaction zones, high ground shaking. No improvement in operational resilience from the rapid treatment.	New facilities will have mitigation against natural hazards. Cross harbour pipeline crosses the fault line and requires mitigation against movement.	Geotechnical information. Faulting information and mitigation methods.
10. Business as usual + rapid treatment in north + wet weather storage in City Centre	Green	Provides operational resilience as a result of storage that could be used during outages. New treatment facilities will be close to fault lines, liquefaction zones, high ground shaking. No improvement in operational resilience from the rapid treatment.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.
11. Greater conveyance in the north + rapid treatment at City Centre	Orange	The findings from the workshop scored this as Green however the reason from scoring orange is that neither conveyance in the north or rapid treatment provide an improvement in operational resilience.	New facilities will have mitigation against natural hazards.	Geotechnical information. Faulting information and mitigation methods.

		New treatment facilities will be close to fault lines, liquefaction zones, high ground shaking.		

Table 2 Assessment of WWTP Long List options

Options	Traffic light score	Reasons	Option specific assumptions	Information gaps / uncertainties
1. Discharge to the CMA from the existing shoreline outfall + existing standard of treatment.	Orange	Low risk for hazards. No known fault lines, liquefaction zones, or high ground shaking. Site is elevated so no risk of flooding. No improvement in operational resilience.		
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment.	Orange	Low risk for hazards. No effect from higher treatment standard. No improvement in operational resilience.		
3. Discharge to the CMA from a new shoreline outfall + existing standard of treatment	Green	Low risk for hazards. Additional outfall increases operational resilience.		Geotechnical information on the coastal route and the shoreline outfall.
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	Green	Low risk for hazards. Additional outfall increases operational resilience. No effect from higher treatment standard.		Geotechnical information on the coastal route and the shoreline outfall.
5a & b. Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	Green	Low risk for hazards. Additional outfall increases operational resilience.		Geotechnical information on the coastal route and the ocean outfall.
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment	Green	Low risk for hazards. Additional discharge route to land increases operational resilience.		
7. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of	Green	Low risk for hazards. Storage of treated effluent increases operational resilience.		Geotechnical information on the storage tank location.

treatment				
8. Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	Green	Low risk for hazards. Storage of treated effluent increases operational resilience. Additional outfall increases operational resilience.		Geotechnical information on the storage tank location.

Attachment D: Traffic Light Workshop & Ngāti Toa Meeting Records

Porirua Wastewater Programme

Long List Assessment Workshop – Meeting Record

29 November 2017, 9 – 4.30 pm

Wellington Water's office, Petone

Attendees:

Stewart McKenzie – WWL
Anna Hector – WWL
Peggy Cunningham-Hales – GWRC
Jeremy Rustbatch – GWRC
Rachael Boisen Round – GWRC
Logen Logeswaran – WCC
Keith Calder – PCC
Jill McKenzie – RPH
John Gibbs – Whaitua Committee
Nathan Baker – Connect Water
David Cameron – Stantec
Paula Hunter – Stantec
Steve Hutchinson – WWL
Kara Dentice – WWL
Al Cross – GWRC
Claire Conwell – GWRC
Hugh Dixon-Paver – (GWRC)
Alastair Smaill – GWRC
Rhys Spicer – WWL
Sharli-Jo Soloman – Ngāti Toa
Matt Trlin – Connect Water
Graeme Jenner – Connect Water
Ron Haverland – Connect Water
Richard Peterson – Stantec
Grant Baker – Porirua Harbour Trust

Introductions, background and context

The workshop commenced with introductions. Stewart then broadly introduced the 'collaborative' approach that is being trialled on this project. In doing so he noted that the intent is that the parties to the collaborative approach work together to identify a solution for the current problems with the Porirua wastewater network and WWTP. The current problems have previously been identified as part of preparing the Porirua Wastewater Consenting Programme strategy. The problems identified are:

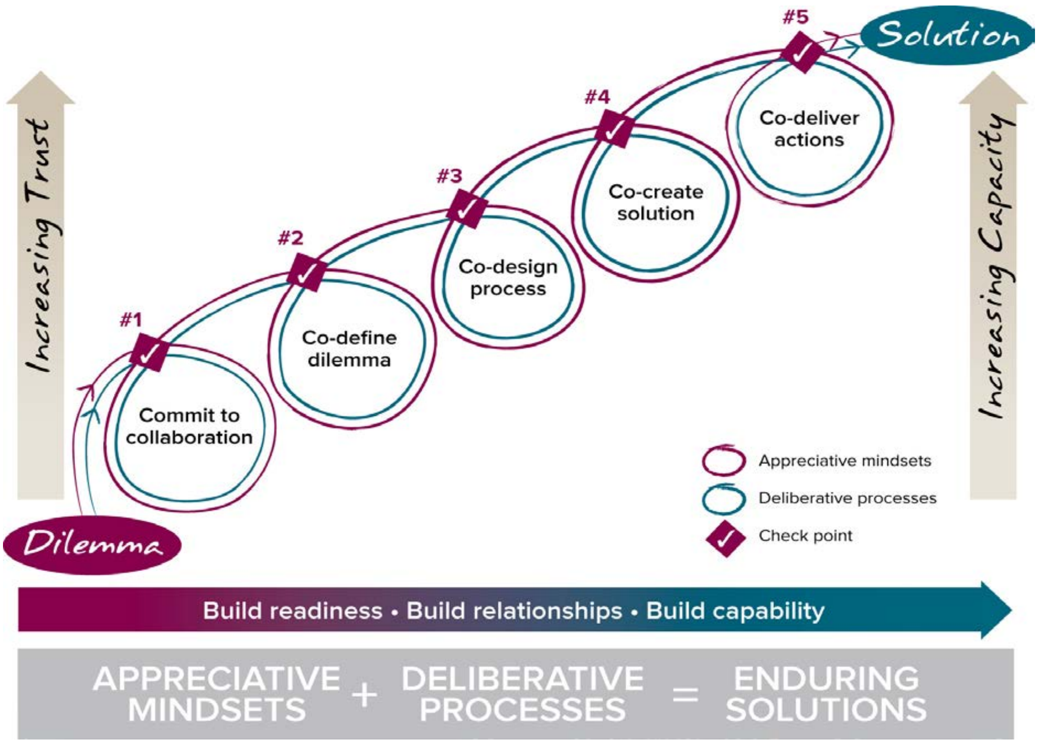
- The wastewater network and treatment plant have capacity and condition problems which contribute to poor water quality in the catchment
- The discharge consents from the Porirua wastewater treatment plant expire in 2020 and need to be re-consented
- The overflows from the wastewater network are currently not consented and new consents must be applied for.

Al then introduced the 'collaborative' approach in more detail, making reference to the Power of Co. framework. See Figure 1.

Al noted that this approach differs from a more traditional approach which places significant focus on the regulatory process, by focusing on the problem, or dilemma and recognising that the regulatory process is just one step in resolving it.

John asked whether the final decision-makers were in the room. In response Al noted that the people that would be making the recommendation to the decision-makers were in the room. However, he also noted that if the process goes well a hearing may not be needed. Therefore, there may not be a need to refer the resource consent application to independent hearing commissioners. It was also noted that, even if a hearing was required, the collaborative approach would hopefully have narrowed the issues substantially.

Figure 1 - Power of Co Framework



Jeremy then provided more detail on the progress that has been made to date through the collaborative approach. He introduced the dilemma statement and noted that it is not fixed in time and will be reviewed in the future as not all of those in the room have had the opportunity to contribute to it. He also discussed the complexity with both the problem and in co-creating a lasting solution.

Our dilemma is to:
Co-create lasting solutions to Porirua's wastewater network and plant discharges to enable a healthy and protected harbour, coastline and catchment.

This is a complex problem due to:
- Regulatory framework - PNRP, FPS, CPS, LTP, DPs, PHS, Whaitua
- Funding $$
- Community expectations > low awareness/profile of issues
- Conflicting priorities
- Cultural sensitivity
- Population growth
- Different receiving environments e.g. harbour vs open coast
- Interrelated issues e.g. stormwater, land use
- Public health risk

Co-creating a lasting solution is complex due to:
- Potential for staged approach
  - Understanding/communicating to wider audience
  - Funding
  - Two-way communication
- Current understanding of effects
  - Water quality
  - Public health
  - Cultural
  - Ecological
- Range of variables re: water quality
- Holistic view vs. quick fix at one location
- Need to have a range of groups/disciplines/experts
- Maintaining political and community commitment
- Community benefits and expectations, how people use and value the harbour
- Climate change/future proofing

Figure 2 - Dilemma Statement

Logen asked whether any specific targets had been set, i.e. is the project seeking 80, 90 or 100% protection. Jeremy noted that there is uncertainty in terms of the targets being sought and that this is probably not unexpected for this early stage of the process. The group will endeavour to reduce that uncertainty as the process evolves.

To conclude the introductory session, Stewart outlined the WWL service goals and the Porirua Wastewater Consenting Programme (PWP) strategy, focussing on its vision, problems, objectives & issues. The vision for the PWP was identified prior to the workshop as being:

> *A healthy and protected harbour, catchment and coastal environment supported by infrastructure that sustains healthy communities, minimises adverse effects and facilitates growth.*

With reference to the PWP objectives, Alastair noted that the Whaitua Implementation Plan is still to be released and that once released, it will need to be taken into account in the PWP. He indicated that this need not be a one-way process however, i.e. it could be a two-way process in which the Whaitua and PWP inform each other.

Assessment methodology

Stewart referred the group to the process diagram on the second page of the PWP strategy. He noted that this workshop relates to the steps in the red circle in Figure 3.

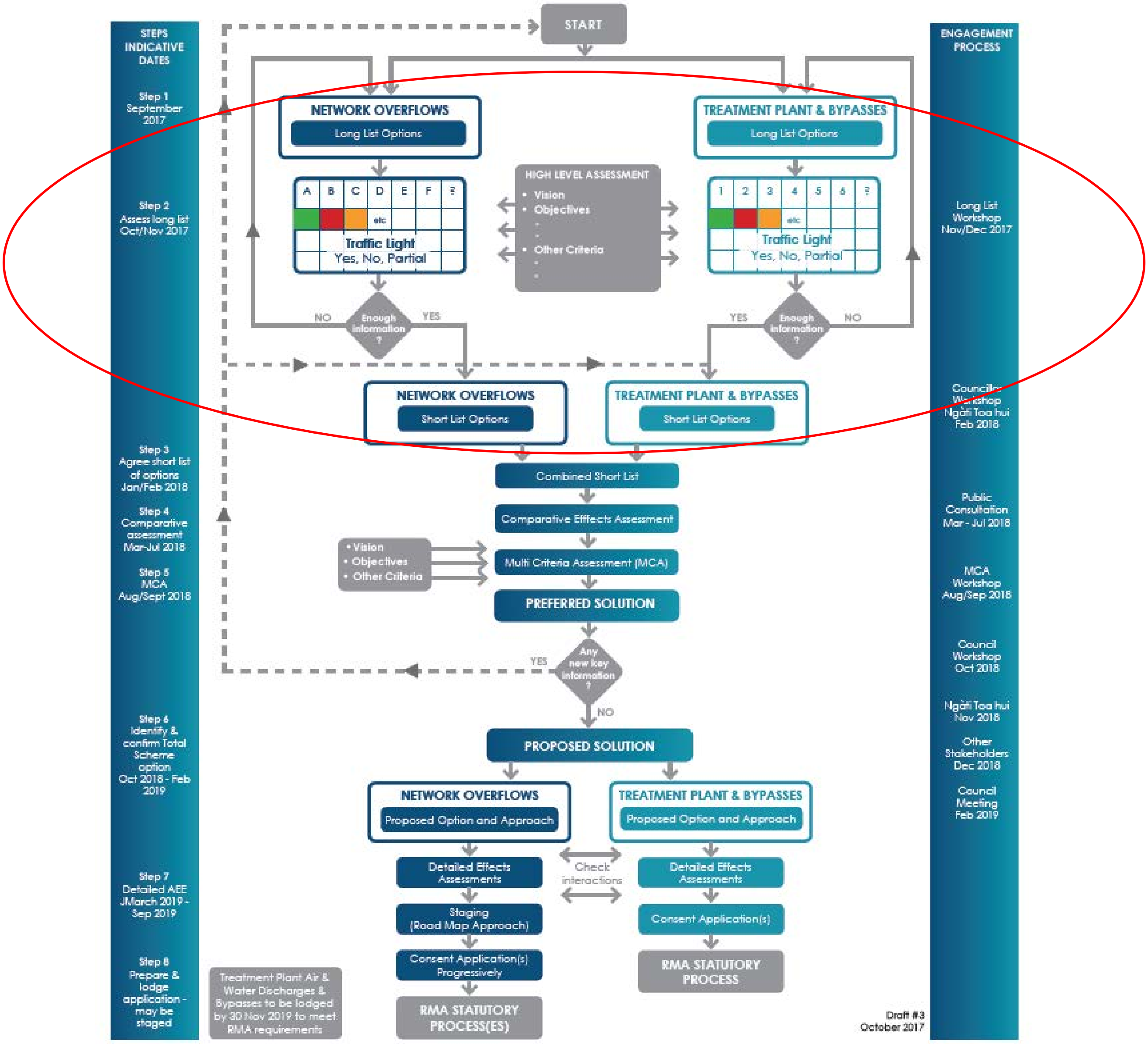


Figure 3 PWP options assessment process

Richard briefly described the steps that have been taken in the lead-up to the workshop. These are as shown on Figure 4, with the current step highlighted by the red circle.

Richard noted that the fatal flaw criteria that were applied to the full list to create the long list were developed based on the PWP strategy objectives. These criteria were:

- Significant increase in public health risk
- Significant increase in adverse effects on natural environment
- Absolutely unpalatable to Ngāti Toa
- Unavailability of technical or natural resource
- Significant constraint on growth
- Absolutely cost prohibitive
- Absolutely non-consentable
- No improvement in the wastewater scheme

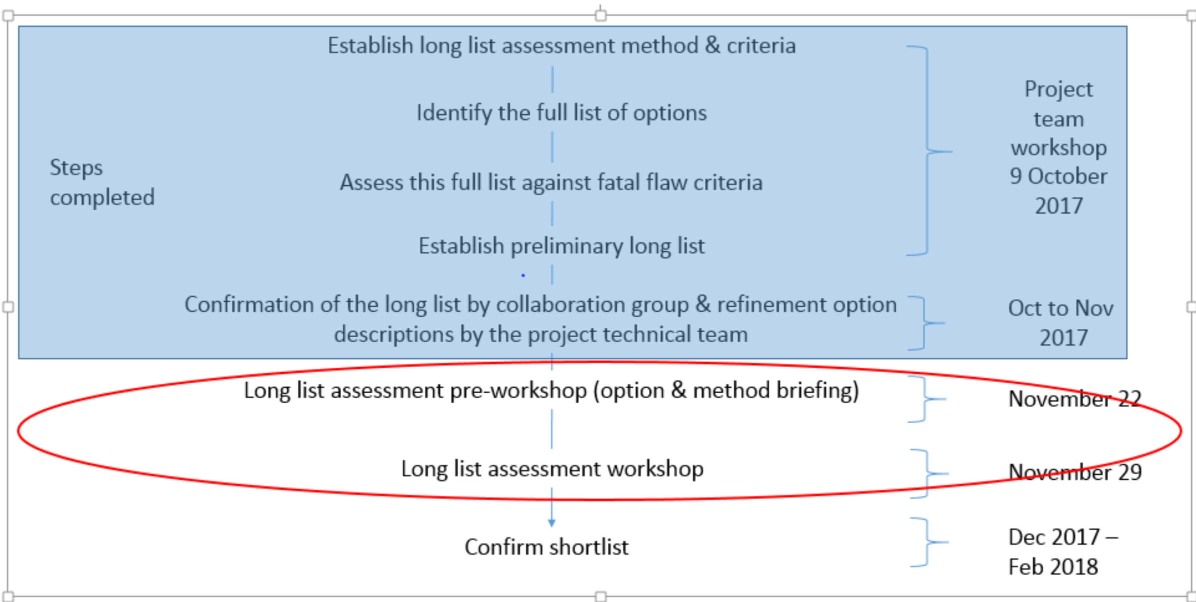


Figure 4 - Steps in the Long List phase

Richard also noted that the 9 October workshop had identified components that can be combined to create options, rather than complete options themselves. Since the October 9 workshop, and taking account of Collaborative Group meeting outcomes, options have been developed by WWL's project advisors. These are described in the following section.

The network options

Confirming the options

Steve introduced the network options describing the general groupings and the components of each[1]. The network options have been grouped based on whether their primary focus is:

- discharges to the harbour
- conveying more wastewater to the WWTP, thereby reducing the frequency of harbour discharges
- a mix of both discharging to the harbour and conveying to the WWTP.

All options have some level of discharge to the harbour, albeit reduced by varying degrees from the existing situation. Conveyance of all flows to the WWTP has been fatally flawed based on it being 'absolutely cost prohibitive'. This fatal flaw was initially identified at the October 9 workshop of the project team. Subsequent Collaborative Group meetings have not requested that this decision be reviewed.

Dry weather discharges will be addressed through a specific programme of works. All options include Business as Usual (BAU).

The options presented by Steve were:

Discharges to harbour

- Business as usual (current level of service with improvements to allow for growth)
- Rapid treatment[2] at northern and City Centre pump stations

[1] Briefing memos on the option components were prepared and circulated to the group prior to the workshop.
[2] Rapid treatment would involve screening, storage, which could include clarification with polymer dosing and disinfection of wet weather flows at one or more pump stations along the network, with discharge to the local environment.

Conveyance of a greater proportion of wastewater to the WWTP

- Greater conveyance across the whole network
- Greater conveyance in the north + wet weather storage at City Centre, which allows conveyance to the WWTP over time as network flows subside
- Wet weather storage in north + greater conveyance from City Centre
- Northern diversion (cross harbour pipe) + wet weather storage at City Centre
- Northern diversion (cross harbour pipe) + greater conveyance from City Centre

Mixed options

- Northern diversion (cross harbour pipe) + rapid treatment at City Centre
- Rapid treatment in north + wet weather storage in City Centre
- Greater conveyance in the north + rapid treatment at City Centre

Keith and John asked for more details about what constitutes BAU. Keith raised a follow–up concern that he is not clear on the criteria used by Porirua City Council and Wellington Water to make BAU decisions. The group was unable fully answer these questions and consequently they were placed in the workshop 'parking lot' as the following questions:

- What is the BAU work programme?
- How is the BAU programme determined?

While these questions remain, Steve did confirm that efforts to resolve overflows from manholes are part of BAU.

A key point identified during discussions is that the options which focus on increasing the volume of wastewater conveyed to the WWTP (through greater conveyance capacity and / or storage) will be designed to accommodate a flow event with a 6 month average return interval (ARI). As a result, under these options, the number of overflow occurrences are expected to reduce from a broad average of 10 per year currently to an average of 2 per year.

In comparison options involving rapid treatment would improve the quality of the discharges but not reduce the number of occurrences. There was some discussion on the efficacy of rapid treatment. It was asked if rapid treatment could be applied further up the Porirua Stream catchment. Steve noted that this is unlikely to be feasible as it needs to be implemented at an overflow point and the most significant of these are in the Porirua Harbour part of the catchment.

During the workshop, the question of whether sufficient physical space is available for the storage options was raised. Steve noted that work on this is currently underway and would be reported to the collaborative group once available.

There was also significant discussion about the potential to locate storage in the Wellington City Council portion of the catchment. Sharli-Jo in particular favoured the inclusion of this as an option as it would enable the flow generated in the southern part of the Porirua Stream catchment to be stored there during storm events, thereby taking pressure off the key 'pinch-point' at Porirua City centre. At the conclusion of this discussion, the group agreed to include 'storage in Wellington' into an option which also included storage in the north. This option has been grouped with the 'greater conveyance' options (see Option 8 in Figure 5 and Figure 7 following).

Later in the workshop Keith suggested that 'planting the catchment' should be added as an option. This was discussed by the group and agreed that, while it was not a complete option on its own, it may be an 'add-on' to any of the options as off-set mitigation. This was added to the workshop 'parking lot'.

<u>Assessment of the network options</u>

The assessment of the options proceeded on a criterion by criterion basis, i.e. all options were assessed against a single criterion, before the group moved on to assess all options in relation to the next criterion.

For each criterion, a technical specialist or specialists acted as the 'discussion lead'. Each discussion lead introduced the factors relevant to the consideration of the criterion, how the green, orange and red 'score' should be applied for the criterion and summarised key contextual information.

Following their introduction, the discussion leads then talked the group through their assessment of each option, including recommending a traffic light 'score' (green, orange or red) and outlining the recommendations for that 'score'.

For each criterion, the introductory information and initial assessments presented by the discussion leads are set out in the specialist memos attached to this meeting record. <u>Please note</u> the scoring recommended in those memos is the preliminary view of the individual(s) who prepared them. The conclusions of the collaborative group are set out in this meeting record.

The presentation by the discussion leads was followed by discussion and debate within the group. The intent of the discussion was to achieve a group consensus on the traffic light score to be awarded in each case. Where consensus has not been achieved, a '?' is placed in the relevant assessment square. An 'F' was used in relation to those options anticipated to the fatally flawed to Ngāti Toa.

The following figure sets out the assessment 'scores' for each option. Figure 7 includes the score and a summary of the group discussion on each criterion.

Figure 5 Network Long List Option Scores

	Harbour discharge options		Options which involve greater conveyance to the WWTP						Options with a mix of increased conveyance and harbour discharges		
Criteria	1. Business as usual	2. Rapid Treatment in north and City Centre	3. Greater conveyance	4. Greater conveyance in north + storage in the City Centre	5. Storage in the north and greater conveyance from the City Centre	6. Cross harbour pipeline + storage in the City Centre	7. Cross harbour pipeline + greater conveyance from the City Centre	8. Storage in Wellington City + storage in the north	9. Cross harbour pipeline + rapid treatment at the city centre	10. Rapid treatment in the north + storage at the city centre	11. Greater conveyance in the north + rapid treatment at the city centre
Public Health Risk		?									
Natural Environment											
Tangata whenua						F	F		F		
Growth											
Affordability											
Social and community		?				F	F		F	?	?

Criteria	Harbour discharge options		Options which involve greater conveyance to the WWTP						Options with a mix of increased conveyance and harbour discharges		
	1. Business as usual	2. Rapid Treatment in north and City Centre	3. Greater conveyance	4. Greater conveyance in north + storage in the City Centre	5. Storage in the north and greater conveyance from the City Centre	6. Cross harbour pipeline + storage in the City Centre	7. Cross harbour pipeline + greater conveyance from the City Centre	8. Storage in Wellington City + storage in the north	9. Cross harbour pipeline + rapid treatment at the city centre	10. Rapid treatment in the north + storage at the city centre	11. Greater conveyance in the north + rapid treatment at the city centre
Technology											
Resilience											

<u>Tangata whenua</u>

At the workshop, it was decided not to assess the options against the Tangata Whenua criterion. This decision was made because Sharli-Jo was the only representative from Ngāti Toa able to attend the workshop. It was agreed that Wellington Water would set up a separate session with Ngāti Toa to assess the options and that the outcomes of that session would be fed into the selection of the shortlist.

Kara did however provide a general introduction as to how the options may be viewed from Ngāti Toa's perspective. To understand the likely Ngāti Toa perspective, Kara noted that the harbour needs to be considered as a 'mother'. When this perspective is taken, Ngāti Toa's abhorrence to wastewater discharges and the cross harbour pipeline (which would be laid across the "mother"), are easier to understand.

Sharli-Jo also noted that the WWTP and the tunnel from the Tangere Drive pump station to the WWTP were installed without Ngāti Toa's agreement. She stated that everyone within Ngāti Toa would like to see the WWTP moved.

Steve asked if additional pipelines (e.g. Option 3) would be fatally flawed. Sharli-Jo responded that Ngāti Toa may consider them to be.

WWTP Options

The assessment of the network long list took longer than had been anticipated. As a result, there was not sufficient time to assess the WWTP long list. In the remaining time, Steve introduced the options on the long list for the WWTP. These options are:

1. Discharge to the CMA from the existing shoreline outfall + existing standard of treatment
2. Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment
3. Discharge to the CMA from a new shoreline outfall + existing standard of treatment
4. Discharge to the CMA from a new shoreline outfall + a higher standard of treatment
5. Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment
6. Discharge to land + seasonal shoreline outfall + existing standard of treatment
7. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment
8. Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + a higher standard of treatment

Steve noted that all options assume that the bypasses are partially treated using fine screening. Hugh made a distinction between the WWTP “bypasses”, which are currently partially treated, and the overflow “discharges” which do not go through any part of the treatment process. These discharges also need to be considered as part of the short list process.

There was also some discussion on what is meant by the phrase ‘a higher standard of treatment’. Steve noted that the level of treatment and how it will be achieved has not been determined at this point. If an option which involves a higher level of treatment is advanced to the shortlist, then further detail on this will need to be determined.

Some discussion occurred around the treatment and disposal of sludge from the WWTP. It was agreed that this issue needed to be addressed as part of the option assessment process. This matter was added to the workshop “parking lot” and will be addressed as part of the short list assessment, which is currently scheduled to occur in mid-2018.

Information gaps relating to the effects of the discharges from the WWTP were noted. It was agreed that dispersion modelling and a survey of the benthic ecology of the areas potentially impacted by options was needed.

Next steps

It was agreed that the matters which had been “parked” during the day would be addressed and reported back to the collaborative group. These are:

- What is the network business as usual (BAU) work programme?
- How is the BAU programme determined?
- What is Ngāti Toa’s view on the options?
- Are the cross harbour pipeline options fatally flawed (i.e. totally abhorrent to Ngāti Toa)?
- How can the WWTP bypasses and the management of sludge be factored into the option assessment process?
- How is it proposed to fill the information gaps relevant to effects of both the network options and the WWTP options?
- Is planting in the catchment a viable ‘add-on’ to any or all of the network options?
- Should consideration of public health include Māori spiritual health, or will this be adequately addressed through the assessment of the Tangata Whenua criterion?
- Is there sufficient land to accommodate the proposed storage options?

Stewart suggested that a follow-up workshop, to assess the WWTP options, should be held prior to Christmas. He undertook to identify an appropriate date in December 2017.

<u>Post meeting note</u>: It did not prove possible to schedule the follow up workshop in December. The date for the second workshop has now been confirmed for Friday 19 January at Wellington Water.

Appendices

Figure 6 - Traffic Light Scoring Approach

Criteria	Red	Orange	Green
Public Health Risk – associated with contact recreation and shellfish gathering	No significant reduction in public health risks anticipated, recreational water quality guidelines not achieved, significant uncertainty and /or significant information gaps.	Moderate reduction in public health risks anticipated, recreational water quality guidelines partially achieved, moderate uncertainty and some information gaps.	Significant reduction in public health risks anticipated, and/or recreational water quality guidelines achieved, little uncertainty or further information required.
Natural environment – adverse effects on water quality and aquatic ecology (streams, harbour and the wider coastal environment)	Significant adverse effect in relation to the criterion, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, little uncertainty or further information required
Tangata whenua – effects on mauri, kai moana, relationships	Significant adverse effect in relation to the criterion, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, little uncertainty or further information required
Growth – supports long term growth and investment, and economic development of city and sub-region	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 10-20 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 20-30 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 30-35 years
Financial implications / affordability /opex	Cost estimates are more than 50% greater than existing 30 year infrastructure strategy budgets. Operating costs are more than 50% greater than existing.	Cost estimates are no more than 50% greater than existing 30 year infrastructure strategy budgets. Operating costs are no more than 50% greater than existing.	Cost estimates are within existing 30 year infrastructure strategy budgets. Operating costs are similar to existing.
Social & community – amenity values, recreation, food gathering, including perception.	Significant adverse effect in relation to the criterion, no or very limited improvement in addressing existing degraded social an	Moderate adverse effect in relation to the criterion, moderate improvement in addressing existing degraded social an	Adverse effect in relation to the criterion is anticipated to be minor or less, significant improvement in addressing existing

Criteria	Red	Orange	Green
	community values, significant uncertainty and /or significant information gaps	community values, moderate uncertainty, some further information required	degraded social an community values, little uncertainty or further information required
Technology – Enduring, long term solution, able to be staged (road map approach), reliable, proven and robust, able to be constructed, Integrated scheme approach, and have flexibility for future technology and capacity upgrades	Unproven technology, suitability for the physical context untested, unique construction methodologies required, the option is unable to be staged or will only bring benefit once fully complete	New technology in NZ, suitable for the physical context, complex construction methodologies required, the option is able to be modular and staged so that additional process units can be added with increasing flows.	Proven technology, suitable for the physical context, standard construction methodologies required, the option is able to be modular and staged so that additional process units can be added with increasing flows.
Resilience –natural hazard / operational resilience	High risk in the known hazard-scape. Performance will be severely affected by climate change over 50 years. Reduces operational resilience.	Moderate risk in known hazard-scape. Performance will be moderately affected by climate change over 50 years. No improvement in operational resilience.	Low risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Improves operational resilience as a result of redundancy.

Figure 7 - Network long list options assessment

Criteria	Harbour discharge options		Options which involve greater conveyance to the WWTP						Options with a mix of increased conveyance and harbour discharges			Discussion points
	1. Business as usual	2. Rapid Treatment in north and City Centre	3. Greater conveyance	4. Greater conveyance in north + storage in the City Centre	5. Storage in the north and greater conveyance from the City Centre	6. Cross harbour pipeline + storage in the City Centre	7. Cross harbour pipeline + greater conveyance from the City Centre	8. Storage in Wellington City + storage in the north	9. Cross harbour pipeline + rapid treatment at the city centre	10. Rapid treatment in the north + storage at the city centre	11. Greater conveyance in the north + rapid treatment at the city centre	
Public Health Risk		?										The key discussion point related to the current state of the Porirua and Kenepuru Streams which are heavily contaminated. Alastair noted that the Porirua Stream does not meet the national bottom line for E. coli. The group agreed that this would mean that 'Business as usual' is unlikely to be acceptable beyond the short term, and therefore a 'score' of red was appropriate. Options involving greater conveyance capacity and/or storage were assumed to result in a reduction of discharge events from 10 per year to 2 per year, as the additional conveyance capacity or storage would be designed to accommodate the 6 month ARI. These options were therefore considered to represent a measurable improvement, and therefore were scored orange. Consensus was not achieved in relation to option 2, most considered that this would result in a measurable improvement, however some remain concerned about the significance of the residual impacts and wanted the score to be red. Note: In relation to the 'public health risk' criterion, the assessment of the project team's technical specialists, Graeme Jenner and David Cameron, differs from the assessment of the workshop group for Option 2. Graeme and Dave consider that while the Option 2 public health outcomes may not be quite as good as the conveyance options they are still clearly in the orange group. Sharli-Jo noted that she expects that Ngāti Toa will view all options involving the cross harbour pipeline as being fatally flawed. If Māori spiritual health was included in the 'public health assessment' then these options may be fatally flawed under this criterion. It was agreed that a specific meeting with Ngāti Toa representatives would be held to discuss this issue and the 'scoring' of the options against the Tangata Whenua criterion more generally. The orange score for the cross harbour pipeline options was retained for this workshop.
Natural Environment												It was agreed that the natural environment, while highly valued and sensitive, was not in 'dire straits' as a result of the wastewater network overflows. Claire noted that there is some degree of consensus amongst 'experts' that the single biggest issue for the harbour is sediment. She placed a caveat on this as there are some reasonable information gaps, and further evidence is required to support this expert opinion. The group agreed that it is not currently possible to conclude that any of the options would deliver a marked change (either positive or negative) to the natural environment. It was noted that there will be some difference between the outcomes achieved by the different options but this is all within the moderate range.
Tangata whenua						F	F		F			See separate section on the Tangata Whenua criterion above.
Growth												Matt recommended that all options be scored green as it can be assumed that growth will be provided for in all options. This assumption and score was generally accepted however there was some discussion on whether it was appropriate for the Business as Usual (BAU) option, which

	Harbour discharge options		Options which involve greater conveyance to the WWTP						Options with a mix of increased conveyance and harbour discharges			
Criteria	1. Business as usual	2. Rapid Treatment in north and City Centre	3. Greater conveyance	4. Greater conveyance in north + storage in the City Centre	5. Storage in the north and greater conveyance from the City Centre	6. Cross harbour pipeline + storage in the City Centre	7. Cross harbour pipeline + greater conveyance from the City Centre	8. Storage in Wellington City + storage in the north	9. Cross harbour pipeline + rapid treatment at the city centre	10. Rapid treatment in the north + storage at the city centre	11. Greater conveyance in the north + rapid treatment at the city centre	Discussion points
												accommodates growth but would make no improvement to the current outcome (level of service). As it is considered that the current level of service is unlikely to be acceptable, it was considered that this option would constrain growth opportunities in the catchment. The group therefore agreed that BAU should be scored orange for growth.
Affordability												In introducing this criterion Steve noted that there is approximately $43m within LTP programme over 30 years. This amount has been included in the draft LTP based on a 'greater conveyance' option. All options except those involving the cross harbour pipeline fall within this budget and were therefore scored green. The options involving the cross harbour pipeline all would exceed this draft budget by less than 50%, and have therefore been scored orange. It is noted that at the workshop the score was recorded as red, but further evaluation of preliminary cost estimates has indicated these options fall into the orange score range.
Social and community		?				F	F		F	?	?	The group agreed that the options 1 and 2 which continue with the same frequency of discharges to the harbour would not meet community expectations in reducing overflow instances and therefore should be scored red on the basis that effluent overflows (both partially treated and untreated) to the harbour were deemed to be socially unacceptable, and adversely effected social and community amenity and recreation values. There was some debate about the red score for option 2, given that rapid treatment would improve the quality of this discharge, even if it didn't reduce the frequency. A red score was maintained for option 2 on the basis that this option would not result in any reduction to existing overflow instances, but a question mark was included in the score to reflect that these overflows would at least be partially treated. The group agreed that if the perceptions of Ngāti Toa are included under this criterion as well as the Tangata Whenua criterion then the options involving the cross harbour pipeline are likely to be fatally flawed. If Ngāti Toa perceptions were not included under this criterion then these options would be orange. The group agreed that with Ngāti Toa's acknowledged role as Kaitiaki for Te Awarua O Porirua, it was appropriate that the social and community value assessment of each option should, as a minimum, at least align with the Tangata Whenua values assessment ranking. Options 10 and 11 were scored orange, although some in the group questioned whether a red score would be more appropriate for both options because some of the discharges (where rapid treatment applies) would occur as frequently as present. An orange score was maintained for both options on the basis that both options would result in at least some reduction in existing overflows, with rapid treatment of remaining overflows. A question mark was applied to both assessments to reflect that overflows would however only be partially reduced and that residual overflows (which would exceed other options) would only be partially treated. Both options still presented a largely undesirable social and community value outcome of maintaining overflows (although partially treated) into the harbour. All other options were scored orange on the grounds that no option proposed to completely remove all effluent overflows to the harbour. All other options would reduce overflows/discharges to the harbour (through greater conveyance capacity or storage) and were considered likely to be perceived

Criteria	Harbour discharge options		Options which involve greater conveyance to the WWTP						Options with a mix of increased conveyance and harbour discharges			Discussion points
	1. Business as usual	2. Rapid Treatment in north and City Centre	3. Greater conveyance	4. Greater conveyance in north + storage in the City Centre	5. Storage in the north and greater conveyance from the City Centre	6. Cross harbour pipeline + storage in the City Centre	7. Cross harbour pipeline + greater conveyance from the City Centre	8. Storage in Wellington City + storage in the north	9. Cross harbour pipeline + rapid treatment at the city centre	10. Rapid treatment in the north + storage at the city centre	11. Greater conveyance in the north + rapid treatment at the city centre	
												by the community as having being a measurable improvement, but not a significant enough improvement to merit a green score.
Technology												It was agreed that options involving greater conveyance capacity and storage use standard technology, which is well understood. It was considered that there is uncertainty as to whether the rapid treatment will achieve expected outcome, and that there is less experience in New Zealand with this technology. All options involving rapid treatment were therefore scored orange.
Resilience												Options 1 and 2 were considered to score as orange because neither of the business as usual or rapid treatment options offer any increases in operational resilience. All other options were considered to score green because they provide some degree of operational resilience. Note: The assessment of the project team's technical specialists, Ron Haverland and Steve Hutchinson, differs from the assessment of the workshop group for Option 11. Ron and Steve consider that neither conveyance in the north nor rapid treatment provide an improvement in operational resilience and therefore a score of orange is appropriate.

Porirua Wastewater Programme

WWTP Long List Assessment Workshop – Meeting Record

19 January 2018, 9 am – 1 pm

Wellington Water's office, Petone

Attendees:

Stewart McKenzie – WWL	Steve Hutchinson – WWL
Anna Hector – WWL	Kara Dentice – WWL
Peggy Cunningham-Hales – GWRC	Jude Chittock – GWRC
Jeremy Rustbatch – GWRC	Claire Conwell – GWRC
Rachael Boisen Round – GWRC	Hugh Dixon-Paver – (GWRC)
Tamsin Evans - PCC	Matiu Rei – Ngāti Toa
Keith Calder – PCC	Waipuna Grace – Ngāti Toa
Jill McKenzie – RPH	Matt Trlin – Connect Water
David Cameron – Stantec	Graeme Jenner – Connect Water
Paula Hunter – Stantec	Ron Haverland – Connect Water
Jim Bradley - Stantec	Richard Peterson – Stantec

Introductions, background and context

The workshop commenced with introductions. Stewart and Jeremy then briefly reminded the group of the 'collaborative' approach that is being trialled on this project. Stewart also took the group through various aspects of the strategy for the Porirua Wastewater Consenting Programme, e.g. the vision, problem statement, programme objectives, issues, consent strategy key components and the work programme flow diagram.

The work programme flow diagram is set out in Figure 1. The red line indicates the current phase of the programme.

Stewart outlined the earlier steps that have been completed to develop the long list for the Wastewater Treatment Plant (WWTP) options. These steps are summarised in Figure 2. Finally Stewart reminded the group of the scoring approach that is being applied for the long list traffic light assessment exercise. This approach is set out in Figure 3.

The WWTP options

Steve and Ron described the long list of WWTP options. They started by providing some base information on the WWTP:

- The WWTP was commissioned in the late 1980's, along with the pump station at Tangare Drive and tunnel from that pump station to the WWTP.
- Average flows through the WWTP are approximately 260 l/s.
- In wet weather, flows of up to 1100 l/s of wastewater are currently able to reach the plant. The amount is limited by the capacity of the pipes and pump station.
- The secondary treatment capacity of the WWTP is limited to 950 l/s, so during wet weather up to 150 l/s can bypass the secondary treatment facilities at the WWTP, and in these instances partially treated wastewater is discharged to the coast.
- Work is underway to increase the capacity of the WWTP to 1500 l/s, which will enable the WWTP to accommodate population growth to 2033 (up to a population of 93,500). Providing costs do not exceed the funding available for this work, it is expected to be completed by 2020. This is prior to date on which the replacement resource consent application for the WWTP needs to be lodged.
- Sludge management is an issue for the WWTP, because of limits on the Spicer Landfill's consent. Investment in sludge treatment is therefore planned for the future.
- In the last year, major resource consent non-compliances have resulted from the treated discharge exceeding the average volume allowed for in the resource consent, discharges of

partially treated wastewater (bypass discharges) exceeding the number anticipated in the resource consent and clarifiers loosing solids that end up in the treated wastewater and cause problems with reduced disinfection performance.

Hugh noted that during dry weather the quality of the treated wastewater discharged from the WWTP is excellent, it’s the wet weather that causes problems.

Jim confirmed that the quality of the treated wastewater discharged from the WWTP was up with the best in NZ to a marine environment, particularly in terms of total nitrogen and bacteriological levels.

Ron discussed dilution and that the existing discharge is diluted 100 times by sea water at ~100m from the outfall and ~800 times at 200m.

The group then discussed what the wastewater concentrations meant in relation to adverse effects on the environment. Keith asked what the term “concentration” means for lay people. It was noted that in the context of an outfall, this is a measure of how much a given substance in wastewater (eg total nitrogen) remains when mixed with seawater. It is important to understand what contaminant is being considered and the effects on the receiving water. For some contaminants (where there can be an immediate effect) we need to consider concentrations e.g. microbiological and toxic compounds such as ammonia or heavy metals. For other contaminants such as nutrients, we consider mass loads (eg daily flow x concentration) that can lead to excessive algal growth if conditions are suitable.

In relation to the long list options, Steve noted that each option is a combination of 3 main elements:

- A discharge method (coastal marine area (CMA), tidal regime or to land)
- A discharge location element (either the existing out fall location or a new discharge location)
- A generalised standard of treatment (either existing or higher).

Each of the long list options was then described individually. All options assume full treatment of up to 1500 l/s and that higher flows will receive some level of treatment.

Steve explained that higher levels of treatment such as membranes are very expensive. Where they have been used is when there are very sensitive, or poorly flushed, receiving environments such estuaries, rivers and lakes.

Stewart asked when is an outfall a shoreline outfall and when is it an offshore ocean outfall.

Jim explained that there is no consistent definition so clear descriptions are needed e.g. shoreline marine outfall and off shore ocean outfall. As a general rule a shoreline outfall discharges above the surface of a waterbody (as with the existing outfall) whereas an offshore outfall pipe is laid below, or on the seabed. Dilutions are typically much higher with a seabed outfall.

Keith stated outfall location is largely irrelevant and that dispersion is key. He asked whether sea level rise will be taken into account in the modelling.

Graeme then discussed outfall performance in terms of dilution, subsequent dispersion and microbiological die-off and how these are modelled during outfall location and performance investigations. He noted that a key reason for operating an offshore outfall is to separate people and their activities from potential public health risks associated with potentially pathogenic micro-organisms. It is noted that sea level rise would have a positive effect on available dilutions for a seabed outfall.

The descriptions of the options are set out in Table 1. Option conceptual drawings are included in Appendix A.

Table 1 - WWTP Long List options

#	Description	Notes
1	Discharge to the CMA from the existing	• Assumes upgrade of WWTP to fully process (secondary treatment plus UV disinfection) 1500 l/s, undertaken prior to 2020

#	Description	Notes
	shoreline outfall + existing standard of treatment	• Total flow of untreated wastewater able to reach the plant will be determined by the network upgrade option selected. • Wastewater flows through the WWTP above 1500l/s (if any) will be partially treated (indicative cost = $10 to $20m). • The existing outfall pipe will need to be duplicated to carry flows above 1500 l/s (indicative cost = $5 to $10m). • Total indicative cost = $15m to $30m.
2	Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment	• Higher standard of treatment achieved by a substantial plant re-build, e.g. a Membrane Bioreactor (indicative cost = $30-60m). • Total flow of untreated wastewater able to reach the plant will be determined by the network upgrade option selected. • Wastewater flows through the WWTP above 1500l/s (if any) will be partially treated (indicative cost = $10 to $20m). • The existing outfall pipe will need to be duplicated to carry flows above 1500 l/s (indicative cost = $5 to $10m). • Total indicative cost = $45m to $90m.
3	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	• As per Option 1 except that instead of duplicating the existing outfall pipe a new shoreline outfall would need to be constructed. This new outfall pipe would be designed with capacity for the maximum flow. That is, the pipe would have a larger capacity than the existing outfall pipe, however it would likely be shorter. Therefore, the estimated cost is approximately the same as duplicating the existing outfall pipeline (i.e. $5 to $10m). • An appropriate location for the new outfall is yet to be identified. • The existing outfall would remain as backup. • Total indicative cost = $15m to $30m.
4	Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	• As per Option 2 except that instead of duplicating the existing outfall pipe a new shoreline outfall would need to be constructed. This new outfall pipe would be designed with capacity for the maximum flow. That is, the pipe would have a larger capacity than the existing outfall pipe, however it would likely be shorter. Therefore, the estimated cost is approximately the same as duplicating the existing outfall pipeline (i.e. $5 to $10m). • An appropriate location for the new outfall is yet to be identified. • The existing outfall would remain as backup. • Total indicative cost = $45m to $90m.
5	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	• Assumes upgrade of WWTP to fully process 1500 l/s undertaken prior to 2020. • Total flow of untreated wastewater able to reach the plant will be determined by the network option selected. • Wastewater flows through the WWTP above 1500l/s (if any) will be partially treated (indicative cost = $10 to $20m). • The location of new outfall would be in a water depth of at least 10m. Indicative Options 5a and 5b (See drawing in Appendix A) would have substantially different costs (indicative cost 5a = $50 to $70m; indicative cost for 5b = $15 to $25m). • An appropriate location for a new outfall is yet to be identified • The existing outfall would remain as backup. • Total indicative cost for 5a = $60m to $90m. • Total indicative costs for 5b = $25m to $45m.
6	Discharge to land + seasonal shoreline outfall + existing standard of treatment	• Assumes upgrade of WWTP to fully process 1500 l/s undertaken prior to 2020. • Total flow of untreated wastewater able to reach the plant will be determined by the network option selected. • Area available for land disposal still to be confirmed, but preliminary desktop analysis indicates a maximum of 135 ha, or

#	Description	Notes
		approximately 20% of the land likely to be required for average flows. For the average flow to be discharged, 700 to 800ha of suitable land would be required. • Existing shoreline outfall would be retained and, based on 135 ha of land available for land application, this would need to operate 83% of the time from November to March, and 100% of the time for the rest of the year due to high soil moisture levels • The costs of this option would be extremely high covering conveyance from the WWTP to the land application area (pipes and pump stations), as well as land application infrastructure. • Overall, a very impractical option due to costs, lack of available / suitable land and the need to continue to discharge most flows to the CMA.
7	Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	• As per Option 1, except that a tank would installed to store treated wastewater and release it on the outgoing tide. • The storage capacity would be sufficient to store average dry weather flows. Flows above this could not be stored and would need to be discharged regardless of tidal state. • Indicative cost of storage = $10m. • Total indicative cost = $25m to $40m.
8	Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	• As per Option 3, except that a tank would installed to store treated wastewater and release it on the outgoing tide. • The storage capacity would be sufficient to store average dry weather flows. Flows above this could not be stored and would need to be discharged regardless of tidal state. • Indicative cost of storage = $10m. • Total indicative cost = $25m to $40m.

<u>Note:</u> Option 8 was described at the previous workshop as “Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + a higher standard of treatment”. In the period between the two workshops the project team gave further consideration to this option, and concluded that the combination of storage and a higher standard of treatment would represent a “belt and braces” approach that is very unlikely to be necessary. The project team therefore replaced the option with Option 8 as described in Table 1.

Hugh asked in terms of storage options whether storage of untreated wastewater had been considered.

Steve explained this had been considered with the network options.

Jeremy asked whether the dispersal modelling would look at the effects on Titahi Bay and Keith asked if the hydro dynamics of Titahi Bay were understood.

David explained that the results of a dispersion model currently being prepared by DHI is needed to confirm effects.

Keith commented that Titahi Bay is one of the best surf beaches in Wellington and people surf there regardless of the weather i.e effects of wet weather overflows will need to be fully understood.

<u>Assessment of the WWTP options</u>

The assessment of the options proceeded on a criterion by criterion basis, i.e. all options were assessed against a single criterion, before the group moved on to assess all options in relation to the next criterion.

For each criterion, a technical specialist or specialists acted as the 'discussion lead'. Each discussion lead introduced the factors relevant to the consideration of the criterion, how the green, orange and red 'score' should be applied for the criterion and summarised key contextual information.

Following their introduction, the discussion leads then talked the group through their assessment of each option, including recommending a traffic light 'score' (green, orange or red) and outlining the recommendations for that 'score'.

The presentation by the discussion leads was followed by discussion and debate within the group. The intent of the discussion was to achieve a group consensus on the traffic light score to be awarded in each case. Where consensus has not been achieved, or where information gaps mean there is some uncertainty of the score, a '?' is placed in the relevant assessment square. The colour of the '?' indicates the preference of the non-consensus or the possible alternative score if the information was available.

Table 2 sets out the assessment 'scores' for each option. Figure 4 includes the score and a summary of the group discussion on each criterion. For Option 5, 5a is a new offshore ocean outfall west of Kaumanga Point and 5b is a new offshore ocean outfall out from the WWTP.

Table 2 WWTP Long List Option Scores

Criteria	1 Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	2 Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment	3 Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4 Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	5 Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	6 Discharge to land + seasonal shoreline outfall + existing standard of treatment	7 Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	8 Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment
Public Health Risk	Orange	Orange	Orange	Orange (green ?)	Green (orange ?)	Orange	Orange	Orange
Natural Environment	Orange	Orange	Orange	Orange	Green	Orange	Orange	Orange
Tangata whenua[1]	Red (orange ?)	Red (orange ?)	Orange	Orange	a: Orange / b: Green	Orange (red ?)	Orange	Orange
Growth	Green	Green	Green	Green	Green	Green	Green	Green
Affordability	Green	Red / Orange	Green	Red / Orange	a: Red / b: Orange	Red	Orange	Orange
Social and community	Orange (red ?)	Orange (red ?)	Orange (red ?)	Orange (red ?)	Green (orange ?)	Red	Orange (red ?)	Orange (red ?)
Technology	Green	Orange / Green	Green	Orange / Green	Green	Red	Green	Green
Resilience	Orange	Orange	Green	Green	Orange / Green	Orange	Green	Green

[1] This scoring is preliminary only. A specific hui with Ngāti Toa will be held.

Next steps

It was agreed that the matters which had been "parked" during the day would be addressed and reported back to the collaborative group. These are:

- Definitions of 'shoreline' and 'off-shore' ocean outfalls
- Outputs from the dispersion model

It was noted that a follow-up session would be held with the group, following the hui with iwi, to confirm the shortlist of options for further assessment and consultation.

Figures

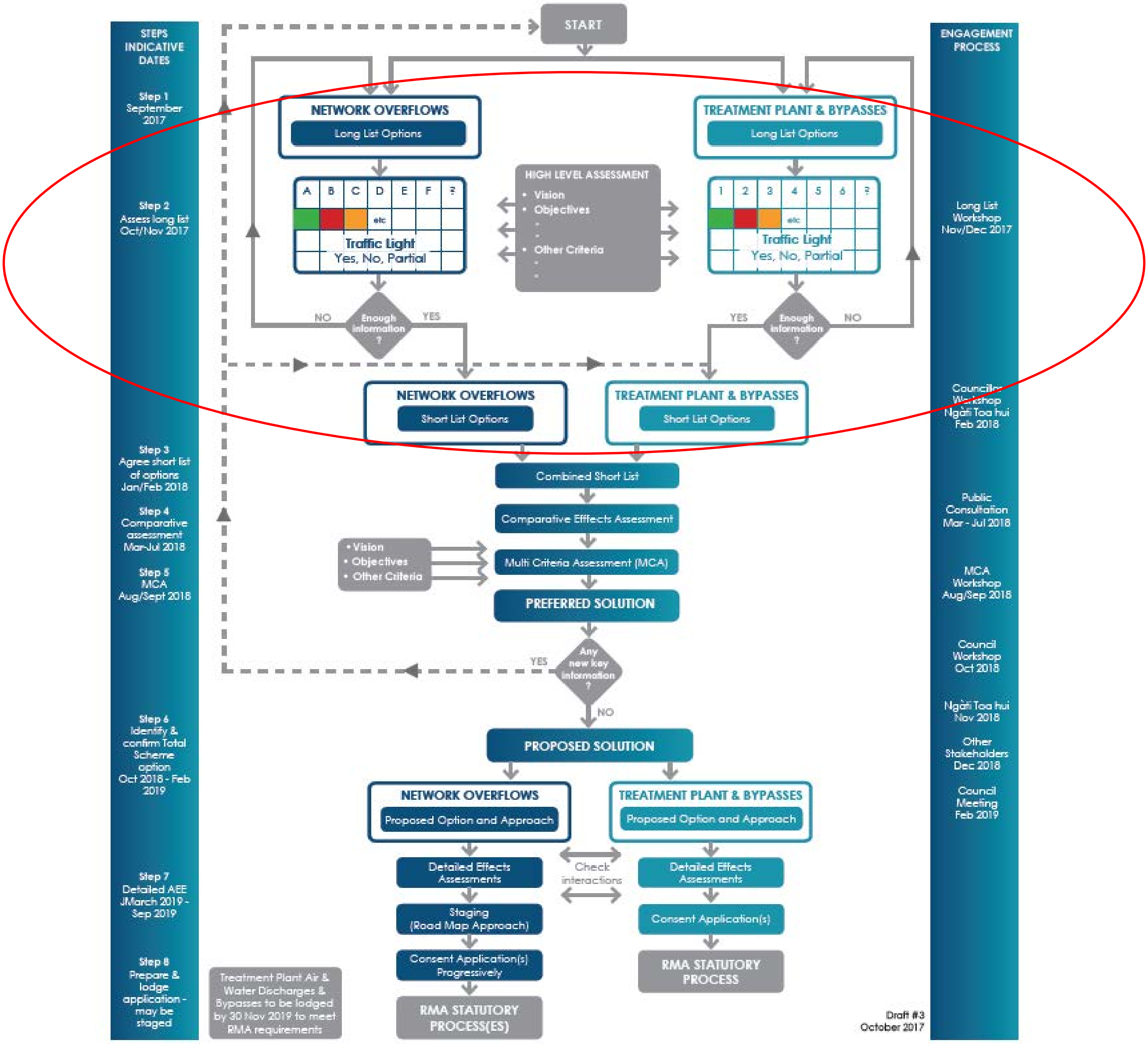


Figure 1 - Work programme flow diagram

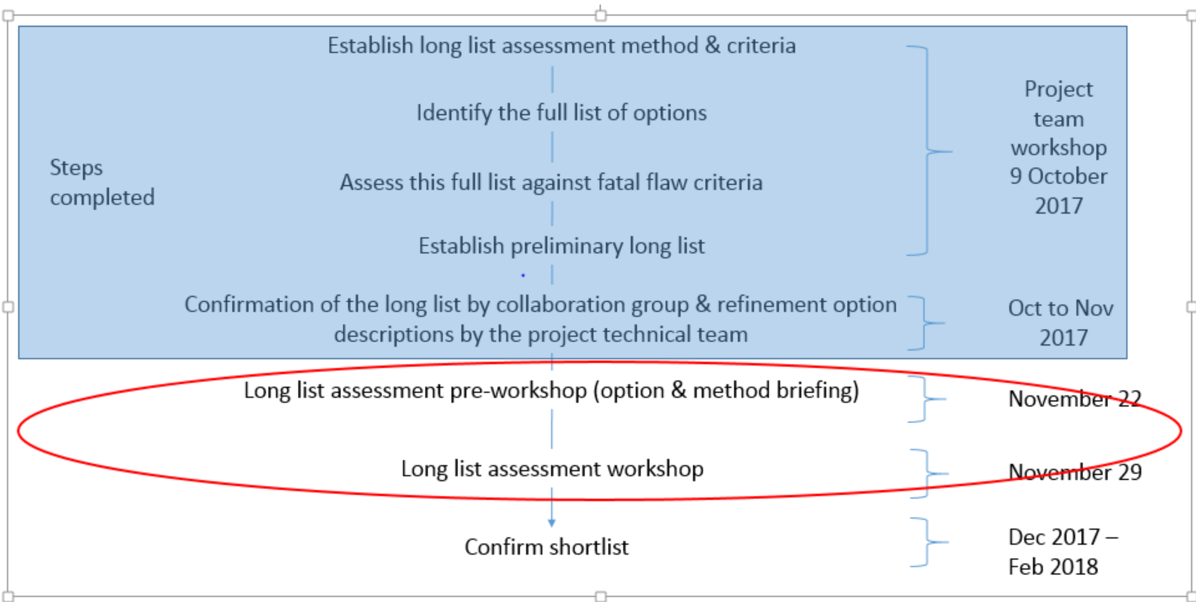


Figure 2 - Steps in the Long List phase

Figure 3 - Traffic Light Scoring Approach

Criteria	Red	Orange	Green
Public Health Risk – associated with contact recreation and shellfish gathering	No significant reduction in public health risks anticipated, recreational water quality guidelines not achieved, significant uncertainty and /or significant information gaps.	Moderate reduction in public health risks anticipated, recreational water quality guidelines partially achieved, moderate uncertainty and some information gaps.	Significant reduction in public health risks anticipated, and/or recreational water quality guidelines achieved, little uncertainty or further information required.
Natural environment – adverse effects on water quality and aquatic ecology (streams, harbour and the wider coastal environment)	Significant adverse effect in relation to the criterion, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, little uncertainty or further information required
Tangata whenua – effects on mauri, kai moana, relationships	Significant adverse effect in relation to the criterion, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, little uncertainty or further information required
Growth – supports long term growth and investment, and economic development of city and sub-region	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 10-20 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 20-30 years	PCC and WCC growth expectations in the catchment will be fully supported over a consent duration of 30-35 years
Financial implications / affordability /opex	Cost estimates are more than 50% greater than existing 30 year infrastructure strategy budgets. Operating costs are more than 50% greater than existing.	Cost estimates are no more than 50% greater than existing 30 year infrastructure strategy budgets. Operating costs are no more than 50% greater than existing.	Cost estimates are within existing 30 year infrastructure strategy budgets. Operating costs are similar to existing.
Social & community – amenity values, recreation, food gathering, including perception.	Significant adverse effect in relation to the criterion, no or very limited improvement in addressing existing degraded social an community values, significant uncertainty and /or significant information gaps	Moderate adverse effect in relation to the criterion, moderate improvement in addressing existing degraded social an community values, moderate uncertainty, some further information required	Adverse effect in relation to the criterion is anticipated to be minor or less, significant improvement in addressing existing degraded social an community values, little uncertainty or further information required

Criteria	Red	Orange	Green
Technology – Enduring, long term solution, able to be staged (road map approach), reliable, proven and robust, able to be constructed, Integrated scheme approach, and have flexibility for future technology and capacity upgrades	Unproven technology, suitability for the physical context untested, unique construction methodologies required, the option is unable to be staged or will only bring benefit once fully complete	New technology in NZ, suitable for the physical context, complex construction methodologies required, the option is able to be modular and staged so that additional process units can be added with increasing flows.	Proven technology, suitable for the physical context, standard construction methodologies required, the option is able to be modular and staged so that additional process units can be added with increasing flows.
Resilience –natural hazard / operational resilience	High risk in the known hazard-scape. Performance will be severely affected by climate change over 50 years. Reduces operational resilience.	Moderate risk in known hazard-scape. Performance will be moderately affected by climate change over 50 years. No improvement in operational resilience.	Low risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Improves operational resilience as a result of redundancy.

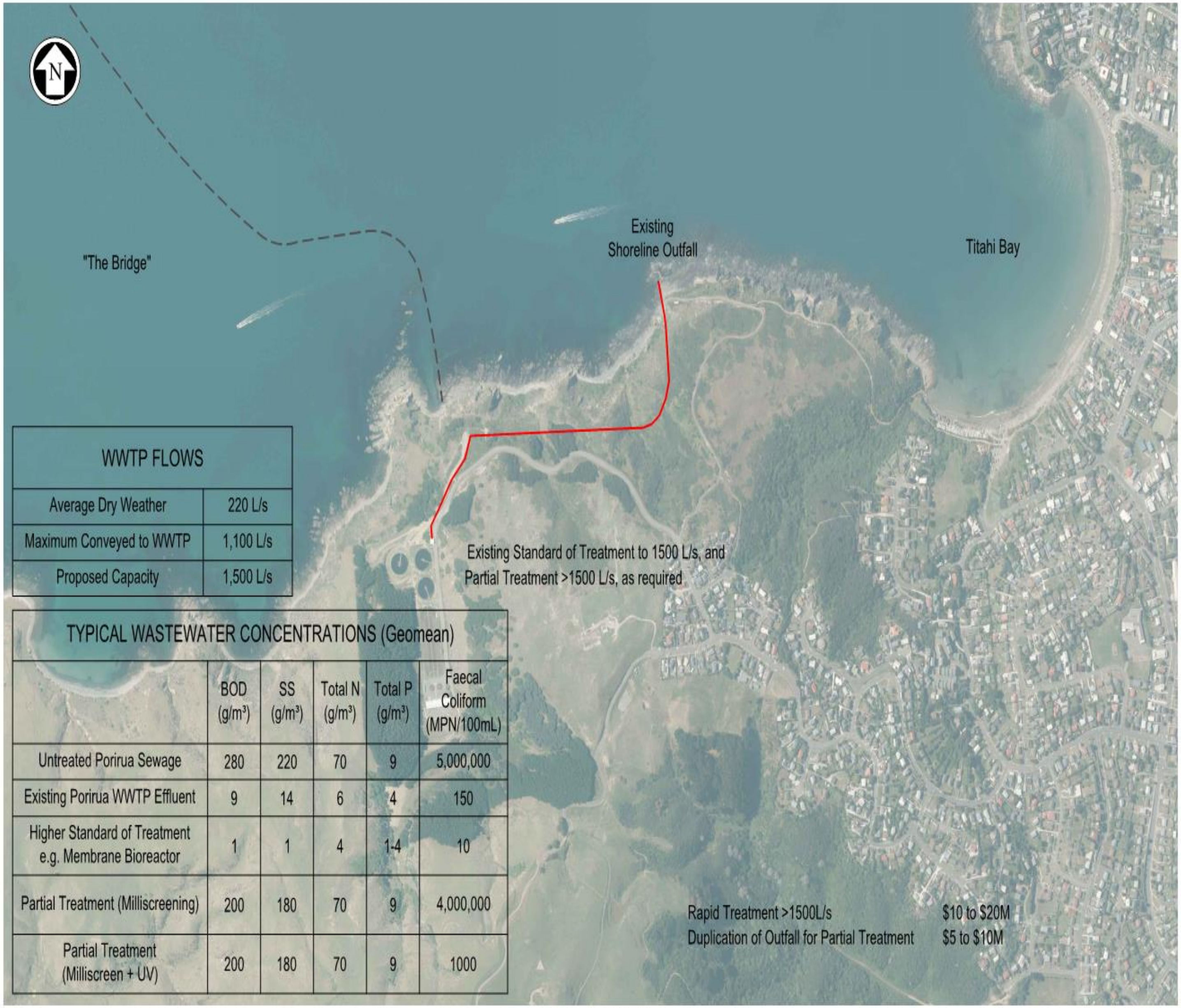
Figure 4 - WWTP long list options assessment

Criteria	1 Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	2 Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment	3 Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4 Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	5 Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	6 Discharge to land + seasonal shoreline outfall + existing standard of treatment	7 Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	8 Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	Comments
Public Health Risk	Orange	Orange	Orange	Orange ?	Green ?	Orange	Orange	Orange	As the quality of dry weather discharges is high, the key risk to public health relates to bypass discharges. Have not got filter feeders (eg mussels) in the area of the outfall which is an important factor from a public health perspective. As there is uncertainty regarding the level, extent of treatment and environment effect of the WWTP bypasses Options 1, 2, 3, 4, 6, 7 and 8 were scored 'orange'. It was noted that the storage options would provide little addition benefit over Option 1. Option 2 could be green but not totally confident without modelling and microbiological risk assessment. There was some discussion whether Option 4 should be scored green, however some in the group considered the risk from bypasses would remain. Option 5 is considered likely to be 'green' but there is some uncertainty about whether recreation activities will occur near the outfall, therefore a question mark was applied to this option. Knowledge gap regarding recreational use, need for a recreational use assessment – opportunities for resources from Regional Public Health. Because of the strong wind influence, discharging on an outgoing tide (Options 7 and 8) may not achieve significant benefits and could result in a large investment for little benefit.
Natural Environment	Orange	Orange	Orange	Orange	Green	Orange	Orange	Orange	Due to current information gaps regarding the environmental effect, all options were scored orange, except Option 5. Green scores may be possible for some, or all of these options, once this information has been collected. It was considered that with the increased dilution and dispersion that would occur with an off-shore ocean outfall, that there is sufficient confidence to score Option 5 green. Key wastewater contaminants eg BOD, total suspended solids, nutrients and toxicants such as ammonia expected to be of little or no concern within a short distance from the outfall in the high energy environment. Effects of emerging contaminants (eg from personal care products and household cleaners) on marine mammals need to be considered in future investigations.
Tangata whenua[2]	Red ?	Red ?	Orange	Orange	a: Orange / b: Green	Orange ?	Orange	Orange	Preliminary scores were given in relation to the Tangata Whenua criteria. A specific hui with Ngāti Toa is to be organised to confirm these scores. Options 1 and 2 are not expected to improve the current situation, which is an objective for Ngāti Toa, so were therefore scored red. It was recognised that this may change once a better understanding of these options is held. Options 5a was scored orange because of the potential for the outfall pipeline to impact on land based sites of cultural value. Option 5b was scored green because it would avoid these sites and improve the overall outcome. Option 6 was scored orange, with the potential to be red because the potential land sites are either of direct cultural value to Ngāti Toa or in catchments which are of value to Ngāti Toa. Historic position of retaining the discharge point in the same place was considered to be no longer relevant. Land application areas problematic not just for Ngāti Toa but the community generally.
Growth	Green	Green	Green	Green	Green	Green	Green	Green	All options can accommodate the growth needs of the City and sub-region and therefore were scored green. There was some discussion about whether Option 6 should be scored orange, because using land for land application of wastewater may limit growth potential (i.e using land for discharge that may be necessary for residential growth). However it was agreed that the potential sites identified for land based discharge were not anticipated as growth locations within the next 35 years (i.e. criterion timeframe) and therefore option 6 would not provide a constraint on residential growth. Even with limited suitable land in the catchment capable of supporting land based disposal land, Option 6 still predominantly relied on continued discharge of treated effluent to the existing shoreline outfall. Option 6 was therefore capable of accommodating growth in the treatment plant output.
Affordability	Green	Red / Orange	Green	Red / Orange	a: Red / b: Orange	Red	Orange	Orange	Options 1 and 3 would fall within the draft 30 year infrastructure budget. In relation to Options 2 and 4 it was noted that the installation of membrane reactor at the WWTP would be substantially above the draft budget (i.e. would score red) but a lesser upgrade, such as an upgrade to UV treatment, while still being above the draft budget would be more affordable (scored orange). For Option 5 the length of the offshore outfall pipeline would drive costs. Option 5a which would have a long pipeline

[2] This scoring is preliminary only. A specific hui with Ngāti Toa will be held.

Criteria	1 Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	2 Discharge to the CMA from the existing shoreline outfall + a higher standard of treatment	3 Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4 Discharge to the CMA from a new shoreline outfall + a higher standard of treatment	5 Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	6 Discharge to land + seasonal shoreline outfall + existing standard of treatment	7 Storage of wastewater + discharge to the CMA from the existing shoreline outfall on outgoing tide + existing standard of treatment	8 Storage of wastewater + discharge to the CMA from a new shoreline outfall on outgoing tide + existing standard of treatment	Comments
									scored red, while Option 5b scored orange. Option 6, involving land application would be the most expensive option and was scored red. Options 7 and 8 would be more than the draft 30 year budget, but not 50% more than that budget.
Social and community	?	?	?	?	?		?	?	It was considered that the social and community effects would be largely driven by public perception. This criteria was very sensitive to community perception of effects, associated with the stigma attached to effluent discharges (regardless of the level of treatment of effluent). All of the options involved increasing the volume of treated and partially treated effluent discharges to the existing or a relocated shoreline or offshore outfalls. No options involved reducing treated WWTP discharges to the coastal environment. Other than the option for a new offshore outfall, no options were considered to be capable of significantly improving public perceptions associated with maintaining effluent discharges to the coastal environment (particularly if discharge volumes were increasing associated with conveyance network improvements and effluent volume growth), irrespective of the level of treatment, shoreline discharge location or use of storage. Therefore Options 1-4 and 7 and 8 received a base score of orange, acknowledging that all options did at least involve dry weather effluent discharges being treated to an exceptionally high standard The projected increase in effluent discharges to shoreline coastal environments, associated with network improvements and growth of effluent volume in the catchment, did however mean that a case did exist to score each option as red (i.e. all options involved increasing- not maintaining or reducing- discharges, reinforcing perceptions of further degradation of the sensitive social and community values associated with shoreline coastal environments). Each of the options was therefore tagged as possibly red. Options 5 was scored green, possibly orange, because it was considered that the off-shore nature of the outfall would very likely result in a perception of this discharge location being removed from a potentially more sensitive shoreline environment, to a less sensitive offshore environment, having less social impacts. This assessment was however noted as only being provisional as it had not been discussed with or had input from Ngati Toa as acknowledged Kaitiaki for Te Awarua O Porirua Harbour and the Cook Strait. Option 6 was scored red because it was considered that there would be a strong social and community resistance to land application at many of the sites identified as being potentially suited to land based discharge (in terms of soil type, slope, drainage and aspect), given many of these areas strong social and community values (i.e Whitireia Park, Mana Island etc). A majority of these sites would also only be useful for land based discharge for relatively short periods of the year. Need to engage with the community to test perception vs. greater investment.
Technology									Several of the options would involve standard and well understood technology and were therefore scored green. Membrane reactors were considered to be less standard and were therefore scored orange, however a lesser upgrade such as improved UV treatment would be green. Land application (Ooption 6) was scored red because it was considered that this option is unsuitable for the physical context of Porirua. Lot of investigative work still to be done including geotech, mixing, dilution and dispersion.
Resilience									Options 1, 2 and 6 were not considered to offer any improved operational resilience and were therefore scored orange. Option 6 was also considered to present extra resilience risk because of the length of infrastructure required for land application and operational risks. As the existing outfall would be retained as backup, options 3 and 4 would improve operational resilience and were therefore scored green. Option 5 b was scored green for the same reason. For option 5a while this option would improve the operational resilience it was considered that a long pipe along the coastal edge would be subject to extra risks (geotech, stability etc.) and therefore was scored orange. Options 7 and 8 would provide some operational benefit (due to the storage capacity) and therefore were scored green.

Appendix A – Conceptual Drawings



WWTP FLOWS	
Average Dry Weather	220 L/s
Maximum Conveyed to WWTP	1,100 L/s
Proposed Capacity	1,500 L/s

TYPICAL WASTEWATER CONCENTRATIONS (Geomean)

	BOD (g/m³)	SS (g/m³)	Total N (g/m³)	Total P (g/m³)	Faecal Coliform (MPN/100mL)
Untreated Porirua Sewage	280	220	70	9	5,000,000
Existing Porirua WWTP Effluent	9	14	6	4	150
Higher Standard of Treatment e.g. Membrane Bioreactor	1	1	4	1-4	10
Partial Treatment (Milliscreening)	200	180	70	9	4,000,000
Partial Treatment (Milliscreen + UV)	200	180	70	9	1000

OPTION 1

Discharge from the Existing Shoreline Outfall
Existing Standard of Treatment

TYPICAL WASTEWATER CONCENTRATIONS (Geomean)

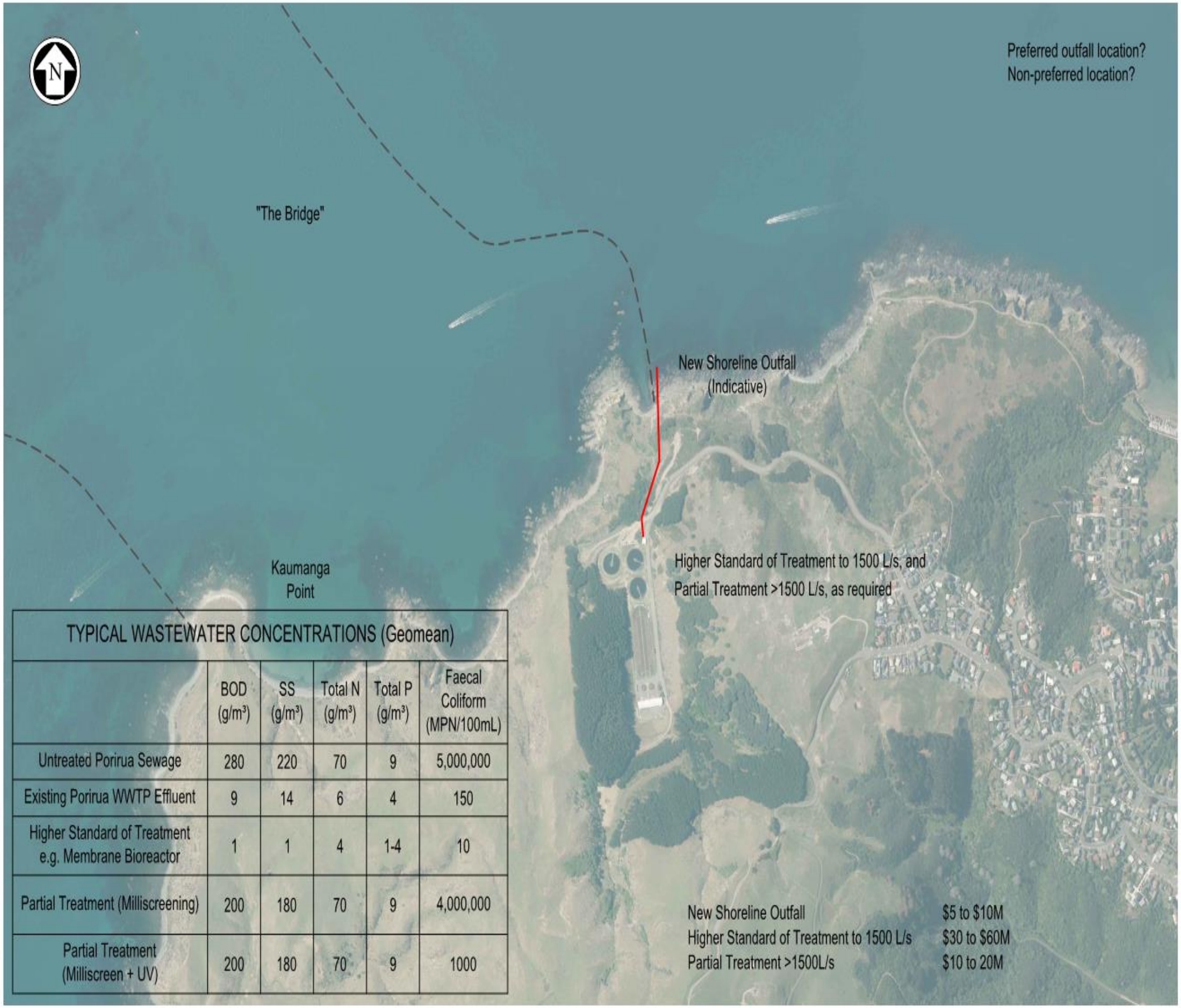
	BOD (g/m³)	SS (g/m³)	Total N (g/m³)	Total P (g/m³)	Faecal Coliform (MPN/100mL)
Untreated Porirua Sewage	280	220	70	9	5,000,000
Existing Porirua WWTP Effluent	9	14	6	4	150
Higher Standard of Treatment e.g. Membrane Bioreactor	1	1	4	1-4	10
Partial Treatment (Milliscreening)	200	180	70	9	4,000,000
Partial Treatment (Milliscreen + UV)	200	180	70	9	1000

OPTION 2

Discharge from the Existing Shoreline Outfall
Higher Standard of Treatment

OPTION 3

Discharge from a New Shoreline Outfall
Existing Standard of Treatment



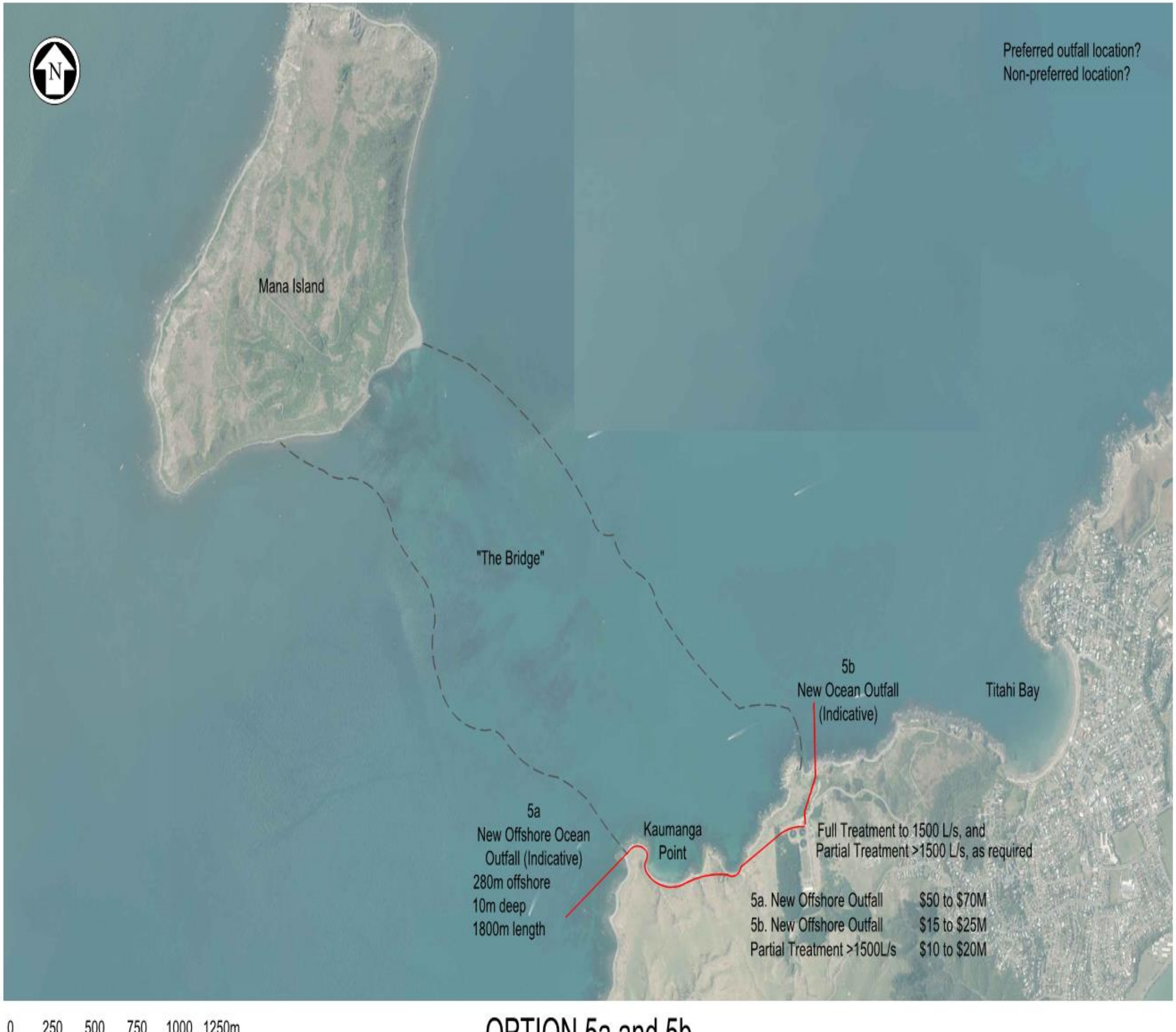
TYPICAL WASTEWATER CONCENTRATIONS (Geomean)

	BOD (g/m^3)	SS (g/m^3)	Total N (g/m^3)	Total P (g/m^3)	Faecal Coliform (MPN/100mL)
Untreated Porirua Sewage	280	220	70	9	5,000,000
Existing Porirua WWTP Effluent	9	14	6	4	150
Higher Standard of Treatment e.g. Membrane Bioreactor	1	1	4	1-4	10
Partial Treatment (Milliscreening)	200	180	70	9	4,000,000
Partial Treatment (Milliscreen + UV)	200	180	70	9	1000

0 100 200 300 400 500m

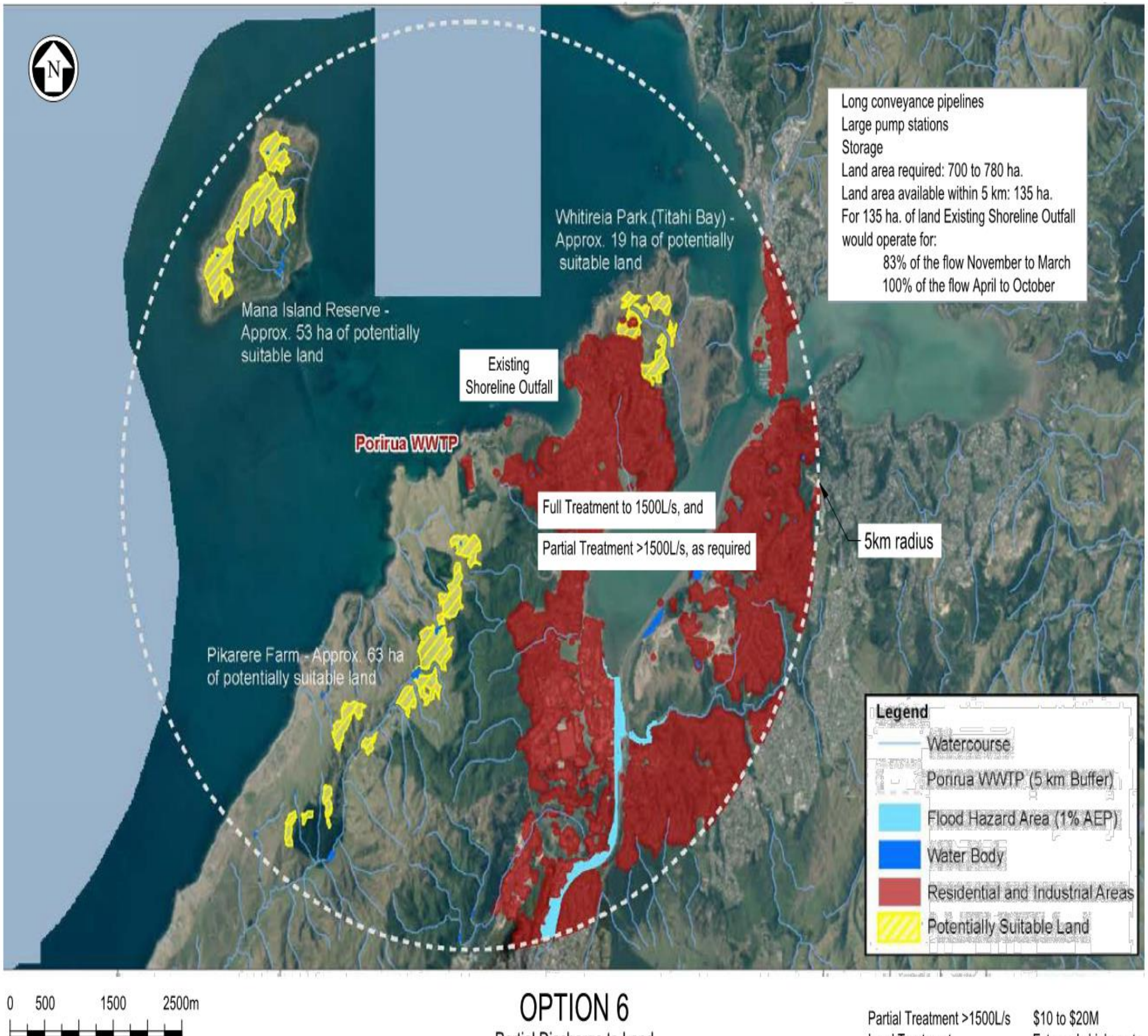
OPTION 4

Discharge from a New Shoreline Outfall
Higher Standard of Treatment



OPTION 5a and 5b

Discharge from a New Offshore Ocean Outfall
Existing Standard of Treatment



OPTION 6

Partial Discharge to Land
Existing Standard of Treatment

Partial Treatment >1500L/s	$10 to $20M
Land Treatment	Extremely high cost

OPTION 7

Storage of Wastewater

Discharge from the Existing Shoreline Outfall on outgoing tide

Existing Standard of Treatment

OPTION 8

Storage of Wastewater

Discharge from a New Shoreline Outfall on outgoing tide

Existing Standard of Treatment

MINUTES

SUBJECT	**Wellington Water/ Ngati Toa - Memorandum of Partnership progress meeting** **Note: this minute only covers that part of the meeting relating to the Porirua Wastewater Consenting Programme**
DATE	Thursday 22 February 2PM
WHERE	Wellington Water
ATTENDEES	Sir Matiu Rei (CE Ngati Toa), Colin Crampton (CEO Wellington Water), Ben Fountain (Chief Advisor Stormwater, Wellington Water), Kara Dentice (Whaitua Relationships, Wellington Water), Stewart McKenzie (Principal RMA Advisor, Wellington Water)
APOLOGIES	

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1. Porirua Wastewater Consenting Programme

1.1 Traffic lighting of Wastewater Network Options

- By way of introduction SM provided a summary of the Porirua Consenting Programme and its scope, the collaborative group formed around the process and recent long list workshops. A copy of the 2-page consenting strategy was tabled and discussed.
- SM invited Sir Matiu to input to the 'traffic lighting' of the network long list options against the Tangata Whenua criterion. The long list options were summarised along with the scoring criteria and the technical reports informing the draft scoring of options. The workshop notes were tabled including the summary traffic light table from the workshop.
- Sir Matiu clearly stated his and Ngati Toa's preference for storage and conveyance options over rapid treatment and harbour discharge during heavy rainfall events. He made it clear that we should be aiming to get wastewater to the WWTP where it can be treated or at least screened and partially treated.
- He also reiterated Ngati Toa's opposition to a cross harbour pipeline carrying wastewater.
- In light of the above he indicated comfort with 'orange lighting' the storage and conveyance options and red lighting all others involving rapid treatment and harbour discharges. He confirmed the fatal flaws with the cross harbour pipeline options from a Ngati Toa perspective.

1.2 Traffic lighting of WWTP Options

- The notes from the WWTP long list workshop and summary traffic light table were tabled and discussed.
- Sir Matiu confirmed he was comfortable with the scoring under the Tangata Whenua criterion from the workshop and didn't see the need to revisit this.

Stewart McKenzie
Principal Advisor – RMA & Environment

Ph: 021 947 523
Stewart.mckenzie@wellingtonwater.co.nz

Attachment E: Records of Collaborative Group meetings setting up the MCA process

Porirua Wastewater Programme
Short List Criteria Workshop – Meeting Record

30 November 2018, 9 am – 12 pm

Puna Ora, Takapuwahia, Porirua

Attendees:

Stewart McKenzie – WWL
Anna Hector – WWL
Paul Gardiner - WWL
Rachael Boisen Round – GWRC
Hugh Dixon-Paver – GWRC
Al Cross - GWRC
Keith Calder – PCC
Jill McKenzie – RPH
Mike Fisher - RPH
Richard Peterson – Stantec
Steve Hutchinson – WWL
Kara Dentice – WWL
Sharli-Jo Soloman – Ngāti Toa
Jenny Ngarimu – Ngāti Toa
Jude Chittock – GWRC
Claire Conwell – GWRC
Jim Bradley - Stantec
Matt Trlin – Connect Water
Anna Gibbs - Stantec

Introductions, background and context

The workshop commenced with a round of introductions. Stewart then provided a brief introduction to the purpose of the workshop.

Richard talked to pre-circulated briefing material covering:

- What's MCA and the MCA process
- The Porirua wastewater programme road map, i.e. how the programme has reached this point
- The criteria used for the longlist assessment, and how these were developed.

Key discussion points were:

- MCA is a <u>tool</u> to help assess options, it is not the decision itself
- Al noted that the collaborative process is bigger than the RMA process. As a group we should not limit our focus just to the RMA. It's important to focus on a robust process and a good outcome, and this should allow the RMA process to take care of itself
- Jim noted that this is a unique project in NZ as we have combined network and treatment plant matters into a single options exercise. The 'Best Practicable Option' is sought through this process, and the approach of combining network and treatment plant elements fits very well with this.
- Stewart reminded the group of the feedback loops in our process (see Figure 1).

The shortlist criteria

The collaborative group then discussed each of the long list criteria, to determine if each remains fit for purpose for the short list MCA. A summary of the discussion on each criterion is set out below.

Public Health Risk

There was some concern that this criterion overlapped with recreation and food gathering elements in the social and community criterion. The group agreed that this could be resolved by removing the food gathering reference from the social and community criterion. No change was made to the public health risk criterion in response to this discussion.

It was noted that the reference to 'shellfish gathering' in the public health risk criterion is too limiting. It was agreed that the broader term 'food gathering' should instead be included (and removed from the social and community criterion).

The criterion agreed by the collaborative group was:

> *'Public Health Risk – direct physical health risk[1] associated with contact recreation and food gathering'*

Natural Environment

It was suggested that the criteria should be replaced with a criterion entitled 'Mountains to Sea – Ki uta ki tai'. There was some discussion about the meaning of this concept and its overarching nature. The collaborative group agreed that this concept should be applied as a principle to all, relevant, criteria. Doing so would recognise that specific elements of the Porirua catchment should not be viewed in isolation, and that, as far as possible, the preferred option needs to provide an integrated solution to the wastewater related issues in the catchment.

A second key aspect of the discussion on this criterion was whether it should cover a broad spectrum of environmental matters or be focussed on water quality and aquatic ecology. It was agreed that this criterion should be reasonably limited, although the ecological element was extended to include terrestrial as well as aquatic ecology. A separate 'Natural Character and Landscape' criterion was agreed to be added to cover other elements of the natural environment.

As it was agreed to limit the criterion in this way, the group felt that the broad 'natural environment' title was mis-leading. It was therefore removed.

The group discussed how to integration the outputs from the Porirua Whaitua process in to the criterion. It was agreed that as the Porirua Whaitua is related to a broad range of matters its outputs and direction should be considered when assessing the short list against all relevant criteria. The collaborative group therefore agreed to consciously recognise the outputs of the Whaitua process during the 2019 MCA workshop – criteria leads will be asked to address this in their briefing material.

There was also some discussion that the phrase 'wider coastal environment' may hide localised effects, such as those on the shoreline. It was agreed to add specific reference to the 'coastal shoreline' to overcome this concern.

The criterion agreed by the collaborative group was:

> *'Water quality and ecology – including streams, harbour, the coastal shoreline and the wider coastal environment, and terrestrial ecology*

Tangata whenua

The group agreed that to aid the assessment of the options against this criterion, and to ensure all of Ngāti Toa's values are considered, several elements should be added to the criterion's explanation. These elements are:

- Mahinga kai
- Kai moana
- Mana
- Hauora

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[1] Underlined section of criterion added following the meeting in response to email comments from Jill McKenzie, dated 11 January 2019.

- Heritage.

It was also agreed that the term 'relationships' should be replaced with the term 'whakapapa'.

The criterion therefore agreed by the collaborative group was:

> *'Tangata whenua values – effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa.'*

Growth

The key discussion point amongst the group on this criterion was whether the focus on long term growth was appropriate. It was noted that this is consistent with the related programme objective. However, a focus solely on long term growth would not recognise the value that would arise if options are able to respond to medium term growth needs. It was therefore agreed to amend the objective to include consideration of medium term growth needs and pressures.

The criterion agreed by the collaborative group was:

> *'Growth – supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures.'*

Financial Implications

There was some discussion within the group about whether this criterion should cover the whole economy (tangible and non-tangible costs and benefits), rather than just covering the cost implications for Wellington Water, the Councils and their ratepayers. It was agreed that this was not necessary, and that between the other criteria the non-monetary 'costs' and 'benefits' are covered.

It was noted that for the MCA whole-of-life cost figures would be used. Therefore, the criteria should be simply stated as the financial cost of the option.

The criterion therefore agreed by the collaborative group was:

> *'The whole-of-life financial cost of the option.'*

Social and community

As already discussed under the 'public health' criterion, the group agreed to remove food gathering from the 'social and community' criterion to avoid duplication.

There was some discussion on the meaning of the term 'perception' in the criterion explanation. It was explained that this was intended to allow consideration of the anticipated community reaction to options. This would be judged based on feedback received in the current and previous community engagement exercises. Community reactions may, for example, result in people choosing not to undertake recreation activities even when monitoring data suggests that there is no technical reason for them not to. It was agreed that perception should be retained in the criterion.

The group agreed to include heritage values under this criterion to align with the corresponding addition to the Tangata Whenua criterion.

The criterion therefore agreed by the collaborative group was:

'Social and community – amenity, recreation and heritage, including perception.'

Technology

The group considered that some of the elements of this criterion were no longer relevant as the options which had been taken forward into the shortlist utilise well proven technology. It was also noted that some of the elements of the criterion were already covered in the revised growth criterion (in particular staging) and in the cost criterion (e.g. constructability).

Therefore, the group decided to rationalise the matters covered in this criterion. The criterion agreed by the collaborative group was:

> *'Technology – enduring, reliable and providing flexibility for future technology changes and capacity upgrades.'*

Resilience

The group agreed that, given the increasing importance of climate change in infrastructure planning and management, this risk should be explicitly recognised in the 'resilience' criterion.

The criterion therefore agreed by the collaborative group was:

> *'Resilience – climate change, natural hazards and operation resilience'*

Scoring

The group discussed the proposed approach to scoring (see briefing material). It was agreed that a 5-point scale would be used, and that a description of the meaning of each score would be provided before the MCA workshop. Richard will provide this to the group before the next meeting.

General discussion

As the workshop had overrun time, it was agreed to schedule a separate meeting to discuss the weighting of the criteria.

The group had a general discussion on the 'pit falls' and limitations of MCA. It was noted that these include not having a representative group involved in the process, treating the MCA as the 'decision' rather than as a tool to assist decision making, and not recognising and being transparent about assumptions and uncertainty.

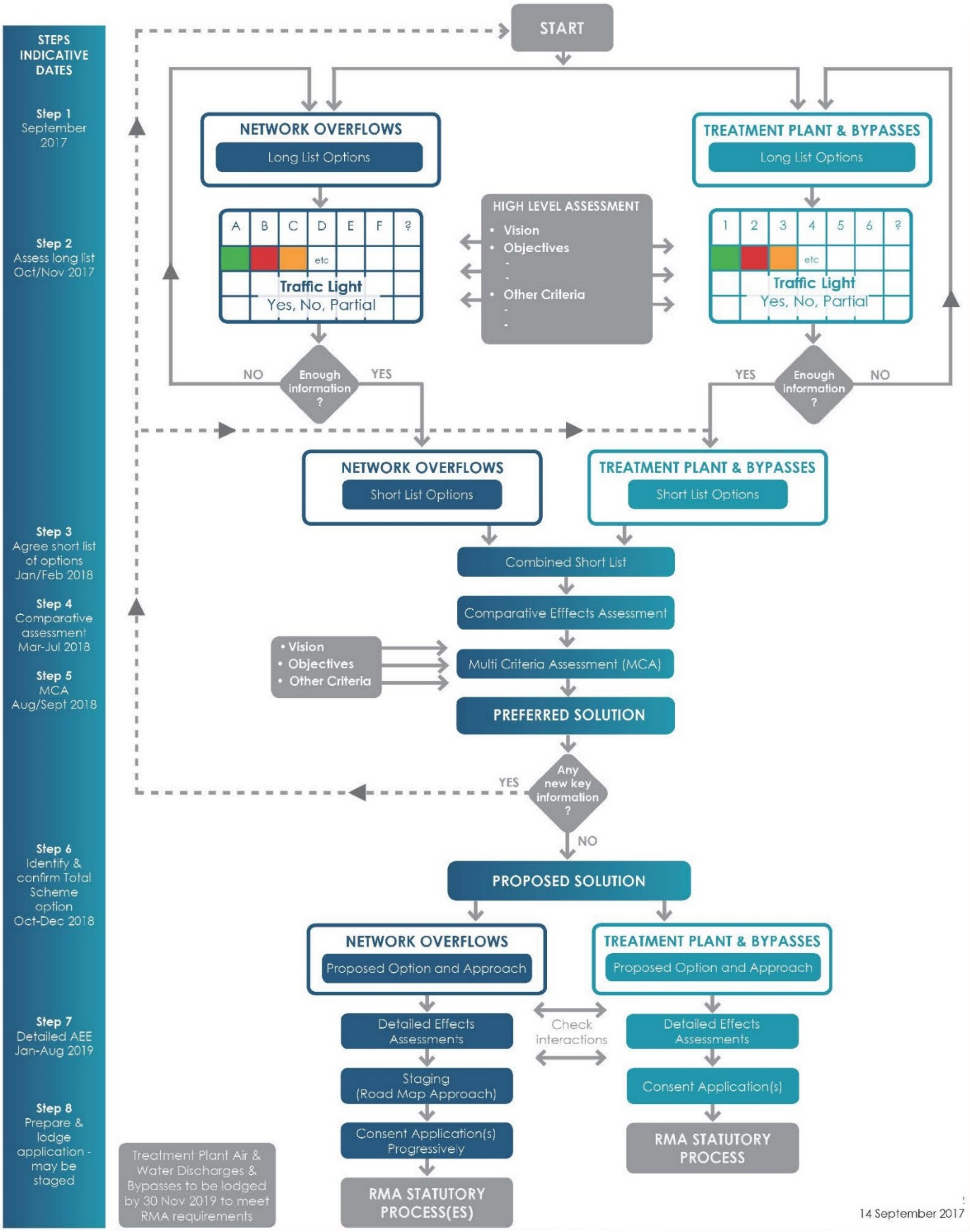
The question was also asked whether there could be 'deal breakers' for options, i.e. during the MCA could we identify that options should not be in the shortlist. It was noted that yes this is a possibility. The options assessment process (see Figure 1) includes feedback loops for this purpose. This means that if new information comes to hand that suggests we should re-visit our earlier decisions then we should do that. This could include re-assessing whether an option is fatally flawed.

Next Steps

Richard will circulate a full set of the revised MCA criteria along with a table describing how the 1 to 5 scale will be applied for each criterion.

It was agreed to schedule a further meeting in February 2019 to discuss and confirm the criteria weighting.

Figure 1 – Porirua wastewater programme options assessment process



Porirua Wastewater Programme
Short List Criteria Workshop – Collaborative Group Meeting Record

25 March 2019, 1.30 pm – 4.30 pm

Puna Ora, Takapuwahia, Porirua

Attendees:

Tristan Reynard– WWL
Anna Hector – WWL
Paul Gardiner - WWL
Rachael Boisen Round – GWRC
David Downs – PCC
Jill McKenzie – RPH
Mike Fisher - RPH
Richard Peterson – Stantec
Zeke Hudspith – Kensington Swan
Steve Hutchinson – WWL
Naomi Soloman – Ngāti Toa
Turi Hippolite – Ngāti Toa
Jude Chittock – GWRC
Claire Conwell – GWRC
Jim Bradley - Stantec
Matt Trlin – Connect Water
Grant Baker – Porirua Harbour Trust

Introductions, background and options

Paul thanked everyone for attending the workshop and then commenced a round of introductions.

Richard then introduced the purpose of the workshop and talked to pre-circulated briefing material which covered (see attached slides):

- What's MCA and the MCA process
- The Porirua wastewater programme road map, i.e. how the programme has reached this point
- The criteria agreed at the previous workshop in November 2018.

Given the length of time since the short list options were identified and given the number of new participants in the Collaborative Group, time was then taken to talk through the short list options using the figure below. The group felt that this would help them better understand which criteria are the most (and least) important.

Naomi asked how the short list had been identified. Richard explained how long lists of 11 network options and 8 wastewater treatment plant (WWTP) options were evaluated in November 2017 and January 2018 by the Collaborative Group using a 'traffic light' assessment method[1]. As key representatives from Ngati Toa were unable to attend the second traffic light workshop, a follow up meeting was held with Ngati Toa representatives on 22 February 2018.

The results of the traffic light assessment, and the subsequent meeting with Ngati Toa, were used to identify 3 network options and 3 WWTP options, which when combined make the 9 options on the Porirua Wastewater Programme short list. The recommended short list was adopted by the Collaborative Groupon at its meeting on 3 April 2018.

[1] A traffic light assessment is a high level MCA-type evaluation technique. It assesses options against multiple criteria. Its key difference from a full MCA is that it uses the traffic light colours to score the options against each criterion rather than numbers. The level of information available on the options and their effects is not detailed at the long list phase.

Figure 1 - Porirua Wastewater Programme - Shortlist Options

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance	Twin storage
WWTP Shortlist[2]	Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Figure 1 Notes:

1. All network shortlist options probably will be designed to accommodate a flow event with a 6-month average return interval (the return interval is to be confirmed)

2. All WWTP shortlist options involve secondary treatment and UV disinfection up to 1,500 l/s, plus partial treatment of flows above this level. The nature of the partial treatment for flows above 1,500 l/s is yet to be determined

Approach to weighting the criteria

Richard explained the reason for, and the proposed approach to, weighting the qualitative (or non-cost) criteria.

First each Collaborative Group was asked to identify the importance of each criterion using a scale of 1 to 10, with 1 being least important and 10 being most important. The Group did this by first placing post-it notes on a whiteboard indicating the importance that they individually would attribute to each criterion (see Figure 2).

Second, these whiteboard scores were used as the basis for a discussion about why individuals had allocated importance as they had, and about whether a consensus view on a 'base' weighting for each criterion could be reached. The discussion on the weighting of each criterion is summarised in the following sections.

Growth was the only criterion on which the Group could not reach a consensus view. As is discussed below it was agreed that two 'base' weightings would be applied to this criterion at the MCA options scoring workshop. For all other criteria a consensus was reached on the 'base' weighting, however where they had been greatest discussion and debate sensitivity weighting(s) were also agreed.

Figure 2 - Importance scores suggested by individuals in the Collaborative Group meeting

Agreed Weighting

Public Health, Water Quality and Ecology & Tangata Whenua Values

The whiteboard weights given to these three criteria were all at the top end of the range, with the majority of the Group suggesting an importance score of 10 out of 10. In the discussion as to why these high importance scores had been awarded members of the Group noted that:

- These criteria relate to matters that are a current issue of significant concern to the community
- These criteria relate to matters for which there is strong policy direction (RMA, regional policy, and local non-statutory policy)
- Public health, water quality and ecology, tangata whenua values are city-wide issues, i.e. unlike some other criteria they are not localised interests
- Public health is the basic issue that reticulated sewerage systems were originally designed to address.

Based on these points that Group agreed that all three criteria are of highest importance (i.e. 10 out of 10). As there was strong agreement on this no sensitivity testing was considered necessary.

Growth

A consensus position on the importance of the growth criterion could not be reached. Some in the Group considered that 'growth' was very important, that Wellington and Porirua City Councils are required to ensure that both medium- and long-term growth is completely provided for and that because this criterion relates to the implementation of the National Policy Statement for Urban Design Capacity it should be given an importance weighting of 10.

Others did not agree that the criterion was that important, and particularly did not agree that it is as important as the public health, water quality and ecology and tangata whenua values criteria. They considered that the importance of this criterion is better represented by an importance weighting of 8.

As a consensus could not be reached it was agreed that importance weightings of 10 and 8 would be applied to this criterion.

Social & Community

The whiteboard weightings for this criterion were relatively varied. Through discussion the group agreed to an importance weighting of 7 based on:

- This being approximately mid-range in the whiteboard weightings
- Some overlap with other criterion (public health and landscape and natural character)
- The effects on these values are more likely to be localised, e.g. amenity
- The policy direction for the components of this criterion (such as recreation and amenity) are not as strong as for public health, water quality and ecology and tangata whenua values
- The general relativity of the importance of this criterion to others.

As there was good agreement on this weighting during the discussion, no sensitivity testing was considered necessary.

Technology

Having discussed the whiteboard weightings, of which most fall in the range between 9 and 6, the Group agreed a base importance weighting for the technology criterion of 5. While the Group acknowledged that it is important to recognise the benefit of some options in terms of more readily allowing for future change, having heard the different views, it considered that this criterion was less important relative to others and that the matters its covers are to an extent a given (i.e. flexibility will be designed into all options). It was also considered that there is some degree of overlap with the resilience criterion and that the combined weight on technology and resilience should not be significantly higher than weight given to any of the public health, water quality and ecology and tangata whenua values criterion.

The Group agreed that sensitivity tests should be applied based this criterion being given an importance weight of 7 (being more aligned with the whiteboard weights) and 3 (based on 'technology' in part just reflecting good design practice).

Resilience

An importance weighting of 7 was agreed for this criterion, which is approximately mid-range in the whiteboard weightings. The group considered resilience is more important than the technology criterion as it is a central element in Wellington Water's Statement of Intent and Service Goals, which has been reflected in the Porirua wastewater programme objectives. It was also recognised that the management of significant risks from natural hazards is a matter of national importance under section 6 of the RMA. However, it was considered that this criterion should not have the same weight as that given to other criteria specifically particularly public health, water quality and ecology, tangata whenua values and growth.

As there was a concern by some that the combined weight of the technology and resilience criteria would be too high it was agreed that sensitivity analysis should be undertaken using an importance weighting of 5.

Natural Character & Landscape

The Group agreed that an importance weighting of 7 should be applied to the Natural Character and Landscape criterion. Again this is broadly mid-range in the whiteboard weightings. It was acknowledged that this criterion reflects matters of national importance in section 6 of the RMA and that there is strong policy direction in the New Zealand Coastal Policy Statement. However, the Group felt that a weighting higher than 7 was not warranted because the direct physical effects of any new infrastructure would be isolated to small patches of the City's coastal environment, and that much of the infrastructure (pipes and pump stations) are likely to be buried. It was also considered that the natural process elements of natural character, such as water quality and ecological processes, would also be addressed under other criteria.

As there was good agreement on this weighting during the discussion, no sensitivity testing was considered necessary.

Ancillary Note:

During the discussion on the weighting for the Natural Character and Landscape criterion, it was clear there was some confusion on how the reference to 'visual amenity' in the criterion description related to the reference to 'amenity' in the Social and Community criterion description. To help resolve this confusion the description for the Social and Community criterion will be amended to read:

> *Social and Community – amenity (excluding visual amenity), recreation and heritage, including perception.*

Weighting summary

At the completion of the discussion on each criterion, the Group considered if any further sensitivity analysis was required. It was agreed that an 'equal weighting' scenario should be tested.

Table 1 summarises the importance weightings agreed, including the different sensitivity testing scenarios, and Table 2 then translates these percentages.

Table 1 - Importance Weightings (out of 10) Agreed for the Qualitative Criteria by the Collaborative Group

Scenario	Criteria							
	Public Health	Water Quality & Ecology	Tangata Whenua Values	Growth	Social & Community	Technology	Resilience	Natural Character & Landscape
Base weighting 1 ('Growth at 10')	10	10	10	10	7	5	7	7
Base weighting 2 ('Growth at 8')	10	10	10	8	7	5	7	7
Higher weight to technology (Base scenario 1)	10	10	10	10	7	7	7	7
Higher weight to technology (Base scenario 2)	10	10	10	8	7	7	7	7
Lower weight to technology & resilience (Base scenario 1)	10	10	10	10	7	3	5	7
Lower weight to technology & resilience (Base scenario 2)	10	10	10	8	7	3	5	7
Equal weighting to all criteria	10	10	10	10	10	10	10	10

Table 2 – Qualitative (Non-cost) Criteria Percentages (%) Based on the Agreed Importance Weightings

Scenario	Criteria							
	Public Health	Water Quality & Ecology	Tangata Whenua Values	Growth	Social & Community	Technology	Resilience	Natural Character & Landscape
Base weighting 1 ('Growth at 10')	15.2	15.2	15.2	15.2	10.6	7.6	10.6	10.6
Base weighting 2 ('Growth at 8')	15.6	15.6	15.6	12.5	10.9	7.8	10.9	10.9
Higher weight to technology (Base scenario 1)	14.7	14.7	14.7	14.7	10.3	10.3	10.3	10.3
Higher weight to technology (Base scenario 2)	15.2	15.2	15.2	12.1	10.6	10.6	10.6	10.6
Lower weight to technology & resilience (Base scenario 1)	16.1	16.1	16.1	16.1	11.3	4.8	8.1	11.3
Lower weight to technology & resilience (Base scenario 2)	16.7	16.7	16.7	13.3	11.7	5.0	8.3	11.7
Equal weighting to all criteria	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5

Weight to be given to cost in the overall MCA result

Following the discussion on the qualitative criteria the Group considered the weight to be given to cost in the overall MCA score.

Richard and Jim discussed the weighting that has been given to cost in a range of other infrastructure projects around the country. Noting that in the examples identified the weight given to cost ranged from 0% to 50%, with multiple examples being in the middle of this band.

It was then noted that Porirua City Council has signalled its budget for wastewater upgrades in its Long-Term Plan, and further that most of the City's investment goes into 3 waters services. It was noted that options which exceed Porirua City's future budgets would have significant opportunity costs for the City's other aspirations. It was also noted that Porirua City Council has a constrained budget. This is recognised in the Long-Term Plan which notes that[2]:

> *Porirua City has a small number of ratepayers relative to the population and lacks significant other income. Our challenge is to provide a high level of services and facilities, and support our four strategic priorities, while keeping rates affordable.*

[2] Porirua City Council, Long-Term Plan 2018-38, page 15

Based on these reasons Wellington Water suggested that the base weight to be given to cost in the overall MCA score be set at 25%. Wellington Water also suggested that sensitivity testing be done using 50% weighting to cost and 0% weighting to cost (aligning with the maximum and minimum weighting identified in the examples presented by Richard and Jim). It was also noted that 0% is a legitimate sensitivity test, as it will enable the consideration of each option based on the qualitative criteria alone, which represent broader community values. There was some discussion on whether sensitivity testing should be done at more refined increments, e.g. at 30% and 40% as well. However, it was agreed that this level of refinement was not necessary.

The Group agreed to apply 25% as the base weight to be given to cost and apply sensitivity tests at 0% and 50%.

Next Steps

Richard outlined the current work on the comparative assessment of options. He noted that comparative assessment reports will be prepared for each criterion and will include recommended scores for each option. These recommendations will be presented and debated at the Collaborative Group MCA scoring workshop. Richard also noted that a summary sheet for each option will be provided to the Collaborative Group members prior to the MCA scoring workshop.

At this point Richard noted that he expected the MCA scoring workshop to be held in mid-June. It was agreed that a briefing session on the short listed options should be held 1-2 weeks in advance of this workshop. The briefing session would focus in ensuring the Group had a common understanding of the options and enable points of clarification to be raised and resolved.

Attachment F: Combined Short List Comparative Assessments

Wellington Water

MCA Briefing Report
Porirua Wastewater Programme

Our water, our future.

1. Introduction

1.1. Report contents

This report provides the briefing material for the Multi-Criteria Analysis (MCA) workshop which is scheduled for June 25, 2019. It sets out the assessment criteria previously agreed by the Collaborative Group and provides a very high-level overview of the 9 options in the Porirua wastewater programme short list.

1.2. MCA & Workshop

MCA is a tool to help us gain an overall understanding of the comparative merits of the 9 options. The MCA assessment provides us with a numerical summary of the comparative assessments and will be used to help develop a recommended preferred option. This recommended option will be reported to Wellington Water and the Wastewater Treatment Plant and Landfill Joint Committee of Porirua and Wellington City Councils.

Our deliberations at the MCA workshop will be informed by the comparative assessments (see Appendices). However, the collective knowledge and experience of the Collaborative Group will be used to test the recommendations made by the authors of the comparative assessments. The workshop is intended to help ensure the conclusions of the MCA are robust. To this end the workshop will involve brief presentations on each comparative assessment report by the author, followed by a group discussion on the assessment findings and the recommended MCA scores.

It is hoped that by undertaking pre-workshop briefings and by pre-circulating the material, workshop participants will have had a chance to become familiar with the recommendations prior to the workshop and that the briefing material can be taken as read at the workshop. We would encourage any questions of detail to be raised prior to the workshop. These can be emailed to Richard.peterson@stantec.com. Responses will be circulated to all workshop attendees.

At the workshop we will confirm if the group agrees with the recommendations, or whether an alternative MCA score can be agreed. If consensus on the assessment and MCA scoring cannot be reached, then the disagreement will be recorded and reported to Wellington Water and the Joint Committee.

2. The MCA Criteria

Table 1 sets outs the criteria that have been adopted for the MCA. The comparative assessments contained in the Appendices to this report explain how each criterion has been assessed.

Table 1 - MCA Criteria

Criteria	Description
Public Health Risk	Associated with contact recreation and food gathering
Water quality and ecology	Including streams, harbour, the coastal shoreline and the wider coastal environment, and terrestrial ecology
Tangata whenua values	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa
Growth	Supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures

Criteria	Description
Social & community	Amenity, recreation and heritage, including perception
Technology	Enduring, reliable and providing flexibility for future technology changes and capacity upgrades
Resilience	Climate change, natural hazards and operation resilience
Natural character & landscape	Including effects on natural character of the coastal environment, landscape fabric, landscape character and visual amenity
Cost	The whole-of-life financial cost of the option

3. The Short List Options

Table 2 provides a high-level summary of the 9 short list options. More details on each of the options, including schematic diagrams, were circulated via email May 29, 2019.

		Network Shortlist		
		Greater conveyance	Combination of storage and conveyance	Twin storage
WWTP Shortlist	Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Appendix 1 – Public Health Risk

Memo

To:	Ilze Rautenbach	From:	Graeme Jenner
	Stantec Wellington Office		Beca Christchurch Office
File:	Porirua Wastewater Upgrade Options - Comparative Assessment of Public Health Effects/Outcomes	Date:	May 17, 2019

Reference: **Porirua Wastewater Upgrade Options - Comparative Assessment of Public Health Effects/Outcomes – Final Draft**

1 INTRODUCTION

1.1 BACKGROUND

Connect Water has been engaged by Wellington Water to assist in the assessment of shortlist options to upgrade the Porirua wastewater scheme, including the wastewater collection network and the existing wastewater treatment plant (WWTP) to the west of Titahi Bay.

Nine upgrade options have been assessed against predetermined criteria to provide a comparative option assessment. The nine options under consideration are listed in Table 1-1. The assessment criteria applied to each option are as follows: public health risk, water quality & ecology, tangata whenua values, growth, social & community, technology, resilience, natural character and landscape.

The study area includes the watercourses that flow into Porirua Harbour, as well as Porirua Harbour and the coastline to the west.

Table 1-1 Wastewater Upgrade Options

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

1.2 PURPOSE OF REPORT

The purpose of this report is to provide a comparative qualitative assessment of the likely public health effects/outcomes of the nine shortlist options. Wastewater discharges contain microorganisms (such as bacteria, protozoa and viruses) in varying concentrations depending on the level of treatment. Some microorganisms can be pathogenic (disease-causing), which may present a risk to public health when discharged to receiving waters that are used for contact recreation (eg swimming or surfing), or for shellfish gathering (if filter feeders such as mussels, pipis or cockles are then ingested).

This assessment, together will similar reports prepared for the other criteria, will form the basis for further discussion at the Multi-criteria Analysis (MCA) Workshop by the wider Collaborative Group.

1.3 AUTHORS' CREDENTIALS

This assessment has been prepared by Graeme Jenner (Connect Water) and reviewed by David Cameron (Stantec). Graeme has a Master of Science (Hons) from Canterbury University and has worked for Beca Consultants Ltd (Connect Water partner) for over 20 years. He is a Senior Associate – Environmental with Beca and has extensive experience in the investigation and assessment of the environmental effects of wastewater discharges throughout New Zealand. David has a Batchelor of Science in Zoology (Hons) from Victoria University and has worked for Stantec for over 24 years. He is a Principal Environmental Scientist with Stantec and has extensive experience in water quality and aquatic ecology.

1.4 TECHNICAL INFORMATION USED IN ASSESSMENT

The following technical information has been used in the assessment:

- *Proposed Natural Resources Plan* for the Wellington Region (Greater Wellington Regional Council, 2015).
- *Regional Coastal Plan for Wellington Region* (Greater Wellington Regional Council, 2000).
- *Porirua Wastewater Network Overflows: Wet Weather Water Quality Monitoring Results* (May 2019); prepared for Wellington Water by Stantec;
- *Titahi Bay Outfall Options* (April 2019); modelling report prepared for Wellington Water by DHI Ltd;
- *Porirua Wastewater Programme Recreation Assessment* (December 2018*).* Prepared by Rob Greenaway and Associates for Wellington Water and Stantec.

1.5 LIMITATIONS OF ASSESSMENT

This assessment is based on available information for the purposes of comparing the nine shortlist options. It is necessarily a high-level, qualitative assessment and does not constitute an assessment of effects of the quantitative risks to public health of primary contact recreation near network overflows, or a shoreline or offshore outfall.

The assessment focuses on the comparative risk of discharges on contact recreation, although it is acknowledged that some shellfish gathering occurs inside the Porirua Harbour and along the coastline. There are multiple sources of contamination in urban environments from both point (eg outfalls) and nonpoint (eg stormwater runoff) sources and the risks of consuming shellfish from within the harbour are therefore noted.

There is a lack of filter feeders (such as mussels, cockles and pipis) along the open coastline in the vicinity of the existing WWTP outfall and the alternative discharge sites. Shellfish such as paua are grazers and do not tend to accumulate contaminants such as pathogens. As such, the risk to consumers in these circumstances is relatively low.

The likely effects of the wastewater network upgrade options have been assessed primarily on the basis of the expected reduction in the number of overflows during wet weather (and therefore microbiological load) to Porirua Harbour. The upgrading process for these options is expected to include greater conveyance by increasing network pipe capacity and storage in the network to reduce controlled overflows (ie from pump stations), as well as uncontrolled overflows (from manholes), during wet weather.

The comparative likely effects of the WWTP coastal outfall options have been assessed on the basis of modelling carried out by DHI Ltd (DHI). The results of the outfall modelling have been compared with the coastal bacteriological criterion (*enterococci*) set out in the *Proposed Natural Resources Plan.* These proposed limits are based on the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* prepared by the Ministry for the Environment (*MfE 2003) which* state that a 95-percentile value of *enterococci* greater than 500 organisms/100mls indicates a "*significant risk of high levels of minor illness transmission",* which is generally considered an unacceptable level of risk[1].

The MfE guidelines support the management of bacteriological water quality for recreational use. However, they should not be directly applied when assessing the microbiological quality of water that is impacted by discharges of wastewater as there is a potential for the relationship between bacterial indicators (such as *enterococci*) and pathogens (such *norovirus*) to be altered by the treatment and disinfection process. For example, UV disinfection which causes genetic damage and prevents reproduction, is most effective on bacteria which are larger and more genetically complex. However, specific viruses (eg adenoviruses that can cause respiratory disease), which are simpler genetically, are more resistant and require higher doses of UV for inactivation. The relationship between in bacterial indicators and pathogens therefore needs to be established before the public health risks of a discharge can be quantified.

On this basis, it is expected that the public health risks associated with the preferred WWTP discharge option will be subject to further assessment through a Quantitative Microbial Risk Analysis (QMRA). The QMRA assesses public risks of exposure to a "model" pathogen (virus) from a wastewater discharge using a variety of inputs such as viral concentration, treatment efficiency, dilution and dispersion, and ingestion/contact. A large number of simulated events (ie swims at a beach) are then modelled and a risk calculated that a given

[1] Risk of gastrointestinal illness greater than 10%.

number of infections will occur per 100 people exposed. This risk can then be compared with World Health Organisation (WHO) recommendations for contact recreation - associated illnesses.

QMRAs provide relatively conservative results and are therefore considered appropriate when assessing public health risks during the consenting process. The framework for the preparation of a QMRA is shown in Figure 1-1.

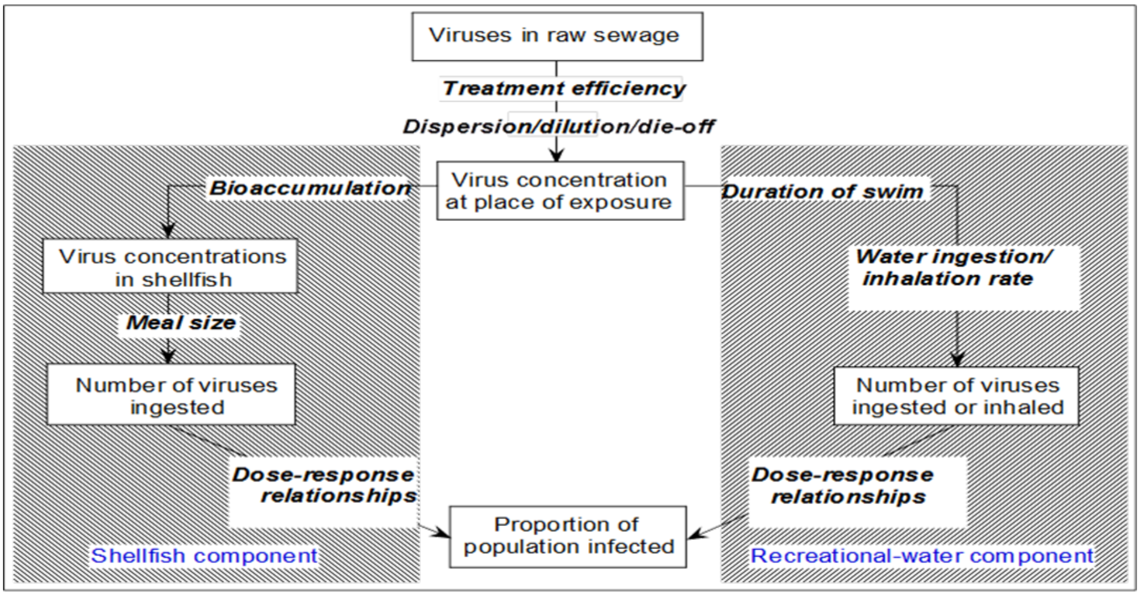


Figure 1-1 Framework for Preparation of a QMRA

2 APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

Public health effects/outcomes criteria have been scored for each option against the criteria set out in Table 2-1.

Table 2-1 Public Health Effects/Outcomes Scoring Categories

Criteria	Description	One	Two	Three	Four	Five
Public Health Risk	Direct physical health risk associated with contact recreation and food gathering	High public health risk	Moderate to high public health risk	Moderate public health risk	Low to moderate public health risk	Low public health risk

Each upgrade option will continue to involve discharges to freshwater, estuarine and marine environment. The assessment provides a score (ie 1-5) for each of these discharge scenarios which is based on judgement of the comparative risks. Where considered appropriate to illustrate differences between options, half scores (eg 2.5) have been used.

2.2 REGIONAL COASTAL PLAN FOR WELLINGTON REGION

The Regional Coastal Plan (RCP) for the Wellington Region identifies coastal areas to be managed for contact recreation and shellfish gathering purposes. The RCP states that all of Te Awarua o Porirua Harbour, Pauatahanui Inlet and Porirua/Plimmerton coast is to be managed for contract recreation purposes and the remainder of the coastal areas is to be managed for shellfish gathering. Figure 2-1 shows the extent of these water quality classifications.

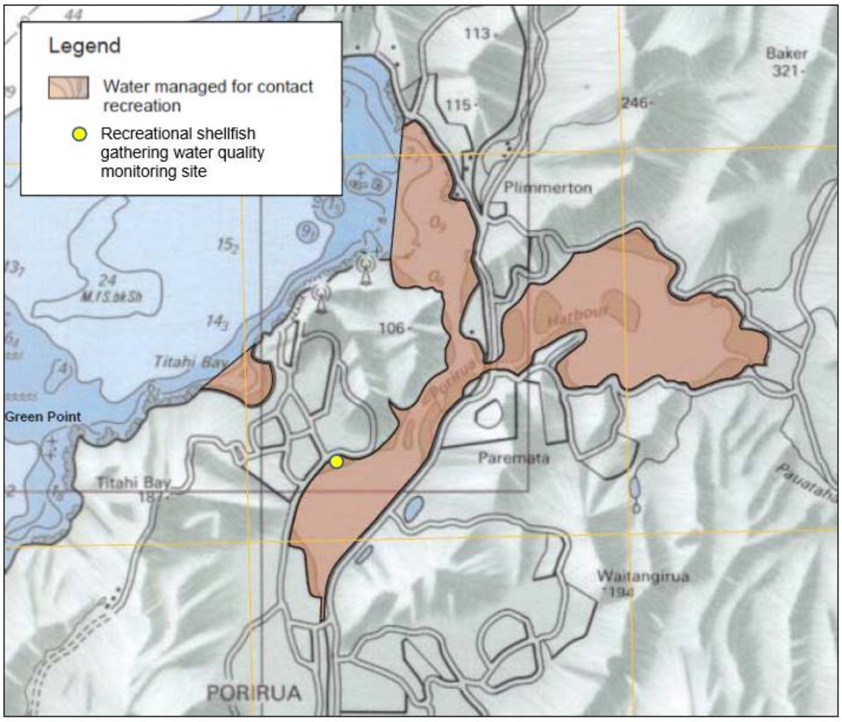


Figure 2-1 RCP Water Quality Classifications (from Greenaway Associates report)

2.3 PROPOSED NATURAL RESOURCES PLAN

The *Proposed Natural Resources Plan* (PNRP) includes several relevant high-level objectives for management of contact recreational values in the region including:

> *Objective O5*
>
> *Fresh water bodies and the coastal marine area, as a minimum, are managed to:*
>
> *(a) safeguard aquatic ecosystem health and mahinga kai, and*
>
> *(b) provide for contact recreation and Māori customary use…*
>
> *Objective O9*
>
> *The recreational values of the coastal marine area, rivers and lakes and their margins and natural wetlands are maintained and enhanced.*
>
> *Objective O23*
>
> *The quality of water in the region's rivers, lakes, natural wetlands, groundwater and the coastal marine area is maintained or improved.*
>
> *Objective O24*
>
> *Rivers, lakes, natural wetlands and coastal water are suitable for contact recreation and Māori customary use….*
>
> *Objective O37*
>
> *Significant surf breaks are protected from inappropriate use and development.*

Objectives O23 and O24 are supported by water quality standards for contact recreation in coastal and fresh waters. The PNRP has drawn on the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* (2003) to provide numeric values for primary contact recreation (eg swimming). These align with the minimum acceptable state and national bottom line attribute state for primary recreation (GWRC, 2015b[2]).

The PNRP microbiological criteria for coastal waters recreation are shown in Table 2-2. *Enterococci* is a bacterium commonly found in the gut of humans and is the preferred "indicator" of faecal contamination in open coastal waters. *Enterococci* are distinguished by their ability to survive in marine waters and are considered more "human-specific" than other faecal indicator organisms.

[2] GWRC (2015b) Section 32 Report: Water Quality – For the Proposed Natural Resources Plan (Document No # 1393053).

Table 2-2 PNRP Microbiological Criteria for Coastal Water Primary Contact Recreation

Coastal water	Pathogens Indicator bacteria/100mL 95th percentile	Māori customary use	Shellfish quality
Estuaries[1]	≤ 540 *E. coli*	Coastal water is safe for primary contact and supports Māori customary use	Concentrations of contaminants, including pathogens, are sufficiently low for shellfish to be safe to collect and consume where appropriate
Open coast and harbours[2]	≤ 500 enterococci		

[1] Excludes Te Awarua-o-Porirua Harbour and includes Lake Onoke. Estuaries, including river mouth estuaries, should be treated as an estuary when they are dominated by saline water, in which case Table 3.3 applies, and as rivers when they are dominated by freshwater, in which case Table 3.1 or 3.2 applies.

[2] Includes Wellington Harbour (Port Nicholson) and Te Awarua-o-Porirua Harbour. Excludes the Lambton Harbour Commercial Port Zone delineated in Map 32.

2.4 MICROBIOLOGICAL WATER QUALITY GUIDELINES FOR MARINE AND FRESHWATER RECREATIONAL AREAS (2003)

The *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* (2003) prepared by the Ministry for Environment provided the basis for the microbiological criteria set by the PNRP. The MfE marine contact recreation guideline values are summarised in Table 2-3. The “alert” and “action” levels are based on keeping illness risks below 2% (ie less than 20 per 1000 swimmers).

Table 2-3 MFE 2003 Recreational Water Guideline Values for Marine Water

Acceptable, alert and action trigger concentrations for marine water contact recreation
Acceptable: No single sample greater than 140 *Enterococci* /100mls
Alert: Single sample greater than 140 *Enterococci*/100mls
Action: Single sample greater than 280 *Enterococci*/100mls

2.5 RECREATIONAL SETTING

2.5.1 OVERVIEW

Greenaway and Associates (2018) notes that the Porirua Harbour area is of regional recreational significance and hosts a significant and varied number of water-based activities. Kenepuru Stream, Taupo Stream, Duck Creek, Browns Bay Stream and the Onepoto watercourse have local recreation values where white baiting, eeling, paddling and some shellfish gathering are carried out.

Most of the streams, harbour and coastline have good public access.

The Greenaway report concludes that, based on the intense use of the harbour area and the results of user surveys, the option that has the least effect on the following values is preferred:

- The frequency of health warnings for contact recreation.
- The ability to consume shellfish taken from the area.
- The quality of habitat and shellfish.

2.5.2 PORIRUA HARBOUR

The Onepoto Arm of the harbour is used extensively for waka ama, rowing, wind surfing, flat-water kayaking, kite surfing, small boat sailing and power boating. While shellfish gathering is not advised, cockle harvesting is popular, and flounder are available. Water quality for bathing is measured by the GWRC at the Porirua Rowing Club site (Onepoto) which is a sheltered swimming site. Two sites are monitored by the GWRC for water quality for bathing.

2.5.3 PAUATAHANUI INLET

Pauatahanui Inlet is popular for small boat sailing and training, swimming (particularly at the Dolly Varden Beach and off the Parramatta Bridge), shellfish harvesting, floundering, set-netting, jet skiing, flat water kayaking, waka ama, wind surfing, kite surfing, power boat racing, stand-up paddle boards and motor boating.

2.5.4 TITAHI BAY

Titahi Bay is a popular surfing site, particularly for beginners, and an important swimming beach, with the Titahi Bay Surf Lifesaving Club located centre-stage. Snorkelling, windsurfing, fishing, walking and picnicking are also popular. There are several surf breaks are located south of Titahi Bay, including the regionally significant Stevo's at Wairere. Three sites are monitored by the GWRC for water quality for bathing.

Fishing is also popular offshore along the Mana Island marine bridge ('The Bridge') to the west of the bay and off many rocky coastal areas.

2.6 UNTREATED OVERFLOWS FROM NETWORK

2.6.1 CURRENT FREQUENCY OF OVERFLOWS UNDER VARIOUS DESIGN STORMS

The Porirua wastewater conveyance network includes 9 constructed (or controlled) raw wastewater overflows at pump stations and numerous uncontrolled overflows (typically manholes) which operate during periods of sustained wet weather when stormwater inflows, or groundwater infiltration into the wastewater network, cause flows to exceed the capacity of pipelines and pumping stations. The resulting overflows discharge either directly to Porirua Harbour, or to stormwater drains and streams that discharge to the harbour, causing reduced water quality and potentially increased public health risk.

The City Centre Pump Station (PS 20) receives sewage from Mana, Whitby, Cannons Creek and Tawa before pumping through the Tangere Drive Pump Station (PS34) and thence to the WWTP. PS20 can become overloaded during high rainfall and is a major overflow point resulting in overflows to Porirua Stream (typically 8-10 per year).

The results of recent modelling of the existing network performance (current population), for various design storms, is shown in Table 2-4. The results show that depending on the design storm, there can be between 5 and 9 controlled overflows and between 37 and 325 manholes discharging from the network. Total overflow volumes range between 8.000 and 95,000m[3]. By way of comparison, this volume equates to between 3 and 38 Olympic-sized swimming pools[3].

[3] Typically, an Olympic pool is 50m long x 25m wide x 2m deep ~2500m^3

Table 2-4 Modelled Frequency of Overflows from Existing Network under Current Population for Various Design Storms (Source: WCS Engineering)

Scenario	Design Storm	Rainfall Event	# of Manhole Overflows	# of Constructed Outfall Overflows	Manhole Overflow Volume (ML)	Outfall Overflow Volume (ML)	Total Overflow Volume (ML)
Existing System, Current Population	5Y	5/13/2015	325	9	65	29	95
	2Y	11/14/2016	306	9	58	23	81
	1Y	4/5/2017	137	7	36	16	52
	2EY	12/9/2014	84	7	13	4.2	17
	4EY	8/13/2010	37	5	7	1.1	8

2.6.2 PROPOSED FREQUENCY OF OVERFLOWS FROM NETWORK UPGRADE OPTIONS (2057)

For the purposes of this assessment, it has been assumed that all network upgrade options that increase the volume of wastewater conveyed to the Porirua WWTP during wet weather (ie through greater conveyance capacity and/or storage in the network), will be designed for the 6-month storm event (2EY) at pump stations () and for the 12-month (1Y) storm event at manholes. Therefore, for the upgraded network in 2057, pump station overflows will be eliminated in the 6-month storm event and in the 1-year event at manholes. However, for greater intensity storms, there will be overflows from the constructed overflows and at manholes.

It is assumed that this reduction in frequency of overflows from the wastewater network, under all the upgrade options, will result in an approximately commensurate reduction in the annual microbiological load to the harbour.

2.7 RESULTS OF OVERFLOW AND WATER QUALITY MONITORING IN HARBOUR

Wellington Water has developed a wet weather overflow monitoring plan to characterise the quality of the receiving waters based on a Monitoring Plan prepared by Stantec. Sampling has been carried out at 7 freshwater sites (blue in Figure 2-2)., four estuarine sites (green in Figure 2-2) and at the overflow site at the City Centre Pump Station 20 (red in Figure 2-2)). The methodology, sampling sites and the results of monitoring are described in report attached as Appendix C of the *Water Quality and Ecology Comparative Effects Assessment Report* prepared by Stantec for this MCA process. Overflow and receiving water samples were analysed for a suite of contaminants including the bacterial indicators *E. coli, Enterococci* and faecal coliforms.

The results of sampling show high concentrations of bacterial indicators in the PS 20 overflow that are also reflected in the Porirua Stream water results upstream and downstream of PS20. These results are supported by stormflow monitoring in the stream carried out by GWRC in 2017. Wet weather monitoring in Kenepuru Stream, Onepoto Stream, Browns Bay Stream and Duck Creek also show significantly elevated concentrations of faecal indictors indicating the influence of network overflows.

The Porirua/Kenepuru Stream systems, together with several large stormwater pipes in the Porirua CBD discharge into the southern end of the Onepoto Arm. The results of monitoring show significantly elevated bacterial indicator concentrations at the Wi Neera Drive sampling site (well in excess of the *enterococci* limit). Concentrations are generally highest on the first day after overflows commence, reducing rapidly as stormflows recede and contaminants are tidally flushed. Monitoring at Mana Marina on the outgoing tide shows relatively low bacterial contaminants in the Pauatahanui Inlet compared with the Onepoto Arm and suggest a relatively high level of compliance with bacterial limits.

Porirua City Council also carried out monthly monitoring of nine sites on catchment streams between January 2015 and August 2016. The E. *coli* concentrations were high at all of the sites with the Semple Street site showing exceptionally high bacteria concentrations even during dry weather (indicating likely leakage from the sewer network).

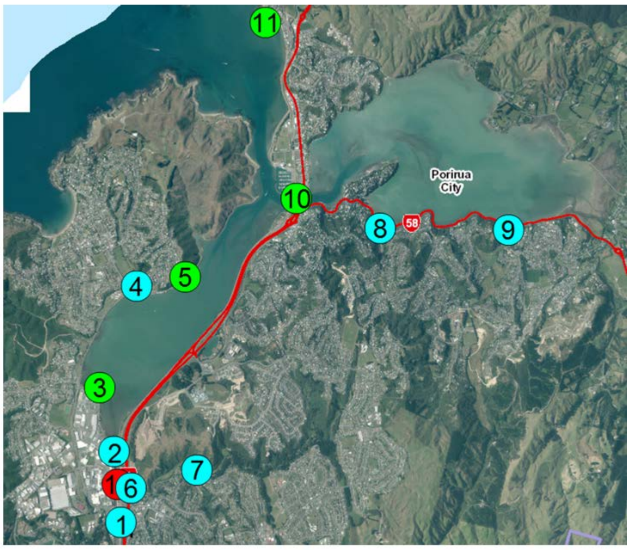


Figure 2-2 Locations of Freshwater (blue), Estuarine (green) and Wastewater (red) Sampling Sites (Source: Stantec, 2019)

2.8 RESULTS OF MONITORING FOR SUITABILITY FOR BATHING AT POPULAR SWIMMING SITES

The GWRC monitors recreational water quality at a number of 'popular' swimming sites in the region, although swimming can occur at many sites around the coast. The "Suitability for Recreation Grades"[4] for the 12 sites in the Porirua City Council area (see Figure 2-3) ranged from 'fair' to 'good', at the end of the 2016/17 swimming season, with the site at the waka ama launching ramp at Wi Neera Drive with insufficient data to report (Brasell & Morar, 2017)[5]. There are no freshwater bathing sites monitored in the study area.

[4] Derived from MfE (2003)

5 Brasall & Morar, 2017 Is it safe to swim? Recreational water quality monitoring results for 2016/17 (GWRC Publication No GW/ESCI-T-17/98

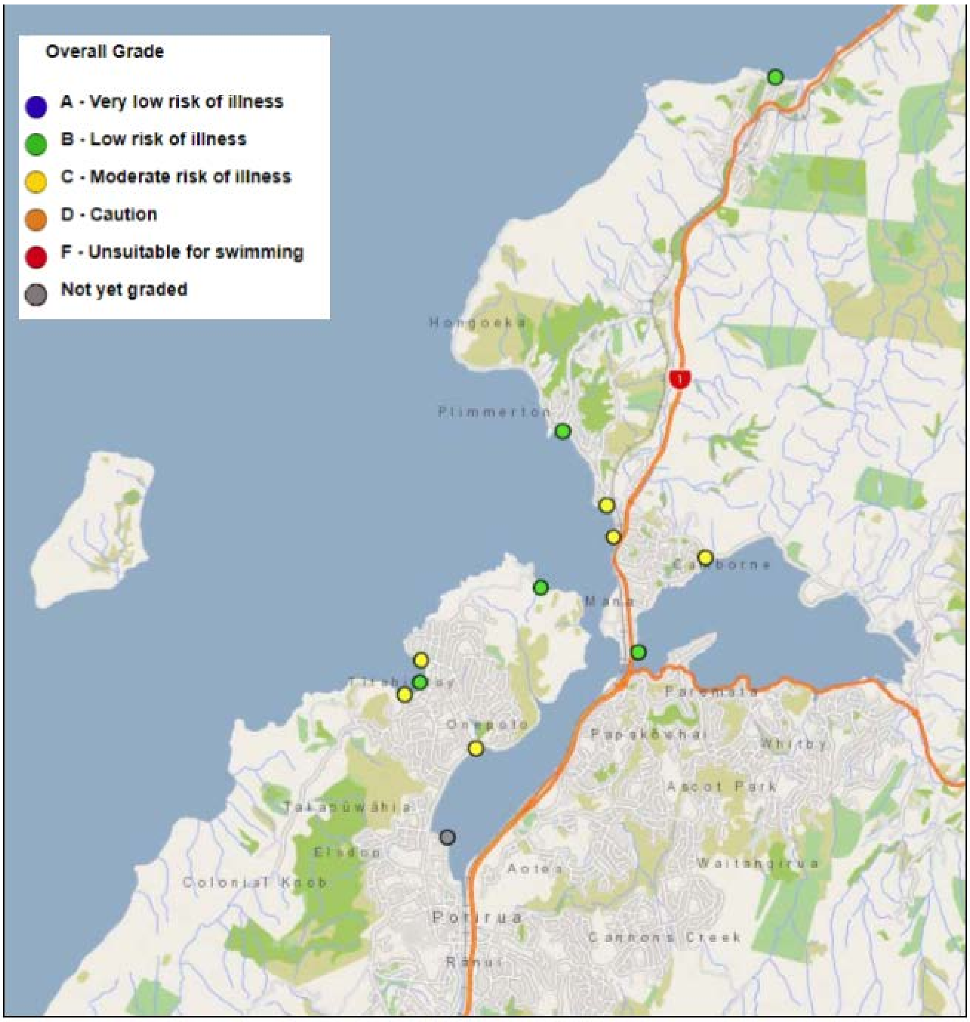


Figure 2-3 Harbour Marine Bathing Sites and Overall Suitability for Bathing

2.9 RESULTS OF MONITORING FOR SUITABILITY FOR SHELLFISH GATHERING IN HARBOUR

Results of monitoring of water in 2016/17 by the GWRC at one site in the harbour (Porirua Rowing Club)) shows a median faecal coliform concentration of 56 organisms/100mls (MfE 2003 guideline =14) with 65% of samples exceeding 43 organisms (MfE guideline allows 10% exceedance). These results show that shellfish at this site are not suitable for consumption.

It is unlikely that the risks associated with shellfish gathering, from within the harbour catchment, will be significantly reduced as a result of the proposed reduction in frequency of overflows. Other sources of contamination (eg from leaky sewer pipes and stormwater runoff) will continue to be a source of micro-organisms as well as other pollutants (eg heavy metals such as copper and zinc). Filter feeding shellfish such as pipis, mussels and cockles will accumulate contaminants such as pathogens and heavy metals over time from a variety of point and nonpoint sources.

2.10 PORIRUA WASTEWATER TREATMENT PLANT

2.10.1 CAPACITY AND BYPASSES

The Porirua WWTP treats wastewater through screens and tanks which use aeration and recycled microorganisms to break down most of the pollutants, converting the balance to solids. Three clarifiers then settle out solids (for landfill disposal). The clear water then passes through an ultraviolet (UV) disinfection process prior to discharge to the surf zone via short outfall at Rukutane Point. The plant currently has capacity to fully treat up to about 1000 litres per second, with another 600litres per second bypassing through fine screens only before discharge. A total of 21 bypass events occurred during 2018 which were almost always associated with heavy rainfall in the catchment, usually in the months June to September (and seldom during the summer months (January to March). The average volume bypassed during these events was approximately 3100m^3.

Currently pumps can deliver 1300 L/s to the WWTP, so it is possible that up to 300 L/s is bypassed. Under all the proposed upgrade options the WWTP capacity will be increased to 1500 L/s so that no bypasses occur.

The plant also currently has an emergency "overflow" at the inlet channel so that if flows were to exceed the capacity of the plant, or there as a plant malfunction, there would be a raw (unscreened) discharge to the overflow – the plant will not overflow under normal and stormflow circumstances.

However, for the "Greater Conveyance" options (ie 1, 4 & 7), flows up to 2600 L/s (updated model is 2900 L/s) will be conveyed to the plant so that 1500 L/s goes through the WWTP and the remaining 1400 L/s will go through a new "storm flow" treatment process- which is yet to be decided (but could include screening, solids reduction and UV).

2.10.2 DISCINFECTION OF TREATED WASTEWATER AT WWTP

Pathogens in wastewater are reduced by passage through primary and secondary treatment processes (such as occurs at Porirua). Factors such as retention time within the plant are important. UV disinfection is a well-established means of inactivating microorganisms in treated wastewater. UV light alters the genetic code to prevent reproduction.

The secondary treatment system plus UV at the Porirua WWTP provides for significant reduction of *enterococci* concentrations in the fully treated wastewater. Based on monitoring carried in May to July 2018, *enterococci* concentrations are reduced from 100,000 to 1 million per 100mls in raw sewage to an average of around 5,600 cfu/100mls (95th percentile of 20,800) before UV disinfection. Following UV irradiation, average *enterococci* concentrations are reduced to around 113 cu/100mls (95th percentile of 670).

However, as noted earlier, some pathogens are more resistant to UV disinfection than others. Pathogens such as viruses are not currently measured in the WWTP wastewater. The relationship between pathogens and indicators such as *enterococci* will need to be assessed to more fully determine the risks from the existing and other outfall options.

2.10.3 RESULTS OF WET WEATHER MONITORING NEAR EXISTING WWTP OUTFALL

Wellington Water monitors the quality of shoreline waters (*enterococci* and faecal coliforms) near the existing WWTP outfall during wet weather when inflows exceed the capacity of the WWTP resulting in bypasses which are screened (but do not go through the full secondary treatment and UV process). These sites are shown on Figure 2-4.

Figure 2-4 WWTP Shoreline Monitoring Sites

From shoreline monitoring results at all sites, except the northern control site and the southern-most site (Te Korohiwa Rocks below the WWTP), the 95th percentile value for *enterococci* exceeds the 500 organisms/100mls criterion indicating a "*significant risk of high levels of minor illness transmission*" for contact recreation – although it is noted that recreational use of these shoreline waters is likely to be low during such events. The faecal coliform results indicate that the northern control site would likely comply with MfE (2003) shellfish gathering guidelines, Mt Couper and Te Korohiwa Rocks are marginal, while sites in Titahi Bay and 200m either side of the outfall would not comply.

In summary, the results indicate that wet weather bypasses from the WWTP appear to have a relatively localised effect on shoreline waters 200m either side of the outfall – and very little impact beyond 700m from the discharge.

2.11 RESULTS OF DHI WWTP OUTFALL OPTIONS MODELLING

2.11.1 OVERVIEW

DHI Water and Environments Ltd (DHI) has modelled the effects of alternative coastal wastewater discharge options for the WWTP. These include the existing shoreline outfall at Rukutane Point, a new shoreline outfall at Round Point (immediately seaward of the WWTP), and two offshore outfalls located approximately 250m and 525m from the existing discharge in 10m and 15m of water respectively. Both the offshore outfall options were assumed to consist of a 150 m long diffuser with an inner diameter of 1.0 m with 60 alternating ports spaced 2.5 m apart. The ports would be fitted with "duckbill" valves that would maintain high jet velocities to maximise the dilution of wastewater from the diffuser.

The locations of these discharge options are shown in Figure 2-5.

Figure 2-5 Locations of WWTP and Coastal Wastewater Discharge Options (Source: DHI)

2.11.2 DISCHARGE SCENARIOS

Discharge scenarios considered include future average daily flow, future peak wet weather flows and a future overflow scenario which includes a split of flows through the WWTP and an overflow component.

The alternative discharge locations have been assessed in the context of the levels of dilution achieved by the existing discharge for both current day and future daily flows (300 L/s and 455 L/s respectively), a future peak wet weather flow of 1500 L/s and an overflow scenario, where a peak discharge rate of 2600 L/s occurs.

For the dry weather and peak wet weather flows, continuous fixed flows rates are assumed while for the future overflow scenarios, time-varying discharge rates has been used based on outputs from network model simulations. The current average dry weather flow is derived from the average from WWTP monitoring data for the period 30 September 2017 to 30 September 2018. The future average dry weather flow is derived from a population increase from to 128,000 in 2057.

Both *enterococci* and a virus have been modelled with appropriate, time-varying inactivation (die-off) rates. A source concentration of 1000 count/100 mL has been assumed for the bacteria and the virus.

The results of modelling the discharge scenarios (concentrations of *enterococci* and the model virus) are presented for existing beach monitoring sites along the coastline (see Figure 2-5).

A summary of the results of the DHI modelling is included in Appendix A.

2.12 COMPARATIVE RISKS TO CONTACT RECREATION FROM NETWORK OPTIONS

The proposed reduction in constructed and manhole overflows from all the network upgrade options will result in a commensurate reduction in the microbiological load to the harbour during wet weather. This will have an overall positive effect on water quality for contact recreation in the harbour (such as swimming, surfing and falling out of sailing dinghies) and a consequent reduction in public health risk. However, the extent of this reduction in risk is not currently quantifiable and there will still be times when the harbour is not suitable for contact recreation.

The proposed reduction in overflows will reduce the frequency with which contact recreation health warnings at those sites are issued.

It is unlikely that the risks associated with shellfish gathering, from within the highly modified harbour catchment, will be significantly reduced as a result of the proposed reduction in overflows. Other sources of contamination will continue to enter the harbour during both dry and wet weather.

2.13 COMPARATIVE RISKS TO CONTACT RECREATION FROM WWTP DISCHARGE OPTIONS

The Porirua WWTP produces a high-quality effluent which has relatively low microbiological concentrations. The secondary treatment system and UV disinfection system provides at least a 99.9% reduction in microorganisms (as measured by the indicator bacteria *enterococci),* compared with raw sewage that enters the plant. The shoreline outfall at Rukutane Point is designed to discharge just below the surface of the water for most of the time. Micro-organisms are therefore mostly reduced after discharge through the processes of wind and tidally based dispersion as well as die-off in the marine environment. There is only limited influence from marine currents which operate further offshore. Under onshore wind conditions, the effluent plume will tend to stay closer to the shoreline.

Under current average daily flows, the DHI modelling shows that there are increases in the concentration of *enterococci* and viruses (compared to background concentrations) at the 200m sites to the SW and E of the discharge - with smaller increases at the Titahi Bay South site. However, there are no exceedances at any sites of the PNRP marine bathing water criterion or the MfE (2003) “Alert” or “Action” bathing water guidelines. Exceedance of the PNRP criterion (which is based on the MfE Guidelines) represents a *significant risk of high levels of minor illness transmission”,* which is generally considered an unacceptable level of risk. The MfE Alert” or “Action values are “early warning triggers” based on keeping illness risks below 2% (ie less than 20 per 1000 swimmers).

Under future average, peak wet weather and overflow scenarios at the existing outfall, there are further increases of *enterococci* and viruses at the nearest sampling sites and at Titahi Bay South. Despite these increases relative to the average flow scenario, there are no exceedances of the PNRP bathing water criterion predicted by the modelling, although concentrations in excess of the MfE Alert” or “Action values would occur at the 200m SW and E sites and at the Titahi Bay Beach site. While the risks to bathers are still relatively low under, they are higher than for the daily average flow scenario.

Relocating a shoreline outfall approximately 500m to the west (immediately to the east of Round Point) either for all flows or for wet weather/overflows reduces the concentration of *enterococci* and viruses predicted at the sites closest to the existing discharge point and at the Titahi Bay Beach South site. This relocation would therefore improve the overall water quality close to recognised bathing and surfing areas compared with the existing site - and result in some consequential reduction in public health risks. However, the concentrations of *enterococci* and viruses are predicted to increase at the nearby Ti Korohiwa site. This area is less popular for bathing but has reasonable public access. Despite this reduction in water quality, there are no exceedances of the PNRP bathing water criterion predicted by the modelling - although concentrations of *enterococci* in excess of the MfE Alert” or “Action values would be expected.

Relocating a discharge offshore to a depth or either 10m or 15m would provide significant separation from the shoreline. The outfall diffuser would consist of a series of ports through which wastewater is jetted - thus maximising the dilution that contaminants would be subject to before reaching the surface. In general, the deeper the outfall, the more dilution is available. Once the diluted wastewater reaches the surface (it is mainly freshwater and therefore more buoyant than seawater), it will be subject to further influences from wind and currents. Microorganisms will die-off over time as they are subjected to other influences (eg salinity, temperature) as well as sunlight. Relatively strong currents as well as tidal influences in area (especially around the Bridge) will move contaminants generally away from the shoreline.

As a result of the design of the diffuser and the offshore environmental conditions, the modelling predicts that for the 10m option there will be only small increases of *enterococci* or viruses at shoreline sites. With the 15m option, virtually no increases in *enterococci* or viruses are predicted. As there would be no exceedances of the PNRP bathing water criterion of the MfE Alert” or “Action values, the risks from bathing at shoreline sites are expected to be low to negligible.

Overall, the modelling shows that while the existing discharge raises shoreline *enterococci* and virus concentrations at nearby sites, the overall risks to bathers in Titahi Bay from this source are likely to be low. Some increase in risk occurs with higher flows but these do not exceed the PNRP bathing water *enterococci* criterion. Shifting the entire discharge (or high flow discharges) 500m to the west reduces risks around the existing discharge and in Titahi Bay but elevates these risks moderately at the adjacent Ti Korohiwa site. Offshore outfalls at either 10m or 15m reduce risks to shoreline bathers to either very low or to negligible.

3 COMPARATIVE ASSESSMENT OF OPTIONS

3.1 OVERVIEW

All the options assume that when the upgrade works is completed, pump station overflows will be eliminated in the 6-month storm and in 1-year storm at manholes. On this basis, it has therefore been assumed that all the network options have a similar weighting for the purposes of assessing comparative public health effects/risks.

For the purposes of the WWTP outfall discharge options, it is assumed that there will be secondary treatment of all flows at the WWTP up to 1500 litres per second with UV disinfection.

The assumed WWTP discharge quality (*enterococci*) for all flows (including overflows) is 1000 organisms/100mls on a 95th percentile (ie worst case) basis. However, some discharge options include conveying more flows to the WWTP during wet weather. In the absence of storage in the network, this will result in flows in excess of the WWTP capacity of 1500 litres per second and bypassing of these flows around the secondary treatment facility. In this case, additional stormflow treatment for the flows greater than 1500 L/s to reduce solids to achieve the required *enterococci* discharge quality. UV disinfection requires a minimum transmissivity of light from the lamps through the wastewater to achieve optimum performance.

In summary:

- The proposed reduction in network overflows (and therefore improvement in water quality as a result of a lower microbiological load) will be the same for all options - therefore the comparison of risks is based primarily on WWTP discharge options.
- There is a progressive benefit between full conveyance, greater conveyance and the twin storage options because lower peak flows will mean less wastewater entering the WWTP (with full storage in the network eliminating flows beyond 1500l/s at the WWTP).
- The existing WWTP produces a good quality effluent with generally low concentrations of *enterococci* during dry weather – but higher concentrations during bypass conditions. Regardless, the effects of the existing discharge (even during wet weather) appear relatively localized.
- All options involve secondary treatment and UV disinfection to 1500l/s plus partial treatment of higher flows. The nature of this partial treatment is yet to be determined but could include screening, solids reduction and UV to achieve the required discharge quality.
- The DHI modelling shows that under future discharge scenarios, there is relatively little difference between the likely water quality/public health effects of the shoreline options (noting that the relocating further from the main recreational area at Titahi Bay would further reduce the risks to bathers).
- The DHI modelling shows that under future discharge options (relative to the shoreline options), the offshore options (particularly the 15m option) would reduce water quality/public health effects to very low to negligible levels.
- A quantitative risk assessment should be carried out to determine the risks of individual exposure to pathogens (eg viruses) as a result of the WWTP discharge.

3.2 COMPARATIVE ASSESSMENT

The comparative assessment of the likely public health effects/outcomes of the 9 upgrade options is shown in Table 3-1.

Table 3-1 The Comparative Assessment of the likely Public Health Effects/Outcomes of the 9 Upgrade Options

Option No.	Description	Score	Summary	Reason
1	Greater network conveyance + Existing treatment + Existing shoreline discharge	2	Pump station overflows eliminated in the 6-month storm and in 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent overflows beyond 1500l/s.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Improved microbiological shoreline water quality near outfall and in Titahi Bay. Compliance with PNRP bathing criterion but predicted exceedance of MfE bathing guidelines under future peak flows and overflow scenarios. Moderate to high risk to shoreline bathers.
2	Greater network conveyance + Increased network storage + Existing treatment + Existing shoreline outfall	2.5	Pump station overflows eliminated in the 6-month storm and in 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent flows beyond 1500l/s (although lower than for Option 1).	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Improved microbiological shoreline water quality near outfall and in Titahi Bay. Compliance with PNRP bathing criterion but predicted exceedance of MfE bathing Alert and Action guidelines. Risk to shoreline bathers lower than Option 1.
3	Twin network storage + Existing treatment + Existing shoreline outfall	3.5	Pump station overflows eliminated in the 6-month storm and in 1-year storm at manholes. Full treatment of flows to 1500l/s. Storage eliminates flows in excess of 1500l/s at WWTP.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Significantly improved microbiological shoreline water quality near outfall and in Titahi

Option No.	Description	Score	Summary	Reason
				Bay due to elimination of overflow discharges. Compliance with PNRP bathing criterion and likely MfE bathing Alert and Action guidelines. Risk to shoreline bathers lower than Option 2.
4	Greater network conveyance + Existing treatment + New shoreline outfall	2	Pump Station overflows eliminated in the 6-month storm and in 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent flows beyond 1500l/s.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour Improved microbiological water quality near to existing outfall (and Titahi Bay) but commensurate reduction in shoreline water quality at new site 500m to west. Compliance with PNRP bathing criterion but predicted exceedance of MfE bathing guidelines under future peak flows and overflow scenarios. Moderate to high risks to shoreline bathers
5	Greater network conveyance + Increased network storage + Existing treatment + New shoreline outfall	2.5	Pump station overflows eliminated in the 6-month storm and in 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent overflows beyond 1500l/s (although lower than for Option 4).	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Improved microbiological shoreline water quality near existing outfall and in Titahi Bay (better than for Option 4) but commensurate reduction in shoreline water quality at new site 500m to west. Compliance with PNRP bathing criterion but predicted exceedance of MfE bathing Alert and Action guidelines. Risks to shoreline bathers lower than Option 4

Option No.	Description	Score	Summary	Reason
6	Twin network storage + Existing treatment + New shoreline outfall	3.5	Pump Station overflows eliminated in the 6-month storm and in the 1-year storm at manholes. Full treatment of flows to 1500l/s. Storage eliminates flows beyond 1500l/s at WWTP.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Significantly improved microbiological shoreline water quality near outfall and in Titahi Bay due to elimination of overflow discharges. Reduction in shoreline water quality close to new discharge. Compliance with PNRP bathing criterion and likely MfE bathing Alert and Action guidelines. Risks to shoreline bathers lower than Option 5.
7	Greater network conveyance + Existing storage + New offshore outfall	4	Pump station overflows eliminated in the 6-month storm and in the 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent flows beyond 1500l/s.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering. Significantly improved microbiological shoreline water quality at all shorelines sites result in either low (10m) or very low to negligible (15m) risks to shoreline bathers. Risks comparatively lower than for shoreline options.
8	Greater network conveyance + Increased storage + Existing treatment + New offshore outfall	4.5	Pump station overflows eliminated in the 6-month storm and in the 1-year storm at manholes. Full treatment of flows to 1500l/s. Increased flows to WWTP resulting in more frequent flows beyond 1500l/s (although less than Option 7).	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Significantly improved microbiological shoreline water quality at all shorelines sites result in either very low (10m) or very low to negligible (15m) risks to shoreline bathers. Risks comparatively lower than for Option 7.

Option No.	Description	Score	Summary	Reason
9	Twin network storage + Existing treatment + New offshore outfall	5	Pump station overflows eliminated in the 6-month storm and in the 1-year storm at manholes. Full treatment of flows to 1500l/s. Storage eliminates flows beyond 1500l/s at WWTP.	Improved water quality in streams and harbour through reduced microbiological load and with some unquantifiable reduction in contact recreation health risks. No measurable improvement in risks around shellfish gathering in harbour. Significantly improved microbiological shoreline water quality at all shorelines sites result in either very low (10m) or negligible (15m) risks to shoreline bathers Risks comparatively lower than for Option 8

LEGAL ENTITY

Phone:
Fax:

Attachment A: Summary of the results of DHI outfall discharge modelling

Summary of Results of DHI Outfall Discharge Modelling

Overview

DHI Water and Environments Ltd (DHI, 2019) has modelled the effects of alternative coastal wastewater discharge options for the WWTP. These include the existing shoreline outfall at Rukutane Point, a new shoreline outfall at Round Point (immediately seaward of the WWTP), and two offshore outfalls located approximately 250m and 525m from the existing discharge in 10m and 15m of water respectively. Both of the offshore outfall options were assumed to consist of a 150 m long diffuser with an inner diameter of 1.0 m with 60 alternating ports spaced 2.5 m apart. The ports would be fitted with "duckbill" valves that would maintain high jet velocities to maximise the dilution of wastewater from the diffuser.

The locations of these discharge options are shown in Figure 1.

Figure 1 Locations of WWTP and coastal wastewater discharge options (Source: DHI)

Discharge Scenarios

Discharge scenarios considered include future average daily flow, future peak wet weather flows and a future overflow scenario which includes a split of flows through the WWTP and an overflow component.

The alternative discharge locations have been assessed in the context of the levels of dilution achieved by the existing discharge for both current day and future daily flows (300 L/s and 455 L/s respectively), a future peak wet weather flow of 1500 L/s and an overflow scenario, where a peak discharge rate of 2600 L/s occurs.

For the dry weather and peak wet weather flows, continuous fixed flows rates are assumed while for the future overflow scenarios, time-varying discharge rates has been used based on outputs from network model simulations. The current average dry weather flow is derived from the average from

WWTP monitoring data for the period 30 September 2017 to 30 September 2018. The future average dry weather flow is derived from a population increase from to 128,000 in 2057.

Both *enterococci* and a virus have been modelled with appropriate, time-varying inactivation (die-off) rates. A source (discharge) concentration of 1000 count/100 mL has been assumed for the bacteria and the virus.

The results of modelling the discharge scenarios (concentrations of *enterococci* and the model virus) are presented for Wellington Water beach monitoring sites along the coastline as shown in Figure 2.

Figure 2 Beach monitoring sites modelled by DHI (Source: DHI)

DHI Modelling Results

<u>Current average daily flow (300l/s) at existing outfall</u>

As expected, current average daily discharges from the existing Rukutane Point outfall have greatest impact (ie most increase in *enterococci* and virus concentrations), at the 200m SW and 20m E sites. A significantly lower impact is noted at the Titahi Beach monitoring sites, while there are only very small effects at the more remote monitoring sites at Te Korohiwa Rocks and Mount Couper.

All sites comply with the PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100mls and the MfE (2003) "Alert" bathing guideline of 140 enterococci/100mls.

<u>Future average daily flow (455l/s) at existing outfall, new shoreline, 10m and 15m offshore outfalls</u>

For a future average daily flow of 455l/s from the existing outfall, there is an increase in *enterococci* and virus concentrations at all the sites. For the new shoreline discharge, there is a significant increase in *enterococci* and virus concentrations at the Ti Korohiwa Rocks site with significant reductions at other sites. The 10m outfall provides significant dilution of the discharge and this increases further at the 15m outfall. Both offshore outfalls therefore result in significant reductions in *enterococci* and virus concentrations at all sites compared with the shoreline options.

All sites comply with the PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100mls under all discharge options. However, for the existing shoreline discharge, the MfE (2003) "Alert" bathing guideline of 140 enterococci/100mls is marginally exceeded at sites at 200m SW and 200m E and approaches the MfE "Action" guideline for the new shoreline outfall at the Ti Korohiwa site. No other discharge locations result in an exceedance of the MfE Alert bathing guideline.

Future peak wet weather flows (1500l/s) at existing outfall, new shoreline, 10m and 15m offshore outfalls

Depending on the prevailing wind at the time of the peak wet weather flow, a discharge from the existing outfall results in significant increases in *enterococci* and virus concentrations at the two sites 200m SW and 200m E sites. Lower impacts occur at the Titahi Bay sites while there are relatively low impacts at the Te Korohiwa and Mount Couper sites. For a new shoreline outfall, the effects are greatest at the Ti Korohiwa Rocks site with reduced effects at the sites closer to the existing outfall.   Relatively low effects occur at either the Titahi Bay or Mount Couper sites.

For the 10m outfall option, the *enterococci* and virus concentrations at the sites closest to the existing outfall are reduced significantly (by at least 90% compared with the existing outfall). The reductions compared with the existing outfall are higher at the Ti Korohiwa Rocks and Mount Couper sites. Under neap tide and more typical wind conditions there are times when the predicted concentrations at these two sites are higher than predicted for the existing shoreline discharge.

For the 15m outfall option, the concentrations at the monitoring sites to the west and east of the existing discharge site are reduced by at least 99% (compared with the existing outfall). Similar levels of reductions occur at the Titahi Beach monitoring sites. At the Ti Korohiwa Rocks site, concentrations are reduced by between 82 and 97%. At the Mount Couper site, concentrations are reduced between 56 and 94%.

Compliance with PNRP criterion and MfE (2003) bathing water guidelines under typical winds and spring tide scenario

All sites comply with the PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100mls for any of the discharge options.

For the existing shoreline discharge, the MfE (2003) "Action" bathing guideline of 280 enterococci/100mls is marginally exceeded at the 200m SW site and the "Alert" bathing guideline of 140 enterococci/100mls is exceeded at the 200m E site.

For a new shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the Ti Korohiwa site.

No offshore discharge locations result in an exceedance of the MfE "Alert" bathing guideline.

Compliance with PNRP criterion and MfE (2003) bathing water guidelines under onshore winds and spring tide

All sites comply with PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100ml for any of the discharge options.

For the existing shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is marginally exceeded at the 200m SW site and the Alert bathing guideline of 140 enterococci/100mls is exceeded at the 200m E site.

For a new shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the Ti Korohiwa site.

No offshore discharge locations result in an exceedance of the MfE "Alert" bathing guideline at any shoreline sites.

Compliance with PNRP criterion and MfE (2003) bathing water guidelines under typical winds and neap tide

All sites comply with the PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100mls for any of the discharge options.

For the existing shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the 200m SW site and the "Alert" bathing guideline of 140 enterococci/100mls is exceeded at the 200m E site.

For a new shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the Ti Korohiwa site.

No offshore discharge locations result in an exceedance of the MfE "Alert" bathing guideline at any shoreline sites.

Compliance with PNRP criterion and MfE (2003) bathing water guidelines under onshore winds and neap tide

All sites comply with the PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100mls for any of the discharge options.

For the existing shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the 200m SW site and marginally exceeded at the 200m E site. The MfE "Alert" bathing guideline of 140 enterococci/100mls is marginally exceeded at the Titahi Beach South site.

For a new shoreline discharge, the MfE "Action" bathing guideline of 280 enterococci/100mls is significantly exceeded at the Ti Korohiwa site.

No offshore discharge locations result in an exceedance of the MfE "Alert" bathing guideline at shoreline sites.

Future overflows at existing outfall, new shoreline, 10m and 15m offshore outfalls

The overflow discharge scenarios modelled by DH are shown in Table 2-5. Four different receiving wind and tidal conditions were considered for the overflows modelling – ie onshore and typical winds for either neap and spring tides[1]. The overflow scenarios are based on a time varying hydrograph, with 58% peak flow through the WWTP and the remaining 42% through the overflow system. The peak flow (~2600 L/s combined flow) coincides with low water to provide a worst-case

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[1] Neap tides have a smaller difference between high and low tide (and therefore water levels) than a spring tide. Dilutions will vary depending on the water level over the outfall discharge.

scenario of minimum initial dilution. The combined discharge exceeds the future average daily flow rate of 455 L/s for a total of 36 hours.

Table 2-6 Modelled overflow scenarios (Source: DHI)

Overflow Scenarios				
	Scenario 9	Scenario 10	Scenario 11	Scenario 12
WWTP Flow and Overflow	Time varying with 36 hours above future ADF rate			
Discharge location	Existing Shoreline Rukutane Point	Existing Shoreline Rukutane Point	New Ocean Outfall Round Point	New Ocean Outfall Round Point
Outfall location	Existing Shoreline Rukutane Point	New Shoreline Round Point	New 10 m Ocean Outfall Round Point	New 15 m Ocean Outfall Round Point

The results of overflow modelling show a similar pattern to the wet weather overflows results. Depending on the prevailing wind at the time of overflow, a discharge from the existing outfall results in significant increases in *enterococci* and virus concentrations at the two sites 200m SW south and 200m E sites. Lower impacts occur at the Titahi Bay sites, while there are relatively low impacts at either the Te Korohiwa or Mount Couper sites.

For an overflow via the new shoreline discharge, concentrations at the monitoring sites at 200 SW and 200E are reduced compared with the existing outfall. Although under neap tides and onshore winds there is a small (< 5%) increase in the predicted 90th percentile concentration at the 200m E site. At the Titahi Beach sites, significant reductions in concentrations occur (25 to 42%) compared to the existing discharge. At the Ti Korohiwa Rocks monitoring site increases in concentrations of between 23 and 42 % occur. At the Mount Couper site, reductions in the concentrations range from 7 to 38%.

For an overflow via a 10 m outfall, reductions in the concentrations of at least 86% occur at the monitoring sites near the existing discharge and the Titahi Beach sites. At Ti Korohiwa Rocks site, reductions in concentrations of between 46 and 75% occur, while at the Mount Couper site reductions in the predicted concentrations of between 27 and 78% occur.

For an overflow via the 15 m outfall, a reduction in concentrations of at least 95% at all sites is predicted by the modelling.

Compliance with PNRP and MfE 2003 Guidelines

<u>Overflow under typical winds and spring tide scenario</u>

All sites comply with PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100ml for any of the discharge options.

For the existing and new shoreline discharge, the MfE (2003) “Alert” guidelines are exceeded at the 200m SW and 200m E sites.

For the new shoreline discharge, the MfE “Action” guideline is exceeded at the Ti Korohiwa site.

No offshore discharge locations result in an exceedance of the MfE “Alert” bathing guideline at shoreline sites.

<u>Overflow under onshore winds and spring tide scenario</u>

All sites comply with PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100ml for any of the discharge options.

For the existing and new shoreline discharge options, the MfE (2003) "Action" guidelines are exceeded at the 200m SW sites and the MfE "alert" guideline is exceeded for the existing discharge at the 200m E site.

For the new shoreline discharge option, the MfE "Action" guideline is exceeded at the Ti Korohiwa site.

No offshore discharge options result in an exceedance of the MfE "Alert" bathing guideline at shoreline sites.

Typical winds and neap tide scenario

All sites (except for the new shoreline discharge option close to the Ti Korohiwa site) comply with PNRP coastal bathing water criterion of a 95th-percentile value of 500 *enterococci*/100ml for any of the discharge options.

For the existing and new shoreline discharge options, the MfE (2003) "Action" guidelines are exceeded at the 200m SW sites and the MfE "alert" guideline is exceeded for the existing and new discharge at the 200m E site.

For the new shoreline discharge option, the MfE "Action" guideline is exceeded at the Ti Korohiwa site.

No offshore discharge options result in an exceedance of the MfE "Alert" bathing guideline at shoreline sites.

Onshore winds and neap tide

All sites comply with PNRP coastal bathing water criterion of a 95th-percentile value of 500 enterococci/100ml for any of the discharge options.

The existing and new shoreline discharge options exceeds the MfE 2003 "Action" bathing guideline at the 200 SW site and the MfE "Alert" guideline at the 200m E sites. The existing discharge option also exceeds the MfE "Alert" guideline at the Titahi Bay Beach South site.

The new shoreline discharge option exceeds the MfE 2003 "Action" bathing guideline at the Ti Korohiwa site.

No offshore discharge options result in an exceedance of the MfE "Alert" bathing guideline at shoreline sites.

Selected Modelling Plots of Predicted *Enterococci* Concentrations for selected options

A significant number of discharge options have been modelled by DHI for both *enterococci* and virus concentrations. The following plots have been included as indicative of the comparative differences of selected discharge options (in terms of predicted 95^{th} percentile *enterococci* concentrations) under future flow scenarios.

Plots for future average daily flow of 455l/s from the WWTP

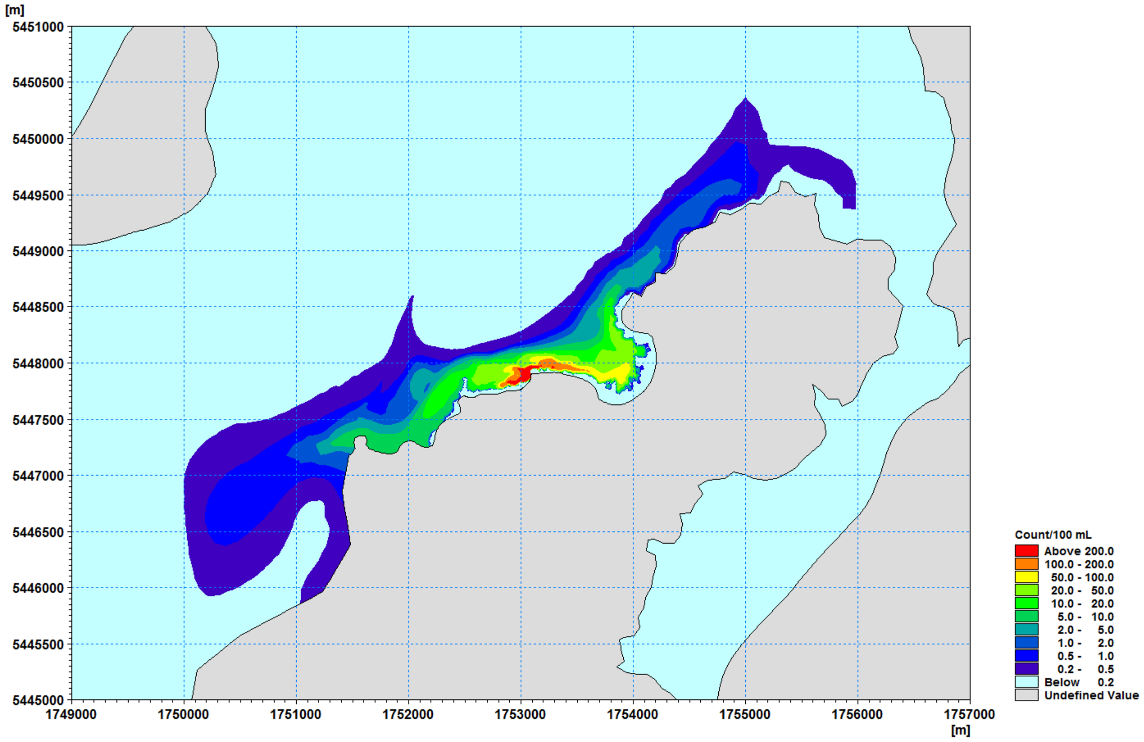

Figure 3 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future ADF flow rate of 455 L/s for the existing shoreline outfall.

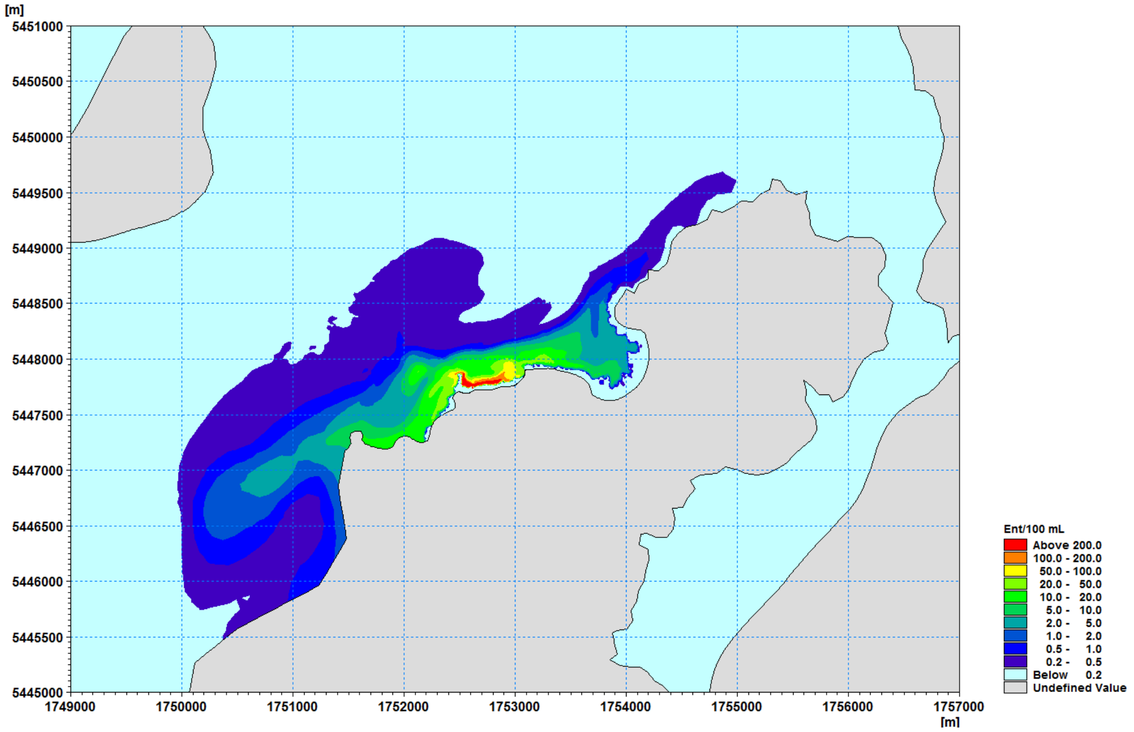

Figure 4 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future ADF flow rate of 455 L/s for a new shoreline outfall.

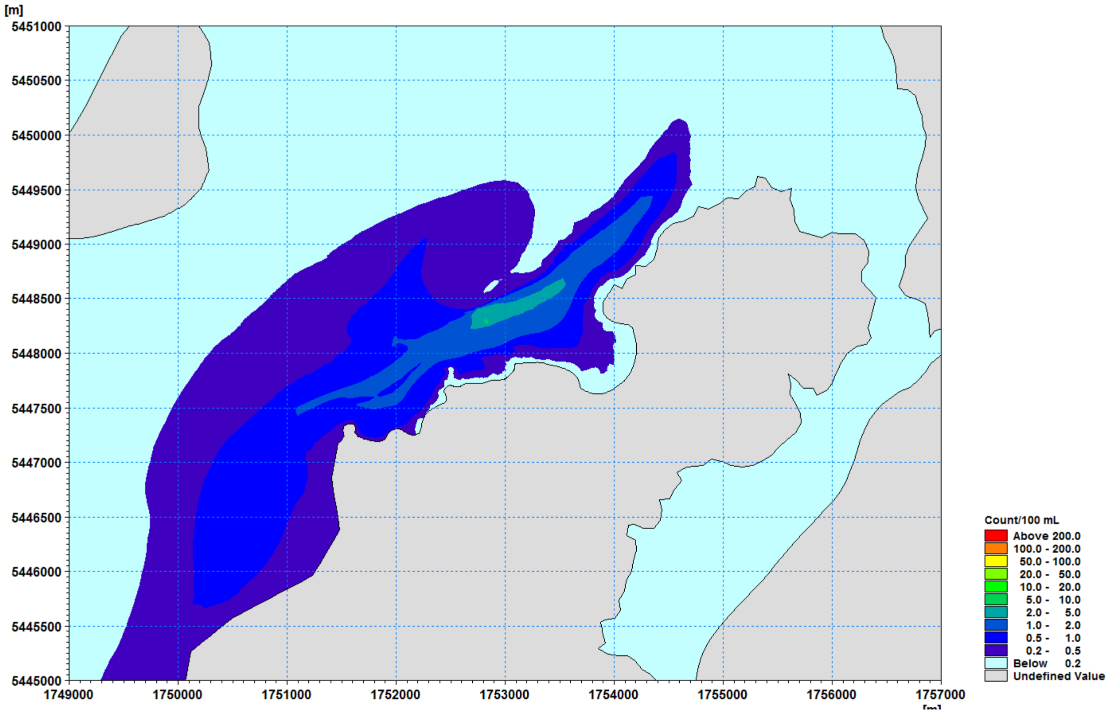

Figure 5 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future ADF flow rate of 455 L/s through a new 15m offshore outfall.

Plots for future flows of 1500l/s from the WWTP

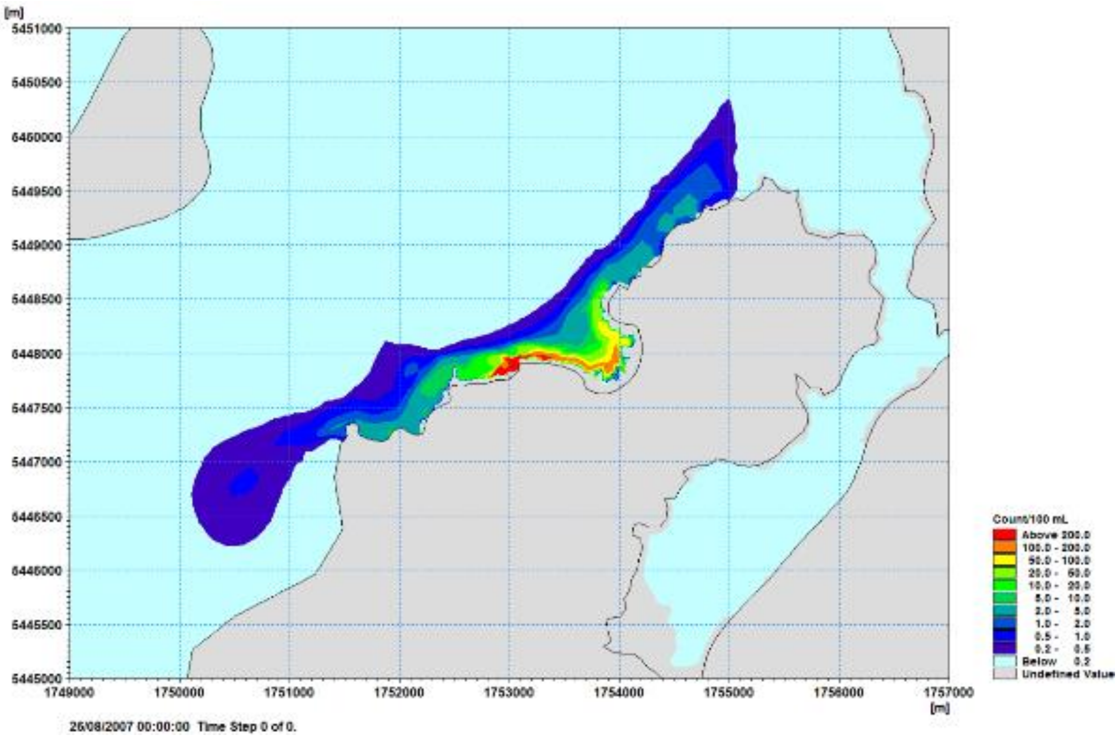

Figure 6 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future flow rate of 1500 L/s for the existing shoreline outfall under typical winds and spring tide.

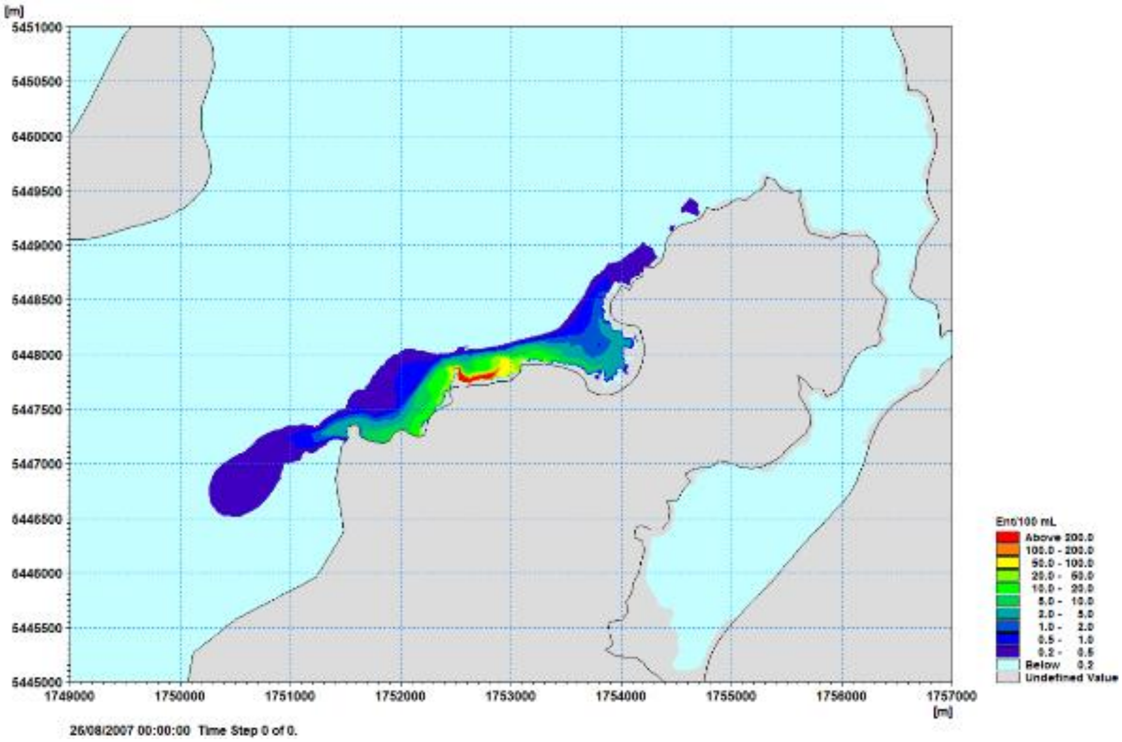

Figure 7 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future flow rate of 1500 L/s for a new shoreline outfall under typical winds and spring tide.

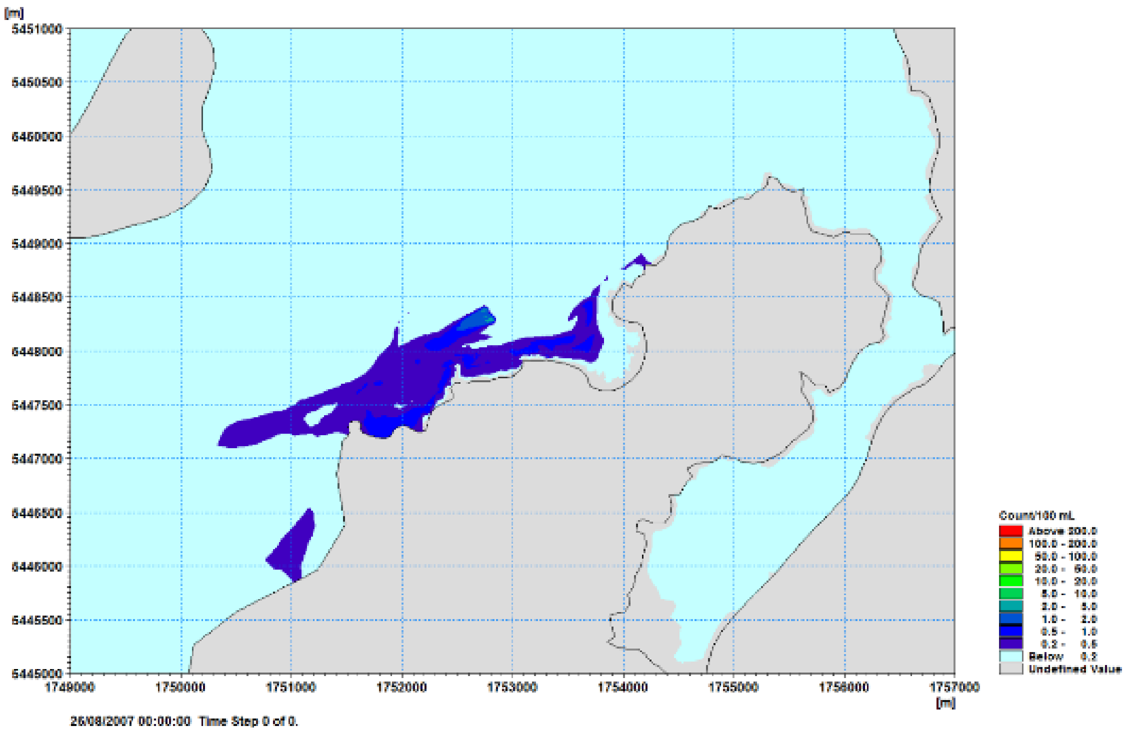

Figure 8 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for the future flow rate of 1500 L/s for a new 15m offshore outfall under typical winds and spring tide.

Plots for future overflow scenarios from the WWTP

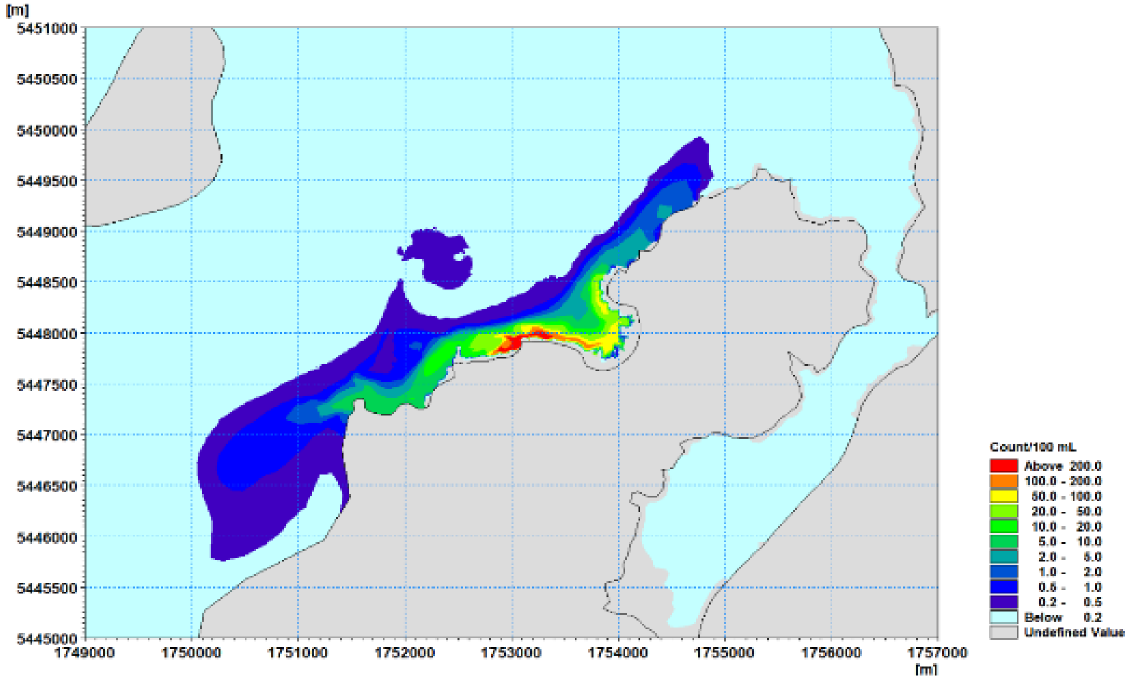

Figure 9 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for future WWTP overflow from existing outfall under typical winds and spring tide

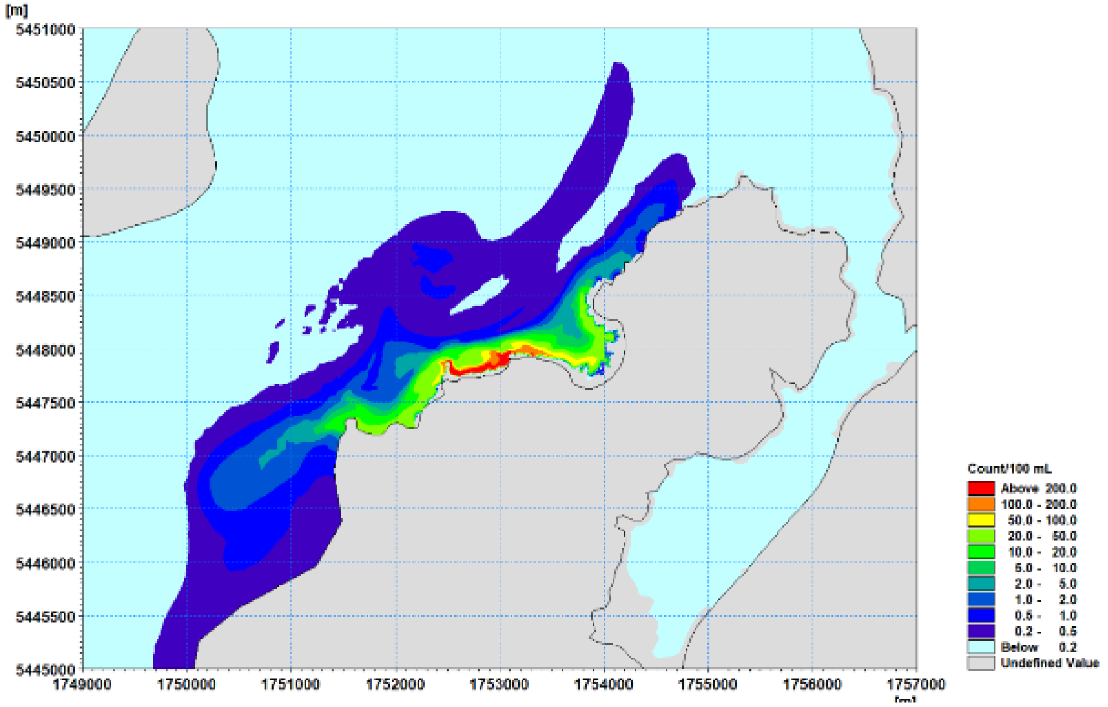

Figure 10 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for a future WWTP overflow (58% through plant and 42% via overflow) via the existing outfall and a new overflow outfall under typical winds and spring tide

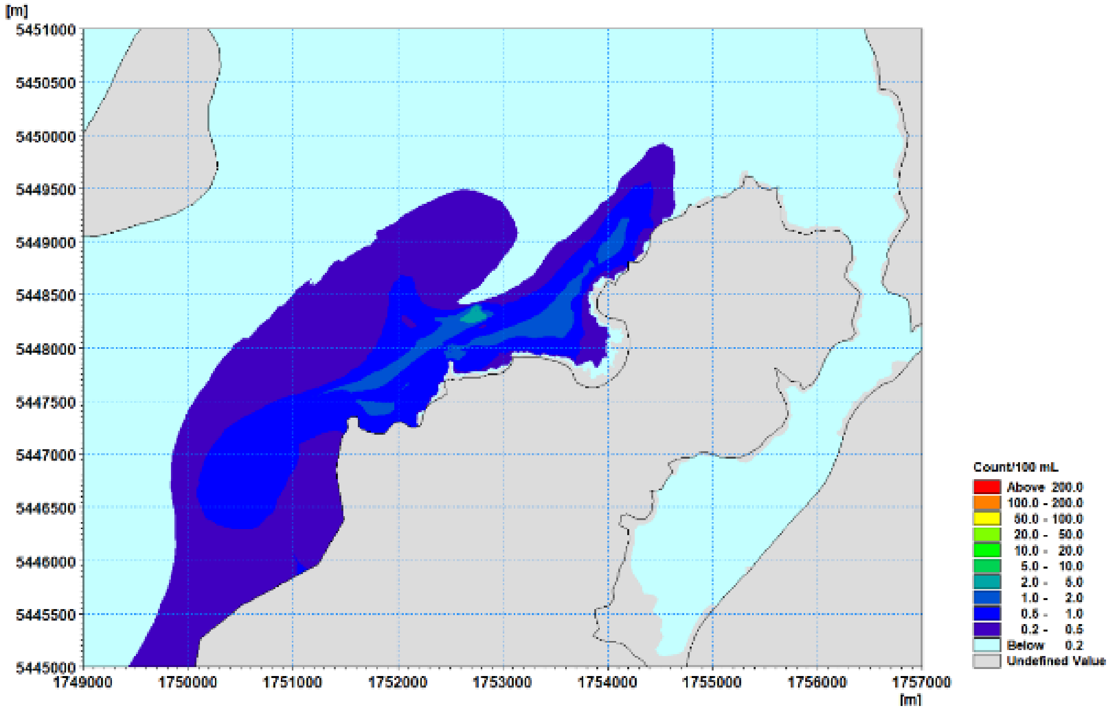

Figure 11 Predicted 95th percentile *Enterococci* concentration (Ent/100 mL) for a future WWTP overflow for a 15m offshore outfall under typical winds and spring tide

Appendix 2 – Water Quality & Ecology

Memo

To:	Richard Peterson Stantec	From:	David Cameron Stantec
File:	Porirua WWTP Collaborative Assessment	Date:	June 7, 2019

Reference: **Porirua Wastewater Network & WWTP - Preliminary Scoring of Water Quality & Ecology**

1. INTRODUCTION

1.1 BACKGROUND

Stantec has been engaged by Wellington Water Limited (WWL) to assist in the selection of a preferred option to upgrade the Porirua wastewater scheme, including the wastewater collection network and the existing wastewater treatment plant (WWTP) to the west of Titahi Bay.

Nine upgrade options have been assessed against predetermined criteria to provide a comparative option assessment. The nine options under consideration are listed in Table 1. The assessment criterion considered in this report is water quality & ecology. The study area includes the inland watercourses that flow into Porirua Harbour, as well as Porirua Harbour itself and Porirua's west coast.

Table 1: Options Considered for Shortlist Selection.

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

1.2 PURPOSE OF REPORT

The purpose of this report is to provide a comparative assessment of the potential water quality and ecology effects of the nine options (not including public health risk which is addressed separately). This report, together with similar reports prepared for the other criteria, will inform a Multi Criteria Assessment (MCA) workshop by the wider collaborative group, eventually leading to selection of a preferred option.

1.3 AUTHORS' CREDENTIALS

The assessment report has been prepared by David Cameron (Stantec) and reviewed by Graeme Jenner (Connect Water). David is a Principal Environmental Scientist with Stantec and has worked for Stantec for over 24 years. He has extensive experience in water quality, aquatic ecology and the assessment of effects of wastewater discharges to freshwater and marine habitats. Graeme Jenner is a Senior Associate – Environmental with Beca Consultants Ltd where he has worked for over 20 years. Graeme has extensive experience in the investigation and assessment of wastewater discharges throughout New Zealand.

1.4 INFORMATION SOURCES

The following technical information has been used in the assessment:

- Porirua Wastewater Network Overflows: Wet weather water quality monitoring results (Stantec 2019), included here as Appendix B;
- Porirua wastewater network overflow flow monitoring & modelling information provided by WWL
- Results from GWRC river water quality and ecology monitoring programme;
- Results of dispersion modelling to assess alternative discharge options for the existing Titahi Bay WWTP (DHI 2018 & DHI 2019);
- Results from Porirua City Council minor watercourse monitoring programme (WWL 2017);
- Porirua Wastewater Treatment Plant Outfall: Preliminary assessment of ecological values and effects of different outfall options (Cawthron Institute 2018);
- The Proposed Natural Resources Plan for the Wellington Region (GWRC 2015);
- ANZECC, 2000 water quality quidelines

1.5 LIMITATIONS OF ASSESSMENT

This assessment is based on available information for the purpose of comparing the nine upgrade options. It is necessarily a high-level assessment and does not constitute an assessment of effects.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

The 'Water Quality/Ecology' criteria were broken down into the following sub-criteria:

- Freshwater (water quality & aquatic ecology);
- Porirua Harbour (water quality & aquatic ecology);
- Coastal water (water quality & aquatic ecology); and
- Terrestrial ecology.

All nine options were scored against these four sub-criteria according to the categories shown in Table 2. From a starting position of 5, a value between 0 and 5 is subtracted according to the magnitude of effect determined for each sub-criterion. The aggregate 5-(x) gives the final MCA score for each option.

Table 0: Water Quality and Ecology Scoring Categories from one to five

Criteria	Description	One	Two	Three	Four	Five
Water quality & ecology	Including streams, harbour, the coastal shoreline and the wider coastal environment, and terrestrial ecology	High adverse effects	Moderate to high adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- The wastewater network upgrade is designed to eliminate overflows via constructed outfalls in a 6-month ARI rainfall event and via manholes in a 1-year ARI rain event. However, for greater intensity storms there will be overflows from manholes and constructed overflows.
- Full implementation of the network upgrade would be a gradual process spread over many years.
- Twin storage options would reduce peak flows and eliminate overflows of partially treated wastewater at the WWTP.
- Combined conveyance/storage options would increase peak flows but still eliminate overflows of partially treated wastewater at WWTP.
- Greater conveyance options would increase peak flows and increase the frequency of overflows of partially treated wastewater at the WWTP.
- Wastewater storage structures would be placed within existing urban areas where there are low ecological values.
- A new rising main between the Tangare PS and tunnel in options 1, 2, 4, 5, 7 and 8 would disturb a small area of scrub with moderate ecological value. All other rising main construction will be within existing roads with no ecological value.
- Duplication of the shoreline outfall (options 1) is assumed to cause temporary disturbance to small area with moderate terrestrial ecological value.
- New shoreline outfall (options 4, 5 and 6) are assumed to cause temporary disturbance to small area with moderate terrestrial ecological value.
- New offshore outfall (options 7, 8 and 9) are assumed to cause temporary disturbance to small area on the landward side with moderate ecological value and a significant marine area of rocky reef habitat.

2.3 PROPOSED NATURAL RESOURCES PLAN (2015)

The Proposed Natural Resources Plan (PNRP) includes criteria relating to aquatic ecosystem health. In particular, Objective O25 and Tables 3.4 and 3.8, are relevant and are attached as Appendix A of this report.

Schedule F4 of the PNRP identifies areas with significant indigenous biodiversity values in the coastal marine area, include the entire Pauatahanui Inlet because it contains a diverse range of regionally significant marine habitats.

Schedule F5 of the PNRP identifies habitats with significant indigenous biodiversity values in the coastal marine area, several of which are known to be present within Porirua Harbour and/or coastal marine area and are therefore relevant to this assessment. Schedule F5 is included in Appendix B of this report. It is not clear whether the habitats listed in Schedule F5 correspond with any of the categories included in Policy 11(a) of the NZ Coastal Policy Statement, for which adverse effects must be avoided.

Tables 3 and 4 of the Te Awarua-o-Porirua Whaitua Implementation Programme (Whaitua Committee, 2019) provide timeframes for achieving freshwater and coastal water quality/ecology objectives. The Whaitua Implementation Plan will be translated into a change to the PNRP and therefore these have also been taken account in this assessment.

3. CURRENT STATE

3.1 WASTEWATER NETWORK OVERFLOWS

Recent modelling simulations of the Porirua wastewater network performance indicate that five constructed overflows and 37 manholes in the network are likely to overflow during intense rainfall at least four times each year, and that the total wastewater overflow volume during a 3-month average recurrence interval (ARI) rainfall event is in the order of 8,100 m^3. Predictions for a range of design storms are summarised in Table 3.

Table 0: Modelling Predictions for Existing Porirua Wastewater Network (Source: WCS Engineering)

Design Storm (ARI)	Rainfall Event	Number of Manhole Overflows	Number of Constructed Outfall Overflows	Manhole Overflow Volume (m^3)	Outfall Overflow Volume (m^3)	Total Overflow Volume (m^3)
5 year	13/05/2015	325	9	65,000	29,000	95,000
2 year	14/11/2016	306	9	58,000	23,000	81,000
1 year	5/04/2017	137	7	36,000	16,000	52,000
6 months	9/12/2014	84	7	13,000	4,200	17,200
3 months	13/08/2010	37	5	7,000	1,100	8,100

The City Centre pump station (PS20) is a key asset which receives wastewater from Mana, Whitby, Cannons Creek and Tawa, pumping it through to Tangere Drive (PS34) which in turn pumps wastewater through to the WWTP. PS20 can become overloaded during intense rainfall events resulting in overflows via a constructed overflow to Porirua Stream. PS20 is the primary overflow location in the wastewater network, typically operating on 8 to 10 occasions annually.

Wastewater overflow discharge quality is characterised in Table 4 from samples collected at the PS20 outfall during rainfall events in February and April 2018. Contaminant concentrations are lower than those normally reported for untreated wastewater, presumably because of dilution from stormwater inflows to the network.

Table 4: Summary of Wastewater Overflow Quality Monitoring at PS20 (n = 2)

Constituent	Unit	Concentration
Total suspended solids (TSS)	mg/L	71 – 70
Total nitrogen	mg/L	10.5 – 11
Ammoniacal Nitrogen	mg/L	4.3 to 4.8
Total Phosphorus	mg/L	0.86 – 0.92
Total copper	mg/L	0.015 – 0.020
Total lead	mg/L	0.003
Total zinc	mg/L	0.049 – 0.060
E. coli	cfu/100ml	1,140,000 – 3,000,000
Enterococci	cfu/100ml	18,000 – 61,000

3.2 DISCHARGES OF TREATED AND PARTIALLY TREATED WASTEWATER TO CMA

The Porirua Wastewater Treatment Plant (WWTP) currently discharges secondary treated and UV irradiated wastewater through a short outfall into the surf zone on the coast at Rukutane Point, to the west of Titahi Bay. The WWTP currently has capacity to fully treat flows up to of 950 L/s, while flow in excess of that amount bypasses the secondary treatment process. During the period from October 2015 to October 2018 bypass discharges occurred at a rate of 19 events per year. WWTP upgrade works currently scheduled will increase treatment capacity to 1,500 L/s which would allow full treatment of all flows that can currently be conveyed to the WWTP.

Summary statistics for the quality of wastewater discharged via the shoreline outfall at Rukutane Point, including fully treated wastewater and occasional bypass discharges, are given in Table 5.

Table 5: Summary Statistic for Titahi Bay WWTP Final Discharge Quality (Oct 2017 to Oct 2018)

Variable	Unit	Number of samples	Mini mum	Geometric mean	90-Percentile	Maximum	Existing Consent Limits	
							Geometric mean	90%ile
Total BOD_5	g/m³	396	6	9	19	200	30	75
TSS	g/m³	396	6	11	29	339	30	75
Faecal coliforms	cfu/100ml	286	4	34	360	15,000	1000	2000

3.3 FRESHWATER STREAMS

3.3.1 WATER QUALITY

Monitoring sites on the Porirua, Pauatahanui and Horokiri Streams are included in the GWRC's routine monthly Rivers Water Quality and Ecology monitoring programme (RWQE). The RWQE annual data report for 2017/18 (Mitchell & Heath, 2019) utilises a water quality index (WQI) to summarise and compare water quality across the Region. Table 6 shows the WQI score for Pauatahanui Stream indicates 'good water quality', while Horokiri Stream and Porirua streams had 'fair water quality'.

All three sites achieved guideline levels for dissolved oxygen, water clarity and ammonia nitrogen, however the *E. coli* criteria was not achieved at any site, indicating that faecal contamination is a significant and widespread issue in Porirua (as it is elsewhere in the Region). Table 7 compares the *E. coli* data against the water quality attribute tables of the NPS-FM 2014 (MfE 2014), with all three sites falling in the E (RED) attribute band, underscoring the poor microbiological quality of those watercourses.

Porirua Stream is one of several urban streams in which GWRC conducts monthly monitoring of copper and zinc in the water column. The Porirua Stream results summarised in Table 8 indicate that ANZECC (2000) 95% protection criteria are exceeded in 33% of samples for copper and 42% of samples for zinc. When the triggers are adjusted for hardness, the guideline exceedances for copper and zinc reduce to 17 and 25%, respectively, still indicating some risk of metal toxicity. The Te Awarua-O-Porirua Whaitua Implementation Programme notes that "Peak concentrations are at a level that could cause toxicant effects in the Te Riu o Porirua WMU and parts of other WMU where there is a high concentration of roading (Te Awarua-O-Porirua Whaitua, 2019).

Table 6: Water Quality Index Grades for Porirua RWQE Sites Sampled at Monthly Intervals of July 2017 to June 2018 Inclusive (from Mitchell & Heath, 2019)

Site Code	Site Name	Nitrate-Nitrite Nitrogen	Dissolved Reactive Phosphorus	Dissolved Oxygen %sat	Black Disc	Ammoniacal Nitrogen	*E. Coli*	WQI Grades
RS13	Horokiri (Snodgrass)	×	✓	✓	✓	✓	×	Fair
RS14	Pauatahanui Stream (Elmwood Bridge)	✓	✓	✓	✓	✓	×	Good
RS16	Porirua Stream (Milk Depot)	×	×	✓	✓	✓	×	Fair

Table 7: National Objective Framework (NOF) Attribute States (from Mitchell & Heath, 2019)

Site Code	Site Name	*E. Coli* (cfu/100ml)			Ammonia Nitrogen (mg/L)			Nitrate Nitrogen (mg/L)		
		Median	95%ile	NOF	Median	95%ile	NOF	Median	95%ile	NOF
RS13	Horokiri	380	4,900	E	0.001	0.015	A	0.570	1.176	A
RS14	Pauatahanui Stream	270	6,005	E	0.001	0.011	A	0.235	0.730	A
RS16	Porirua Stream	1,500	6,910	E	0.008	0.045	B	1.060	1.686	B

Table 8: Summary of Copper and Zinc Concentrations in Water Samples from Porirua Stream (@ Milk Depot) during July 2017 to June Inclusive (after Mitchell & Heath, 2019)

Determinand	*Median*	*Maximum*	*N*	*Default trigger value (ANZECC 2000)*
Dissolved copper (mg/L)	0.0009	0.0019	12	(≤0.0014), exceeded by 33%
Total copper (mg/L)	0.0014	0.0014	12	-
Dissolved zinc (mg/L)	0.0064	0.0163	12	(≤0.008), exceeded by 42%
Total zinc (mg/L)	0.0078	0.0340	12	-

PCC commissioned additional monthly monitoring at the nine sites to provide water quality information for small water courses not covered by the RWQE programme. The *E. coli* median and 95-percentile values for the period January 2015 to August 2016 were significantly elevated at all of these stream sites, falling into the NPS-FM E (RED) attribute band (Table 9). The Semple Street outlet carried exceptionally high indicator bacteria, even in dry weather, indicating a significant wastewater network fault in the upstream catchment.

Table 9: *E. Coli* (cfu/100ml) Summary Statistics for Minor Streams (Monthly, Jan 2015 to Aug 2016, N=21)

Site No.	Site Name	Minimum	Median	95%ile	Maximum	NOF
PCCSWM-01	Taupo Stream	52	350	21,300	23,000	E
PCCSWM-02	Duck Creek	88	240	8,585	17,000	E
PCCSWM-03	Browns Bay Stream	310	3,000	24,400	31,000	E
PCCSWM-04	Kenepuru Stream	110	1,700	11,470	14,000	E
PCCSWM-05	Semple Street	410	16,000	266,000	420,000	E
PCCSWM-06	Te Hiko	12	110	5,815	6,200	E
PCCSWM-07	Onepoto	35	380	24,850	32,000	E
PCCSWM-08	Gloaming Hill	56	1,100	6,895	8,600	E
PCCSWM-09	Titahi Bay South Access	56	2,200	12,885	18,000	E

PCC and WWL also commissioned a water quality monitoring study of Porirua stream and harbour waters during and after periods of intense rainfall. The results of that investigation are reported in detail in Appendix C. In summary the results show that:

- During periods of intense rainfall, stream water concentrations of *E. coli* ranged between 15,400 and 84,400 cfu/10ml.
- Wastewater network overflows are the principle source of that contamination (the PS20 overflow contained up to 3,000,000 E. coli per 100ml, discharging at a rate of up to 246 L/s).
- Networks overflows also contribute to receiving water loads of suspended solids, total nitrogen, nitration nitrogen, ammonia nitrogen, total phosphorus, dissolved reactive phosphors, copper and zinc.
- These contaminants are transported rapidly through the stream network to Porirua Harbour and the coastal marine area, which is the ultimate receiving environment.

3.3.2 AQUATIC ECOLOGY

The RWQE includes an annual assessment of macroinvertebrate community composition in the Horokiri, Pauatahanui and Porirua streams. Table 10 summarises macroinvertebrate community index (MCI) scores for the 2017/18 summer, which indicate 'good' instream conditions for Horokiri Stream and 'fair' for Pauatahanui and Porirua streams. The Te Awarua-O-Porirua Whaitua Implementation Programme notes that MCI is typically indicate limited to moderate habitat disturbance in Whaitua (Te Awarua-O-Porirua Whaitua, 2019)

Table 10: MCI Scores and Quality Classes (from Mitchell & Health 2019)

Site Code	Site Name	MCI	MCI class	MCI 3-year rolling median score
RS13	Horokiri (Snodgrass)	120	Good	118.5
RS14	Pauatahanui Stream (Elmwood Bridge)	96	Fair	100.4
RS16	Porirua Stream (Milk Depot)	86	Fair	85.7

Schedule F1 of the PNRP identifies the Porirua, Kenepuru, Duck, Browns Bay, Horokiri and Pauatahanui streams as watercourses with significant indigenous values including habitat for indigenous threatened or at-risk fish, and habitat for more than six species of indigenous fish. The tidal reaches of many of these watercourses are known to provide inanga spawning habitat (i.e., Taylor & Marshall, 2016).

3.4 PORIRUA HARBOUR

3.4.1 PHYSICAL CHARACTERISTICS

The Porirua Harbour is a large, shallow, well flushed "tidal lagoon" type estuary consisting of two shallow drowned river valleys, the southern Porirua or Onepoto Arm and the northern Pauatahanui Inlet, meeting at a deep narrow confluence which opens to the west coast of the lower North Island opposite Mana Island. Porirua Harbour at 807 ha (524 ha in the Pauatahanui Inlet and 283 ha in the Onepoto Arm) is moderate in size compared to other New Zealand estuaries but is the largest estuarine system in the Wellington region.

3.4.2 WATER QUALITY

The Porirua/Kenepuru stream system, together with several large stormwater pipes in the Porirua CBD, discharge into the southern end of the Onepoto Arm of Porirua Harbour. These, combined with smaller watercourses such as the unnamed stream at Onepoto, have a measurable hydraulic influence on the Onepoto Arm during intense rainfall events. The Onepoto Arm catchment area is intensively developed, with approximately 50% of the catchment in urban land-use. Monitoring results confirm a strong freshwater influence in estuarine waters near Wi Neera Drive, with significantly elevated suspended solids, nitrogen, phosphorus, copper, zinc and indicator bacteria levels, generally well above guideline levels (refer Appendix C). Copper and zinc concentrations are higher than those recorded in Porirua Stream or in the wastewater overflow, indicating that the Porirua CBD stormwater drains, including the Semple Street drain, may be an important delivery route for these contaminants.

Contaminant levels were generally highest on the first day of the three-day sampling period, receding rapidly on subsequent days as stormflows reduce and contaminants are dispersed by tidal flushing (refer Appendix C).

The Pauatahanui Arm of Porirua Harbour has a much smaller proportion of urban development in its catchment and most of the catchment area is in pasture and scrub. Monitoring results for Mana Marina on the outgoing tide indicate relatively low contaminant levels in the Pauatahanui Arm compared with the Onepoto Arm and in the context of an intensive rainfall event indicate a relatively high level of compliance with water quality guidelines (refer Appendix C).

3.4.3 SEDIMENT QUALITY

The subtidal basins in each arm of the harbour are dominated by fine muds, providing a 'sink' in which contaminants accumulate. GWRC has, to date, conducted four sub tidal sediment quality monitoring surveys at five sub-tidal sampling sites in Porirua Harbour, three in the Pauatahanui Inlet and two in the Onepoto Inlet. These sites were sampled in 2004, 2005, 2008 and 2010. Oliver & Conwell (2014) reported in relation to the 2010 survey report that concentrations of total Cu, Pb and Zn exceed 'early warning' sediment quality guidelines (ANZECC 2000 ISQG-Low) in sub tidal sediments of the Onepoto Inlet.

Mercury concentrations are approaching guidelines levels but otherwise, along with the other five metals analysed, are below guideline levels in Onepoto Inlet. TOC-normalised total DDT and Dieldrin exceeded the ANZECC 2000 ISQG-Low trigger values at all sites.

The general trend across the five sites over the last four surveys has been for Zn concentrations to increase steadily, for Pb concentrations to decrease and for Cu concentrations to be variable, showing both increases and decreases.

3.4.4 AQUATIC ECOLOGY

Stevens and Robertson (2008) observed that saltmarsh is virtually non-existent in the Onepoto Arm but occupies 51 ha in the Pauatahanui Arm where it is dominated by wide beds of rushland which, as the terrestrial influence increased, transitioned through areas dominated by saltmarsh ribbonwood and grassland. Areas of seagrass are relatively extensive, 41.2 ha in the Pauatanui Arm and 17.3ha in the Onepoto Arm.

Schedule F2c of the PNRP lists Porirua Harbour as being one of only a handful of relatively large estuaries in the Wellington Region, and a regionally important stop-over for several migrant shorebird species such as the NZ pied oystercatcher and bar-tailed godwit.

Schedule F3 identifies the tidal flats of Pauatahanui Inlet as significant natural wetlands.

Schedule F5 of the PNRP identifies habitats with significant biodiversity values in the CMA, including inanga spawning habitat, saltmarsh and seagrass, all of which are known to be present within Porirua Harbour.

3.5 PORIRUA COASTAL WATERS

3.5.1 PHYSICAL CHARACTERISTICS

Treated and partially treated wastewater from Titahi Bay WWTP discharges via a shoreline outfall to an open rocky coast at Rukutane Point, 3.5 km southwest of the entrance to Porirua Harbour. Mana Island lies opposite and 3.2 km offshore from the existing outfall. The relatively sheltered environment of Titahi Bay lies 500 m east.

3.5.2 WATER QUALITY

Water quality monitoring conducted in the vicinity of the existing outfall is mostly focused on microbiological risk and is of limited value in terms of assessing ecological impacts. Nevertheless, dispersion modelling of the discharge plume from the outfall options has been conducted and model outputs in combination with discharge quality monitoring results can be used to predict water column contaminant concentrations.

DHI (2018) modelled discharge plume concentrations at selected locations around the existing shoreline outfall, including 200m south west of the outfall, 200m east of the outfall, Titahi Beach – south, Titahi Beach, Ti Korohiwa Rocks and Mount Couper. Of these locations the site 200m south west of the outfall consistently received the highest plume concentrations and so has been used in this assessment to indicate the likely level of impact.

Assuming median treated wastewater quality[1] (from Table 11) and the dilution values calculated by DH1 (2018) the average, and upper percentile values expected at a site 200m south west of the outfall are summarised in Table 3-9. These results indicate that Total N and P will be significantly elevated at 200m south west of the outfall from time to time, when the plume is carried in that direction by wind or tidal currents, but that exposure to elevated nutrient levels would be intermittent, and may not be consistent or sustained enough to significantly increase production of phytoplankton or benthic algae.

Predicted levels of biochemical oxygen demand and suspended solids are low and would not be expected to cause oxygen depletion or significant sediment deposition 200m from the outfall. Treated wastewater concentrations of ammonia-N are not available but, even if it is assumed that all of the total N shown in Table 3-9 was present as ammonia, which is unlikely, the risk ammonia toxicity would be low (ANZECC 2000 95% protection trigger level is 0.91 mg/L).

Table 11: Predicted Wastewater Plume Concentrations 200m South West of the Outfall (assuming median wastewater quality)

Determinant	*Units*	*Average*	*75-percentile*	*90-percentile*	*95-percentile*
BOD_5	mg/L	0.26	0.32	0.39	0.44
TSS	mg/L	0.53	0.65	0.79	0.88
Total N	mg/L	0.53	0.65	0.79	0.88
Total P	mg/L	0.35	0.43	0.53	0.58
FC	cfu/100ml	6	7	9	9

[1] The median value is used in respect of nutrients because a sustained increase is required to influence phytoplankton or algae growth biomass.

3.5.3 AQUATIC ECOLOGY

An assessment of the distribution and risks to coastal habitats in the Greater Wellington Region identified the southwest coast in general as *an area of exposed rugged coastline backed by hard rock and primarily grassland catchments* (Robertson & Stevens, 2007). Near the outfall, only Titahi Bay was included in the Robertson and Steven's (2007) habitat mapping but they made a preliminary assessment of the adjacent coast, noting that *this area of coast includes a large area of exposed rocky shore and shallow sub-tidal reef habitat with high biodiversity of animals and plants.*

Cameron (1993) noted that while paua and kina are common in sub-tidal areas of the coast south of Titahi Bay, filter feeding shellfish such as mussels are rare or absent. Gardiner (2000) observed that mussels are absent from large stretches of the wave-exposed shoreline of Cook Strait including the southwest coast of Wellington and that the low quality seston (organisms and non-living matter swimming or floating in water) along these shores might explain their absence.

In a preliminary assessment of ecological values and potential effects of discharges from Titahi Bay WWTP, Morrisey (2018) noted that potential effects on the ecology of receiving waters include increasing concentrations of nutrients and suspended solids, including organic material, and by reduced salinity. Under normal flow conditions nutrients are likely to be the main factor in any ecological effects from the discharge.

Morrisey (2018) noted also that: "*Increased nutrient concentrations may cause increased abundances and biomass of planktonic algae and benthic algae. These increases may result in increased abundances of herbivorous zooplankton and benthic invertebrates, such as gazing gastropods. Very large increases in biomass of macroalgae can smother the seabed, adversely affecting other species, and may be dislodged and carried to more sheltered areas (such as Titahi Bay) where they accumulate and decompose, creating adverse effects and a nuisance for human users of the area*.

Morrissey (2018) concluded that: "*Predictions of ecological effects of the three outfall options currently under consideration are limited by lack of information on the behaviours of the discharges and the nature of the biota in the receiving environment. However, effects are not expected to be large.*" It is noted that studies currently underway will provide relevant information about discharge plume behaviour and local biota.

Several habitats listed in Schedule F5 of the PNRP are present in coastal water near the existing outfall, including kelp, giant kelp and subtidal rocky reefs.

4. COMPARATIVE ASSESSMENT

Tables 12 and 13 provide a preliminary assessment of the potential impacts on water quality and ecology of nine options. The option scores range from 4 (low-moderate adverse effects) to 1.5 (moderate/high adverse effects); none of the options were assessed 1 (High adverse effects) or 5 (low adverse effects).

Table 12: Summary of Water Quality and Ecology Comparative Assessment

Code	Description	Freshwater	Harbour	Coastal	Terrestrial	Combined (5-x)
1	Greater conveyance + Existing treatment + Existing shoreline outfall + duplicated outfall pipeline	-0.5	0	-2	-1.0	1.5
2	Combined storage & conveyance +Existing treatment + Existing shoreline outfall	-0.5	0	-1.5	-0.5	2.5
3	Twin storage + Existing treatment + Existing shoreline outfall	-0.5	0	-1	0	3.5
4	Greater conveyance + Existing treatment + New shoreline outfall	-0.5	0	-2	-0.5	2.0
5	Combined storage & conveyance +Existing treatment + New shoreline outfall	-0.5	0	-1.5	-0.5	2.5
6	Twin storage + Existing treatment + New shoreline outfall	-0.5	0	-1	0	3.5
7	Greater conveyance + Existing treatment + New offshore outfall	-0.5	0	-1.5	-0.5	2.5
8	Combined storage & conveyance +Existing treatment + New offshore outfall	-0.5	0	-0.5	-0.5	3.5
9	Twin storage + Existing treatment + New offshore outfall	-0.5	0	-0.5	0	4.0

Table 13: Rational for Water Quality and Ecology Comparative Assessment

Code	Option description	Score	Summary	Reason
1	Greater conveyance + Existing treatment + Existing shoreline outfall	1.5	Network overflows ≤ 2 per year to streams and harbour. Increased flows to WWTP causing frequent overflows of partially treated wastewater	Improved stream water quality with benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction impacts for rising main from Tangare PS to tunnel [-0.5] Construction impacts arising from duplication of outfall pipeline [0] Reduced water quality in CMA close to existing outfall compared to current situation, especially in terms of nutrients and salinity. Low to moderate ecological effects beyond 200m [-2]
2	Combined storage & conveyance + Existing treatment + Existing shoreline outfall	2.5	Network overflows ≤ 2 per year to streams and harbour. Increased flows to WWTP but remains within treatment capacity	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction impacts for rising main from Tangare PS to tunnel [-0.5] Slightly improved water quality in CMA close to existing outfall compared to current situation due to elimination of overflows but increased peak flows. Probably low ecology effect beyond 200m. [-1.5]
3	Twin storage + Existing treatment + Existing shoreline outfall	3.5	Network overflows ≤ 2 per year to streams and harbour. Reduced peak flow to WWTP eliminates overflows of partially treated wastewater	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Improved water quality in CMA close to existing outfall compared with status quo due to elimination of overflow discharges and lower peak flow. Low ecological effects beyond 200m. [-1.0]
4	Greater conveyance + Existing treatment + New shoreline outfall	2.0	Network overflows ≤ 2 per year to streams and harbour. Construction of outfall Increased flows to WWTP causing frequent overflows of partially treated wastewater	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction effects for new shoreline outfall expected to be localised & temporary [0] Construction impacts for rising main from Tangare PS to tunnel [-0.25] Reduced water quality in CMA close to new outfall, especially in terms of nutrients and salinity, balanced by improved conditions near the existing outfall. Low to moderate ecological effects beyond 200m. [-2]

Code	Option description	Score	Summary	Reason
5	Combined storage & conveyance + Existing treatment + New shoreline outfall	2.5	Network overflows ≤ 2 per year to streams and harbour. Construction of outfall Increased flows to WWTP but remains within treatment capacity	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction effects for new shoreline outfall localised and temporary [0] Construction impacts for rising main from Tangare PS to tunnel [-0.5] Slightly reduced water quality in CMA close to new outfall, especially in terms of nutrients and salinity, balanced by improved conditions near the existing outfall. Probably low ecology effect beyond 200m. [-1.5]
6	Twin storage + Existing treatment + New shoreline outfall	3.5	Network overflows ≤ 2 per year to streams and harbour. Construction of outfall Reduced peak flow to WWTP eliminates overflows	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Construction effects for new shoreline outfall are localised and temporary [0] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Reduced water quality in CMA close to new outfall, especially in terms of nutrients and salinity, but improved conditions near existing outfall. Low ecological effects beyond 200m. [-1]
7	Greater conveyance + Existing treatment + New offshore outfall	2.5	Network overflows ≤ 2 per year to streams and harbour. Increased flows to WWTP causing frequent overflows of partially treated wastewater. Construction of offshore outfall Offshore outfall improves mixing efficiency	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction of new outfall involves considerable seabed disturbance, but effect will be temporary. [-0.5] Construction impacts for rising main from Tangare PS to tunnel [-0.5] Higher discharge flows but improved water quality in CMA due to higher mixing efficiency and better separation from sensitive rocky reef habitats [-1]
8	Combined storage & conveyance + Existing treatment + New offshore outfall	3.5	Network overflows ≤ 2 per year to streams and harbour. Increased flows to WWTP but remains within treatment capacity Offshore outfall improves mixing efficiency	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction of new outfall involves considerable seabed disturbance, but effect will be temporary. [-0.5] Construction impacts for rising main from Tangare PS to tunnel [-0.5] Slightly higher discharge flows but improved water quality in CMA due to higher mixing efficiency and better separation from sensitive rocky reef habitats [0]

Code	Option description	Score	Summary	Reason
9	Twin storage + Existing treatment + New offshore outfall	4.0	Network overflows ≤ 2 per year to streams and harbour. Reduced peak flow to WWTP eliminates overflows of partially treated wastewater Offshore outfall improves mixing efficiency	Improved stream water quality and some benefits for stream biota, but a significant increase in MCI scores is not expected due to other factors associated with urban development (flow regime, habitat quality, stormwater quality, etc). [-0.5] Reduced contaminant load discharged in Porirua Harbour, low ecological impact. [0] Construction of new outfall involves considerable seabed disturbance, but effect will be temporary. [-0.5] Greatly improved water quality in CMA due to higher mixing efficiency and better separation from sensitive rocky reef habitats [0]

APPENDIX A: PNRP OBJECTIVE O25

Objective O25 COASTAL

To safeguard **aquatic ecosystem health** and **mahinga kai** in fresh water bodies and coastal marine area:

(a) water quality, flows, water levels and aquatic and coastal habitats are managed to maintain **aquatic ecosystem health** and **mahinga kai**, and

(b) **restoration** of **aquatic ecosystem health** and **mahinga kai** is encouraged, and

(c) where an objective in Tables 3.4, 3.5, 3.6, 3.7 or 3.8 is not met, a fresh water body or coastal marine area is improved over time to meet that objective.

Table 3.4 Rivers and streams

River class		Macrophytes	Periphyton mg/m² chlorophyll *a*		Invertebrates Macroinvertebrate Community Index		Fish	Mahinga kai species
			All rivers	Significant rivers	All rivers	Significant rivers		
1	Steep, hard sedimentary	Indigenous macrophyte communities are resilient and their structure, composition and diversity are balanced	≤ 50	≤ 50	≥ 120	≥ 130	Indigenous fish communities are resilient, and their structure composition and diversity are balanced.	Mahinga kai species, including taonga species, are present in quantities, size and of a quality that is appropriate for the area.
2	Mid-gradient, coastal and hard sedimentary		≤ 120	≤ 50	≥ 105	≥ 130		
3	Mid-gradient, soft sedimentary		≤ 120*	≤ 50*	≥ 105	≥ 130		
4	Lowland, large, draining ranges		≤ 120	≤ 50	≥ 110	≥ 130		
5	Lowland, large, draining plains and eastern Wairarapa		≤ 120*	≤ 50*	≥ 100	≥ 120		
6	Lowland, small		≤ 120*	≤ 50*	≥ 100	≥ 120		

Table 3.8 Coastal waters

Coastal water type	Macroalgae	Seagrass and saltmarsh	Invertebrates	Mahinga kai species	Fish	Sedimentation rate	Mud content
Open coast	The algae community is balanced with a low frequency of nuisance blooms	NA	Invertebrate communities are resilient, and their structure, composition and diversity are balanced	Mahinga kai species, including taonga species, are present in quantities, sizes and of a quality that is appropriate for the area	NA		
Estuaries and harbors		Seagrass, saltmarsh and brackish water submerged macrophytes are resilient and diverse and their cover is sufficient to support invertebrate and fish communities			Indigenous fish communities are resilient, and their structure, composition and diversity are balanced	The sedimentation rate is within an acceptable range of that expected under natural conditions	The mud content and areal extent of soft mud habitats is within a range of that found under natural conditions

APPENDIX B: PNRP SCHEDULE F5

Habitats with Significant Indigenous Biodiversity Values in the Coastal Marine Area

Schedule F5: Habitats with significant indigenous biodiversity values in the coastal marine area		
Habitat	**General descriptor**	**Known locations**
Adamsiella algal beds	*Adamsiella* beds are known to harbour a range of associated species in other areas of New Zealand but Wellington studies are lacking.	Evans Bay, Wellington Harbour (Port Nicholson) 41°18.83'S 174°48.10'E
Deep-sea woodfall habitat	Woodfalls are reducing environments undergoing a prolonged decay process during which a diverse range of organisms comes to be associated with it. Mollusks are the principal group represented (also including chitons and gastropods), followed by crustaceans, polychaetes and echinoderms. The fauna is frequently closely related to the fauna around hydrothermal vents, cold seeps, and whale falls.	1100 m off Wairarapa coast
Giant kelp, *Macrocystis*, beds	*Macrocystis* beds are considered to sustain one of the most diverse, productive and dynamic ecosystems of the planet. Kelp beds provide three dimensional habitat space and structuring in areas of rocky reef and are critical to food chains. The beds in the Wellington region are patchily distributed and known to vary in size and position over time.	Point Howard to Hinds Point, and Worser Bay to Kau Bay, Wellington Harbour (Port Nicholson)
Inanga spawning habitat	Inanga are the adult life stage of the most abundant whitebait species *Galaxias maculatus*. It spawns gregariously on spring tide events during late summer and autumn amongst tidally influenced riparian vegetation. Preferred habitat is the moist litter-layer, on the banks of rivers and streams, inundated by the spring tide. In pastoralized areas, ungrazed pasture grasses, especially tall fescue, Yorkshire fog and creeping bent provide suitable conditions. Native plants such as flax, raupo, and native rushes in low salinity areas are also suitable.	See Schedule F1b for a list of rivers where inanga spawning habitat has been identified.
Kelp beds	Kelp beds provide three dimensional habitat space and structuring to the environment in rocky reef habitats. Kelp beds are known to harbour high biodiversity and are critical to food chains.	Kelp beds occur on exposed rocky reefs region wide
Rhodolith Beds	Biota associated with rhodolith beds and other biogenic habitats are usually highly diverse. Rhodolith beds in the region have not been studied so the extent and specific biodiversity values are unknown.	The rhodolith bed within the Kāpiti Island Marine Reserve is protected, but the bed extends to the East of Kāpiti Island beyond the reserve boundaries, and potentially in other locations.

Memo

Schedule F5: Habitats with significant indigenous biodiversity values in the coastal marine area		
Habitat	**General descriptor**	**Known locations**
Saltmarsh	A variety of saltmarsh species (scrub, sedge, tussock, grass, reed and herb fields) grow in the upper margins of most NZ estuaries where this vegetation stabilizes sediments transported by tidal flows. Saltmarshes have high biodiversity and are amongst the most productive habitats on earth. Saltmarshes are sensitive to a large range of pressures, including reclamation, margin development, flow regulation, grazing, sea level rise, wastewater contaminants and weed invasion.	Saltmarsh occurs at the margins of estuaries region wide, though the historical extent and quality of saltmarsh has been severely depleted in most estuaries.
Seagrass	Seagrass grows in soft sediments in NZ estuaries where its presence enhances estuarine biodiversity. Seagrass is highly valued ecologically for the ecosystem services it supports, such as, primary production, nutrient recycling, sediment stabilization, and as a nursery for fish and invertebrates. Seagrass is also an important forerunner to the establishment of healthy saltmarsh on tidal flats. Though tolerant of a wide range of conditions, seagrass is vulnerable to high levels of suspended sediments and poor sediment quality	The largest seagrass beds in the region are in Pauatahanui inlet, Te Awarua-o-Porirua Harbour. Seagrass occurs as small remnant beds in many other estuaries region wide.
Seal haul-outs	Seals need to come onto land to rest and breed. While they may be above mean high water springs for some of the time, they need unencumbered access to the foreshore and water. Seals are particularly sensitive to disturbance during the breeding season (mid November to mid-January), but will be disturbed by loud noises, construction activity and vehicles at all times when they are ashore.	Known seal haul outs in the region include Pariwhero/Red Rocks, Turakirae Head and Cape Palliser
Sponge garden	Sponges are sedentary, filter feeding metazoans that can encrust hard surfaces, or anchor themselves in mud, sand, or gravel. Hotspots of species diversity, density, richness, or endemism are known as sponge gardens. Sponge gardens create three-dimensional biogenic habitat for associated flora and fauna.	Pukerua Bay
Subtidal rocky reefs	Subtidal rocky reefs generally have high levels of species richness because of the large number of microhabitats. This richness is frequently augmented by biogenic 3- dimensional habitats created by reef species as well as high levels of biotic interaction.	Subtidal rocky reefs occur along the majority of coast in the Wellington region. Notable exceptions are the sandy beaches north of Paekakariki and in Palliser Bay.

APPENDIX C: WATER QUALITY MONITORING REPORT

Porirua Wastewater Network Overflows: Wet Weather Water Quality Monitoring Results

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Rev. No.	Date	Description	Prepared By	Reviewed By	Approved By
0	8/5/2019	Draft report	D. Cameron		
1	17/5/2019	Final report	D. Cameron	A. Fountain	I. Rautenbach

1 Introduction

The Porirua wastewater collection network includes nine constructed overflows and numerous uncontrolled overflow locations (typically from manholes) which operate during periods of sustained wet weather when stormwater inflows or groundwater infiltration into the wastewater network cause flows to exceed the capacity of pipelines and pumping stations. The resulting overflows discharge either directly to Porirua Harbour or to stormwater drains and streams that discharge to the harbour, causing reduced water quality and potentially increased public health risk.

Porirua City Council and Wellington Water recognise that growth in the city's population as well as inflow and infiltration into the wastewater network is adversely affecting the performance of the network. A number of key features have been identified as contributing to overflows from the trunk wastewater network, these include the capacity of the City Centre Pump Station (PS20), high levels of inflow and infiltration in the Cannons Creek and Duck Creek collection areas, and high current and projected population growth in Mana above the Bridge Pump Station (PS7). These factors will result in significantly increased overflow frequency and volume in the future unless the existing infrastructure is upgraded.

Porirua City Council and Wellington Water are currently considering upgrade options including improved conveyance, increased storage, enhanced treatment and reduction of wastewater volumes in wet weather.

WWL and Stantec prepared a wastewater overflow monitoring plan for Porirua in order to better characterise the effects of overflow events on freshwater streams and Porirua Harbour (Stantec 2017). The results of the first two rounds of water quality monitoring under the plan are presented in this report.

2 Methods

2.1 Location of Wet Weather Sampling Sites

The overflow monitoring plan includes seven freshwater sites, four estuarine sites, and the wastewater network overflow site (PS20), as detailed in Table 2-1 and illustrated Figure 2-1.

Table 2-1: Location of wet weather sampling sites

Site	Site name	Purpose	Type	Map reference NZTM	
1	Porirua Stream at Town Centre	upstream ref.	freshwater	E1754675	N5443937
2	Porirua Stream near mouth	impact	estuarine	E1754677	N5444952
3	Harbour off Wi Neera Dr	impact	coastal	E1754499	N5445727
4	Unnamed stream @ Onepoto Rd (400m u/s mouth)	impact	freshwater	E1754958	N5447000
5	Harbour off Onepoto Rd	impact	coastal	E1755738	N5447322
6	Kenepuru Stream @ SH1 Off-ramp	impact	freshwater	E1754864	N5444481
7	Kenepuru Stream @ Bothamley Park	upstream ref.	freshwater	E1755702	N5444693
8	Browns Bay Stream (60m u/s mouth)	impact	freshwater	E1757997	N5447737
9	Duck Creek	impact	estuarine	E1759595	N5447718
10	Harbour channel at Mana Marina	impact	coastal	E1756906	N5448114
11	Plimmerton Beach at Sunset Parade	impact	coastal	E1756465	N5450315
12	PS20 Overflow	wastewater	wastewater	E1754650	N5444476

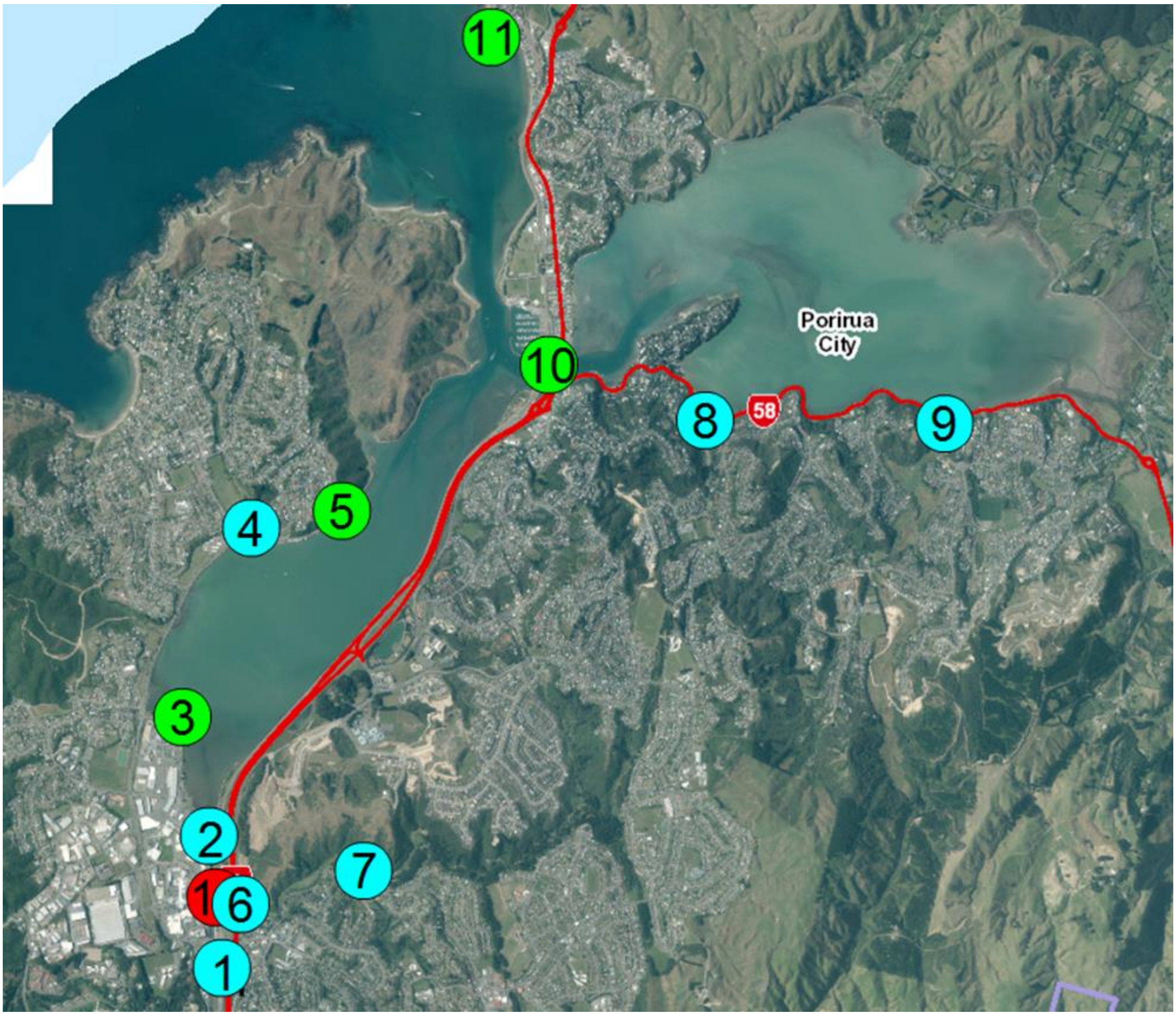


Figure 2-1: Location of freshwater (blue), estuarine (green) and wastewater (red) sampling sites

2.2 Wastewater overflow quality sampling programme

Sampling was conducted while the PS20 overflow was in operation and on two consecutive days immediately after the overflow ceased. All estuarine sites were sampled on the outgoing tide, between 2 and 5 hours after high tide:

a) Day one, after the 24-hour cumulative rainfall at the Tawa Pool rain-gauge exceeds 15mm and the PS20 overflow has operated continuously for 60 minutes or more[1][2], collect water samples at sites 1 to 11 and a wastewater sample at site 12. On two consecutive days immediately after the overflow has ceased, repeat sample collection at sites 1 to 11.

b) On each sample day record the following information:

- 24-hour cumulative rainfall at Porirua Elsdon Park AWS
- Porirua Stream flow at GWRC Town Centre flow gauge
- Time of high tide preceding sample collection
- PS20 wastewater overflow duration, volume and mean flow

[1] Rainfall was tracked via the GWRC website.

[2] Overflows from PS20 are monitored by telemetry.

2.3 Sample analyses

All wastewater, stream and estuarine water samples were analysed for the following:

a) pH, temperature, dissolved oxygen & electrical conductivity (in situ)
b) pH, water hardness (lab)
c) Turbidity & total suspended solids;
d) Nitrate-nitrogen, nitrite-nitrogen, ammoniacal nitrogen, dissolved inorganic nitrogen (DIN) & total nitrogen;
e) Dissolved reactive phosphorus & total phosphorus
f) Total and dissolved copper, lead and zinc
g) *E. coli,* Enterococci & faecal coliforms

2.4 Wastewater overflow volume and flows

Wastewater flow monitoring at a constructed overflow structure immediately upstream of PS20 was conducted to enable reliable measurement of the following:

- Discharge volume m^3 per day (or per event)
- Discharge flow rate L/s
- Discharge duration (start and stop times)

Further wastewater flow monitoring and modelling is required to confirm the locations of overflows elsewhere in the catchment and their relative contributions during discharge events.

3 Results

3.1 Wastewater Overflow Modelling Predictions

Modelling simulations of the existing wastewater network performance indicates that five constructed overflows and 37 manholes in the network are likely to overflow during intense rainfall at least four times each year, and that the total wastewater overflow volume during a 3-month average recurrence interval (ARI) rainfall event is in the order of 8,100 m^3. Predictions for a range of design storms are summarised in Table 3-1. Wastewater overflow locations are illustrated in Appendix A.

Table 3-1: Modelling predictions for existing Porirua wastewater network

Design Storm (ARI)	Rainfall Event	Number of Manhole Overflows	Number of Constructed Outfall Overflows	Manhole Overflow Volume (m^3)	Outfall Overflow Volume (m^3)	Total Overflow Volume (m^3)
5 year	13/05/2015	325	9	65,000	29,000	95,000
2 year	14/11/2016	306	9	58,000	23,000	81,000
1 year	5/04/2017	137	7	36,000	16,000	52,000
6 months	9/12/2014	84	7	13,000	4,200	17,200
3 months	13/08/2010	37	5	7,000	1,100	8,100

3.2 Porirua Stream

The City Centre pump station (PS20) is a key asset which receives wastewater from Mana, Whitby, Cannons Creek and Tawa, pumping it through to Tangere Drive (PS34) which in turn pumps wastewater through to the WWTP. PS20 can become overloaded during intense rainfall events resulting in overflows via a constructed overflow to Porirua Stream. PS20 is the primary overflow location in the wastewater network, typically operating on 8 to 10 occasions annually but, indicated above, is one of many overflows in the network.

Flow monitoring statistics for the February and April overflow events are summarised in Table 3-1. During these two events the overflow discharge rate peaked at 246 L/s L/s, run for a combined duration of 32 hours and had a combined discharge volume of 9,781 m^3. During these overflow periods the ratio of discharge to stream flows (at Town Centre Gauge Station) varied between 1:35 and 1:74 (see Appendix B).

Overflow discharge quality monitoring results from overflows on 20 Feb 2018 and 10 April 2018 are summarised in Table 3-2 (refer Appendix B for further detail). The table also summarises water quality monitoring results for Porirua Stream upstream and downstream of PS20 at the Town Centre and Stream Mouth sites, respectively. The results show significantly elevated levels of turbidity, suspended solids, nutrients and indicator bacteria at both Porirua Stream sites, generally exceeding guideline levels. The PS20 overflow discharge appears to have caused a marked increase in indicator bacteria concentrations in Porirua Stream, however no clear increase in concentrations of suspended solids, nutrients or metals was observed, or expected based on discharge loads. It is noted that the lower Porirua Stream site is also influenced by the Kenepuru Stream discharge.

Stormflow monitoring conducted by GWRC in Porirua Stream at the Town Centre site during rain events on March and April 2017, by both grab samples and auto-sampler, shows *E. coli* concentrations commonly exceeded 10,000 cfu/100ml during intense rainfall, up to a maximum recorded value of 48,000 cfu/100ml (pers com. Dr Claire Conwell). Both WWL and GWRC results indicate a significant source or sources of faecal contamination upstream of Town Centre, in addition to the PS20 overflow downstream of Town Centre.

Table 3-2: Flow monitoring results at PS20 during the water quality survey period

Site	Start date/time	End date/time	Duration (min)	Ave Rate (L/s)	Max Rate (L/s)	Overflow Volume (m^3)
PS20	20/02/2018 08:15	20/02/2018 15:50	455	113	246	3080
PS20	20/02/2018 20:05	20/02/2018 22:30	145	40.2	78.1	350
PS20	10/04/2018 07:40	10/04/2018 13:45	360	90.9	228	1911
PS20	10/04/2018 15:50	10/04/2018 23:20	450	79.7	165	2150
PS20	11/04/2018 16:50	12/04/2018 01:30	520	73.3	198	2290

Table 3-3: Maximum water quality values recorded at Porirua Stream sites during and after intense rainfall (n=6)

Variable	Guideline[1]	Porirua Stream @ Town Centre	Porirua Stream @ mouth	Overflow @ PS20
Water temperature (ºC)	<19	19.8	19.6	21.0
Dissolved oxygen - minimum (mg/L)	≥80%sat	8.3	7.9	5.8
pH	6.5-9.0	8.60	8.57	7.16
Conductivity (µS/cm)	-	269	8960	232
Turbidity (NTU)	median ≤5.6	113	75	44
Total suspended solids (mg/L)	-	132	74	79
Total nitrogen (mg/L)	≤0.614	1.86	1.80	11.0
Inorganic nitrogen (mg/L)	≤0.465	1.56	1.46	8.55
Nitrate-nitrogen (mg/L)	≤0.444	1.46	1.42	4.17
Ammoniacal nitrogen (mg/L)	≤2.2	0.15	0.11	4.78
Dissolved reactive phosphorus (mg/L)	≤0.010	0.043	0.048	0.511
Total phosphorus (mg/L)	≤0.033	0.172	0.159	0.918
E. coli (cfu/100ml)	95th %ile ≤1200	15,400	41,000	3,000,000
Faecal coliforms (cfu/100ml)	-	24,000	41,000	3,000,000
Enterococci (cfu/100ml)	95th %ile <500	29,000	38,000	61,000
Copper -dissolved (mg/L)	<0.0014	0.003	0.003	0.007
Copper – total (mg/L)	-	0.007	0.006	0.020
Lead – dissolved (mg/L)	<0.0034	<0.0005	<0.0005	<0.0005
Lead – total (mg/L)	-	0.005	0.005	0.003
Zinc – dissolved (mg/L)	<0.008	0.015	0.018	0.023
Zinc – total (mg/L)	-	0.054	0.085	0.060

Note: [1]The water quality guidelines used in this report are tabulated in Appendix C.

3.3 Kenepuru Stream

Wet weather water quality monitoring results for Kenepuru Stream are summarised in Table 3-3 (the full data set is included in Appendix B). The results show significantly elevated levels of turbidity, suspended solids, nutrients and indicator bacteria at both Kenepuru Stream sites, generally well in excess of guideline levels. These results are similar to those shown in Table 3-2 for Porirua Stream at Town Centre. Some contaminants, including turbidity, suspended solids, ammonia-N, total-N and total P increase in a downstream direction in Kenepuru Stream while concentrations of indicator bacteria and metals are similar at both sites.

Table 3-4: Maximum recorded water quality values at two sites on Kenepuru Stream (n=6)

Variable	Guideline[1]	Kenepuru Stream @ Bothamley Park	Kenepuru Stream @ Railway Station
Water temperature (ºC)	<19	19.9	19.9
Dissolved oxygen - minimum (mg/L))	≥80%sat	7.7	6.8
pH	6.5-9.0	8.99	8.01
Conductivity (µS/cm)	-	263	268
Turbidity (NTU)	annual median ≤5.6	116	161
Total suspended solids (mg/L)	-	105	118
Total nitrogen (mg/L)	≤0.614	2.16	2.24
Inorganic nitrogen (mg/L)	≤0.465	1.63	1.60
Nitrate-nitrogen (mg/L)	≤0.444	1.58	1.60
Ammoniacal nitrogen (mg/L)	≤2.2	0.04	0.11

Variable	Guideline[1]	Kenepuru Stream @ Bothamley Park	Kenepuru Stream @ Railway Station
Dissolved reactive phosphorus (mg/L)	≤0.010	0.033	0.032
Total phosphorus (mg/L)	≤0.033	0.178	0.198
E. coli (cfu/100ml)	95th percentile ≤1200	20,800	22,000
Faecal coliforms (cfu/100ml)	-	22,900	22,000
Enterococci (cfu/100ml)	95th percentile <500	36,000	31,000
Copper -dissolved (mg/L)	<0.0014	0.003	0.003
Copper – total (mg/L)	-	0.007	0.008
Lead – dissolved (mg/L)	<0.0034	<0.0005	<0.0005
Lead – total (mg/L)	-	0.005	0.006
Zinc – dissolved (mg/L)	<0.008	0.017	0.014
Zinc – total (mg/L)	-	0.042	0.041

3.4 Onepoto Stream, Browns Bay Stream and Duck Creek

The wet weather monitoring results summarised in Table 3-4 show significantly elevated levels of turbidity, suspended solids, nutrients, zinc and indicator bacteria at Onepoto Stream, Browns Bay Stream and Duck Creek, well in excess of guideline levels. Browns Bay Stream contained exceptionally high indicator bacteria concentrations, indicating significant wastewater network overflow in the upstream catchment.

Table 3-5: Maximum recorded water quality values at two sites on Kenepuru Stream (n=6)

Variable	Guideline[1]	Unnamed Stream @ Onepoto	Browns Bay Stream	Duck Creek
Water temperature (°C)	<19	21	19.7	19.6
Dissolved oxygen - minimum (mg/L)	≥80% sat	5.7	6.5	7.1
pH	6.5-9.0	8.11	8.20	8.79
Conductivity (uS/cm)	-	535	377	336
Turbidity (NTU)	≤5.6	16.4	44.9	203
Total suspended solids (mg/L)	-	17	39	151
Total nitrogen (mg/L)	≤0.614	3.03	2.07	1.50
Inorganic nitrogen (mg/L)	≤0.465	2.51	1.57	1.17
Nitrate-nitrogen (mg/L)	≤0.444	2.39	1.50	1.15
Ammoniacal nitrogen (mg/L)	≤2.2	0.182	0.060	0.020
Dissolved reactive phosphorus (mg/L)	≤0.010	0.076	0.027	0.028
Total phosphorus (mg/L)	≤0.033	0.153	0.111	0.151
E. coli (cfu/100ml)	95th percentile ≤1200	26,000	85,550	6,820
Faecal coliforms (cfu/100ml)	-	31,000	86,400	10,100
Enterococci (cfu/100ml)	95th percentile <500	32,000	26,000	20,000
Copper -dissolved (mg/L)	<0.0014	0.007	0.004	0.002
Copper – total (mg/L)	-	0.012	0.006	0.007
Lead – dissolved (mg/L)	<0.0034	<0.0005	<0.0005	<0.0005
Lead – total (mg/L)	-	0.002	0.002	0.006
Zinc – dissolved (mg/L)	<0.008	0.075	0.138	0.016
Zinc – total (mg/L)	-	0.094	0.177	0.033

3.5 Porirua Harbour

The Porirua/Kenepuru stream system, together with several large stormwater pipes in the Porirua CBD, discharge into the southern end of the Onepoto Arm of Porirua Harbour. These, combined with several smaller watercourses such as the unnamed stream at Onepoto, have a major hydraulic influence on the Onepoto Arm during intense rainfall events. The Onepoto Arm catchment area is intensively developed, with approximately 50% of the catchment in urban land-use. The monitoring location offshore of Wi Neera is directly impacted by freshwater inputs from Porirua Stream and the Porirua CBD, while the Onepoto Rd site is further removed from major freshwater inputs (Table 3-5).

The monitoring results in Table 3-5 confirm a strong freshwater influence in estuarine waters near Wi Neera Drive, with significantly elevated suspended solids, nitrogen, phosphorus, copper, zinc and indicator bacteria levels, generally well above guideline levels. Copper and zinc concentrations are higher than those recorded in Porirua Stream or in the wastewater overflow, indicating that the Porirua CBD stormwater drains may be an important delivery route for these contaminants.

Contaminant levels were generally highest on the first day of the three-day sampling period, receding rapidly on subsequent days as stormflows recede and contaminants are dispersed by tidal flushing (refer Appendix B).

The Pauatahanui Arm of Porirua Harbour has a much smaller proportion of urban development in its catchment and, while Browns Bay Stream and Duck Creek are predominately urban watercourses, the larger streams such as the Pauatahanui, Horokiri and Kakaho Streams have catchments predominantly in pasture and scrub. Monitoring results for Mana Marina on the outgoing tide indicate relatively low contaminant levels in the Pauatahanui Arm compared with the Onepoto Arm, and the context of an intensive rainfall event, suggest a relatively high level of compliance with water quality guidelines.

Table 3-6: Maximum recorded water quality values at three sites in Porirua Harbour (n=6)

Variable	Guideline[1]	Off-shore Wi Neera Drive	Off-shore Onepoto Rd	Mana Marina
Water temperature (°C)	-	21.6	23.4	21.2
Dissolved oxygen – minimum (mg/L)	-	6.5	5.9	6.2
pH	-	8.56	8.01	8.07
Conductivity (uS/cm)	-	32,000	41,400	52,000
Turbidity (NTU)	-	66	68	16.5
Total suspended solids (mg/L)	-	161	236	91
Total nitrogen (mg/L)	-	2.10	1.04	0.83
Inorganic nitrogen (mg/L)	-	1.48	0.50	0.46
Nitrate-nitrogen (mg/L)	-	1.24	0.38	0.43
Ammoniacal nitrogen (mg/L)	<0.910	0.240	0.090	0.020
Dissolved reactive phosphorus (mg/L)	-	0.050	0.030	0.016
Total phosphorus (mg/L)	-	0.147	0.256	0.082
E. coli (cfu/100ml)	-	16,500	11,900	769
Faecal coliforms (cfu/100ml)	-	17,200	12,000	770
Enterococci (cfu/100ml)	95^{th} percentile <500	60,000	20,000	660
Copper -dissolved (mg/L)	<0.001	0.006	0.001	<0.0005
Copper – total (mg/L)	-	0.011	0.006	0.001
Lead – dissolved (mg/L)	<0.0044	<0.0005	<0.0005	<0.0005
Lead – total (mg/L)	-	0.005	0.005	0.001
Zinc – dissolved (mg/L)	<0.015	0.089	0.009	0.003
Zinc – total (mg/L)	-	0.121	0.033	0.008

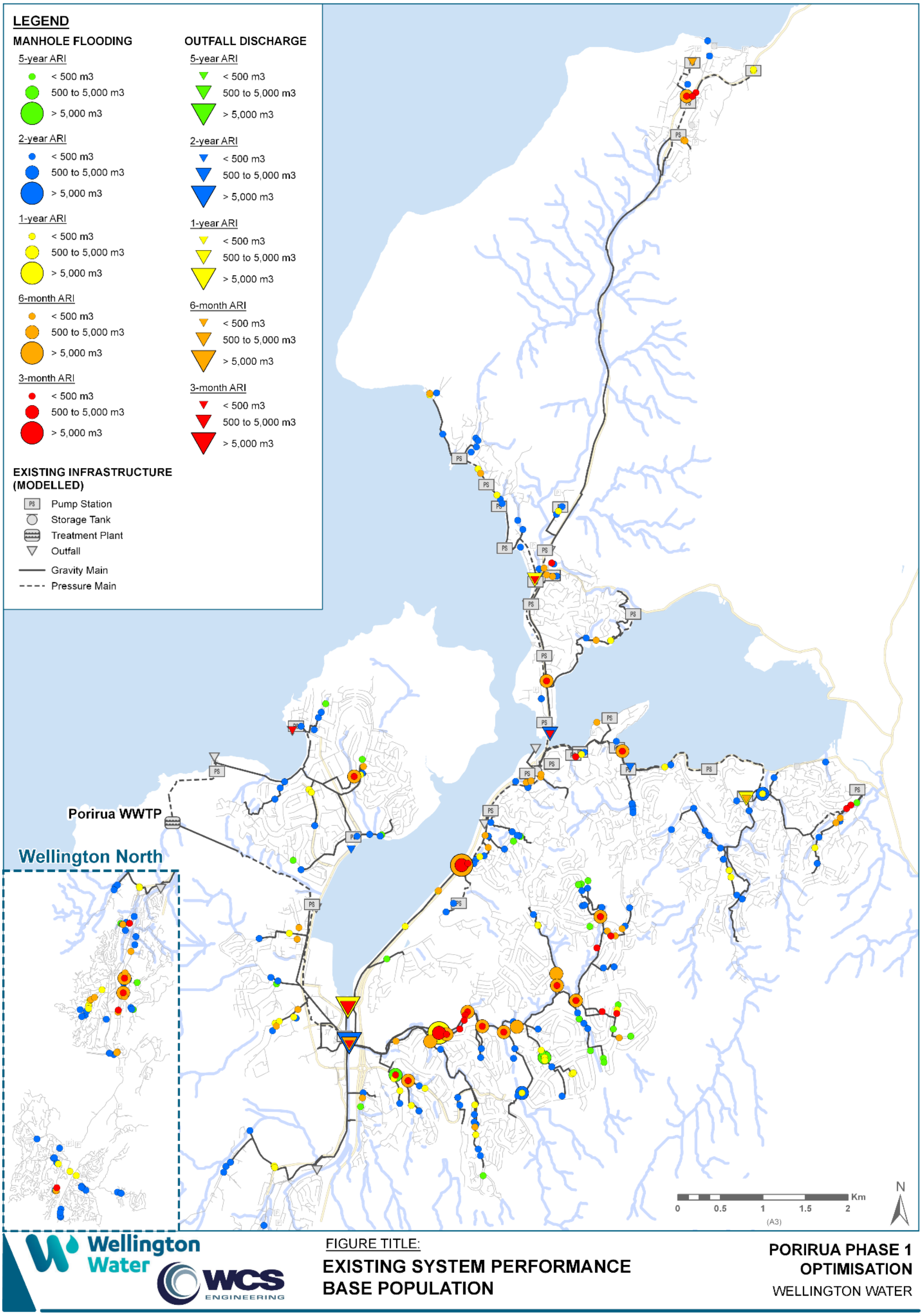
3.6 Plimmerton Beach

Plimmerton Beach is the only open coastal site in the study, although it is influenced by estuarine waters from Porirua Harbour on the outgoing tide, and more locally by Taupo Stream and stormwater discharges from the Plimmerton area. Contaminant levels are generally low, with the exception of indicator bacteria which are significantly elevated (Table 3-6). The source is likely to be either the outflow from the Onepoto arm of the harbour or more locally a wastewater network overflow within the Plimmerton area.

Table 3-7: Maximum recorded water quality values at Plimmerton Beach (n=6)

Variable	Guideline[1]	Plimmerton Beach
Water temperature (°C)	-	21.7
Dissolved oxygen – minimum (mg/L)	-	6.7
pH	-	8.19
Conductivity (uS/cm)	-	49,000
Turbidity (NTU)	-	18.6
Total suspended solids (mg/L)	-	148
Total nitrogen (mg/L)	-	0.54
Inorganic nitrogen (mg/L)	-	0.19
Nitrate-nitrogen (mg/L)	-	0.05
Ammoniacal nitrogen (mg/L)	<0.910	0.005
Dissolved reactive phosphorus (mg/L)	-	0.015
Total phosphorus (mg/L)	-	0.102
E. coli (cfu/100ml)	-	2,300
Faecal coliforms (cfu/100ml)	-	2,600
Enterococci (cfu/100ml)	95th percentile <500	2,900
Copper -dissolved (mg/L)	<0.001	0.001
Copper – total (mg/L)	-	0.001
Lead – dissolved (mg/L)	<0.0044	<0.0005
Lead – total (mg/L)	-	0.001
Zinc – dissolved (mg/L)	<0.015	0.002
Zinc – total (mg/L)	-	0.009

Appendix A: Wastewater network overflows


LEGEND
MANHOLE FLOODING
5-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
2-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
1-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
6-month ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
3-month ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
OUTFALL DISCHARGE
5-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
2-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
1-year ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
6-month ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
3-month ARI
< 500 m3
500 to 5,000 m3
> 5,000 m3
EXISTING INFRASTRUCTURE (MODELLED)
Pump Station
Storage Tank
Treatment Plant
Outfall
Gravity Main
Pressure Main
Porirua WWTP
Wellington North
0 0.5 1 1.5 2 Km
(A3)
N
Wellington Water
WCS ENGINEERING
FIGURE TITLE:
EXISTING SYSTEM PERFORMANCE
BASE POPULATION
PORIRUA PHASE 1
OPTIMISATION
WELLINGTON WATER

Appendix B: Flow monitoring results

Flow monitoring results						
Site name	Event 1			Event 2		
	20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018
Daily maximum flow in Porirua Stream at Town Centre (L/s)	13,407	3,195	2,207	16,908	6,902	3,158
Daily maximum flow at Constructed Sewer Overflow upstream of PS20 (L/s)	246	0	0	228	198	0
Daily discharge volumes at PS20 (m^3)	3080	0	0	4061	2290	0
Discharge to stream ratio	54	0	0	74	35	0

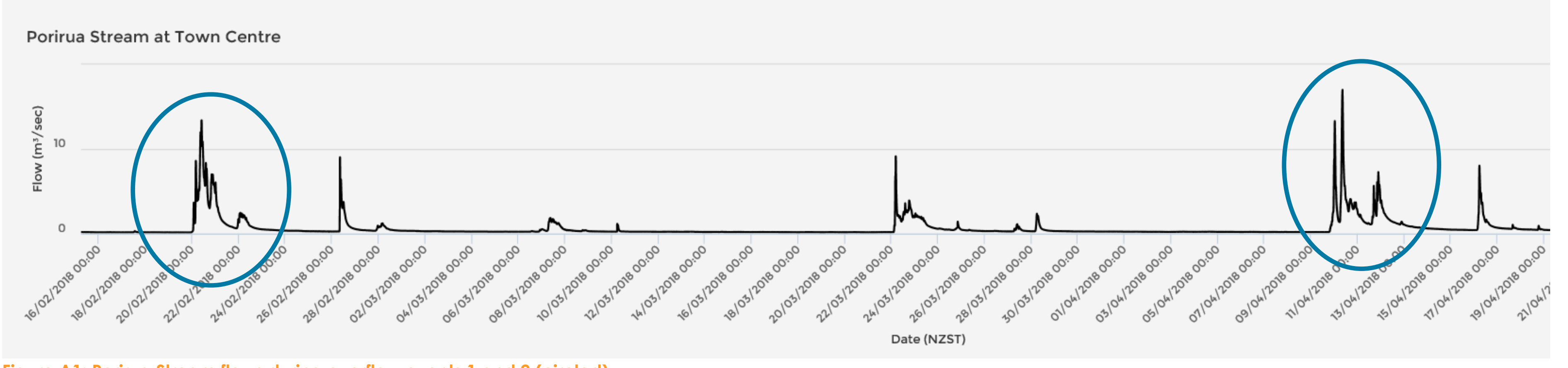


Figure A1: Porirua Stream flows during overflow events 1 and 2 (circled)

Appendix C: Water quality monitoring results

Escherichia coli (cfu/100ml)										
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	10000	5800	2400	15400	3700	5000	5,400	15,400
2	Porirua Stream near Mouth	41000	4900	2900	5000	4200	73	4,550	41,000
3	Porirua Harbour - Wi Neera Drive	7730	6400	496	16500	7800	1900	7,065	16,500
4	Unnamed stream @ Onopoto Rd	26000	7200	7000	7400	6000	7100	7,150	26,000
5	Porirua Harbour @ Onepoto Rd	4600	600	208	11900	869	942	906	11,900
6	Kenepuru Stream at Porirua Railway Station Carpark	11500	3400	792	8600	22000	9600	9,100	22,000
7	Kenepuru Stream at Bothamley park	7820	7700	2200	7300	5700	20800	7,500	20,800
8	Browns Bay Stream at Reserve	12400	500	469	85500	4300	835	2,568	85,500
9	Duck Creek	6820	3000	1500	3600	2900	1050	2,950	6,820
10	Mana Marina Boat Ramp	36	100	20	148	496	769	124	769
11	Plimmerton Beach near Fire Station	2300	112	24	869	212	23	162	2,300
12	Constructed Sewer Overflow @ PS20	300,000			3,000,000			1,650,000	3,000,000

Faecal coliforms (cfu/100ml)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	20000	5800	2700	24000	3700	5000	5400	24000
2	Porirua Stream near Mouth	41000	5100	3100	20100	4200	73	4650	41000
3	Porirua Harbour - Wi Neera Drive	7730	6400	510	17200	7800	2200	7065	17200
4	Unnamed stream @ Onopoto Rd	31000	7200	8400	20800	6000	7100	7800	31000
5	Porirua Harbour @ Onepoto Rd	4600	800	210	12000	870	970	920	12000
6	Kenepuru Stream at Porirua Railway Station Carpark	11800	5200	920	21800	22000	9600	10700	22000
7	Kenepuru Stream at Bothamley park	7910	7700	3200	22900	5700	20800	7805	22900
8	Browns Bay Stream at Reserve	12700	900	600	86400	4700	840	2800	86400
9	Duck Creek	6910	3000	2800	10100	2900	1060	2950	10100
10	Mana Marina Boat Ramp	44	100	24	390	500	770	245	770
11	Plimmerton Beach near Fire Station	2600	120	32	890	210	31	165	2600
12	Constructed Sewer Overflow @ PS20	1,140,000			3000000			2070000	3000000

Enterococci (cfu/100ml)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	25000	3000	720	29000	5600	18000	11800	29000
2	Porirua Stream near Mouth	23000	4000	600	38000	5800	8500	7150	38000
3	Porirua Harbour - Wi Neera Drive	18000	4400	440	31000	11000	60000	14500	60000
4	Unnamed stream @ Onopoto Rd	24000	3600	2200	32000	4000	4400	4200	32000
5	Porirua Harbour @ Onepoto Rd	12000	100	290	20000	470	550	510	20000
6	Kenepuru Stream at Porirua Railway Station Carpark	19000	2800	700	31000	6400	6200	6300	31000
7	Kenepuru Stream at Bothamley park	18000	2200	740	36000	3700	6800	5250	36000
8	Browns Bay Stream at Reserve	12000	4000	2500	26000	4900	2000	4450	26000
9	Duck Creek	13000	5800	930	20000	2300	900	4050	20000
10	Mana Marina Boat Ramp	77	100	16	460	640	660	280	660
11	Plimmerton Beach near Fire Station	2900	170	36	430	300	12	235	2900
12	Constructed Sewer Overflow @ PS20	18000			61000			39500	61000

Temperature (°C)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	18.9	19.8	18.9		10.7	11.8	18.9	19.8
2	Porirua Stream near Mouth	18.9	19.6	18.4		11	11.3	18.4	19.6
3	Porirua Harbour - Wi Neera Drive	21.3	21.2	21.6		11.1	17	21.2	21.6
4	Unnamed stream @ Onopoto Rd	20.4	20.9	21		13.4	14.2	20.4	21
5	Porirua Harbour @ Onepoto Rd	21	23.4	19.9		11.4	14	19.9	23.4
6	Kenepuru Stream at Porirua Railway Station Carpark	19.9	19.8	19.1		11.9	12.5	19.1	19.9
7	Kenepuru Stream at Bothamley park	19.9	19.5	18.3		11.4	12.1	18.3	19.9
8	Browns Bay Stream at Reserve	19.7	18	17.1		13.6	13.1	17.1	19.7
9	Duck Creek	19.6	18.4	17.1		12	12.3	17.1	19.6
10	Mana Marina Boat Ramp	21.2	20.5	20.6		11.9	11.4	20.5	21.2
11	Plimmerton Beach near Fire Station	21.7	20.5	20.1		13.6	16	20.1	21.7
12	Constructed Sewer Overflow @ PS20	21						21	21

Dissolved oxygen (mg/L)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	8.3	8.5	8.8		9.7	10.7	8.8	10.7
2	Porirua Stream near Mouth	7.9	8.6	8.6		10.8	11.4	8.6	11.4
3	Porirua Harbour - Wi Neera Drive	7.1	8	6.5		11.1	9.2	8	11.1
4	Unnamed stream @ Onopoto Rd	6.9	5.7	6.3		9.6	9.2	6.9	9.6
5	Porirua Harbour @ Onepoto Rd	5.9	7.4	7.2		9	11.8	7.4	11.8
6	Kenepuru Stream at Porirua Railway Station Carpark	7.6	6.8	7.7		10.1	9.5	7.7	10.1
7	Kenepuru Stream at Bothamley park	8.2	7.7	7.9		10	10.3	8.2	10.3
8	Browns Bay Stream at Reserve	6.5	8.6	8.3		9.6	10.6	8.6	10.6
9	Duck Creek	8.4	7.3	7.1		9.8	9.5	8.4	9.8
10	Mana Marina Boat Ramp	6.5	6.5	6.2		8.1	9.8	6.5	9.8
11	Plimmerton Beach near Fire Station	6.7	7	8.9		8.2	9	8.2	9
12	Constructed Sewer Overflow @ PS20	5.8						5.8	5.8

Conductivity (µS/cm)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	134	264	231		246	184	231	264
2	Porirua Stream near Mouth	144	290	8960		269	175	269	8960
3	Porirua Harbour - Wi Neera Drive	5440	1390	32000		2020	1280	2020	32000
4	Unnamed stream @ Onopoto Rd	243	520	535		445	284	445	535
5	Porirua Harbour @ Onepoto Rd	36600	34800	41400		40100	2870	36600	41400
6	Kenepuru Stream at Porirua Railway Station Carpark	143	268	231		255	141	231	268
7	Kenepuru Stream at Bothamley park	148	263	220		240	180	220	263
8	Browns Bay Stream at Reserve	286	377	347		346	246	346	377
9	Duck Creek	250	336	322		265	191	265	336
10	Mana Marina Boat Ramp	51200	49700	52000		39100	18700	49700	52000
11	Plimmerton Beach near Fire Station	45900	46700	46600		49000	42500	46600	49000
12	Constructed Sewer Overflow @ PS20	232						232	232

pH									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	7.96	8.13	8.62		8.52	7.48	8.13	8.62
2	Porirua Stream near Mouth	7.43	8.57	7.99		8.36	7.41	7.99	8.57
3	Porirua Harbour - Wi Neera Drive	6.65	7.82	7.8		8.59	7.32	7.8	8.59
4	Unnamed stream @ Onopoto Rd	7.35	7.28	8.11		7.48	7.78	7.48	8.11
5	Porirua Harbour @ Onepoto Rd	7.98	7.98	7.92		8.01	7.89	7.98	8.01
6	Kenepuru Stream at Porirua Railway Station Carpark	7.46	7.68	7.63		7.7	8.01	7.68	8.01
7	Kenepuru Stream at Bothamley park	8.56	7.67	7.58		7.87	8.99	7.87	8.99
8	Browns Bay Stream at Reserve	7.64	6.97	7.16		8.28	7.78	7.64	8.28
9	Duck Creek	8.04	7.11	7.52		8.01	8.79	8.01	8.79
10	Mana Marina Boat Ramp	8.07	7.88	7.89		8.03	7.78	7.89	8.07
11	Plimmerton Beach near Fire Station	8.13	8.03	8.11		8.19	8.18	8.13	8.19
12	Constructed Sewer Overflow @ PS20	7.16						7.16	7.16

TSS (mg/L)									
Site No.	Site name	Event 1			Event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	89	5	<3	132	11	6	11	132
2	Porirua Stream near Mouth	49	6	8	74	13	16	15	74
3	Porirua Harbour - Wi Neera Drive	8	161	12	70	19	<6	19	161
4	Unnamed stream @ Onopoto Rd	14	17	5	11	7	<6	11	17
5	Porirua Harbour @ Onepoto Rd	18	60	111	176	236	88	100	236
6	Kenepuru Stream at Porirua Railway Station Carpark	78	5	6	118	12	14	13	118
7	Kenepuru Stream at Bothamley park	56	5	4	105	9	12	11	105
8	Browns Bay Stream at Reserve	39	10	9	30	13	15	14	39
9	Duck Creek	91	17	14	151	24	36	30	151
10	Mana Marina Boat Ramp	32	91	27	85	65	64	65	91
11	Plimmerton Beach near Fire Station	110	148	77	68	90	79	85	148
12	Constructed Sewer Overflow @ PS20	79			63			71	79

Turbidity (NTU)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	56.4	5.63	2.88	113	10.3	9.29	9.8	113
2	Porirua Stream near Mouth	50.7	7.77	5.62	74.9	11.3	11.4	11.4	74.9
3	Porirua Harbour - Wi Neera Drive	7.24	48.2	7.03	66.4	15.6	4.47	11.4	66.4
4	Unnamed stream @ Onopoto Rd	15.5	10.9	5.62	16.4	10.9	10.3	10.9	16.4
5	Porirua Harbour @ Onepoto Rd	9.13	12.7	54.5	68	65.3	12	33.6	68
6	Kenepuru Stream at Porirua Railway Station Carpark	74.2	6.68	7.7	161	12.2	14.1	13.2	161
7	Kenepuru Stream at Bothamley park	55.2	5.38	5.46	116	9.8	15	12.4	116
8	Browns Bay Stream at Reserve	44.9	20	14.5	43.2	13.6	25.4	22.7	44.9
9	Duck Creek	150	23.8	27.9	203	29.2	36.7	33.0	203
10	Mana Marina Boat Ramp	2.84	10.5	14.3	5.67	14.7	16.5	12.4	16.5
11	Plimmerton Beach near Fire Station	7.47	18.6	16.4	2.75	5.87	2.44	6.7	18.6
12	Constructed Sewer Overflow @ PS20	11.5			43.8			27.7	43.8

Total N (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	1.61	1.77	1.19	1.43	1.67	1.86	1.64	1.86
2	Porirua Stream near Mouth	1.56	1.77	0.98	1.55	1.71	1.8	1.64	1.8
3	Porirua Harbour - Wi Neera Drive	1.19	1.77	0.93	1.47	1.71	2.1	1.59	2.1
4	Unnamed stream @ Onopoto Rd	2.32	2.45	2.18	1.96	2.6	3.03	2.39	3.03
5	Porirua Harbour @ Onepoto Rd	0.75	1.04	0.92	0.88	0.83	0.92	0.90	1.04
6	Kenepuru Stream at Porirua Railway Station Carpark	1.59	1.34	1.01	2.24	2.07	2.05	1.82	2.24
7	Kenepuru Stream at Bothamley park	1.47	1.3	0.94	2.16	1.78	2.06	1.63	2.16
8	Browns Bay Stream at Reserve	2.07	1.5	1.23	1.62	1.49	1.7	1.56	2.07
9	Duck Creek	1.43	1.09	0.94	1.5	1.25	1.39	1.32	1.5
10	Mana Marina Boat Ramp	0.38	0.49	0.39	0.35	0.73	0.83	0.44	0.83
11	Plimmerton Beach near Fire Station	0.54	0.48	0.54	0.26	0.41	0.21	0.45	0.54
12	Constructed Sewer Overflow @ PS20	10.5			11			10.75	11

Inorganic N (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.99	1.49	0.94	0.81	1.27	1.56	1.13	1.56
2	Porirua Stream near Mouth	1.07	1.46	0.77	1.09	1.31	1.4	1.20	1.46
3	Porirua Harbour - Wi Neera Drive	0.68	1.26	0.55	0.85	1.28	1.48	1.06	1.48
4	Unnamed stream @ Onopoto Rd	1.72	2.04	1.76	1.35	1.95	2.51	1.86	2.51
5	Porirua Harbour @ Onepoto Rd	0.38	0.48	0.34	0.45	0.33	0.5	0.42	0.5
6	Kenepuru Stream at Porirua Railway Station Carpark	1.13	1.05	0.76	1.57	1.43	1.69	1.28	1.69
7	Kenepuru Stream at Bothamley park	1.05	0.96	0.66	1.48	1.33	1.63	1.19	1.63
8	Browns Bay Stream at Reserve	1.57	1.25	0.97	1.06	0.91	1.33	1.16	1.57
9	Duck Creek	0.88	0.7	0.58	0.88	0.86	1.17	0.87	1.17
10	Mana Marina Boat Ramp	0.19	0.12	0.12	0.19	0.25	0.46	0.19	0.46
11	Plimmerton Beach near Fire Station	0.19	0.19	0.18	0.19	0.18	0.19	0.19	0.19
12	Constructed Sewer Overflow @ PS20	7.98			8.55			8.27	8.55

Nitrate N (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.96	1.46	0.92	0.81	1.18	1.4	1.07	1.46
2	Porirua Stream near Mouth	1	1.42	0.65	1	1.22	1.28	1.11	1.42
3	Porirua Harbour - Wi Neera Drive	0.55	1.19	0.37	0.72	1.18	1.24	0.95	1.24
4	Unnamed stream @ Onopoto Rd	1.63	1.84	1.58	1.34	1.83	2.39	1.73	2.39
5	Porirua Harbour @ Onepoto Rd	0.25	0.35	0.16	0.35	0.19	0.38	0.30	0.38
6	Kenepuru Stream at Porirua Railway Station Carpark	1.05	0.99	0.71	1.53	1.31	1.6	1.18	1.6
7	Kenepuru Stream at Bothamley park	1.01	0.94	0.65	1.47	1.31	1.58	1.16	1.58
8	Browns Bay Stream at Reserve	1.5	1.19	0.93	1.05	0.86	1.29	1.12	1.5
9	Duck Creek	0.86	0.67	0.56	0.87	0.85	1.15	0.86	1.15
10	Mana Marina Boat Ramp	<0.10	0.01	0.02	<0.10	0.15	0.43	0.09	0.43
11	Plimmerton Beach near Fire Station	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.1	0
12	Constructed Sewer Overflow @ PS20	3.07			4.17			3.62	4.17

Ammonia N (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.02	0.03	0.01	<0.01	0.08	0.15	0.03	0.15
2	Porirua Stream near Mouth	0.06	0.03	0.04	0.09	0.09	0.11	0.08	0.11
3	Porirua Harbour - Wi Neera Drive	0.13	0.06	0.09	0.13	0.09	0.24	0.11	0.24
4	Unnamed stream @ Onopoto Rd	0.07	0.18	0.16	<0.01	0.1	0.1	0.10	0.18
5	Porirua Harbour @ Onepoto Rd	0.04	0.04	0.09	<0.01	0.05	0.03	0.04	0.09
6	Kenepuru Stream at Porirua Railway Station Carpark	0.06	0.05	0.04	0.03	0.11	0.08	0.06	0.11
7	Kenepuru Stream at Bothamley park	0.03	0.02	<0.01	<0.01	0.01	0.04	0.03	0.04
8	Browns Bay Stream at Reserve	0.06	0.05	0.03	<0.01	0.04	0.04	0.04	0.06
9	Duck Creek	0.02	0.02	0.02	<0.01	<0.01	0.01	0.02	0.02
10	Mana Marina Boat Ramp	0.01	0.02	0.01	<0.01	0.01	0.02	0.01	0.02
11	Plimmerton Beach near Fire Station	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
12	Constructed Sewer Overflow @ PS20	4.78			4.28			4.53	4.78

Total Phosphorus (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.172	0.054	0.041	0.154	0.053	0.051	0.054	0.172
2	Porirua Stream near Mouth	0.159	0.063	0.065	0.136	0.06	0.064	0.065	0.159
3	Porirua Harbour - Wi Neera Drive	0.09	0.144	0.079	0.147	0.065	0.111	0.101	0.147
4	Unnamed stream @ Onopoto Rd	0.153	0.116	0.11	0.135	0.096	0.1	0.113	0.153
5	Porirua Harbour @ Onepoto Rd	0.112	0.131	0.256	0.077	0.086	0.056	0.099	0.256
6	Kenepuru Stream at Porirua Railway Station Carpark	0.145	0.048	0.04	0.198	0.063	0.058	0.061	0.198
7	Kenepuru Stream at Bothamley park	0.122	0.051	0.037	0.178	0.053	0.058	0.056	0.178
8	Browns Bay Stream at Reserve	0.111	0.064	0.052	0.099	0.061	0.061	0.063	0.111
9	Duck Creek	0.151	0.059	0.049	0.146	0.062	0.057	0.061	0.151
10	Mana Marina Boat Ramp	<0.050	0.082	0.062	0.028	0.042	0.031	0.042	0.082
11	Plimmerton Beach near Fire Station	0.072	0.102	0.094	0.026	0.029	0.028	0.051	0.102
12	Constructed Sewer Overflow @ PS20	0.856			0.918			0.887	0.918

Dissolved Reactive Phosphorus (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.043	0.029	0.023	0.035	0.022	0.022	0.026	0.043
2	Porirua Stream near Mouth	0.048	0.031	0.023	0.034	0.022	0.021	0.027	0.048
3	Porirua Harbour - Wi Neera Drive	0.05	0.04	0.024	0.039	0.022	0.043	0.040	0.05
4	Unnamed stream @ Onopoto Rd	0.076	0.029	0.029	0.065	0.028	0.03	0.030	0.076
5	Porirua Harbour @ Onepoto Rd	0.026	0.023	0.025	0.03	0.021	0.022	0.024	0.03
6	Kenepuru Stream at Porirua Railway Station Carpark	0.032	0.017	0.014	0.03	0.015	0.016	0.017	0.032
7	Kenepuru Stream at Bothamley park	0.033	0.017	0.014	0.031	0.015	0.015	0.016	0.033
8	Browns Bay Stream at Reserve	0.027	0.012	0.012	0.022	0.012	0.011	0.012	0.027
9	Duck Creek	0.028	0.016	0.015	0.019	0.015	0.017	0.017	0.028
10	Mana Marina Boat Ramp	0.009	0.009	0.007	0.008	0.014	0.016	0.009	0.016
11	Plimmerton Beach near Fire Station	0.015	0.012	0.009	0.009	0.01	0.013	0.011	0.015
12	Constructed Sewer Overflow @ PS20	0.349			0.511			0.430	0.511

Copper – dissolved (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.0029	0.0009	0.0015	0.0024	0.0015	0.0015	0.002	0.0029
2	Porirua Stream near Mouth	0.0021	0.001	0.0015	0.0026	0.0023	0.0016	0.002	0.0026
3	Porirua Harbour - Wi Neera Drive	0.0063	0.0011	0.0013	0.0028	0.0016	0.0043	0.002	0.0063
4	Unnamed stream @ Onopoto Rd	0.0066	0.0035	0.0038	0.0072	0.0049	0.0054	0.005	0.0072
5	Porirua Harbour @ Onepoto Rd	0.0011	0.001	0.001	0.0012	0.0006	0.0007	0.001	0.0012
6	Kenepuru Stream at Porirua Railway Station Carpark	0.0026	0.0018	0.0015	0.0033	0.0021	0.0021	0.002	0.0033
7	Kenepuru Stream at Bothamley park	0.0022	0.0017	0.0015	0.003	0.0022	0.002	0.002	0.003
8	Browns Bay Stream at Reserve	0.0034	0.0021	0.0018	0.0035	0.0025	0.0025	0.003	0.0035
9	Duck Creek	0.0019	0.0017	0.0012	0.0015	0.0011	0.0009	0.001	0.0019
10	Mana Marina Boat Ramp	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0006
11	Plimmerton Beach near Fire Station	<0.0005	<0.0005	0.0005	0.0009	<0.0005	<0.0005	<0.0005	0.0009
12	Constructed Sewer Overflow @ PS20	0.0051			0.007			0.006	0.007

Copper – total (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.007	0.002	0.002	0.006	0.002	0.002	0.002	0.007
2	Porirua Stream near Mouth	0.006	0.003	0.003	0.006	0.003	0.003	0.003	0.006
3	Porirua Harbour - Wi Neera Drive	0.011	0.006	0.002	0.007	0.003	0.009	0.007	0.011
4	Unnamed stream @ Onopoto Rd	0.012	0.006	0.006	0.01	0.007	0.007	0.007	0.012
5	Porirua Harbour @ Onepoto Rd	0.002	<0.002	0.005	0.006	0.004	<0.002	0.005	0.006
6	Kenepuru Stream at Porirua Railway Station Carpark	0.007	0.003	0.003	0.008	0.003	0.003	0.003	0.008
7	Kenepuru Stream at Bothamley park	0.006	0.002	0.003	0.007	0.003	0.002	0.003	0.007
8	Browns Bay Stream at Reserve	0.006	0.003	0.003	0.006	0.004	0.004	0.004	0.006
9	Duck Creek	0.007	0.002	0.002	0.006	0.002	<0.002	0.002	0.007
10	Mana Marina Boat Ramp	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
11	Plimmerton Beach near Fire Station	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
12	Constructed Sewer Overflow @ PS20	0.02			0.015			0.018	0.02

Lead – dissolved (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	median
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
2	Porirua Stream near Mouth	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
3	Porirua Harbour - Wi Neera Drive	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
4	Unnamed stream @ Onopoto Rd	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
5	Porirua Harbour @ Onepoto Rd	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6	Kenepuru Stream at Porirua Railway Station Carpark	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
7	Kenepuru Stream at Bothamley park	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8	Browns Bay Stream at Reserve	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
9	Duck Creek	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10	Mana Marina Boat Ramp	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
11	Plimmerton Beach near Fire Station	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
12	Constructed Sewer Overflow @ PS20	<0.0005			<0.0005			<0.0005	<0.0005

Lead – total (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.005	<0.001	<0.001	0.005	<0.001	<0.001	0.001	0.005
2	Porirua Stream near Mouth	0.004	<0.001	<0.001	0.004	<0.001	0.001	0.003	0.004
3	Porirua Harbour - Wi Neera Drive	<0.001	0.005	<0.001	0.004	<0.001	<0.001	<0.001	0.005
4	Unnamed stream @ Onopoto Rd	0.002	0.001	<0.001	0.002	0.001	0.001	0.001	0.002
5	Porirua Harbour @ Onepoto Rd	<0.001	<0.001	0.005	0.002	0.003	<0.001	0.001	0.005
6	Kenepuru Stream at Porirua Railway Station Carpark	0.004	<0.001	<0.001	0.006	<0.001	<0.001	<0.001	0.006
7	Kenepuru Stream at Bothamley park	0.003	<0.001	<0.001	0.005	<0.001	<0.001	<0.001	0.005
8	Browns Bay Stream at Reserve	0.002	0.001	<0.001	0.002	0.002	0.001	0.002	0.002
9	Duck Creek	0.006	<0.001	<0.001	0.006	0.001	0.001	0.001	0.006
10	Mana Marina Boat Ramp	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	<0.001	0.001
11	Plimmerton Beach near Fire Station	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001
12	Constructed Sewer Overflow @ PS20	0.003			0.003			0.003	0.003

Zinc – dissolved (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.013	0.008	0.011	0.01	0.015	0.014	0.012	0.015
2	Porirua Stream near Mouth	0.011	0.008	0.013	0.014	0.018	0.012	0.013	0.018
3	Porirua Harbour - Wi Neera Drive	0.089	0.003	0.013	0.031	0.022	0.04	0.027	0.089
4	Unnamed stream @ Onopoto Rd	0.059	0.052	0.038	0.07	0.075	0.052	0.056	0.075
5	Porirua Harbour @ Onepoto Rd	0.009	0.005	0.005	0.005	0.003	0.004	0.005	0.009
6	Kenepuru Stream at Porirua Railway Station Carpark	0.008	0.008	0.006	0.008	0.014	0.012	0.008	0.014
7	Kenepuru Stream at Bothamley park	0.006	0.01	0.008	0.008	0.017	0.013	0.009	0.017
8	Browns Bay Stream at Reserve	0.028	0.03	0.027	0.038	0.138	0.024	0.029	0.138
9	Duck Creek	0.003	0.008	0.006	<0.002	0.016	0.003	0.006	0.016
10	Mana Marina Boat Ramp	<0.002	0.003	<0.002	<0.002	<0.002	<0.002	<0.002	0.003
11	Plimmerton Beach near Fire Station	<0.002	<0.002	<0.002	0.002	<0.002	<0.002	<0.002	0.002
12	Constructed Sewer Overflow @ PS20	0.023			0.022			0.023	0.023

Zinc – total (mg/L)									
Site No.	Site name	Storm event 1			Storm event 2			median	Max
		20/02/2018	21/02/2018	22/02/2018	10/04/2018	11/04/2018	12/04/2018		
1	Porirua Stream at Town Centre	0.054	0.019	0.017	0.044	0.028	0.022	0.025	0.054
2	Porirua Stream near Mouth	0.085	0.021	0.029	0.045	0.028	0.026	0.029	0.085
3	Porirua Harbour - Wi Neera Drive	0.121	0.046	0.023	0.072	0.036	0.068	0.057	0.121
4	Unnamed stream @ Onopoto Rd	0.091	0.081	0.054	0.089	0.094	0.077	0.085	0.094
5	Porirua Harbour @ Onepoto Rd	0.021	0.014	0.031	0.033	0.032	0.015	0.026	0.033
6	Kenepuru Stream at Porirua Railway Station Carpark	0.04	0.028	0.014	0.041	0.027	0.018	0.028	0.041
7	Kenepuru Stream at Bothamley park	0.035	0.016	0.014	0.042	0.027	0.017	0.022	0.042
8	Browns Bay Stream at Reserve	0.069	0.047	0.048	0.072	0.177	0.041	0.059	0.177
9	Duck Creek	0.033	0.017	0.017	0.03	0.032	0.012	0.024	0.033
10	Mana Marina Boat Ramp	<0.005	0.008	<0.005	0.005	0.008	<0.005	0.005	0.008
11	Plimmerton Beach near Fire Station	0.008	0.009	0.006	0.005	<0.005	<0.005	0.005	0.009
12	Constructed Sewer Overflow @ PS20	0.06			0.049			0.055	0.06

Appendix C: Water quality guidelines

The water quality guideline values used in this report (Table A-1) generally follow the approach outlined by Milne & Morar (2017). In most instances the guideline values used are the ANZECC (2000) 'default' trigger values for lowland aquatic ecosystems or (chronic) toxicity. The trigger values for lowland aquatic ecosystems are intended to be compared against the median values from independent samples at a site. These trigger values are not legal standards and breaches do not necessarily mean an adverse effect would result (i.e., they are not effects based). Rather, they can be considered 'nominal thresholds' that provide an 'early warning' mechanism to alert resource managers to a potential problem or emerging change that may warrant site specific investigation or remedial action (ANZECC 2000).

Table A-1: Water quality guideline values

Variable	Guideline value	Reference
Water temperature (°C)	≤19	Quinn and Hickey (1990) & Hay et al (2007
Dissolved oxygen (%sat)	≥80	RMA 1991 Third Schedule
pH	6.5-9.0	ANZECC (1992)
Turbidity (NTU)	annual median ≤5.6	ANZECC (2000) lowland TV
Nitrate-nitrogen (mg/L)	annual median ≤0.444	ANZECC (2000) lowland TV
Nitrate-nitrogen (mg/L)	annual median <6.9	NPS-FM national bottom line
Ammoniacal nitrogen (mg/L)	annual median ≤0.021	ANZECC (2000) lowland TV
	maximum <2.2	NPS-FM (MfE 2014)
	Varies	ANZECC (2000) freshwater toxicity TV (95% protection level)
Dissolved inorganic nitrogen (mg/L)	annual median ≤0.465	ANZECC (2000) by addition of the nitrate, nitrite, ammonia TVs
Total nitrogen (mg/L)	annual median ≤0.614	ANZECC (2000) lowland TV
Dissolved reactive phosphorus (mg/L)	annual median ≤0.010	ANZECC (2000) lowland TV
Total phosphorus (mg/L)	annual median ≤0.033	ANZECC (2000) lowland TV
E. coli. (cfu/100 ml)	95^{th} percentile < 1200	NPS-FM (MfE 2014)
Enterococci (cfu/100ml)	95^{Th} percentile ≤ 500	PNRP Primary contact recreation (coastal waters)
Dissolved copper (mg/L)	annual median <0.0014	ANZECC (2000) freshwater toxicity TV (95% protection level)
Dissolved lead (mg/L)	annual median <0.0034	ANZECC (2000) freshwater toxicity TV (95% protection level)
Dissolved zinc (mg/L)	annual median <0.008	ANZECC (2000) freshwater toxicity TV (95% protection level)

Appendix 3 – Tangata Whenua Values

Memo

To:	Richard Peterson (cc Naomi Solomon, Te Runanga o Toa Rangatira)	From:	Miria Pomare
	Stantec		Stantec
File:	Porirua WWTP Collaborative Assessment	Date:	June 7, 2019

Reference: **Porirua Wastewater Network & WWTP - Comparative Assessment of Effects on 'Tangata whenua values' – Final Draft**

1. INTRODUCTION

1.1 BACKGROUND

This report presents a comparative assessment of the Porirua wastewater network and wastewater treatment plant short listed options. The Porirua wastewater short list includes nine options for the management of wet weather overflows and the treatment/discharge of wastewater to the coastal environment.

An MCA scoring approach has been used to compare each option against the 'Tangata whenua values' assessment criterion. Seven key elements or sub-criteria have been encapsulated within this criterion to reflect Ngati Toa's values and ensure they are properly recognised and considered in the assessment. The criterion explanation describes these values as follows:

> *'Tangata whenua values – effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa.'*

A range of cultural effects thresholds (from 1-5) have been identified and will be used as the basis for scoring each option against 'Tangata whenua values'. These thresholds are provided in Table 1.

Table 1: Scoring Thresholds for Porirua Wastewater Programme Short List Assessment

Criteria	Description	One	Two	Three	Four	Five
Tangata Whenua values	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa.	High adverse effects	Moderate to high adverse effects.	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

The purpose of this report, together with similar reports prepared for a range of other criteria, is to inform a Multi Criteria Assessment (MCA) workshop by the larger collaborative group. This assessment will be used to report back to the workshop on the recommended scoring of options against the 'Tangata whenua values' criterion and it will be compared to the assessments for other criteria, finally leading to the selection of a preferred option.

This report has been prepared by Miria Pomare, on behalf of Te Runanga o Toa Rangatira (the Runanga). Miria has a Masters of Political Science from the University of Hawaii and previously worked for the Runanga for 15 years in key roles relating to iwi resource management and the Treaty claims settlement process. She has considerable experience with tangata whenua interests in respect of resource management processes and has worked extensively with district and regional councils in relation to planning and resource consent issues. She is also a qualified Independent Commissioner with the Chair's endorsement and regularly acts in this role.

The Runanga is the mandated iwi authority for Ngati Toa Rangatira (Ngati Toa). Ngati Toa has held exclusive 'tangata whenua' status in the Porirua area since 1822 following their migration to Cook Strait and displacement of Ngati Ira by conquest ('take raupatu') in accordance with Maori custom. The Runanga has responsibility for protecting and enhancing the 'mana' of Ngati Toa across all spheres of the political, economic, social and environmental landscape. In resource management terms, this involves advocating for the sustainable management of the environment and natural resources and creating opportunities for the exercise of kaitiakitanga (guardianship or stewardship) through the Iwi's involvement in policy and decision-making processes in all aspects of environmental management. Kaitiakitanga is also exercised through Ngati Toa's relationships with the community, local and regional authorities and Wellington Water, as an integrated and coordinated approach is required to achieve sustainable resource management. In this context, the preparation of this report is an expression of kaitiakitanga or stewardship by Ngati Toa in relation to the Porirua Harbour and surrounding coastal environment; as such, the expression of Ngati Toa's values as encapsulated within the 'Tangata whenua values' criterion must be understood from within a 'Ngati Toa world view' paradigm (discussed below).

The information replied upon for the completion of this assessment includes the following:

- Memo prepared by Richard Peterson on Porirua Wastewater Consenting Programme - Recommended Shortlist of Options (March 2, 2018)
- Porirua Wastewater Consenting Strategy
- Aerials illustrating the WWTP outfall options
- Draft notes from Collaborative Group Meeting (Nov 2018)
- Draft Options Sheets (Description & Schematics) (April 1, 2019)
- All 9 Options (Description & Schematics) (May 2, 2019)
- "Marine Cultural Health Indicators Report"; Te Runanga o Toa Rangatira (June 2017)
- "Te Awarua-o-Porirua Whaitua Implementation Programme: Ngati Toa Rangatira Statement" (2019)

This assessment is limited to consideration of available information for the purposes of comparing the nine upgrade options. It is necessarily a high-level assessment and does not in any way constitute an assessment of cultural effects.

2. APPROACH TO THE ASSESSMENT

2.1 EXISTING ENVIRONMENT – NGATI TOA WORLD VIEW

The approach taken in this assessment of comparing options against 'Tangata whenua values' needs to be understood from a Matauranga Maori or Maori world view perspective. The traditional Maori world view has its philosophical roots in a pantheist paradigm which attributes status to deities (atua) which preside over elemental domains. Ranginui (Sky father) and Papatuanuku (Earth mother) are the parents, and from their union came the atua or deities who became the first kaitiaki of the domains in the natural world. The domains of atua provide the linkages across resources giving a holistic and integrated approach to environmental management. The relationship between atua, representing the environment, and Maori (in this case Ngati Toa) is expressed by way of kaitiakitanga.

Kaitiakitanga is a central manifestation of the Maori environmental resource management system and should be recognised as both a practice and the result of a Maori philosophy of sustainable resource management. Kaitiakitanga requires the healthy existence of 'mauri' within individual natural, physical and metaphysical resources. The correct maintenance of this 'mauri' guarantees the ongoing life of that resource. As traditionally practiced, it ensures that resources are sustainably managed for future generations.

For the purposes of this assessment, the 'Tangata whenua values' criterion is made up of seven key cultural indicators of environmental health and wellbeing. These are all derived from the domain of the Atua and form part of the set of cultural practices or 'tikanga' that are intended to unify the elements of all living things in a holistic way to achieve the overriding goal of maintaining the 'mauri' of the natural environment.

The restoration of 'mauri' is central to Ngati Toa's vision for Te Awarua-o-Porirua (the traditional name for Porirua Harbour and its environs) which aims to revitalise the harbour so that its waters are healthy and all those who live in the region, including Ngati Toa, "can enjoy, live and play in our environment and future generations are sustained, physically and culturally". [1] Te Awarua-o-Porirua is integral to the identity of Ngati Toa. The harbour has played a fundamental role over the generations in sustaining the physical and cultural needs of Ngati Toa, and as kaitiaki, the Iwi has a reciprocal obligation to nurture and protect the environment in order that it can sustain future generations.

However, today, the effects of intensive land use, including contamination and siltation of the waterways, have resulted in poor water quality and an inability to exercise important customary and commercial practices, including harvesting kaimoana from the harbour, which was relied upon for generations as the food basket of Ngati Toa. Ngati Toa's vision of restoring 'mauri' to the harbour is of critical importance to the future of both the harbour and its Ngati Toa people. The measure of success for Ngati Toa in achieving this vision will be through the health and wellbeing of its people: "when our people are physically and spiritually well and culturally thriving, we will know that the mauri of Te Awarua-o-Porirua has been restored".[2]

Ngati Toa's vision highlights the fundamental importance of the whakapapa connection between the iwi and the harbour, and the extent to which the health of the harbour manifests as a direct reflection of the health of the Iwi. It also emphasises the importance of the harbour as a source of sustenance for Iwi members and for future generations. The restoration of traditional mahinga kai and kaimoana resources is integral to sustaining the cultural and physical needs of the Iwi. These core values which are at the heart of Ngati Toa's vision for the harbour are the same values that have been identified as sub-criteria of the 'Tangata whenua values' criterion. In the context of this assessment, these values or cultural health indicators have been described as sub-criteria with the following explanations:

- **Mauri** – life force of an object or being, the essence of existence, the bonding element that holds the fabric of the universe together. It is an important cultural measure of well-being, an indicator of health or sickness, and can be diminished or enhanced through external influences. Small shifts in the mauri or life force of any part of the environment, for example through use or misuse, can cause shifts in the mauri of the whole ecosystem. This concept is central to Maori environmental management practices and shows that impacts upon one indicator can have a flow on effect to other indicators. Understanding this interconnectedness is important for Ngati Toa, as kaitiaki, to ensure the mauri of a resource can be maintained or enhanced.
- **Mana** – authority, prestige or influence, expressed through the ability of Ngati Toa to maintain control over its interests (people, land and resources) and manage an environment that can sustain its people. The maintenance of a viable food source for Ngati Toa people is integral to upholding iwi mana, as is the ability to source and provide kaimoana for visitors (manuhiri). The ability to maintain and utilise mahinga kai is seen as a direct reflection of Ngati Toa mana. The practice and responsibility of 'manaakitanga' is critical to iwi identity and the maintenance and enhancement of mana.
- **Hauora** – the health and vitality of the natural environment is viewed in a holistic sense by Maori as a direct reflection of the health and vitality of the people. For Ngati Toa, the harbour is seen as the primary health indicator for the Iwi. Historically, the harbour provided an abundant and plentiful food supply which sustained the needs of the Iwi for generations. However, over time, Ngati Toa's inability to maintain its mana over the harbour and coastal areas has resulted in a degraded environment and contributed to declining health and prosperity amongst its people. In this sense, the hauora of the harbour and its environs can be seen as a reflection of the hauora of its Ngati Toa people.
- **Kaimoana** – food harvested from the sea formed an integral part of Ngati Toa's staple diet until the despoliation of the harbour from around the 1940s onwards. Until this time, Ngati Toa people were still substantially dependent on kaimoana, taken mainly from the harbour, for their daily food intake. The collection of pipi and pupu (cat's eyes), supplemented with a range of fish species in plentiful supply, provided for the day-to-day needs of Iwi members. Commercial fishing from within the harbour was also important for the Iwi's economic sustenance but became unsustainable as fish and shellfish stocks were increasingly depleted due to the adverse effects of pollution and contamination. The impacts of urban development in Porirua throughout much of the twentieth century, including the pollution of waterways

[1] "Te Awarua-o-Porirua Whaitua Implementation Programme: Ngati Toa Rangatira Statement" (2019); page 4
[2] Ibid; page 4

through the discharge of raw sewerage directly into the harbour in the 1940s, has had an ongoing detrimental impact on Ngati Toa's ability to harvest kaimoana from its most treasured 'food basket'.

Furthermore, as the harbour has declined and become more degraded over time, so too has the health and wellbeing of its Ngati Toa people. The link between the health of kaimoana and the health of the people, is inherent within Ngati Toa's understanding of the importance, as kaitiaki, of ensuring the sustainable management of shellfish and other seafood resources. This involves regulating the harvest of kaimoana through 'tikanga' or customary protocols that determine the place, season and quantities of shellfish to be taken for a particular cultural purpose. More fundamentally, though, kaitiakitanga requires ongoing management of the marine resource itself, in order to maintain the environmental conditions required for kaimoana to thrive.

- **Mahinga kai** – refers to both the place of food gathering, as well as the types of food gathered. Traditionally, the harbour and wider catchment was regarded as Ngati Toa's food basket because it provided an abundance of kaimoana and other resources which Ngati Toa depended on for the cultural and physical sustenance of the Iwi. The wider coastal environment of Raukawa Moana (Cook Strait) also played a critical role, and continues to do so today, in sustaining food gathering areas and certain taonga species, such as paua, that could not be found within the harbour. Mahinga kai were not only located within the marine environment, the streams flowing into the harbour also provided a plentiful supply of freshwater fish and tuna (eels). Areas set aside as mahinga kai were rested periodically to provide for species regeneration and the restoration of ecosystem health. The ability of Ngati Toa to access mahinga kai for food gathering purposes continues to be an important customary practice and one of the key indicators of ecological and cultural health.
- **Heritage** – refers to sites or places of traditional and/or cultural significance to Ngati Toa, including waahi tapu (sacred sites) and waahi tupuna (ancestral sites). Traditionally, Ngati Toa settlements were established around the harbour and in more expansive coastal locations to take advantage of the easily accessible and abundant food resources in the local marine environment. A large number of Ngati Toa settlements and sites of cultural significance are located within the environs of the harbour. Takapuwahia became the principal residence of Ngati Toa following Te Rauparaha's capture and detention by Grey in 1847; and, at the entrance to the harbour, Whitireia Peninsula was an important area of occupation for Ngati Toa, as evidenced by the archaeological remains of numerous kainga (settlements) and waahi tapu located within the coastal margins. Ngati Toa also had settlements further south along the coast at various locations including Rukutane, Te Korohiwa and Komangarautawhiri (where Kupe first made landfall in Cook Strait during his circumnavigation of Aotearoa). However, these coastal settlements were largely abandoned following Grey's military campaign against Ngati Toa in 1846. Subsequently, these sites were occupied intermittently for the seasonal gathering of kaimoana and other resources. As kaitiaki, Ngati Toa are aware of the importance of maintaining traditional linkages between sites/places of heritage significance to Ngati Toa and the harbour and coastal environments.
- **Whakapapa** – genealogical relationships underpin the entire Maori world view of the universe, including traditional notions of sustainable resource management. Every element of the physical and metaphysical world has a whakapapa or genealogical origin that is inter-connected and inter-related with every other element, thus creating the tapestry of an inter-woven universe. In an elemental sense, this means that all things in the natural world are closely inter-connected, including people, who along with other species are themselves descended from Papatuaanuku (as opposed to being ascendant to her as in the 'Western' world view). The Maori understanding that we are all inextricably connected to the natural world through whakapapa establishes a 'familial' relationship and reciprocal duty of care, whereby people are obligated to nurture and protect the environment, to ensure that it can sustain future generations. It is ultimately because of this whakapapa connection that the health and wellbeing of the environment directly reflects the health and wellbeing of its people.

Therefore, from a 'Ngati Toa world view' perspective, these values or sub-criteria are all closely interconnected and an adverse impact on one sub-criteria or elemental domain will inevitably have a flow on impact(s) to another. An illustration of this principle, which is of central relevance to this assessment, is the Maori aversion to the disposal of human waste into waterways. In pre-European times the importance of maintaining demarcation points between aspects of nature and community practices was paramount. Perhaps one of the most significant of these was latrines and the protocols surrounding their location, use and management. These practices were entirely land-based and there was a deep-seated aversion to disposing of any waste into freshwater. This included water that flowed from one place to another (such as rivers and streams) and the marine environment. The centrality of water to the sustenance of all life was well recognised by Ngati Toa communities, as was its ability to transmit any effects of disturbance or degradation.

While early European settlers in the Porirua region also adopted land-based methods of sewage disposal, population growth and urban pressure drove local authorities to follow the lead of European countries in developing a water-based effluent disposal system which eventually found its way into our streams and harbour, and then to the sea. Ngati Toa communities living along the coast (in the vicinity of the existing Wastewater Treatment Plant) and around the harbour struggled to sustain communal and Paa-like living, and as Iwi members became increasingly assimilated as residents of urban environments, they had little choice but to adopt European practices. Nevertheless, the cultural and spiritual repugnance of mixing human waste with water continues to be an issue of upmost concern to Ngati Toa today.

The harbour is still suffering the effects from hundreds of thousands of gallons of raw sewerage entering its waters in the 1940s, mainly from the Mental Hospital. This caused major despoliation of mahinga kai and kaimoana, and seriously degraded the 'mauri' and ecological health of the harbour and wider catchment. The establishment of the Porirua Wastewater Treatment Plant in the 1980s has led to considerable improvements in local sewerage disposal and the European perspective on waste disposal via waterways has now been reflected as "best practice" in the establishment of towns and cities around the country. However, Ngati Toa's concerns have not diminished over time given the high levels of contamination of the harbour and waterways which continue to pose serious risks to ecosystem and human health, and increasing issues with the capacity of the current infrastructure network (wastewater and stormwater) to keep abreast of population growth in the catchment.

This comparative assessment of options to upgrade the Porirua wastewater network and treatment plant provides an opportunity for the ongoing concerns of the Iwi to finally be addressed. The 'Ngati Toa world view' described above outlines the unique perspective within which this assessment has been undertaken. The assessment criteria and their application to each of the nine options is consistent with Ngati Toa's world view perspective, central to which is a holistic and integrated approach to environmental management.

3. THE COMPARATIVE ASSESSMENT

As described previously, the Ngati Toa World View requires a holistic and integrated approach to environmental management to ensure the sustainable use of resources for the benefit of future generations. Underpinning the Maori approach to sustainable resource management or kaitiakitanga is the need to recognise and respect important cultural and spiritual values associated with the use and management of the environment.

To this end, the 'Tangata whenua values criterion' encapsulates these key values from Ngati Toa's perspective and breaks them down into sub-criteria. These sub-criteria are so closely related and interconnected that any adverse impact on one sub-criteria or domain will inevitably have a flow on impact to another. However, the impact will not necessarily have the same effect(s) and therefore it has been necessary to consider the options in relation to each of the seven sub-criteria, rather than make an overall judgement based on the 'Tangata whenua values' criterion.

Therefore, all nine options have been assessed against each of the sub-criteria and given an individual score based on the effect's thresholds (1-5), as set out in Table 1. The individual scores for each of the sub-criteria have then been tallied up to provide a total score for each option. These total scores have been divided by 7 (being the number of sub-criteria) to provide an aggregate (average) score between 1-5. This gives the overall MCA score for each option provided in Table 11 below.

The recommended scores against the 'Tangata whenua values' criterion for all nine options, including brief explanations, are provided in Tables 2 -10 attached to this report as Appendix 1.

Table 2: Summary of Recommended Scores against 'Tangata whenua values' Criterion for all Options

Option	Overall Assessment	Score (total)	Average score
1. Greater conveyance in the network, existing standard of treatment, discharging from duplicated shoreline outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • adverse/uncertain effects of partially treated storm flows on the coastal environment and potential degradation of 'mauri', 'kaimoana' and 'mahinga kai' • uncertainty regarding effects of the duplicated shoreline outfall • reduced water quality in CMA close to the existing outfall	25	3.5
2. Combination of storage and conveyance in the network, existing standard of treatment, discharge from the existing shoreline outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • capacity for partial storage of overflows in the network during storm events • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects in relation to 'mahinga kai' and 'kaimoana' • increased peak flows may cause a slight reduction of water quality in the vicinity of the outfall	28	4
3. Twin storage in the network, existing standard of treatment, discharge from the existing shoreline outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • capacity for greatest storage of overflows in the network during storm events • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects in relation to 'mahinga kai' and 'kaimoana'	29	4
4. Greater conveyance in the network, existing standard of treatment, discharge from a new shoreline outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • adverse/uncertain effects of partially treated storm flows on the coastal environment and potential degradation of 'mauri', 'kaimoana' and 'mahinga kai' • adverse/uncertain effects of the proposed new outfall at Round Point on 'heritage' values • reduced water quality in the vicinity of the proposed new outfall	25	3.5
5. Combination of storage and conveyance in the network, existing standard of treatment,	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri'	25	3.5

discharge from a new shoreline outfall	• capacity for partial storage of overflows in the network during storm events • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects in relation to 'mahinga kai' and 'kaimoana'. • adverse/uncertain effects of the proposed new outfall at Round Point on 'heritage' values • increased peak flows may cause a slight reduction of water quality in the vicinity of the outfall		
6. Twin storage in the network, existing standard of treatment, discharge from a new shoreline outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • capacity for greatest storage of overflows in the network during storm events • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects in relation to 'mahinga kai' and 'kaimoana'. • adverse/uncertain effects of the proposed new outfall at Round Point on 'heritage' values	25	3.5
7. Greater conveyance in the network, existing standard of treatment, discharge from a new offshore ocean outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • adverse/uncertain effects of partially treated storm flows on the coastal environment and potential degradation of 'mauri', 'kaimoana' and 'mahinga kai' • new offshore outfall at Rukutane Point will improve dispersion and enhance water quality in the vicinity of the existing outfall.	27	4
8. Combination of storage and conveyance in the network, existing standard of treatment, discharge from a new offshore ocean outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects on 'mahinga kai' and 'kaimoana' • new offshore outfall will improve dispersion and enhance water quality in the vicinity of the existing outfall.	28	4
9. Twin storage in the network, existing standard of treatment, discharge from a new offshore ocean outfall	Adverse effects on Tangata whenua values are anticipated to be low to moderate due to: • reduced overflows to freshwater courses and Porirua Harbour which will improve water quality and enhance 'mauri' • capacity for greatest storage of overflows in the network during storm events • no requirement for partially treated bypasses to the coastal marine area, reducing adverse effects on 'mahinga kai' and 'kaimoana' • new offshore outfall at Rukutane Point will improve dispersion and enhance water quality in the vicinity of the existing outfall.	31	4.5

4. KEY FINDINGS

1. In comparison to the existing situation, each option would provide significant benefits in relation to 'Tangata whenua values', and overall there were not substantial differences between the options.
2. All options satisfy Ngati Toa's preference for conveyance and treatment of most wet weather flows at the plant rather than discharging to the harbour and streams.
3. There is little variation in scores across the options which range from 3.5 to 4.5; all within the low to moderate adverse effects envelope.
4. Six of the options (2, 3, 5, 6, 8 & 9) also satisfy Ngati Toa's preference for full treatment of wastewater discharges to the coastal marine area. The particular differences between these options relate to performance against specific sub-criteria, including:
   - Options 2, 3 and 9 scored better in relation to 'heritage' than other options as these all involved discharge from the existing shoreline outfall (or from an extension of the existing outfall as in option 9) which is not anticipated to generate additional adverse effects on sites of cultural significance.
   - Options 1, 4, 5 and 6 were all allocated the same scores for all sub-criteria which reflects the environmental benefits of reducing overflows from the network, as well as potential adverse effects on 'heritage', 'mahinga kai' and 'kaimoana' as a result of proposed new shoreline (or duplicated) outfalls in the existing location or at Round Point.
   - Options 3 and 9 were given the highest scores overall because of the additional capacity of the twin storage options which ensure wastewater flows to the WWTP are within capacity of the full treatment process and therefore eliminate the requirement for partially treated bypasses. Option 6 also has the capacity to eliminate overflows, but adverse 'heritage' effects related to the siting of the new shoreline outfall at Round Point resulted in the allocation of a lower score.
5. Overall, option 9 was assessed with the highest score and is therefore Ngati Toa's preferred option. This option scored higher than others due to its capacity for greatest storage of flows within the network during wet weather events up to the 6 month ARI, combined with full treatment of discharges from the WWTP and the ability to significantly improve dilution and dispersion of wastewater discharges via an offshore ocean outfall.

Ngati Toa's preferred option is premised on the assumption that any challenges in relation to the availability of suitable land for storage and obtaining resource consent will be overcome. It also assumes that the offshore ocean outfall will have greater capacity than the existing shoreline outfall to mitigate adverse effects of wastewater discharges on the receiving environment. It is noted that anticipated cultural effects of the outfall options currently under consideration are limited by lack of information on the behaviour of the discharges and the nature of the receiving environment. However, I understand that studies currently underway will provide relevant information about discharge plume dispersion and ecological effects.

5. CONCLUSION

In conclusion, all nine options performed favourably when assessed against the 'Tangata whenua values' criterion. The options most favoured by Ngati Toa were those which eliminate the requirement for partially treated discharges to the coastal marine environment. Of these, Option 9 was identified as the preferred option due to its capacity for both greatest storage of flows in the network and full treatment of discharges from the WWTP. These benefits combined with the additional capacity for dilution and dispersion of discharges via an offshore ocean outfall were seen to advantage Option 9 over all others. Option 9 was therefore considered the best option overall to support the achievement of Ngati Toa's vision for the restoration of the 'mauri' (life force) to Te Awarua-o-Porirua and the surrounding coastal environment.

APPENDIX A: SCORES FOR EACH OPTION AGAINST 'TANGATA WHENUA VALUES'

OPTION 1 – GREATER CONVEYANCE TO THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGING FROM DUPLICATED SHORELINE OUTFALL

Table A 1: Option 1 - Greater Conveyance to the Network, Existing Standard of Treatment, Discharging from Duplicated Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua valueS	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana			X		
Mahinga kai			X		
Heritage				X	
Whakapapa			X		
SCORE			25		

OPTION1: ADVERSE EFFECTS ON 'MAURI', 'MANA', 'HAUORA', 'KAI MOANA', MAHINGA KAI' AND 'WHAKAPAPA' ARE LIKELY TO BE MODERATE; ADVERSE EFFECTS IN RELATION TO 'HERITAGE' ARE ANTICIPATED TO BE LOW TO MODERATE.

This assessment is based on the assumption that greater conveyance to the WWTP reduces overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (from an average of 10 to 2 overflow discharges per annum). However, existing capacity of the WWTP is likely to be exceeded more often under this option, resulting in more frequent bypasses of partially treated storm flows to the coastal marine environment.

A brief explanation of the 'tangata whenua values' assessment of option 1 (summarised in Table 2) is outlined below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, thereby enhancing its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways.

- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana' which remain critical to the fulfilment of Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important to Ngati Toa's identity and the maintenance and enhancement of the Iwi's 'mana'.
- However, the discharge of partially treated stormflows to the coastal marine area at Rukutane Point will potentially undermine the high quality of treated wastewater provided by the full treatment process at the WWTP. Depending on the volumes and frequency of the discharges, water quality and the ecological health of the coastal environment may be adversely affected. This in turn could undermine the general health and wellbeing of the coastal marine area, negatively impacting on 'hauora' and 'mauri'.
- There is also potential for further adverse effects on 'mahinga kai' and 'kaimoana' in the wider vicinity of the WWTP. Although Ngati Toa does not customarily gather 'kaimoana' from Rukutane Bay due to the presence of the outfall, customary fishing does occur along the coastline south of the WWTP.
- The ongoing presence of 'mahinga kai' is an important indicator of marine ecological and cultural health. The link between the health of 'kaimoana' and the health of people has been exemplified over the years in negative terms through the impact of degraded water quality and ecosystem health which has undermined Ngati Toa's ability to access 'mahinga kai'.
- Ngati Toa is concerned to ensure that existing adverse effects on 'kaimoana' are not further exacerbated by this option. However, there is insufficient information currently available in relation to the environmental and human health impacts of the lower quality discharges to the coastal marine area. A full assessment of 'Tangata whenua values' would be required to determine the significance of any adverse effects of the lower quality (partially treated) discharges.
- Adverse effects on 'heritage' values are not expected to be significant due to confirmation of the duplicated shoreline outfall to be sited at Rukutane Bay, in the same location as the existing outfall. Therefore, no additional adverse effects on 'heritage' values are anticipated under this option. However, the duplicated outfall may reduce water quality in the coastal marine area close to the existing outfall.

OPTION 2 – COMBINATION OF STORAGE AND CONVEYANCE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM THE EXISTING SHORELINE OUTFALL

Table A 2: Option 2 - Combination of Storage and Conveyance in the Network, Existing Standard of Treatment, Discharge from the Existing Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse Effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana				X	
Mahinga kai				X	
Heritage				X	
Whakapapa				X	
SCORE			28		

OPTION 2: ADVERSE EFFECTS ON 'TANGATA WHENUA VALUES', INCLUDING 'MAURI', 'HAUORA', 'MANA', 'KAI MOANA', 'MAHINGA KAI' AND 'WHAKAPAPA' ARE ALL ANTICIPATED TO BE LOW TO MODERATE; ADVERSE EFFECTS IN RELATION TO 'HERITAGE' ARE LIKELY TO BE LOW (DUE TO THE PROPOSED DISCHARGE FROM THE EXISTING SHORELINE OUTFALL AT RUKUTANE POINT, WHICH IS NOT LIKELY TO HAVE ANY ADDITIONAL ADVERSE EFFECTS ON 'HERITAGE' VALUES).

This assessment is based on the assumption that greater conveyance to the WWTP and new storage reduces overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (reducing from an average of 10 to 2 overflow discharges per annum). This option also has the ability to partially store flows in the network until the wet weather event passes. The two sub-options proposed for the storage of overflows will have similar effects in terms of volumes of overflows and implications for the WWTP. Furthermore, the wastewater flows to WWTP are within capacity of the full treatment process, so there is no need for partially treated bypasses under this option.

A brief explanation of the 'tangata whenua values' assessment of option 2 (summarised in Table 3) is outlined below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, thereby enhancing its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.

- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which remain critical to the fulfilment of Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important in maintaining the identity and 'mana' of Ngati Toa.
- The storage of flows in the network and elimination of the requirement for partially treated bypasses from the WWTP, will reduce adverse effects from wastewater discharges to the coastal environment and benefit 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will likely contribute to improved water quality and ecological health of the marine environment. Improved water quality will likely contribute to enhanced 'mauri' and 'hauora' of the receiving marine environment and could have positive flow on effects for the health of 'mahinga kai' and 'kaimoana' located in areas further south of the WWTP. However, increased peak flows may cause a slight reduction of water quality in the vicinity of the outfall.

OPTION 3 – TWIN STORAGE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM THE EXISTING SHORELINE OUTFALL

Table A 3: Option 3 - Twin Storage in the Network, Existing Standard of Treatment, Discharge from the Existing Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana				X	
Mahinga kai				X	
Heritage					X
Whakapapa				X	
SCORE			29		

OPTION 3: ADVERSE EFFECTS IN RELATION TO ALL 'TANGATA WHENUA VALUES' ARE ANTICIPATED TO BE LOW TO MODERATE, WITH THE EXCEPTION OF 'HERITAGE', WHICH IS EXPECTED TO HAVE LOW ADVERSE EFFECTS (AS IT IS PROPOSED TO DISCHARGE FROM THE EXISTING SHORELINE OUTFALL WHICH IS NOT ANTICIPATED TO GENERATE ADDITIONAL ADVERSE EFFECTS.)

This assessment is based on the assumption that the twin storage option (including the two sub-options) will be designed to reduce the frequency of overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (ARI). This option also has the greatest ability to store flows in the network, to be conveyed to the WWTP once the storm event has passed. This has the additional advantage of eliminating the requirement for partial treatment of stormflows and the associated bypass discharges to the coastal environment.

A brief explanation of the 'Tangata whenua values' assessment of Option 3 (summarised in Table 4) is outlined below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, and thereby enhance its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.
- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which remain critical to the fulfilment of

Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important to maintaining the identity and 'mana' of Ngati Toa. Full storage of flows in the network up to a 6 month ARI storm event and elimination of the requirement for partially treated bypasses from the WWTP, should significantly reduce adverse effects from wastewater discharges to the coastal environment and positively impact on 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will undoubtedly contribute to improved water quality and ecological health of the marine environment and lead to an enhancement of the 'mauri' and 'hauora' of the receiving marine environment. This may, in turn, have positive flow on effects for the health of 'mahinga kai' and 'kaimoana' located in areas south of the WWTP.

OPTION 4 – GREATER CONVEYANCE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW SCORELINE OUTFALL

Table A 4: Option 4 - Greater conveyance in the Network, Existing Standard of Treatment, Discharge from a New Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana			X		
Mahinga kai			X		
Heritage			X		
Whakapapa				X	
SCORE			25		

OPTION 4: ADVERSE EFFECTS IN RELATION TO 'MAURI', 'MANA', 'HAUORA', AND 'WHAKAPAPA' ARE ANTICIPATED TO BE LOW TO MODERATE; ADVERSE EFFECTS ON 'KAIMOANA', 'MAHINGA KAI' AND 'HERITAGE' ARE LIKELY TO BE MODERATE.

This assessment is based on the assumption that greater conveyance to the WWTP will reduce the frequency of overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (ARI). However, existing capacity of the WWTP is likely to be exceeded more often under this option, requiring increased bypasses of partially treated storm flows to the coastal marine environment.

An explanation of the 'Tangata whenua values' assessment of option 4 (summarised in Table 5) is outlined below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, and thereby enhance its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.
- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which are critical to the fulfilment of Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice

of manaakitanga continues to be important to the maintenance of Ngati Toa's identity and 'mana' as Tangata whenua.

- The location of the proposed new outfall at Round Point may reduce adverse water quality effects in the vicinity of Titahi Bay and help revitalise the 'mauri' and 'hauora' of the local marine environment. However, there are 'heritage' values associated with Round Point that may be adversely affected by the placement of the new outfall in this location. Ngati Toa were traditionally domiciled at strategic locations around Cook Strait and had numerous settlements along the south-west coast from Titahi Bay to Makara, including in the vicinity of Round Point. The new outfall appears to be in close proximity to an ancient Ngati Ira pa site, Te Korohiwa, which was heavily populated at the time of Ngati Toa's arrival in 1822. In the 1830s, a whaling station was also established in this location under the 'mana' of Ngati Toa. The layers of history and archaeological remains associated with centuries of Maori occupation along this coast now form an important part of the cultural heritage landscape and will need to be carefully considered to ensure that any adverse effects from the new outfall can be appropriately mitigated. There may also be adverse effects on 'mahinga kai' and 'kaimoana' in the wider vicinity of Round Point due to the construction of the outfall and as a result of wastewater discharges to the local marine environment. There is currently insufficient information available to properly assess the cultural effects of the new outfall in this location, however the impacts on 'heritage' values are not anticipated to be significant.
- Increased flows to the WWTP will cause frequent overflows of partially treated wastewater to the marine environment which will likely have adverse effects on 'Tangata whenua values'. Partially treated storm flows will be mixed with fully treated wastewater, reducing the high quality of the wastewater discharge and undermining water quality in the vicinity of the new outfall. Therefore, the 'hauora' and 'mauri' of the coastal environment will also be adversely impacted. This may result in further adverse effects on 'mahinga kai' and 'kaimoana' resources, as customary fishing occurs regularly along this coastline and is relied upon for the purposes of hui and tangihanga. Ngati Toa 's ability to access kaimoana from these locations is necessary to fulfil traditional obligations which reflect on Ngati Toa's 'mana' as Tangata whenua.

OPTION 5 – COMBINATION OF STORAGE AND CONVEYANCE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW SHORELINE OUTFALL

Table A 5: Option 5 - Combination of Storage and Conveyance in the Network, Existing Standard of Treatment, Discharge from a new Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana			X		
Mahinga kai			X		
Heritage			X		
Whakapapa				X	
SCORE			25		

OPTION 5: ADVERSE EFFECTS IN RELATION TO 'MAURI', 'HAUORA', 'MANA', AND 'WHAKAPAPA' ARE ALL ANTICIPATED TO BE LOW TO MODERATE; ADVERSE EFFECTS ON 'KAI MOANA', 'MAHINGA KAI' AND 'HERITAGE' ARE EXPECTED TO BE MODERATE.

This assessment is based on the assumption that greater conveyance to the WWTP and new storage reduces overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (reducing from an average of 10 to 2 overflow discharges per annum). This option has the ability to store flows in the network, to be conveyed to the WWTP once the storm event has passed. This option also provides for full treatment of flows to the WWTP which eliminates the requirement for partial treatment of stormflows. The two proposed sub-options have similar effects in terms of volumes of overflows and implications for the WWTP, and therefore, have not been assessed separately.

An explanation of the 'Tangata whenua values' assessment for option 5 (summarised in Table 6) is outlined below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, and thereby enhance its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.

- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which are critical to the fulfilment of Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important to the maintenance of Ngati Toa's identity and 'mana' as Tangata whenua.
- The storage of flows in the network and elimination of the requirement for partially treated bypasses from the WWTP, will reduce adverse effects from wastewater discharges to the coastal environment and considerably benefit 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will likely contribute to improved water quality and ecological health of the receiving marine environment. This could have positive flow on effects for the 'mauri' and 'hauora' of the surrounding environment, including the health of 'mahinga kai' and 'kaimoana' located in areas south of the WWTP. However, increased peak flows may cause a slight reduction of water quality in the vicinity of the outfall.
- The location of the proposed new outfall at Round Point may reduce adverse water quality effects in the vicinity of Titahi Bay and help revitalise the 'mauri' and 'hauora' of the local marine environment. However, there are 'heritage' values associated with Round Point that may be adversely affected by the placement of the new outfall in this location. Ngati Toa were traditionally domiciled at strategic locations around Cook Strait and had numerous settlements along the coast from Titahi Bay to Makara, including in the vicinity of Round Point. The new outfall appears to be in close proximity to an ancient Ngati Ira pa site, Te Korohiwa, which was heavily populated at the time of Ngati Toa's arrival in 1822. In the 1830s, a whaling station was also established in this location under the 'mana' of Ngati Toa. The layers of history and archaeological remains associated with centuries of maori occupation along this coastline now form an important part of the cultural heritage landscape that will need to be carefully considered to ensure that any adverse effects from the new outfall can be appropriately mitigated. There may also be adverse effects on 'mahinga kai' and 'kaimoana' in the wider vicinity of Round Point due to the construction of the outfall and as a result of wastewater discharges to the local marine environment. There is currently insufficient information available to properly assess the cultural effects of the new outfall in this location, however the impacts on 'heritage' values are not anticipated to be significant.

OPTION 6 – TWIN STORAGE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW SHORELINE OUTFALL

Table A 6: Option 6 - Twin Storage in the Network, Existing Standard of Treatment, Discharge from a new Shoreline Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana			X		
Mahinga kai			X		
Heritage			X		
Whakapapa				X	
SCORE			25		

OPTION 6: ADVERSE EFFECTS ON 'MAURI', 'MANA', 'HAUORA' AMD 'WHAKAPAPA' ARE ANTICIPATED TO BE LOW TO MODERATE; ADVERSE EFFECTS IN RELATION TO 'KAIMOANA', MAHINGA KAI' AND 'HERITAGE' ARE EXPECTED TO BE MODERATE.

This assessment is based on the assumption that the twin storage option (including the two sub-options) will be designed to reduce the frequency of overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (ARI). This option also has the greatest capability of storing flows in the network, to be conveyed to the WWTP once the storm event has passed. It also has the additional advantage of removing the requirement for partial treatment of stormflows and eliminating bypass discharges to the coastal environment.

An explanation of the 'tangata whenua values' assessment for option 6 (summarised in Table 7) is outlined below:

- Reduced overflows from the network will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment and contribute to the restoration of 'mauri' and 'hauora', thereby enhancing the harbour's capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.
- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which are critical to the fulfilment of Ngati

Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important to maintaining Ngati Toa's identity and 'mana' as Tangata whenua.

- Full storage of flows in the network up to a 6 month ARI storm event and elimination of the requirement for partially treated bypasses from the WWTP, should significantly reduce adverse effects from wastewater discharges to the coastal environment and positively impact on 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will undoubtedly contribute to improved water quality and ecological health of the marine environment and lead to an enhancement of the 'mauri' and 'hauora' of the receiving marine environment. This may, in turn, have positive flow on effects for the health of 'mahinga kai' and 'kaimoana' located in areas south of the WWTP.
- This option (& option 9) is the most consistent with Ngati Toa's preference for wastewater (containing human waste) to be fully treated to minimise the possibility of physical and/or spiritual contamination of the marine environment. The disposal of human waste to water, including the coastal marine environment, is not consistent with tikanga maori and, in Ngati Toa's view, is regarded as culturally and spiritually abhorrent. However, in the absence of land-based alternatives full treatment of all discharges is Ngati Toa's preference.
- The location of the proposed new outfall at Round Point may reduce adverse water quality effects in the vicinity of Titahi Bay and help revitalise the 'mauri' and 'hauora' of the local marine environment. However, there are 'heritage' values associated with Round Point that may be adversely affected by the placement of the new outfall in this location. Ngati Toa were traditionally domiciled at strategic locations around Cook Strait and had numerous settlements along the coast from Titahi Bay to Makara, including in the vicinity of Round Point. The new outfall appears to be in close proximity to an ancient Ngati Ira pa site, Te Korohiwa, which was heavily populated at the time of Ngati Toa's arrival in 1822. In the 1830s, a whaling station was also established in this location under the 'mana' of Ngati Toa. The layers of history and archaeological remains associated with centuries of maori occupation along this coastline now form an important part of the cultural heritage landscape and will need to be carefully considered to ensure that any adverse effects from the new outfall can be appropriately mitigated. There may also be adverse effects on 'mahinga kai' and 'kaimoana' in the wider vicinity of Round Point due to the construction of the outfall in this location and as a result of wastewater discharges to the local marine environment. There is currently insufficient information available to properly assess the cultural effects of the new outfall in this location, however the impacts on 'heritage' values are not anticipated to be significant.

OPTION 7 – GREATER CONVEYANCE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW OFFSHORE OCEAN OUTFALL

Table A 7: Option 7 - Greater Conveyance in the Network, Existing Standard of Treatment, Discharge from a new Offshore Ocean Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri			X		
Mana				X	
Hauora				X	
Kai moana				X	
Mahinga kai				X	
Heritage				X	
Whakapapa				X	
SCORE			27		

OPTION 7: ADVERSE EFFECTS IN RELATION TO ALL 'TANGATA WHENUA VALUES', INCLUDING 'MAURI', 'MANA', 'HAUORA', 'KAIMOANA', 'MAHINGA KAI', 'HERITAGE' AND 'WHAKAPAPA' ARE ANTICIPATED TO BE LOW TO MODERATE.

This assessment is based on the assumption that greater conveyance to the WWTP will reduce the frequency of overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (ARI). However, existing capacity of the WWTP is likely to be exceeded more often under this option, requiring increased bypasses of partially treated storm flows to the coastal marine environment.

An explanation of the 'Tangata whenua values' assessment for option 7 (as summarised in Table 8) is outlined below:

- Reduced overflows from the network will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment and contribute to the restoration of 'mauri' and 'hauora', thereby enhancing the harbour's capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.
- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to sustainable management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which are critical to the fulfilment of Ngati Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary

practice of manaakitanga continues to be important to Ngati Toa's identity and the maintenance and enhancement of the Iwi's 'mana'.

- More frequent bypasses of the WWTP full treatment process due to the greater conveyance option, will probably adversely affect 'Tangata whenua values'. Partially treated storm flows will be mixed with fully treated wastewater, reducing the high quality of treated wastewater provided by the full treatment process at the WWTP. Depending on the duration and frequency of storm flow bypasses, there may be adverse effects on the 'hauora' and 'mauri' of the coastal environment.
- However, the proposed new offshore ocean outfall at Rukutane Point will have greater capacity to mitigate adverse effects from bypass discharges, due to the open and exposed character of the coastal environment that will improve dispersion and mixing efficiency. The new offshore outfall will also be significantly separated from Titahi Bay, reducing the adverse effects on water quality in the area. This may also have positive impacts on local 'mahinga kai' and 'kaimoana' resources which Ngati Toa continue to rely on for customary purposes, especially for hui and tangihanga. Ngati Toa's ongoing ability to harvest kaimoana from these locations is important in fulfilling cultural obligations, such as 'manaakitanga' (providing for visitors) which reflect on Ngati Toa's 'mana' as Tangata whenua.

OPTION 8 – COMBINATION OF STORAGE AND CONVEYANCE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW OFFSHORE OCEAN OUTFALL

Table A 8: Option 8 - Combination of Storage and Conveyance in the Network, Existing Standard of Treatment, Discharge from a new Offshore Ocean Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana				X	
Mahinga kai				X	
Heritage				X	
Whakapapa				X	
SCORE				28	

OPTION 8: ADVERSE EFFECTS IN RELATION TO 'MAURI', 'HAUORA', 'MANA', AND 'WHAKAPAPA' ARE ALL ANTICIPATED TO BE LOW TO MODERATE; ADVERSE EFFECTS ON 'KAI MOANA', 'MAHINGA KAI' AND 'HERITAGE' ARE EXPECTED TO BE MODERATE.

This assessment is based on the assumption that greater conveyance to the WWTP and new storage reduces overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (reducing from an average of 10 to 2 overflow discharges per annum). This option has the ability to store flows in the network to be conveyed to the WWTP once the storm event has passed. It also has the additional advantage of removing the requirement for partial treatment of stormflows and eliminating bypass discharges to the coastal environment. The two proposed sub-options have similar effects in terms of volumes of overflows and implications for the WWTP, and therefore have not been considered separately.

A brief explanation of the 'Tangata whenua values' assessment for option 7 (as summarised in Table 9), is provided below:

- Reduced overflows will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, which will help to revitalise and restore the 'mauri' and 'hauora' of the natural environment, and thereby enhance its capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of the ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.

- The regeneration of ecological health to the harbour may enhance Ngati Toa's ability to exercise 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana' which remain critical to the fulfilment of Iwi obligations to manaaki (take care of) manuhiri (visitors). The customary practice of manaakitanga is an important aspect of Ngati Toa's identity and tribal 'mana'.
- This option involves the elimination of the requirement for partially treated bypasses from the WWTP, should significantly reduce adverse effects from wastewater discharges to the coastal environment and positively impact on 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will undoubtedly contribute to improved water quality and ecological health of the marine environment and lead to an enhancement of the 'mauri' and 'hauora' of the receiving marine environment. This may, in turn, have positive flow on effects for the health of 'mahinga kai' and 'kaimoana' located in areas south of the WWTP.
- The proposed new offshore ocean outfall at Rukutane Point will further reduce any adverse effects from wastewater discharges, due to the open and exposed character of the coastal environment which is anticipated to improve dispersion and mixing efficiency. The new offshore outfall will also be significantly separated from Titahi Bay, reducing any adverse effects on water quality in the area. This may also have positive impacts on local 'mahinga kai' and 'kaimoana' resources which Ngati Toa continue to rely on for customary purposes, especially for hui and tangihanga. Ngati Toa's ongoing ability to harvest kaimoana from these locations is important in fulfilling cultural obligations, such as 'manaakitanga' (providing for visitors) which reflect on Ngati Toa's 'mana' as Tangata whenua.

OPTION 9 – TWIN STORAGE IN THE NETWORK, EXISTING STANDARD OF TREATMENT, DISCHARGE FROM A NEW OFFSHORE OCEAN OUTFALL

Table A 9: Option 9 - Twin storage in the Network, Existing Standard of Treatment, Discharge from a new Offshore Ocean Outfall

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri					X
Mana				X	
Hauora					X
Kai moana				X	
Mahinga kai				X	
Heritage					X
Whakapapa				X	
SCORE			31		

OPTION 9: ADVERSE EFFECTS ON 'MAURI', 'MANA', 'HAUORA', 'KAIMOANA', 'MAHINGA KAI'AND 'WHAKAPAPA' ARE ANTICIPATED TO BE LOW TO MODERATE; AND ADVERSE EFFECTS IN RELATION TO 'HERITAGE' ARE LIKELY TO BE LOW.

This assessment is based on the assumption that the twin storage option (including the two sub-options) will be designed to reduce the frequency of overflows from the network to freshwater courses and Porirua Harbour to a 6 month average return interval (ARI). This option also has the greatest capability of storing flows in the network, to be conveyed to the WWTP once the storm event has passed. It also has the additional advantage of removing the requirement for partial treatment of stormflows and eliminating bypass discharges to the coastal environment.

A brief explanation of the 'tangata whenua values' assessment of option 9 (summarised in Table 10) is outlined below:

- Reduced overflows from the network will result in improvements to the overall health and wellbeing of Porirua Harbour and the wider catchment, and contribute to the restoration of 'mauri' and 'hauora', thereby enhancing the harbour's capacity to sustain the health and wellbeing of Ngati Toa and the wider community.
- The 'whakapapa' connection between Ngati Toa and the harbour will be strengthened as a result of the revitalisation of ecological health and wellbeing of the environment, which in turn will reflect positively on the health and wellbeing of its people.
- Improved water quality and ecosystem health may reduce the health risks associated with harvesting 'kaimoana' from the harbour and improve the abundance of 'mahinga kai'. This, in turn, could enhance Ngati Toa's access to traditional food sources and help restore customary fishing practices that have been negatively impacted by the degradation of the harbour over the decades, including pollution caused by discharging human waste into waterways and the harbour.
- Restoration of the harbour may also enhance Ngati Toa's 'mana' in relation to management and use of traditional resources such as 'mahinga kai' and 'kaimoana', which are critical to the fulfilment of Ngati

Toa's obligations to manaaki (extend hospitality/take care of) manuhiri (visitors). The customary practice of manaakitanga continues to be important to maintaining Ngati Toa's identity and 'mana' as Tangata whenua.

- Full storage of flows in the network up to a 6 month ARI storm event and elimination of the requirement for partially treated bypasses from the WWTP, should significantly reduce adverse effects from wastewater discharges to the coastal environment and positively impact on 'Tangata whenua values'. This option will ensure that only fully treated wastewater of high quality is discharged to the coastal marine area. This will undoubtedly contribute to improved water quality and ecological health of the marine environment and lead to an enhancement of the 'mauri' and 'hauora' of the receiving marine environment. This may, in turn, have positive flow on effects for the health of 'mahinga kai' and 'kaimoana' located in areas south of the WWTP.
- The proposed new offshore ocean outfall at Rukutane Point will further reduce any adverse effects from wastewater discharges, due to the open and exposed character of the coastal environment which is anticipated to improve dispersion and mixing efficiency. The new offshore outfall will also be significantly separated from Titahi Bay, reducing any adverse effects on water quality in the area. This may also have positive impacts on local 'mahinga kai' and 'kaimoana' resources which Ngati Toa continue to rely on for customary purposes, especially for hui and tangihanga. Ngati Toa's ongoing ability to harvest kaimoana from these locations is important in fulfilling cultural obligations, such as 'manaakitanga' (providing for visitors) which reflect on Ngati Toa's 'mana' as Tangata whenua.
- This option is the most consistent with Ngati Toa's preference for wastewater (containing human waste) to be fully treated to minimise the possibility of physical and/or spiritual contamination of the marine environment. The disposal of human waste to water, including the coastal marine environment, is not consistent with tikanga maori and, in Ngati Toa's view, is regarded as culturally and spiritually abhorrent. However, in the absence of land-based alternatives full treatment of all discharges is Ngati Toa's preference.

Appendix 4 – Growth

Memo

To:	Richard Peterson Wellington	From:	Matt Trlin (Connect Water)
File:	Porirua WWTP Collaborative Assessment: GROWTH	Date:	May 23, 2019

Reference: **Porirua Wastewater Network & WWTP - Preliminary Scoring of Growth Criteria**

1. INTRODUCTION

This memo presents a comparative assessment of each of the Porirua Wastewater Network (PWWN) and Porirua Wastewater Treatment Plant (WWTP) shortlisted options and the extent to which each option supports long term growth, and investment and economic development of the city and sub-region and is responsive to medium term growth needs and pressures.

The shortlist includes three PWWN options for the management of wet weather overflows, and three WWTP discharge options. Combining the three network and three discharge options results in nine permutations shown in Table 1.

For the Storage & Conveyance and Twin Storage options, there are sub-options which define the location of the storage and where the greater conveyance occurs.

Table 1: Shortlisted Network and WWTP Discharge Options 1 to 9 (Stantec, March 2018).

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

This assessment, together with similar memos prepared for the other criteria against which the short list options are being assessed, will form the basis for further discussion at the Multi-criteria Analysis (MCA) Workshop by the wider Collaborative Group.

1.2 AUTHORS CREDENTIALS

This assessment has been prepared by Matt Trlin (Connect Water) and reviewed by Richard Peterson (Stantec).

Matt is a Principal- Planning at Beca Consultants Ltd (Connect Water partner), and Richard is a Principal Planner at Stantec.

Matt has been with Beca since 2016. Prior to joining Beca Matt worked in local government, including 15 years at Porirua City Council as the Manager Environment and City Planning. Matt has extensive experience in urban and environmental planning and management, strategic planning, district plan development, and water infrastructure planning and consenting. Richard is a planner with over 20 years' experience. He has worked at Stantec for 4 years and during that time has worked on various infrastructure projects and is currently involved in resource consent projects for three wastewater treatment plants.

1.3 INFORMATION SOURCES

The following information has been used in this assessment;

- Porirua Wastewater Catchment Alternatives Optimisation Phase 1, WCS Engineering, April 2019
- Porirua Growth Strategy 2048
- Porirua Population and housing projections, Beryl 2018
- Economic and demographic trends for Wellington – Presentation to the Wellington Regional Strategy Committee, Dave Grimmond, November 2018
- Statistics New Zealand subnational population projections 2017
- Forecast.id population projections, Wellington and Porirua.

1.4 LIMITATIONS OF ASSESSMENT

The short list options presented are concept designs and are based on desk top studies with limited site-specific information. Detailed site investigations, planning and feasibility assessments are required to further refine the options.

This assessment assumes:

- each of the 9 options is able to be technically consented, constructed and operated
- each of the options will be progressively implemented over a 35-year time frame, with the option being fully rolled out and completed by year 35
- that attempts would be made with the 'roll out' or 'staged delivery' of each option (where this is possible), to provide sufficient network or WWTP capacity in advance of any growth in wastewater network volumes within the network.

2. APPROACH TO ASSESSMENT

Table 2 sets out a 5-point scoring system, for the Growth criteria, to score each of the 9 short list options.

The scoring criteria assess the extent to which each option would be able to accommodate, and service wastewater network conveyance and treatment volumes associated with increased wastewater generation related to projected medium and long term population growth within the Porirua WWTP catchment.

For the wastewater network component of Porirua's wastewater system, the assessment considers the extent to which each option will be able to:

- Provide PWWN capacity to accommodate and meet short, medium- and long-term growth related wastewater growth <u>without</u> deterioration in the existing network's current 'overflow' level of service, i.e. the extent to which the option will successfully prevent any growth related increase in PWWN overflow frequency or volume, **and**

- Improve PWWN overflow performance, even with growth related increases in wastewater volumes, targeting a potential reduction in the frequency of overflows events to 2EY (2 events per year) or less, and an overall reduction in PWWN overflow volumes.

For the WWTP component of Porirua's wastewater system, the assessment considers the extent to which each option will be able to accommodate growth generated increases in wastewater volumes conveyed by the network to the WWTP in the short, medium and long term:

- Without deterioration in the existing standard of wastewater treatment at the WWTP,
- Without deterioration in the frequency and/or volume of WWTP bypass or overflow discharge events associated with planned and committed upgrades to the WWTP capacity (to 1500l/s).

Table 2: Scoring approach for Porirua Wastewater Programme Short List Multi Criteria Assessment: GROWTH

Criteria	Description	One	Two	Three	Four	Five
Growth	Supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures	Would not fully support long term growth needs, and would not support medium term growth needs	Fully supports long term growth needs but does not even partially support medium term growth needs	Fully supports long term growth needs and partially supports medium term growth needs	Fully supports long term growth needs and largely supports medium term growth needs	Fully supports long and medium term growth needs

2.1 PORIRUA WASTEWATER SYSTEM PERFORMANCE

The performance of the existing Porirua Wastewater System (encompassing the PWWN and WWTP) is detailed in the Water Quality, Ecology and Public Health criteria assessments.

2.2 PORIRUA WASTEWATER NETWORK AND WASTEWATER TREATMENT PLANT GROWTH ASSUMPTIONS

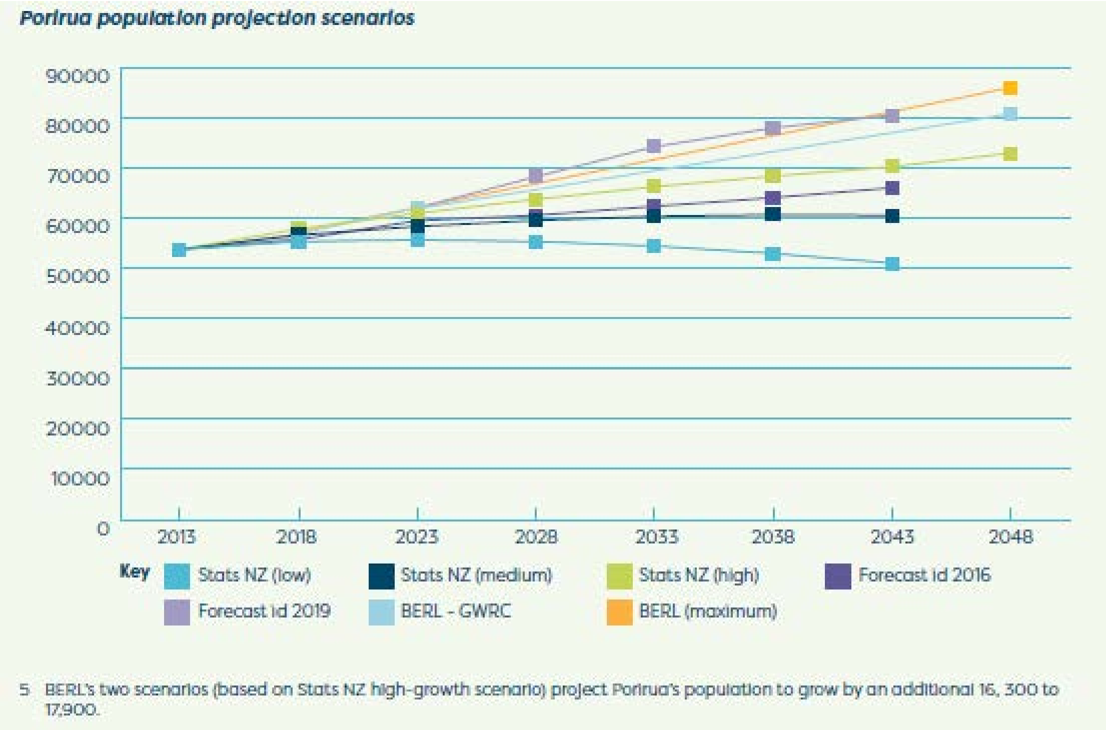
Growth assumptions for residential development and population growth within the PWWN and Porirua WWTP catchment are described in the Porirua Growth Strategy 2048 (the growth strategy).

The growth strategy identifies that this growth will lead to increased wastewater conveyance, storage and/or treatment demands on the Porirua Wastewater network and treatment plant

In summary the growth strategy currently identifies (Table 3) that the Porirua WWTP catchment area, encompassing Porirua City and north Wellington (encompassing the suburbs of Paparangi and Johnsonville north to Tawa), is likely to experience a sustained period of consistent and potentially high population and housing growth over the next 30 years.

Population growth within this catchment (currently 1% growth p.a.) may potentially rise to a sustained level of growth 2% p.a. The growth strategy identifies that under a high growth scenario in this catchment 75% of growth is likely to occur in Porirua City.

Table 3: Porirua City Population Projection Scenarios (excludes northern Wellington)



2.3 EXISTING DEVELOPMENTS

Key existing green field and brown field residential growth areas are located within Porirua City at Aotea, Whitby, and Kenepuru. Within Wellington City green field and brown field residential growth areas are located at Stebbings Valley, Lincolnshire farm, and Grenada north.

These existing development areas, based on documented historical development trends and projected Wellington regional urban growth trends (Greater Wellington Regional Council, 2018) are expected to continue to support existing and sustained levels of new housing demand over each of their anticipated development lifecycles.

Infill growth is also expected to be sustained and, in some cases, increase within Wellington city's existing northern residential communities (Johnsonville and Tawa), and within Porirua's existing older seaside suburbs of Titahi Bay, Plimmerton, Mana, to a lesser extent Paremata. Inner city residential development and growth may occur within the Porirua City Centre.

2.4 TRANSMISSION GULLY MOTORWAY, EASTERN PORIRUA REGENERATION, NORTHERN PORIRUA URBAN GROWTH AREA

The opening of transmission gully motorway in 2020/21 and enhanced accessibility to Eastern Porirua, coupled with the commencement of a new planned urban growth greenfield development north of Plimmerton and central governments $1.5 billion investment into the regeneration of eastern Porirua, is anticipated to drive increased growth activity particularly within the Porirua City portion of the PWWTP catchment.

2.5 GROWTH ASSUMPTIONS

Overall it is assumed for the purpose for this assessment that the PWWTP catchment's residential population, and housing stock, will grow between 2018 and 2048 by at least 20% (Medium growth projections Forecast .id and Stas NZ, 2018.)

Potentially population and housing growth over this period could be as high as 50% (High growth projections Beryl, 2018). This assessment also assumes that the options considered have also provided for meeting a high growth scenario.

Beryl, 2018, has identified that there are strong regional growth indicators that support planning for high growth within Porirua City and the PWWTP catchment area.

Under a sustained high growth scenario, this could result in up to 13,000 new homes, accommodating up to 40,000 new residents, being constructed within the existing PWWTP catchment area in the next 30 years.

75% of this growth may occur exclusively within Porirua City, potentially increasing the city's population from approximately 56,000 to 86,000 residents, and the overall catchment population for the PWWTP from 82,000 to 122,400 (2057).

The effect of this growth will be to place substantial pressure on the dry and wet weather conveyance capacity performance of the Porirua Wastewater system, and the extent to which wet weather overflows currently occur (in terms of frequency and volume) from the network into water ways and Te Awarua o Porirua Harbour.

In turn increased and sustained wastewater conveyance to the PWWTP will also increase total discharge volumes from the plant. Should the PWWN conveyance capacity be expanded to accommodate higher wet weather flow volumes, wastewater volume growth in the PWWN will increase the potential for WWTP overflow or bypass events, where the WWTP capacity is not expanded to manage this increase.

The current PWWTP has a planned upgrade capacity for 110,000 people.

Porirua City's growth strategy to 2048 has assumed that the city should plan for a high growth scenario.

2.6 PLANNING BEYOND 2048, AND MONITORING AND TRACKING GROWTH ASSUMPTION PROJECTIONS

Beyond 2048, growth projections become increasingly more speculative and difficult to make.

Stats NZ, Forecast.id and Beryl have not produced population and housing growth projections for the PWWTP catchment beyond 2048.

However, to enable long term 35-year horizon network planning and for WWTP consenting purposes, Wellington Water is currently using a conservative assumption that beyond 2048 projected 2018-48 rates of urban growth are likely to be sustained out to at least 2057, and potentially to 2060.

These figures and assumptions will be actively tracked and monitored and periodically reviewed and updated through forthcoming Long-Term Plan and infrastructure strategy review cycles.

Using the above assumptions Wellington Water is currently projecting that the wastewater servicing population for the Porirua WWTP catchment will be 128,000 by 2057. That figure has been adopted for the purposes of this report.

2.7 PLANNING FOR GROWTH

Wellington Water's wastewater network improvement plan, infrastructure strategy and its supporting consenting programme currently provides for the possibility of high residential population growth projections not only being met but potentially being sustained over the next 35 years, and potentially out to 2057.

Network planning and consenting must, based on historical development trends and largely corroborating information developed for population and urban growth projections by Stats NZ, Forecast.id and Beryl, assume that medium residential growth projections (at least) will be sustained within the catchment out to 2048.

Under the National Policy Statement on Urban Development Capacity, active provision also needs to be made in city planning, and related wastewater network and treatment plant planning, investment and consenting, to not just anticipate but appropriately plan, provide for and include provision for meeting or accommodating high growth projections.

Equally Council's network infrastructure planning and investment planning processes also need to include responsible provision for ensuring that a degree of flexibility is retained in network planning, network design and investment staging and network upgrade delivery, to ensure that communities are not unduly burdened with developing, servicing and funding assets designed for growth which never arrived.

2.8 Economic Development

Economic development within urban areas has the potential to increase wastewater flows and contaminant loads in addition to increases associated with residential growth. Potential industrial development, involving trade waste discharges, is of particular relevance to the future contaminant load within a city's wastewater.

Porirua's growth strategy provides for a medium term 'employment' area near the transmission gully interchange at Waitangirua. Long term employment areas are provided for along adjacent to transmission gully motorway and state highway 58.

'Wet' industries (requiring access to large water volumes and related wastewater treatment capacity) have not traditionally chosen to locate in Porirua. This assessment has assumed that Porirua will remain unattractive attract to wet industries. Industrial and commercial wastewater growth are also assumed to remain tied to any increase in local population.

2.9 WASTEWATER NETWORK AND WASTEWATER TREATMENT PLANT OPTIONS

A short list of 9 Wastewater Network and Wastewater Treatment Plant improvement options have been developed for assessment, targeted at managing wet weather network overflows and WWTP treatment discharges.

These options have a servicing horizon for meeting urban growth out to at least 2060.

2060 corresponds with a potential 35 year consenting life that may be attached to the reconsenting of the Porirua Wastewater Treatment Plant Discharges.

The 2060-time horizon very conservatively assumes a PWWTP consent lodged in 2020 will be granted by no later than 2025.

3. COMPARATIVE ASSESSMENT- GROWTH

Preliminary scores for the 9 network and WWTP options against the Growth criteria are provided in Table 4.

Each option details the various factors that were considered in determining the option score. Each option includes a summary assessment statement which references the score against the scoring criteria in Table 2.

Table 4: Porirua Wastewater Network and Treatment Plant options for managing wet weather overflows – Growth

Option	Option Description	Assessment (1-5)	Reasons
	Greater conveyance + Existing treatment + Existing shoreline outfall	2	Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Network conveyance upgrades are however progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period. Full conveyance installation is required to accommodate growth and achieve total target reductions in existing overflows. Progressive staging of conveyance installation may result in increased overflow frequencies and volumes to Te Awarua o Porirua Harbour associated with Growth in some sub catchments in the short and/or medium term. Increased flows to WWTP, particularly in the long term, will cause, during high flow wet weather events, frequent discharges of partially treated wastewater. Subject to the timing, staging and alignment of progressive PWWN conveyance upgrades and WWTP capacity improvements, there is a risk that some increases in flows to the WWTP in the short term /medium term could result in a temporary increase in the frequency of partially treated discharges and/or possible bypasses or overflows of untreated wastewater discharges. Summary assessment: Overall this option will eventually **provide for and meet long term growth needs** by providing sufficient network

Option	Option Description	Assessment (1-5)	Reasons
			conveyance and treatment plant processing capacity to meet these needs. This option is however considered to struggle to partially support meeting short- and medium-term growth needs. The option is reliant on all network conveyance upgrades across the PWWN being completed to both reduce existing network wastewater overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term because of growth generated increases in network wastewater volumes. Subject to the timing, staging and sequencing of PWWN capacity and WWTP processing upgrades, a risk also exists with this option that conveyance upgrades ahead of WWTP processing upgrades could result in a temporary short and/or medium-term deterioration of WWTP discharges.
	Combination of conveyance and storage (Greater conveyance + Increased storage) + Existing treatment + Existing shoreline outfall	4	Under both options network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Progressive and targeted network storage and associated conveyance upgrades associated with both options provide for growth by enabling staging of network storage and supporting conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Staging allows for short- medium term location specific significant reductions in overflow volumes and frequency, providing localized capacity for growth in wastewater volumes. Staged storage upgrades contribute toward improved network wet weather capacity performance. Staging may be challenged however where multiple growth areas are simultaneously developed, and localized network storage and related or supporting conveyance upgrades are not able to be scheduled to keep pace with enabling all growth areas to commence 'on demand'. Both options result in increased volume of total flows to WWTP but peak flows are constrained by network conveyance capacity and are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges occur from WWTP under this option. PWWTP able to treat all received flows to current LOS throughout a 35-year period, up to 2057. Summary assessment: Overall both options provide for and meet long term growth needs by providing sufficient network storage, conveyance and treatment plant processing capacity to meet these needs. Both options are considered to **largely support short- and medium-term growth needs** by deploying a combination of progressive and targeted network
	Twin storage + Existing treatment + Existing shoreline outfall	4	

Option	Option Description	Assessment (1-5)	Reasons
			storage and associated conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Both options result in WWTP processing capacity not being exceeded at any time. Some risk does exist with both options, where both options could struggle to keep pace with growth if growth simultaneously occurs in all projected growth catchment areas and requires all required network storage and conveyance upgrades to be developed simultaneously. For the purpose of this assessment this risk is why both options are not scored a 5.
	Greater conveyance + Existing treatment + New shoreline outfall	2	Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Network conveyance upgrades are however progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period. Full conveyance installation is required to accommodate growth and achieve total target reductions in existing overflows. Progressive staging of conveyance installation may result in increased overflow frequencies and volumes to Te Awarua o Porirua Harbour associated with Growth in some sub catchments in the short and/or medium term. Increased flows to WWTP, particularly in the long term, will cause, during high flow wet weather events, frequent discharges of partially treated wastewater at the new shoreline outfall. Subject to the timing, staging and alignment of progressive PWWN conveyance upgrades and WWTP capacity improvements, there is a risk that some increases in flows to the WWTP in the short term /medium term could result in a temporary increase in the frequency of partially treated discharges and/or possible bypasses or overflows of untreated wastewater discharges. Summary assessment: Overall this option is considered to eventually **provide for and meet long term growth needs** by providing enough network conveyance and treatment plant processing capacity to meet these needs. This option is however considered to struggle to partially support meeting short- and medium-term growth needs. The option is reliant on all network conveyance upgrades being completed to both reduce existing network wastewater overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term as a result of growth generated increases in network wastewater volumes. Subject to timing, staging and sequencing of PWWN capacity and WWTP processing upgrades, a risk also exists that conveyance upgrades ahead of WWTP processing upgrades could also be potentially misaligned and result in a short and/or medium-term deterioration of WWTP discharges.

Option	Option Description	Assessment (1-5)	Reasons
	Combination of conveyance and storage (Greater conveyance + Increased storage) + Existing treatment + New shoreline outfall	4	Under both options network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Progressive and targeted network storage and associated conveyance upgrades associated with both options provide for growth by enabling staging of network storage and supporting conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Staging allows for short- medium term location specific significant reductions in overflow volumes and frequency, providing localized capacity for growth in wastewater volumes. Staged storage upgrades contribute toward improved network wet weather capacity performance. Staging may be challenged however where multiple growth areas are simultaneously developed, and localized network storage and related or supporting conveyance upgrades are not able to be scheduled to keep pace with enabling all growth areas to commence 'on demand'. Both options result in increased volume of total flows to WWTP but peak flows are constrained by network conveyance capacity and are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges occur from WWTP under this option. PWWTP able to treat all received flows to current LOS throughout a 35-year period, up to 2057. Summary assessment: Overall both options provide for and meet long term growth needs by providing enough network storage, conveyance and treatment plant processing capacity to meet these needs. Both options are considered to **largely support short- and medium-term growth needs** by deploying a combination of progressive and targeted network storage and associated conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Both options result in WWTP processing capacity not being exceeded at any time. Some risk does exist with both options, where both options could struggle to keep pace with growth if growth simultaneously occurs in all projected growth catchment areas and requires all required network storage and conveyance upgrades to be developed simultaneously. For this assessment this risk is why both options are not scored a 5.
	Twin storage + Existing treatment + New shoreline outfall	4	
	Greater conveyance + Existing treatment + New offshore outfall	2	Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Network conveyance upgrades are however progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period.

Option	Option Description	Assessment (1-5)	Reasons
			Full conveyance installation is required to accommodate growth and achieve total target reductions in existing overflows. Progressive staging of conveyance installation may result in increased overflow frequencies and volumes to Te Awarua o Porirua Harbour associated with Growth in some sub catchments in the short and/or medium term. Increased flows to WWTP, particularly in the long term, will cause, during high flow wet weather events, frequent discharges of partially treated wastewater at the new offshore outfall. Subject to the timing, staging and alignment of progressive PWWN conveyance upgrades and WWTP capacity improvements, there is a risk that some increases in flows to the WWTP in the short term /medium term could result in a temporary increase in the frequency of partially treated discharges and/or possible bypasses or overflows of untreated wastewater discharges. Summary assessment: Overall this option is considered to eventually **provide for and meet long term growth needs** by providing enough network conveyance and treatment plant processing capacity to meet these needs. This option is however considered to struggle to partially support meeting short- and medium-term growth needs. The option is reliant on all network conveyance upgrades being completed to both reduce existing network wastewater overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term as a result of growth generated increases in network wastewater volumes. Subject to timing, staging and sequencing of PWWN capacity and WWTP processing upgrades, a risk also exists that conveyance upgrades ahead of WWTP processing upgrades could also be potentially misaligned and result in a short and/or medium-term deterioration of WWTP discharges.
	Combination of conveyance and storage (Greater conveyance + Increased storage) + Existing treatment + New offshore outfall	4	Under both options network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2057. Progressive and targeted network storage and associated conveyance upgrades associated with both options provide for growth by enabling staging of network storage and supporting conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Staging allows for short- medium term location specific significant reductions in overflow volumes and frequency, providing localized capacity for growth in wastewater volumes. Staged storage upgrades contribute toward improved network wet weather capacity performance. Staging may be challenged however where multiple growth areas are simultaneously developed, and localized network storage and related or supporting
	Twin storage + Existing treatment + New offshore outfall	4	

Option	Option Description	Assessment (1-5)	Reasons
			conveyance upgrades are not able to be scheduled to keep pace with enabling all growth areas to commence 'on demand'. Both options result in increased volume of total flows to WWTP but peak flows are constrained by network conveyance capacity and are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges occur from WWTP under this option. PWWTP able to treat all received flows to current LOS throughout a 35year period, up to 2057. Summary assessment: Overall both options provide for and meet long term growth needs by providing sufficient network storage, conveyance and treatment plant processing capacity to meet these needs. Both options are considered to **largely support short- and medium-term growth needs** by deploying a combination of progressive and targeted network storage and associated conveyance upgrades to meet growth demands and target growth areas at a sub-catchment level. Both options result in WWTP processing capacity not being exceeded at any time. Some risk does exist with both options, where both options could struggle to keep pace with growth if growth simultaneously occurs in all projected growth catchment areas and requires all required network storage and conveyance upgrades to be developed simultaneously. For this assessment this risk is why both options are not scored a 5.

Appendix 5 – Social and Community

Memo

To:	Richard Peterson Wellington	From:	Matt Trlin (Connect Water)
File:	Porirua WWTP Collaborative Assessment: SOCIAL and COMMUNITY	Date:	May 23, 2019

PORIRUA WASTEWATER NETWORK & WWTP – PRELIMINARY SCORING OF SOCIAL AND COMMUNITY CRITERIA

1. INTRODUCTION

This memo provides a comparative assessment of the Social and Community effects likely to be associated with each of the Porirua wastewater network and WWTP shortlisted options.

The shortlist includes three network options for the management of wet weather overflows, and three WWTP discharge options.

Combining the three network and three discharge options results in nine permutations shown in **Table 1**. For the Storage & Conveyance and Twin Storage options, there are sub-options which define the location of the storage and where the greater conveyance occurs.

Table 1: Shortlisted network and WWTP discharge options 1 to 9 (Stantec, March 2018).

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

1.1 SOCIAL AND COMMUNITY – AMENITY (EXCLUDING VISUAL AMENITY), RECREATION AND HERITAGE, INCLUDING PERCEPTION

This assessment compares the extent to which each of the 9 short list options are likely to impact (either positively or negatively) on recognised Social and Community values that may be associated with sites, areas or environments affected by those option.

For the purpose of this assessment the Social and Community criteria considered include:

- Local amenity values (excluding visual amenity),
- Recreation values,
- Heritage values and
- Any other social and cultural activities, practices and perception values (excluding mana whenua which are separately assessed) that may be impacted by the operation and management of the Porirua Waste Water Network and Waste Water Treatment Plant.

This assessment provides a comparative assessment of each option's likely potential effect/s on this collective set of matters.

These different components are explained in more detail below. However, for the purposes of this assessment an overall judgment was used to score each option, rather than treating these different elements as sub-criteria and then scoring them separately.

1.2 LOCAL AMENITY VALUES

In the case of evaluating effects on local amenity values, this includes assessing the likelihood and impact of an option generating a noise and/or odour effect impacting the perceived amenity value or quality of a site or a place. This may be generated through option construction and/or operation and ongoing management.

This includes any likely community perceptions of an effect on the amenity of a site, area or environment (i.e. a perceived belief that the amenity of the place has been impacted or degraded by the option). Perceptions include tangible perceptions associated with observing active discharges (treated or otherwise) to place or site and observing the presence of environmental effects associated with the presence of discharges. This includes perceiving smells/odour, and observing the presence of litter, and any physical presence of environmental degradation (habitat change or loss, presence of diseased, dying or dead vegetation or wildlife). It also includes effect that may be related to a held community spiritual or belief-based value/s (i.e. treated discharges are not observed, but are understood to occur, and are therefore considered to have an effect on a social or community value/s of a site or place or the ability to undertake an activity, such as recreational fishing or swimming)

Effects on natural character, landscape values, or visual amenity are not included in this assessment. These values are addressed under the Natural Character and Landscape values criteria.

Effects on recognised Tangata Whenua values are also not included in this assessment. These values are separately addressed, under the Tangata Whenua values criteria, notwithstanding that these values are intimately linked to the social and community value criteria.

1.3 RECREATION VALUES

In the case of evaluating effects on recreation values, this includes assessing each option's potential effects generated through option construction and/or operation and ongoing management on:

- **Recreational sites, facilities and places**: this includes sites, facilities, places used for recreational activities
- **Informal and passive recreational activities**: including recreational walking, swimming, cycling, fishing, sailing, casual beach activities, site seeing etc and/or
- **Formal recreational activities**: including organized sports and activities and recreational events such as waka ama, rowing, competition fishing, events such as the grand traverse etc.

1.4 HERITAGE VALUES

In the case of evaluating effects on heritage values, this includes assessing each option's potential effect/s generated through option construction and/or operation and ongoing management on:

- **Recognised heritage sites, places or facilities**: this includes community perceptions of an effect on a recognised place or site (i.e. perceptions of an effect on a spiritual and/or intangible value associated with place or site).

Effects on values, sites and/or places of importance or significance to Ngati Toa, as mana whenua, are not included in this assessment. These values are separately addressed under the Tangata Whenua values criteria.

1.5 OTHER SOCIAL AND CULTURAL ACTIVITIES, PRACTICES AND PERCEPTION VALUES

In the case of other social and cultural activities, practices and perception values this includes any other spiritual and belief based activities, practices and perception values that may be held by the community that may be impacted by any of the options. As an example, some communities within Porirua share strongly held cultural views with Iwi that waste water, treated even to potable water standard, is still 'tainted' as waste water. In such cases contact with or use of that water for a range of social and community activities (i.e. contact recreation use, food gathering, cleaning or washing) may not be acceptable.

This assessment, together with similar memos prepared for the other criteria against which the short list options are being assessed, will form the basis for further discussion at the Multi-criteria Analysis (MCA) Workshop by the wider Collaborative Group.

2. AUTHORS' CREDENTIALS

This assessment has been prepared by Matt Trlin (Connect Water) and reviewed by Richard Peterson (Stantec). Matt is a Principal- Planning at Beca Consultants Ltd (Connect Water partner), and Richard is a Principal Planner, Team Leader at Stantec.

Matt has been with Beca since 2016. Prior to joining Beca Matt worked in local government, including 15 years at Porirua City Council as the Manager Environment and City Planning. In this role Matt, working with Porirua City Council's Porirua Harbour Strategy coordinator, oversaw the development, roll out and delivery of the community and stakeholder engagement processes which informed the development of the Te Awarua o Porirua Harbour and Catchment strategy. Matt has extensive experience in urban and environmental planning and management, strategic planning, community and stakeholder engagement and consultation, and district plan development, and water infrastructure planning and consenting.

Richard is a planner with over 20 years experience. He has worked at Stantec for 4 years and during that time has worked on various infrastructure projects and is currently involved in resource consent projects for three wastewater treatment plants.

3. INFORMATION SOURCES

The following information has been used in this assessment;

- Public Health Assessment – PWWN and WWTP Short list MCA, Graeme Jenner, Connect Water, 2019
- Porirua Waste water Programme, Recreation Assessment, Rob Greenaway and Associates, December 2018
- Porirua Wastewater Catchment Alternatives Optimisation Phase 1, WCS Engineering, April 2019
- Porirua Waste Water Network Storage Site Selection, Site selection report, Connect Water, 2019
- Porirua Growth Strategy 2048
- Porirua Population and housing projections, Beryl 2018
- Porirua City District Plan- Part HH Historic Heritage
- Porirua City Council Heritage Management Strategy 2010

4. LIMITATIONS OF ASSESSMENT

The short list options presented are concept designs and are based on desk top studies with limited site-specific and construction related effects information.

Site specific information has been developed for the assessment of outfall options from the WWTP.

The assessment of potential site storage options is based on the desk top assessment of site storage options and sites produced by Connect Water.

Detailed site investigations, planning and feasibility assessments will be required to further refine the options and undertake a detailed assessment of effects.

This assessment assumes:

- Each of the 9 options is technically feasible and can be technically delivered,
- Each of the options will be progressively implemented over a 35 year timeframe, with full option roll out and completion occurring by year 35
- That the timing and sequencing of option implementation will be tied to meet or closely respond to growth related demands for network capacity improvement, in so far as it is practical.

5. APPROACH TO ASSESSMENT

Table 2 sets out a 5 point scoring system, for the Social and Community criteria, to score each of the 9 short list options.

The scoring criteria assess the extent to which each assessed option is likely to effect recognised 'social and community values'.

Social and community values, as identified above, include:

- Local amenity values (excluding visual amenity),
- Recreation values
- Heritage values, and
- Community perceptions of effects on these values (excluding Tangata Whenua values).

For the purpose of this assessment, effects on social and community values include:

- Positive and/or negative effects of option construction, operation and management on identified values,
- Short to medium term effects (5-20 years) on identified values
- Long term effects (20-35years +) on identified values.

This includes the extent to which an assessed option is likely to result in either an improvement to or degradation of a recognised social and community value/s.

The assessment assumes that the effects of the existing operation of the current PWWN and WWTP, including consented and unconsented PWWN and WWTP discharges on the environment, currently define the existing state of the environment (whether accepted by the community or otherwise).

The assessment therefore assumes that social and community perceptions of the effects of each option will be based around the extent to which each option causes either an improvement to, worsening of or no change to the PWWN and WWTP effects on the environment.

This assessment includes allowing for and recognising effects associated with growth related increases in waste water conveyance and treatment volumes.

It is noted that this assessment approach differs from an assessment that would be taken for a Resource Management Act consenting assessment of effects on the environment. Under a RMA consenting assessment of an option, any assessment would be required to assess the proposal as if any existing discharges from the

PWWN and/or WWTP and any effects of those discharges on the environment, would not be occurring in the future (pending the outcome of the resource consent process).

For the purpose of this assessment and selecting a preferred option to progress and consent, it is assumed that the community perceptions of each option's effects on social and community values will be based on the relative impact of each option against the current status quo. This provides for a wider range in 'scoring' the assessed effects of each option on social and community values, assisting with differentiating between the options. This method has been used to assist in selecting a preferred option to take to formal assessment and consenting.

5.1 PWWN AND WWTP OPTIONS ASSESSMENT

For both the PWWN and WWTP components of Porirua's waste water system, this social and community assessment provides an overall judgement of the social and community effects associated with each option. This assessment considers, within the limitations of the existing information currently available for each of these concept short listed options, the extent to which each option will:

- **Affect sites, places, facilities and activities**: Result in the development of new infrastructure that may directly affect, displace and/or disrupt existing social and community infrastructure, sites, places, facilities and/or activities, including recreational and heritage sites, places and facilities. This includes specific consideration of option effects on any site/s and/or places identified in the current operative District Plan with heritage values (Part HH historic Heritage). Sites of significance to Ngati Toa have been separately assessed as part of the Tangata Whenua values assessment.
- **Affect amenity values and perceptions:** Result in effects on amenity values and perceptions associated with a site, place or facility. This includes effects associated with infrastructure construction and operation affecting social and community perceptions of the values of that environment. This includes effects (excluding visual effects of structures, buildings and any temporary visual effects that may be associated construction activity) associated with providing for or continuing to discharge treated, partially treated and/or untreated waste water to local receiving environments. This includes provision of 'overflow' facilities from existing pipe and or storage facilities. Effects include potential effects associated with the visual presence of 'overflow' structures (i.e. the structure is observed and is known to overflow) visual effects associated with discharge residues/litter, and/or potential odour effects associated with the presence of waste water utilities and waste water discharges
- **Result in a change in effects:** Where discharges of treated, partially treated and/or untreated waste water continue the extent to which each option will result in:
    - A change (increase or decrease) to the volume and/or frequency of such discharges, and/or
    - A measurable and/or perceived change or effect on local social and community water based values (i.e. the ability to be able to use water for social and community activities such as bathing and contact recreation, food gathering), and
    - A measurable and/or perceived change or effect on any other identified local social and community amenity and/or recreational values.

  Rob Greenaway's recreation assessment report, having considered community perceptions and comments on values and effects impacting recreational users, provides a useful summary of key effects that could be considered as a proxy for the above criteria, recognising that some community groups and individuals have identified that a permanent stigma is associated with the overflow of any waste water into the Te Awarua-o-Porirua's catchment, harbour and coastal environment. Proxy criteria for assessing changes in effects cover the extent to which each option has an effect on:

    - **Health warnings:** The frequency (increase or decrease) of health warnings in the study area for contact recreation (noting that any of the options selected will not eliminate these)
    - **Shellfish harvesting and consumption:** The ability to consume shellfish taken from within the study area (noting that other sources of pollution not related to the operation and management of the waste water network will continue)

- o **Habitat quality:** the quality of habitat for fish and shellfish

The scoring criteria in **Table 2** therefore includes a two limbed assessment of social and community effects, related to the direct effect of each option on social and community values and/or whether the option results in any change in effect from the current performance of the network and WWTP outfall activities.

6. PORIRUA WASTE WATER SYSTEM PERFORMANCE

The performance of the existing Porirua Wastewater System (encompassing the Network and Treatment Plant) is detailed in the Water Quality, Ecology and Public Health criteria assessments.

7. PORIRUA WASTE WATER NETWORK AND WASTE WATER TREATMENT PLANT CONTEXT AND SETTING

The Porirua Waste Water Network (PWWN) and Porirua Waste Water Treatment Plant (PWWTP) services an area that is heavily-used for a wide variety of coastal and water based recreational and community activities.

The area plays a significant role in servicing local and regional recreation needs and provides significant amenity values and services to both the local and regional community.

The report of Greenway and Associates outlines range of services that are provided by the harbour and coastline to the local and regional community.

Recreationally the Onepoto arm of Te Awarua of Porirua Harbour is identified as being used extensively for various water based activities including waka ama, rowing, wind surfing, flat-water kayaking, kite surfing, small boat sailing and power boating. These activities are supported by various public boat launching ramps, areas for personal watercraft, and defined boat mooring areas and private boat sheds. While shellfish gathering is not advised, cockle harvesting is popular and flounder are available.

Pauatahanui Inlet is similarly popular for small boat sailing and training, swimming – particularly at the Dolly Varden Beach and off the Paremata Bridge – shellfish harvesting, floundering, setnetting, jet skiing, flat water kayaking, waka ama, wind surfing and kite surfing.

Other recreation and community activities undertaken within Pauatahanui include bird watching and conservation work – particularly at the Pauatahanui Wildlife Reserve.

As with the Onoepoto arm there are various boat launching ramps, mooring areas, and private boat sheds within the harbour. Several bays and beaches provide picnic and swimming opportunities.

The inshore area from the Paremata Bridge to Hongoeka Bay is popular for: swimming, wind surfing, kite surfing, sea kayaking, sailing, surf-casting, surfing and beach activities.

Moving to the city's outer coastal environments and beaches, which fall within the catchment of the WWTP, Titahi Bay is a popular surfing site, particularly for beginners, and an important swimming beach, with the Titahi Bay Surf Lifesaving Club located centre-stage.

Fishing is popular offshore along the Mana Island marine bridge ('The Bridge') and off many rocky coastal areas.

Most of the Porirua coast has easy public access, and almost all has some form of access.

In line with these values various sail and boating clubs maintain facilities at various sites around the harbour. PCC maintains an extensive recreational and public access network along and immediately adjacent to the coast designed to integrate with and utilise the amenity and recreation values of this environment.

Similarly GWRC also maintains regional parks and in its environment regulatory role undertakes regular water and environmental quality monitoring for bathing, shell fish, and ecological habitat and community monitoring at various sites around the harbour and coast.

Social and community values associated with the coastal environment's amenity values and recreation access to and use of the harbour and its edges, also extend up to into the various freshwater catchments that drain to the harbour and coast.

The catchments various freshwater courses are also extensively used for linking to and from the coastal environment, and for walking, cycling, fishing, white baiting, and bird watching. Various sites around the harbour edges and along some of the freshwater ways also provide key gathering spaces for community events and activities.

Social and community values attached to the harbour, the coastal and freshwater catchment environments relate to its utility, accessibility, shelter, and safety. Greenaway concludes that it is clear that almost all parts of the study area (Te Awarua o Porirua Harbour and catchment, including open coastal areas on the west Porirua coastal line) are used for recreation, and while some may be used less intensely, there is no area which can be described as low value.

Overall these values are significant, defining Porirua as a place, influencing community wellbeing and defining community identity.

Threats to these values are associated with activities which impact or affect access and use of the coast, water, water quality, amenity experiences, perceptions of health and safety and the social and recreational amenity experience of the environment.

This community and social value assessment of the 9 short list options for enhancements to the WWN and WWTP, has considered the impact that each of the listed options is likely to have on these values, both at a catchment wide and local site-specific based scale.

Table 2: Scoring approach for Porirua Wastewater Programme Short List Multi Criteria Assessment: SOCIAL AND COMMUNITY

Criteria	Description	One	Two	Three	Four	Five
Social and community	Amenity (Excluding visual), recreation and heritage, including perception	High adverse effects **OR** **No** short, medium- **or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Moderate to High adverse effects **AND/OR** **Minimal – modest** short, medium- **and/or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and/or** the WWTP	Moderate adverse effects **AND/OR** **Modest** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Low adverse effects **AND/OR** **Moderate** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Very Low or nil adverse effects **AND** **Moderate to Significant** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP

Comparative Assessment- Social and Community

Preliminary scores for the 9 network and WWTP options against the Social and Community criteria are provided in **Table 4.**

Table 4: **Porirua Wastewater Network and Treatment Plant options for managing wet weather overflows – SOCIAL AND COMMUNITY VALUES**

Option	Option Description	Assessment (1-5)	Reasons
1.	Greater conveyance + Existing treatment + Existing shoreline outfall	**2**	Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2060. Network conveyance upgrades are progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period. This option will result in greater peak event conveyance to the WWTP and with expansion to WWTP peak flow partial treatment capacity it will result in a greater volume and frequency of partially treated waste water discharges to the coastal environment. **WWN component** Short and medium term 5-20yrs:**.** Full conveyance installation is required to achieve a sustained reduction in existing waste water overflow frequencies and volumes into Porirua Harbour. Under this option network conveyance upgrades progressively occur over a 35-year period. Conveyance upgrade staging will mean that upgrades may only be partially able to achieve some reduction/s in overflow frequency and volumes into Te Awarua o Porirua Harbour in the short to medium term. **At best, minimal to modest improvements** are achieved in overflow frequencies into Porirua Harbour for the **short and medium term** until a full WWN conveyance upgrade is completed. The absence of a short to medium term fully upgraded WWN conveyance option to the WWTP results in **moderate to high effects** on social and community values associated with sustained and potentially increased overflows occurring into Te Awarua o Porirua, associated with waste water volume growth related to urban growth. Sustained and potentially increased overflow frequencies and volumes in the short to medium term will continue to affect the use of harbour (contact recreation, community perceptions, shell fish gathering etc), and perceptions of harbour water quality. It is anticipated that health warning frequency and access to shell fish in the harbour under this option will not change until greater conveyance capacity is fully installed across the network and fully optimized with the operation of the WWTP. Community concerns with water quality, harbour health remain potentially constraining community and social engagement with and use of the harbour and harbour edge. Minor and temporary effects on social and community values (i.e local amenity impacts related to noise effects) are associated with progressive conveyance upgrades. Long term 20-35yr+**:**

Option	Option Description	Assessment (1-5)	Reasons
			Long term the WWN component of this option will result in perceived moderate to significant improvements in WWN overflows, by reducing overflow frequencies and volumes associated with completed installation of all WWN conveyance upgrades. Long term this option results in a reduction of overflow effects on social and community values associated with Te Awarua o Porirua. This will manifest through reduction in health warning frequencies, and the potential for improved access to coastal and foreshore areas for recreational activities, including for shellfish harvesting and consumption. Community perceptions of the harbour and water quality will improve with the completion of conveyance upgrades, where warnings and beach closures are reduced, increasing community confidence in using and accessing coast for social and recreational use. **WWTP component:** Short and medium term 5-20yrs:**.** For this assessment it is assumed that the WWTP partial treatment capacity will be upgraded early, providing WWTP capacity to receive and partially treatment any greater conveyance from the WWN. This will result in a greater frequency and volume of partially treated wastewater discharges from WWTP into the coastal environment with peak flow events received from any WWN conveyance upgrades. Where additional WWTP upgrades do not precede or match WWN conveyance upgrades, untreated by-passes or overflow events will occur to this environment. At best **short to medium term moderate adverse effects** will be generated on existing social and community values associated with the coastal environment related to an increase in the frequency and volume of WWTP partially treated discharges. Where WWTP plant upgrades do not meet WWN conveyance upgrades, these effects may be perceived to be moderate to high adverse, with a perceived deterioration in the quality of WWTP discharges associated with potentially untreated overflow or bypass discharges. This would be associated with presence of warning signs and restrictions on fishing and water contact in the area. For this assessment **it is assumed that WWTP upgrades will precede and match any WWN conveyance upgrades avoiding this effect.** The instances of higher frequencies and volumes of partially treated waste water discharging to the coast will impact on community perceptions of the quality of the existing coastal environment. This will manifest through reduced or modified community use of this environment. This option does not result in any short or medium improvement of coastal discharges effects on social and community values associated with the coastal environment.

Option	Option Description	Assessment (1-5)	Reasons
			Long term 20-35yr+: **Long term <u>no improvement</u> occurs in existing effects on the coastal environment** associated with existing outfall discharges. An increased frequency and rising volume of partially treated discharges to coastal environment results in a worsening of social and community perceptions of effects on coastal social and community values. Existing perceptions of amenity and recreation degradation associated with existing the outfall site will remain unchanged and/or worsen with outfall duplication and increase in discharge of partially treated overflows. Duplication of the outfall, to accommodate greater outfall discharges associated with enhanced WWN conveyance, will reinforce social and community perceptions of the WWTP discharges further impacting social and community values associated with the recreational use of this area. This will occur in spite of the standard of any partial or full treatment of higher WWTP discharge volumes during peak flow events. It is anticipated that this will act to constrain use and enjoyment of this section of the coast line. **<u>Summary assessment:</u>** Overall this option, once fully implemented, will reduce WWN overflow frequencies and overflow volumes to Te Awarua o Porirua. This will not be achieved until the full WWN conveyance network is upgraded. This option will result in a greater volume and frequency of partially treated waste water discharges to the coastal environment. The option is reliant on all network conveyance upgrades across the PWWN being completed to both reduce existing short, medium- and long-term network waste water overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term because of growth generated increases in network waste water volumes. Subject to the timing, staging and sequencing of PWWN capacity and WWTP processing upgrades, a risk also exists with this option that conveyance upgrades ahead of WWTP processing upgrades could result in a temporary short and/or medium-term deterioration of WWTP discharges. For this assessment it is assumed WWTP upgrades will precede any WWN upgrades. This risk is therefore not factored into this assessment of effects on social and community values. In the short to medium term the option: • Struggles to maintain and/or reduce the current frequency and volume of overflow events into Te Awarua O Porirua • Struggles to maintain and reduce social and community effects on Te Awarua o Porirua Harbour. • Is unlikely to reduce warning signs and/or improve access to shell fish harvesting. • Will continue to have at least moderate amenity impacts along sensitive harbour and stream edges and recreation areas. The community will not observe the full benefits of this option until it is fully installed

Option	Option Description	Assessment (1-5)	Reasons
			• Will increase discharges to the coastal outfall site, and increase instances of partially treated discharges to the coast, affecting and potentially compounding community perceptions of the options impact on social and community values (i.e recreation use, access, and amenity) Having regard to the options short to medium term effects, this option **does not** result in a modest, moderate or significant short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. At best it results in **minimal** – **modest short to medium improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the **WWN**. Long term it results in a moderate to significant improvement for the WWN but achieves no improvement in the discharge from the WWTP. The option potentially gives rise to moderate long-term effects on social and community values associated with the coastal environment related to the presence of an outfall, and WWTP partially treated discharges into a sensitive and valued coastal recreation edge environment. On this basis the option has an overall assessment as a **2**.
2.	Greater conveyance + Increased storage + Existing treatment + Existing shoreline outfall	**4**	Under both these options Network overflows are reduced to ≤ 2 per year to streams and harbour by 2060. Both options involve: • Progressive and targeted network storage and associated conveyance upgrades throughout the WWN • The same WWTP configuration and continued utilization of the WWTP's existing outfall. Staging allows for immediate short-, medium- and long-term location specific significant reductions in overflow volumes and frequency, providing opportunities for significant reductions in overflow impacts on local social and community values, associated with removal of warning signs and enhanced perceptions of improved access to enhanced harbour and coastal edges. **WWN component:** <u>Short and medium term 5-20yrs:</u>**.** Progressive upgrades in network storage and associated conveyance installation associated with both options 2 and 3 achieve a **moderate to significant sustained improvement in short to medium term** reductions of WWN overflow frequency and volumes into Te Awarua o Porirua Harbour. Both options provide a degree of network upgrade flexibility to target and stage network storage and related conveyance upgrades to achieve reductions in the worst performing existing overflow sites.
3.	Twin storage + Existing treatment + Existing shoreline outfall	**4**	

Option	Option Description	Assessment (1-5)	Reasons
			Reduced frequency of WWN overflows has **moderate to high positive effects** on social and community values associated with improving harbour water quality and perceptions of being able to increasingly use harbour for activities such as contact recreation, swimming, fishing, and in places shell fish gathering etc. This will manifest through reduced use of warning signs, and enhanced community confidence in accessing coast that is perceived to be enhanced with effect of reduced overflows. Minor to moderate temporary effects on social and community values are associated with development and installation of some WWN storage options. Overall network upgrades are considered to have low and, in some cases, very low adverse effects. Localised effects are associated with amenity impacts of construction and operation of activities. This may include in some sites and places site specific effects related to noise and traffic disruption, and the localized temporary and/or permanent displacement of some recreational and/or social and/or community activities/values. <u>Long term 20-35yr+</u>**:** **Long term both options provide perceived moderate to significant improvements** in WWN overflows, by reducing overflow frequencies and volumes, and reducing overflow effects on social and community values associated with Te Awarua o Porirua. This includes reduced amenity impact of overflows, reduction in warning sites, and improvement in community confidence in accessing the coast and water for recreation and social use. **WWTP component:** <u>Short and medium term 5-20yrs:</u> WWN storage upgrades act to 'throttle back' or 'limit' peak WWN loadings to the WWTP. Existing planned and committed WWTP upgrades enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP at current high levels of treatment. Untreated overflow and/or bypass events are avoided (except in emergencies). **Short to medium term low – moderate adverse effects** are generated on the existing social and community values of the existing coastal environment associated with maintaining fully treated peak flow discharges from the existing WWTP to the coastal foreshore. <u>Long term 20-35yr+</u>**:** **Long term no improvement is provided to reducing existing effects of WWTP discharges on the coastal environment.** Existing outfalls are maintained, and overall treated waste water volumes are increased.

Option	Option Description	Assessment (1-5)	Reasons
			Social and community perceptions of discharge effects on social and community values of the coastal environment remain neutral, with acceptance that a retained shoreline discharge will have a modest impact on social and community values and perceptions associated with that environment- continuing to limit some recreation use and enjoyment of this environment. However high level waste wqter treatment and avoidance of overflows/bypasses and limited use of warning signs, does not deteriorate existing use and enjoyment of environment. **Summary assessment:** Both options contribute toward immediate short, medium- and long-term reduction in WWN overflow frequency and volumes to Te Awarua o Porirua. Both options result in treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal environment. In the **short, medium and long** term both options: • Reduce the current frequency and volume of overflow/bypass events into Te Awarua o Porirua • Reduce social and community effects of WWN overflows on Te Awarua o Porirua Harbour. • Reduce warning signs improve community confidence in accessing and using coast and stream edge environments, including for shell fish harvesting. • Result in a moderate to significant improvement in remedying existing degraded sensitive harbour and stream edges and recreation areas. The community receives an immediate benefit of any localized WWN storage and related conveyance upgrades significantly reducing localized overflow events and perceived restriction son using these environments. • Do not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Improves overall community perceptions of the option positively impacting social and community values, providing greater confidence for access to coastal areas and edges, and use of water for recreational activities, including improvement in local amenity values These options result in a **moderate to significant short, medium- and long-term improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. The options result in **low to moderate adverse effects** associated with the continued operation and discharge of treated WWTP discharges to the coastal environment. On this basis both options have an overall assessment of **4**
4.	Greater conveyance + Existing treatment +		Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2060.

Option	Option Description	Assessment (1-5)	Reasons
	New shoreline outfall	**2**	Network conveyance upgrades are progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period. This option will result in greater peak event conveyance to the WWTP and with expansion to WWTP peak flow partial treatment capacity it will result in a greater volume and frequency of partially treated waste water discharges to the coastal environment at a new outfall site. It is noted that the new outfall may potentially be located adjacent to or within an existing heritage site, HS010 Round Point. This is a small, low headland situated near the sewage treatment plant. The headland of Round Point was once a Ngati Ira stockade called Te Korohiwa. Directly north of Te Korohiwa the whaling station 'Coalheavers' was established in 1837. Evidence of human occupation, such as pits, terraces, middens, and ovens – which are recorded as archaeological sites R27/14-13 and R27.147-150 – gives this place archaeological value. The site has Māori cultural and historic values due to its association with past generations and the history of Porirua. The District Plan treats the destruction of listed heritage sites as a non-complying activity, and provides a policy framework that favours **avoidance** of destruction. For this assessment it is assumed that the destruction of the site can be avoided, and options can be found to engineer the outfall to either avoid or appropriately minimise any impact on the site. **WWN Component:** Short and medium term 5-20yrs: The same as option 1, full conveyance installation is required to achieve a sustained reduction in existing overflow frequencies and volumes into Porirua Harbour. Network conveyance upgrades progressively occur over a 35year period, but conveyance upgrades are staged and are only partially able to achieve some reductions in overflow frequency and volumes into Te Awarua o Porirua Harbour in the short to medium term. At best, **minimal to modest improvements** are achieved in overflow frequencies into Porirua Harbour for the **short and medium term** until a full WWN conveyance upgrade is completed. The absence of a short to medium term fully upgraded WWN conveyance option to the WWTP results in moderate to high effects on social and community values associated with sustained overflows and their effect on the use of harbour (i.e impacting contact recreation, community perceptions and confidence in using the harbour, streams and coastal edges, shell fish gathering etc), and perceptions of harbour water quality. Minor and temporary effects on social and community values (i.e local amenity impacts such as noise effects, traffic disruption etc) are associated with progressive conveyance upgrades.

Option	Option Description	Assessment (1-5)	Reasons
			<u>Long term 20-35yr+</u>**:** The same as option 1, **long term this option results in perceived moderate to significant improvements** in WWN overflows, by reducing overflow frequencies and volumes associated with completed installation of all WWN conveyance upgrades. Long term this option results in a reduction of overflow effects on social and community values associated with Te Awarua o Porirua. Community perceptions of the harbour and water quality will improve where warnings and beach closures are reduced, increasing community confidence in using and accessing the harbour, stream and coastal edges for social and recreational use. **WWTP Component:** <u>Short and medium term 5-20yrs:</u> Similar to option 1. Increase in WWN conveyance to WWTP in the short to medium results in greater frequency and volume of partially treated wastewater discharges from WWTP into the coastal environment. **Short to medium term moderate- high adverse effect** generated on existing social and community values associated with coastal environment by an increase in frequency and volume of partially treated WWTP discharges. The timing of new shoreline outfall construction unlikely to impact this assessment. For this assessment it is assumed that values associated with the heritage site in proximity to the new outfall location will not be compromised through avoidance or significant mitigation of any effects of associated with developing the outfall. The destruction of this site would be deemed to be a significant adverse effect to be avoided, where practical. <u>Long term 20-35yr+</u>**:** **Long term some minimal to modest improvement** in existing effects on social and community values associated with creating new outfall location. New outfall location potentially reduces current discharge effects on social and community values associated with the use Titahi Bay, relocating the outfall further south providing greater community access and community confidence in using the environment around the existing decommissioned outfall, and to the coastal environment not subject to WWTP discharges (treated or otherwise). However, increased frequency and volume of partially treated discharges to the new shoreline outfall location results in a worsening social and community perception of WWTP discharge impacts on social and community values associated with the coastal environment. New outfall location affects social and community perceptions of WWTP outfall impacts on coastal recreational values and use. Existing amenity and recreation degradation is associated with constructing and operating the new outfall location.

Option	Option Description	Assessment (1-5)	Reasons
			Overall perceptions of WWTP discharge impacts on social and community values remain unchanged or worsen with an increase in the discharge of partially treated discharges to new outfall location (notwithstanding potentially increased use and confidence in accessing existing outfall location). **Summary assessment:** Overall this option once implemented will reduce WWN overflow frequencies and overflow volumes to Te Awarua o Porirua. This will not be achieved until the full WWN conveyance network is upgraded. The option is reliant on all network conveyance upgrades across the PWWN being completed to both reduce existing network waste water overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term because of growth generated increases in network waste water volumes. Subject to the timing, staging and sequencing of PWWN capacity and WWTP processing upgrades, a risk also exists, as with option 1, with this option that conveyance upgrades ahead of WWTP processing upgrades could result in a temporary short and/or medium-term deterioration of WWTP discharges. For this assessment it is assumed that WWTP capacity upgrades and outfall installation will occur ahead of WWN conveyance upgrades. In the **short to medium** term the option: • Struggles to maintain and/or reduce the current frequency and volume of overflow events into Te Awarua O Porirua • Struggles to maintain and reduce social and community effects on Te Awarua o Porirua Harbour. • Is unlikely to reduce warning signs and/or improve access to shell fish harvesting. • Will continue to have at least moderate amenity impacts along sensitive harbour and stream edges and recreation areas. The community will not observe the full benefits of this option until it is fully installed • Has the potential to impact a site of heritage importance. For this assessment it is assumed that impacts on this site can be avoided or mitigated. However they are localized factor that needs to be considered as an effect with this option. • Will increase discharges to the coastal outfall site, and increase instances of partially treated discharges to the coast, affecting and potentially compounding community perceptions of the options impact on social and community values (i.e recreation use, access, and amenity) Having regard to the options short to medium term effects, this option **does not** result in a modest, moderate or significant short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. At best it results in **minimal** – **modest short to medium improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the **WWN**. Long term the option results in a moderate to significant improvement for the WWN, but achieves no improvement in the discharge from the WWTP.

Option	Option Description	Assessment (1-5)	Reasons
			The option potentially gives rise to moderate long term adverse effects on social and community values associated with the coastal environment, related to the presence of an outfall and WWTP partially treated discharges into a sensitive and valued coastal recreation edge environment. On this basis the option has an overall assessment as a **2**.
5.	Greater conveyance + Increased storage + Existing treatment + New shoreline outfall	**4**	Under both these options Network overflows are reduced to ≤ 2 per year to streams and harbour by 2060. Both options involve: • Progressive and targeted network storage and associated conveyance upgrades throughout the WWN • The same WWTP configuration and continued utilization of a new WWTP outfall. Staging allows for immediate short-, medium- and long-term location specific significant reductions in overflow volumes and frequency, providing opportunities for significant reductions in overflow impacts on local social and community values, associated with removal of warning signs and enhanced perceptions of improved access to enhanced harbour and coastal edges. **WWN Component:** Short and medium term 5-20yrs: Progressive upgrades in network storage and associated conveyance installation associated with both options 5 and 6 achieve a **moderate to significant sustained improvement in short to medium term** reductions of WWN overflows frequency and volumes into Te Awarua o Porirua Harbour. Both options provide a degree of network upgrade flexibility to target and stage network storage and related conveyance upgrades to achieve reductions in the worst performing existing overflow sites. Reduced frequency of WWN overflows has **moderate to high positive effects** on social and community values associated with improving harbour water quality and perceptions of being able to increasingly use harbour for activities such as contact recreation, swimming, fishing, and in places shell fish gathering etc. This will manifest through reduced use of warning signs, and enhanced community confidence in accessing coast that is perceived to be enhanced with effect of reduced overflows. Minor to moderate temporary effects on social and community values are associated with development and installation of some WWN storage options. Overall network upgrades are considered to have low and, in some cases, very low adverse effects. Localized effects are associated with amenity impacts of construction and operation of activities. This may include in some sites and places, site specific effects related to the localized temporary and or permanent displacement of some recreational and/or social and/or community activities/values.
6.	Twin storage + Existing treatment + New shoreline outfall	**4**	

Option	Option Description	Assessment (1-5)	Reasons
			<u>Long term 20-35yr+</u> **Long term both options provide perceived moderate to significant improvements** in WWN overflows, by reducing overflow frequencies and volumes, and reducing overflow effects on social and community values associated with Te Awarua o Porirua. This includes reduced amenity impact of overflows, reduction in warning sites, and improvement in community confidence in accessing the coast and water for recreation and social use. **WWTP Component:** <u>Short and medium term 5-20yrs:</u> Similar to Options 2 and 3, WWN storage upgrades constrain or throttle back peak WWN loadings to the WWTP. Existing planned and committed WWTP upgrades enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP at current high levels of treatment. Untreated overflow and/or bypass events are avoided (except in emergencies). **Short to medium term low – moderate adverse effects** are generated on the existing social and community values of the existing coastal environment associated with maintaining fully treated peak flow discharges from the existing WWTP to the coastal foreshore. New outfall location on shore line may or may not change community perceptions of new outfall location. It is assumed that some community perceptions will be of lower or improved effects on social and community values, associated with relocating the outfall south, and 'opening' the existing outfall area to improved access and opportunities for community and social activities. Any prospect of reduced impacts on Titahi Bay will be positively received. Countering these benefits, parts of the community may be concerned with the impact of the new outfall location on the round point site. <u>Long term 20-35yr+</u>**:** **Long term no improvement is provided to reducing existing effects of WWTP discharges on the coastal environment.** While a new shoreline outfall site is developed, this still results in waste water discharges to the coastal environment. Net discharge volumes of waste water to the coast also increased with optimization of WWTP processing capacity. Social and community perceptions of discharge effects on social and community values of the coastal environment remain neutral, with perception that new shoreline discharge results in modest to moderate impact on improving discharge effects on social and community values associated with the use of Titahi bay. Any perceived positive benefits may be tempered by the new outfall location potentially impacting heritage values at round point. However high level waste wqter treatment and avoidance of overflows/bypasses and limited use of warning signs, does not deteriorate existing use and enjoyment of environment.

Option	Option Description	Assessment (1-5)	Reasons
			Summary assessment: Both options contribute toward immediate short, medium- and long-term reduction in WWN overflow frequency and volumes to Te Awarua o Porirua. Both options result in treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal environment. In the **short, medium and long** term both options: • Reduce the current frequency and volume of overflow/bypass events into Te Awarua o Porirua • Reduce social and community effects of WWN overflows on Te Awarua o Porirua Harbour. • Reduce warning signs improve community confidence in accessing and using coast and stream edge environments, including for shell fish harvesting. • Result in a moderate to significant improvement in remedying existing degraded sensitive harbour and stream edges and recreation areas. The community receives an immediate benefit of any localized WWN storage and related conveyance upgrades significantly reducing localized overflow events and perceived restriction son using these environments. • Do not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Improves overall community perceptions of the option positively impacting social and community values, including by relocating outfall further south of Titahi bay. This provides greater confidence for access to coastal areas and edges, and use of water for recreational activities, including improvement in local amenity values • A risk exists with option that outfall location and construction impacts on round point heritage site viewed as a detrimental impact on heritage values. For this assessment it is assumed that this can be avoided or appropriately mitigated. These options result in a **moderate to significant short, medium- and long-term improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. Assuming any outfall construction on round point can be avoided or appropriately mitigated, options result in **low to moderate adverse effects** associated with the continued operation and discharge of treated WWTP discharges to the coastal environment. On this basis both options have an overall assessment of **4**
7.	Greater conveyance + Existing treatment + New offshore outfall	**3**	Under this option network overflows are reduced to potentially ≤ 2 per year to streams and harbour by 2060. Network conveyance upgrades are progressively implemented and are likely to be staged over a 35-year period to achieve target overflow reductions by near the end of the consent period.

Option	Option Description	Assessment (1-5)	Reasons
			The WWTP outfall is redeveloped and placed to an new offshore location. This option will result in greater peak event conveyance to the WWTP and with expansion to WWTP peak flow partial treatment capacity it will result in a greater volume and frequency of partially treated waste water discharges to the coastal environment at a new offshore outfall site. **WWN Component:** Short and medium term 5-20yrs: The same as option 1, full conveyance installation is required to achieve a sustained reduction in existing overflow frequencies and volumes into Porirua Harbour. Network conveyance upgrades progressively occur over a 35year period, but conveyance upgrades are staged and are only partially able to achieve some reductions in overflow frequency and volumes into Te Awarua o Porirua Harbour in the short to medium term. At best, **minimal to modest improvements** are achieved in overflow frequencies into Porirua Harbour for the **short and medium term** until a full WWN conveyance upgrade is completed. The absence of a short to medium term fully upgraded WWN conveyance option to the WWTP results in moderate to high effects on social and community values associated with sustained overflows and their effect on the use of harbour (i.e impacting contact recreation, community perceptions and confidence in using the harbour, streams and coastal edges, shell fish gathering etc), and perceptions of harbour water quality. Minor and temporary effects on social and community values (i.e local amenity impacts such as noise effects, traffic disruption etc) are associated with progressive conveyance upgrades. Long term 20-35yr+**:** The same as option 1, **long term this option results in perceived moderate to significant improvements** in WWN overflows, by reducing overflow frequencies and volumes associated with completed installation of all WWN conveyance upgrades. Long term this option results in a reduction of overflow effects on social and community values associated with Te Awarua o Porirua. Community perceptions of the harbour and water quality will improve where warnings and beach closures are reduced, increasing community confidence in using and accessing the harbour, stream and coastal edges for social and recreational use.

Option	Option Description	Assessment (1-5)	Reasons
			WWTP Component: Short and medium term 5-20yrs: A new offshore outfall eventually removes all treated waste water discharges from existing shoreline discharge site. Timing of the outfall installation could potentially result in significant short term positive impact by relocating waste water discharge away from shore line. Delays in relocating shore line discharge offshore, to the medium or long term, would result in greater short- and medium-term impact of existing shoreline outfall on social and community values associated with coastal environment. However these effects would be no worse than those assessed for options 1 and 4. For this assessment it is assumed that WWTP processing upgrades would be constructed to precede any upgrade in WWN conveyance upgrade. **Short to medium term moderate – significant improvements potentially** generated on existing social and community values of coastal environment by WWTP full or partial treatment of all waste water discharges and construction of offshore outfall, and enhanced dilution and dispersal of discharges. Construction of new offshore outfall results in temporary effects on social and community values, associated with recreation activity displacement and construction impacts on amenity values. This may impact, temporarily, some recreation activities. Delayed outfall construction results in both options having a similar short to medium effect on social and community values as options 1 and 4. Long term 20-35yr+**:** **Long term significant improvement in existing effects on social and community values associated with new offshore outfall location** removing discharges from shoreline environment and reducing effects on Titahi Bay. Offshore dilution is assumed to not impact existing recreation fishing use of the off shore coastal discharge location, although discharge warnings may be provided. Offshore outfall location may have some effect on social and community perceptions of WWTP outfall impacts on coastal recreational values and use (i.e recreation fishing)associated with increased frequency and volume of partially treated discharges to new offshore outfall. This may potentially result social and community perception that WWTP discharge and impacts on social and community values associated with the offshore outfall site are not optimised. Offshore outfall location may, with increased peak partially treated discharges, affect social and community perceptions of WWTP outfall impacts on coastal recreational values and use (i.e recreation fishing). Construction of new outfall results in temporary effects on social and community values, associated with recreation activity displacement and construction impacts on amenity values.

Option	Option Description	Assessment (1-5)	Reasons
			<u>**Summary assessment:**</u> Overall this option, once fully implemented, will reduce WWN overflow frequencies and overflow volumes to Te Awarua o Porirua. This will not be achieved until the full WWN conveyance network is upgraded. This option will result in a greater volume and frequency of partially treated waste water discharges to a new offshore coastal outfall. The option is reliant on all network conveyance upgrades across the PWWN being completed to both reduce existing short, medium- and long-term network waste water overflow frequencies and volumes, **and** to prevent any increase in network overflow volumes and frequency that may arise in the short, medium and long term because of growth generated increases in network waste water volumes. Subject to the timing, staging and sequencing of PWWN capacity and WWTP processing upgrades and outfall construction, a risk also exists with this option that conveyance upgrades ahead of WWTP processing upgrades could result in a temporary short and/or medium-term deterioration of WWTP discharges. For this assessment it is assumed WWTP upgrades will precede any WWN upgrades. This risk is therefore not factored into this assessment of effects on social and community values. It is assumed that outfall relocation may occur in the longer term. In the short to medium term the option: • Struggles to maintain and/or reduce the current frequency and volume of overflow events into Te Awarua O Porirua • Struggles to maintain and reduce social and community effects on Te Awarua o Porirua Harbour. • Is unlikely to reduce warning signs and/or improve access to shell fish harvesting. • Will continue to have at least moderate amenity impacts along sensitive harbour and stream edges and recreation areas. The community will not observe the full benefits of this option until it is fully installed • Will increase discharges to the coastal outfall site in the short term, and to the offshore outfall in the long term. This may increase instances of partially treated discharges to the coast in the short to medium term, affecting and potentially compounding community perceptions of the options impact on social and community values (i.e recreation use, access, and amenity). Having regard to the options short to medium term effects, this option **does not** result in a moderate or significant short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. At best it results in **minimal** – **modest short to medium improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the **WWN**. Long term it results in a moderate to significant improvement for the WWN.

Option	Option Description	Assessment (1-5)	Reasons
			The construction of an offshore outfall is considered improve community perceptions of discharges from the WWTP, by relocating these away from the sensitive shoreline environment. This result sin a moderate to significant improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP, not withstanding any increase in waste water peak flow discharges and partial treatment. Social and community perceptions of coastal environment and related social and community values associated with environment improve with offshore outfall location. Community and social values still affected by continued waste water discharges to coastal environment. On this basis the option has an overall assessment as a **3**, on the basis of its constrained short to medium benefits, but recognising that long term the option will result in a more favored offshore outfall that enhances community and social values associated with access to and use of the existing coastal foreshore.
8.	Greater conveyance + Increased storage + Existing treatment + New offshore outfall	**5**	Both options involve: • Progressive and targeted network storage and associated conveyance upgrades throughout the WWN • The same WWTP configuration and utilization of a new offshore outfall Staging allows for immediate short-, medium- and long-term location specific significant reductions in overflow volumes and frequency, providing opportunities for significant reductions in overflow impacts on local social and community values, associated with removal of warning signs and enhanced perceptions of improved access to enhanced harbour and coastal edges. **WWN Component:** <u>Short and medium term 5-20yrs:</u> Similar to options 5 and 6, progressive upgrades in network storage and associated conveyance installation associated with both options 8 and 9 achieve a **moderate to significant sustained improvement in short to medium term** reductions of WWN overflows frequency and volumes into Te Awarua o Porirua Harbour. Both options provide a degree of network upgrade flexibility to target and stage network storage and related conveyance upgrades to achieve reductions in the worst performing existing overflow sites. Reduced frequency of WWN overflows has **moderate to high positive effects** on social and community values associated with improving harbour water quality and perceptions of being able to increasingly use harbour for activities such as contact recreation, swimming, fishing, and in places shell fish gathering etc. This will manifest through reduced use of warning signs, and enhanced community confidence in accessing coast that is perceived to be enhanced with effect of reduced overflows. Minor to moderate temporary effects on social and community values are associated with development and installation of some WWN storage options.
9.	Twin storage + Existing treatment + New offshore outfall	**5**	

Option	Option Description	Assessment (1-5)	Reasons
			Localized effects are associated with amenity impacts of construction and operation of activities. This may include in some sites and places, site specific effects related to the localized temporary and or permanent displacement of some recreational and/or social and/or community activities/values. Long term 20-35yr+: **Long term both options provide perceived moderate to significant improvements** in WWN overflows, by reducing overflow frequencies and volumes, and reducing overflow effects on social and community values associated with Te Awarua o Porirua. This includes reduced amenity impact of overflows, reduction in warning sites, and improvement in community confidence in accessing the coast and water for recreation and social use. **WWTP Component:** Short and medium term 5-20yrs: A new offshore outfall eventually removes all treated waste water discharges from existing shoreline discharge site. Timing of the outfall installation could potentially result in significant short term positive impact by relocating waste water discharge away from shore line. Delays in relocating shore line discharge offshore, to the medium or long term, would result in greater short- and medium-term impact of existing shoreline outfall on social and community values associated with coastal environment. However these effects would be no worse than those assessed for options 2, 3, 5 and 6. WWN storage upgrades constrain or throttle back peak WWN loadings to the WWTP. Existing planned and committed WWTP upgrades enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP. **Short to medium term moderate – significant improvements potentially** generated on existing social and community values of coastal environment by WWTP full treatment of all waste water discharges and construction of offshore outfall. Construction of new outfall results in temporary effects on social and community values, associated with recreation activity displacement and construction impacts on amenity values. Delayed outfall construction results in both options having a similar short to medium effect on social and community values as options 2, 3, 5 and 6. Long term 20-35yr+: **Long term significant improvement in existing effects on social and community values associated with new outfall location** removing discharges from shoreline environment and reducing effects on Titahi Bay.

Option	Option Description	Assessment (1-5)	Reasons
			Offshore dilution is assumed to not impact existing recreation fishing use of the off shore coastal discharge location, although discharge warnings may be provided. Offshore outfall location may have some effect on social and community perceptions of WWTP outfall impacts on coastal recreational values and use (i.e recreation fishing). **<u>Summary assessment:</u>** Both options contribute toward immediate short, medium- and long-term reduction in WWN overflow frequency and volumes to Te Awarua o Porirua. Both options result in treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal offshore environment. In the **short, medium and long** term both options: • Reduce the current frequency and volume of overflow/bypass events into Te Awarua o Porirua • Reduce social and community effects of WWN overflows on Te Awarua o Porirua Harbour. • Reduce warning signs improve community confidence in accessing and using coast and stream edge environments, including for shell fish harvesting. • Result in a moderate to significant improvement in remedying existing degraded sensitive harbour and stream edges and recreation areas. The community receives an immediate benefit of any localized WWN storage and related conveyance upgrades significantly reducing localized overflow events and perceived restrictions on using these environments. • Do not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Improves overall community perceptions of the option positively impacting social and community values, by relocating outfall offshore, opening up use of coastal foreshore environment. This provides greater confidence for access to coastal areas and edges, and use of water for recreational activities, including improvement in local amenity values These options result in a **moderate to significant short, medium- and long-term improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** WWTP. Assuming any outfall construction effects can be appropriately mitigated, options result in **moderate to significant improvement** in effects associated with treated WWTP discharges to the coastal environment. On this basis both options have an overall assessment of **5**

Appendix 6 – Technology

Memo

To:	Richard Peterson Stantec	From:	Ron Haverland (Connect Water)
File:	Porirua WWTP Collaborative Assessment	Date:	June 7, 2019

Porirua Wastewater Network & WWTP – Preliminary Scoring of Technology Criteria

1. INTRODUCTION

This memo presents a comparative qualitative assessment of the technology aspects of the Porirua wastewater network and WWTP shortlisted options. The shortlist includes three network options for the management of wet weather overflows, and three WWTP discharge options. Combining the three network and three discharge options results in the nine permutations shown in Table 1. For the Storage & Conveyance and Twin Storage options, there are sub-options which define the location of the storage and where the greater conveyance occurs. These sub-options are further defined in the notes 2 and 3 in Table 1.

Table 1: Shortlisted network and WWTP discharge options 1 to 9 (Stantec, March 2018)

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Table 1 notes:

1. All network shortlist options probably will be designed to accommodate a flow event with a 6 month average return interval (the return interval is to be confirmed)
2. This option includes two sub-options: sub-option (a) greater conveyance in the north + storage in the City Centre; sub-option (b) storage in the north and greater conveyance in the City Centre
3. This option includes two sub-options: sub-option (a) storage in the north + storage in the City Centre; sub-option (b) storage in Wellington and storage in the north or Porirua
4. All WWTP shortlist options involve secondary treatment and UV disinfection up to 1,500 l/s, plus partial treatment of flows above this level. The nature of the partial treatment for flows above 1,500 l/s is yet to be determined
5. Under these options the existing shoreline outfall will need to be duplicated to convey anticipated flows from the WWTP

This assessment, together will similar memos prepared for the other criteria, will form the basis for further discussion at the Multi-criteria Analysis (MCA) Workshop by the wider Collaborative Group.

1.1 AUTHORS CREDENTIALS

This assessment has been prepared by Ron Haverland (Connect Water) and reviewed by Steve Hutchison (Wellington Water). Ron has a Bachelor of Civil Engineering (Hons) from Canterbury University and has worked for Beca Consultants Ltd (Connect Water partner) for over 20 years and has nearly 30 experience in the consulting industry. He is a Senior Associate – Wastewater Specialist with Beca and has extensive experience in the investigation, planning and options assessment of wastewater projects in New Zealand.

Steve has a Bachelor of Technology (Hons) from Massey University and is a Chartered Professional Engineer. He has worked in the consulting industry for most of his career and has extensive experience as a wastewater specialist working in this field for over 20 years. He is currently Chief Advisor Wastewater for Wellington Water.

1.2 TECHNICAL INFORMATION USED IN ASSESSMENT

The following technical information and cost data has been used in this assessment;

- Porirua WWTP – Process Model, Connect Water, April 2019
- Porirua Wastewater Catchment Alternatives Optimisation Phase 1, WCS Engineering, April 2019
- Porirua WWTP Storm Flow Treatment to 3000 L/s, Feasibility Design Report, Connect Water, December 2018
- Porirua Outfall Options Review Update and Preliminary Cost Estimates, April 2019
- PCC Wastewater Network Improvement Plan, PS20 - Attenuation Feasibility Study, GHD, July 2018
- PCC Wastewater Network Improvement Plan, 5137408-REP-003: PS20, New PS Feasibility Report GHD, February 2019
- PCC Wastewater Network Improvement Plan, 5137408-REP-005: PS34 - Tangare Drive, PS Upgrade Feasibility Report, September 2018

1.3 LIMITATIONS OF ASSESSMENT

The options presented are concept designs and are based on desk top studies with limited site-specific information and therefore the assessment of the technology criteria is high level. Detailed site investigations, planning and feasibility assessments are required to further refine the options.

Following the WCS analysis, for the option of Storage + Conveyance (sub-option (a); (greater conveyance in the north + storage in City Centre) was discarded because storage in the North is the optimum solution for all options involving storage.

1.4 APPROACH TO ASSESSMENT

Technology criteria have been scored for each option against the criteria set out in Table 2. Factors to be considered are that the technology proposed is an enduring, long term solution, able to be staged and provide flexibility, reliable, proven and robust, able to be constructed, and an integrated scheme approach. In addition to these criteria agreed at the Short List Criteria Workshop, 'simple technology' and 'staging' of the solution (related to flexibility) have been added. An overall score for each network and WWTP discharge option has been assigned for all the sub-criteria under the technology scoring, rather than scoring the sub-criteria individually.

Table 2: Technology scoring categories

Criteria	Description	One	Two	Three	Four	Five
Technology	Enduring, reliable, and providing flexibility for future technology changes and capacity upgrades.	Technology is very complex, proven to not be enduring & to be unreliable, and does not provide any staging / flexibility.	Technology is complex, proven to be enduring or reliable, but not both. The technology also provides only limited staging / flexibility.	Technology is complex, proven to be enduring & reliable, but provides limited staging / flexibility.	Technology is routine, proven to be enduring & reliable, and provides partial staging / flexibility.	Technology is simple, proven to be enduring & reliable, and provides total staging / flexibility.

1.5 NETWORK GREATER CONVEYANCE

Conveyance and pump stations are well proven and long term solutions that are reliable. They have the capacity for future upgrades by the provision of additional or larger pumps and duplicating pipelines. For the Greater Conveyance option however, all the storm flows for anything up to a 6 month recurrence interval are conveyed to the treatment plant which requires a number of new medium sized pump stations and the two main terminal pumps stations to have significant increases in capacity with the following upgrades:

City Centre Pump Station (PS 20) would require an additional pump station to deliver a total flow of 2,380 L/s, an additional 1,600 L/s. This would require 365 kW pumps with the electrical infrastructure being upgraded to deliver 2.5MW-3MW. The wet well would require an excavation depth of approximately 9m with a secant piled caisson. The PS 20 rising main would be 1000 mm diameter with a route through the CBD which would cross numerous existing services and in places be installed at depths up to 4m below ground. As well as risks associated with shoring of excavations, the full extent of the proposed alignment is within an area of high groundwater. Mitigation for these hazards should be within the skillset of a competent contractor, however the project would still be technically challenging.

Tangare Drive Pump Station (PS34) would require a flow of 2,600 L/s which would be upgraded with new pumps and suction pipework. Feasibility work on this pump station concluded that delivering a flow of 2,400 L/s is technically feasible, however flows in excess of this would need to consider other options such as a new pump station at the site, or conversion of the dry-well to wet-well, or a supplementary wet well. It would require the rising main to be duplicated with a 750mm diameter pipe.

The design and construction of both these pump stations is technically challenging due to the large flow rates, and large capacity pumps, complexity with the PS 20 rising main, and complexity converting PS 34 to large capacity pumps. They are however likely to be enduring and reliable. There is partial flexibility to increase the capacity of PS 20 however limited flexibility to increase the capacity of PS 34.

1.6 NETWORK STORAGE & CONVEYANCE AND TWIN STORAGE

1.6.1 Pump Stations

For Storage & Conveyance and Twin Storage a number of pump station upgrades and new pump stations are required mostly with small and medium sized pump stations and one large pump station upgrade at Paremata Crescent (670 L/s). Pump stations have some flexibility for future capacity upgrades with the installation of additional or larger pumps. WCS assumes that a new pump station is required when the required capacity is 1.4 times the capacity of the existing pump station.

1.6.2 Network Storage

Large scale storage options for wastewater overflows are proven and there are a number of examples in use in NZ including the 10 ML Silverstream Excess Flow Tank in Upper Hutt, and the 6.5 ML Silverfield tank on the North Shore. There are medium and small examples in Wellington, namely 2.5ML Wainuiomata and 0.8ML in Michael Fowler Centre car park. The filling and emptying of the storage tank can either be achieved through gravity or using pumps. From the WCS Optimisation work the critical storage location is City Centre where for Twin Storage sub-option (a) up to 16 ML is required and Twin Storage sub-option (b) up to 12 ML.

Storage & Conveyance reduces the City Centre Storage volume significantly however requires PS 20 (total 1080 L/s) and PS 34 (total 1320 L/s) upgrades. City Centre storage at volumes less than 5.2 ML can be achieved with gravity fill and gravity empty based on water levels within the existing network. This greatly simplifies the operation with no pumps or active controls being needed.

Modular storage would have challenges depending on the site limitations but could be achieved provided it is planned for at the outset.

1.7 WWTP UPGRADES

For all options, the WWTP will be upgraded to an ultimate capacity of 1,500 L/s with the UV disinfection plant being progressed in the in the 2019/20 year. The aeration feedpipe will also be upgraded in the near future to increase the plant treatment capacity to 1,500 L/s to prevent existing wet weather biological treatment bypasses.

Activated sludge processes are well proven in New Zealand and overseas and produce a high quality effluent. The Porirua WWTP generally provides less than 20 mg/L suspended solids and BOD and is configured for nitrogen reduction, currently performing to less than 8 mg/L total nitrogen.

Some process upgrades are required to the WWTP for the 35-year period of the resource consent up to 2057, particularly for aeration supply and sludge treatment. Process modeling of the plant using GPS-X software was carried out for the current contributing population of 84,000 and the projected 2057 population of 128,000. This demonstrates that the plant has the physical tank capacity for the projected population and as loads increase the Solids Retention Time will decrease. This means the final effluent concentration for the total suspended solids, BOD ammonia and total nitrogen is predicated to increase slightly while plant loads increase over this time, however effluent quality is expected to remain within current consent parameters.

1.8 WWTP STORM FLOW PROCESS

Where peak flows delivered to the WWTP exceed its capacity of 1,500 L/s, the excess flow would receive treatment in a storm flow treatment process located at the north end of the WWTP. Storm flow treatment uses the basic building blocks of screening, UV disinfection and potentially primary treatment which are well proven technologies. Treatment for storm overflows is currently is used at Hatea in Whangarei and in Picton. One technology related consideration with this option is the quality of the storm flow and particularly the effluent transmissivity. Solids in the effluent decrease the UV light transmittance and make UV disinfection less effective. Sampling during storm events has shown that the storm flows transmissivity at Porirua is low and would require primary treatment in addition to fine screening. This increases the complexity and operational costs associated with treatment of storm flows however this has been allowed for in the cost estimates.

1.9 DISCHARGE OPTIONS

Ocean outfalls are widely used with many cities in New Zealand discharging to shoreline or ocean outfalls. Outfall length will vary depending on the wastewater quality and the sensitivity of the receiving environment. Outfalls in NZ typically range from 500 to 3000 meters long. A multiport diffuser improves mixing and dilutions of 1:100 are typical immediately above ocean outfalls. Conceptual designs for the three discharge options were prepared as follows;

1.9.1 Existing shoreline outfall

The existing shoreline outfall is suitable for flows up to 1500 L/s. Increasing the capacity to 2,900 L/s for Greater Conveyance options would require the outfall to be duplicated from the outlet tunnel portal to the discharge location. This would involve breaking into the portal chamber, careful excavation in a rocky foreshore and construction of a temporary working platform at the discharge location. The work is technologically feasible but somewhat complex in the exposed environment and in close proximity to the live outfall.

1.9.2 New shoreline outfall

A new shoreline outfall at Round Point requires the construction of a new outfall pipeline from the WWTP to the rocky shoreline. This coastal area is steep and there is limited opportunity to provide pipeline access to the foreshore and there are technical challenges with the pipeline construction in this difficult terrain. The drop in elevation from the treatment plant at around 30m to sea level requires either a drop structure or energy dissipating valves to reduce this energy. A drop structure requires the excavation of a vertical shaft in rock for the 30m drop. Energy dissipating valves require significant design considerations and careful valve selection, with power to the site and the valves in an enclosed compound in the bay at Round Point. Both these options have significant technology and construction challenges.

1.9.3 New ocean outfall

A new ocean outfall would be constructed with a length of approximately 700m with a diffuser at a depth of 15m. The inlet to the pipeline will require a new de-aeration structure with an excavation to 7m below ground and into rock. The inshore section of the pipeline will require excavation into the outer extent of the rock shelf where it can emerge in the sediment sea bed. This work is very complex and significant investigations and design inputs are required. Construction is technically challenging with managing health and safety, sea conditions and pipe welding. Similar projects have been carried out for Christchurch, Dunedin and Whangaparaoa treatment plant discharges. Outfalls have limited flexibility to increase the capacity however are typically designed with allowance for long term growth for 100 years.

1.10 COMPARATIVE ASSESSMENT OF OPTIONS

Scores have been assigned to the network options and discharge options separately as the technology for each of the scheme components could score quite differently. The two scores have then been combined to form an overall (average) score for the options 1 to 9.

The comparative assessment of the technology criteria of the 3 network options is shown in Table 3.

Table 3: Scoring for network options

	Score	Reason
Greater conveyance	3	Complex and technically challenging pump stations Likely to be enduring and reliable Partial flexibility to increase the capacity of PS 20 Limited flexibility to increase the capacity of PS 34 Medium sized pump stations are routine, proven, enduring, reliable and partial flexibility Entire network system can be partially staged
Storage & Conveyance	4	Requires large pump station upgrades; PS 20 (total 1080 L/s), PS 34 (total 1320 L/s), Paremata Cr (530 L/s) Requires multiple medium sized pump station upgrades Requires smaller storage tanks; City Centre 5.2 ML, North Wellington 5.2 ML, North Plimmerton 3.5 ML, Whitby 0.4 ML Medium to large sized pump stations and storage tanks are routine, proven, enduring, reliable and partial flexibility Entire network system can be partially staged
Twin Storage	4	Requires multiple medium sized pump station upgrades plus Paremata Cr (530 L/s) Requires large storage at City Centre up to 20 ML, or 12 ML plus North Wellington 5ML

		Requires smaller storage tanks North Plimmerton 3.5 ML, Whitby 0.4 ML Medium to large sized pump stations and storage tanks are routine, proven, enduring, reliable and partial flexibility Entire network system can be partially staged

The comparative assessment of the technology criteria of the 3 discharge options is shown in Table 4.

Table 4: Scoring for discharge options

	Score	Reason
Existing shoreline outfall	5 4	No modifications required for 1500 L/s options Simple, proven, enduring, reliable Conveyance options would require the outfall to be duplicated Routine, proven, enduring, reliable
New shoreline outfall	3	Complex technology challenges Technical difficulties/access with the pipeline construction in difficult terrain Drop structure and energy dissipating valves require significant design considerations, but are proven
New ocean outfall	3	Complex but proven and significant investigations and design inputs are required Construction is technically challenging Ocean outfalls are enduring and reliable

Table 5 presents the combined technology scores for the options 1 to 9. The scorings have been calculated by taking an average of the network score and the conveyance score, with no weightings applied.

Table 5: Scoring Summary

	Greater Conveyenance	Conveyenance + Storage	Twin Storage
Existing shoreline outfall	1. 3.5	2. 4.5	3. 4.5
New shoreline outfall	4. 3	5. 3.5	6. 3.5
New Ocean outfall	7. 3	8. 3.5	9. 3.5

Appendix 7 – Resilience

Wellington Water

Stantec

CONNECT WATER

GHD

Memo

To:	Richard Peterson Stantec	From:	Ron Haverland (Connect Water)
File:	Porirua WWTP Collaborative Assessment	Date:	June 7, 2019

Reference: Porirua Wastewater Network & WWTP – Preliminary Scoring of Resilience Criteria

1. INTRODUCTION

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		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
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WWTP Shortlist[4]	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
WWTP Shortlist[4]	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Table 1 notes:

1. All network shortlist options probably will be designed to accommodate a flow event with a 6 month average return interval (the return interval is to be confirmed)
2. This option includes two sub-options: sub-option (a) greater conveyance in the north + storage in the City Centre; sub-option (b) storage in the north and greater conveyance in the City Centre
3. This option includes two sub-options: sub-option (a) storage in the north + storage in the City Centre; sub-option (b) storage in Wellington and storage in the north or Porirua
4. All WWTP shortlist options involve secondary treatment and UV disinfection up to 1,500 l/s, plus partial treatment of flows above this level. The nature of the partial treatment for flows above 1,500 l/s is yet to be determined
5. Under these options the existing shoreline outfall will need to be duplicated to convey anticipated flows from the WWTP

This assessment, together will similar memos prepared for the other criteria, will form the basis for further discussion at the Multi-criteria Analysis (MCA) Workshop by the wider Collaborative Group.

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1.3 LIMITATIONS OF ASSESSMENT

The options presented are concept designs and are based on desk top studies with limited site-specific information and therefore the assessment of the resilience criteria is high level. Detailed site investigations, planning and feasibility assessments are required to further refine the options.

Following the WCS analysis, for the option of Storage + Conveyance (sub-option (a); (greater conveyance in the north + storage in City Centre) was discarded because storage in the North is the optimum solution for all options involving storage.

2. APPROACH TO ASSESSMENT

Resilience criteria have been scored for each option against the criteria set out in Table 2. Factors to be considered are climate change, natural hazards and operational resilience.

Table 2 Resilience scoring categories

Criteria	Description	One	Two	Three	Four	Five
Resilience	Climate change, natural hazards and operation resilience	High risk in the known hazard-scape. Performance will be severely affected by climate change over 50 years.	Moderate to high risk in known hazard-scape. Performance will be moderately to severely affected by climate change over 50 years. No improvement in operational resilience.	Moderate risk in known hazard-scape. Performance will be moderately affected by climate change over 50 years. No improvement in operational resilience.	Low to moderate risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Some improvement in operational resilience as a result of redundancy	Low risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Improves operational resilience as a result of redundancy

2.1 NETWORK CONVEYANCE

Conveyance upgrades in the network require a significant duplication of gravity mains and rising mains with new parallel pipes. All the network options require trunk main upgrades to provide additional capacity to allow for future population growth and to mitigate overflows to a 6 month Average Recurrence Interval (ARI). The sizing of trunk mains is contingent on the degree of conveyance and storage provided in the network.

A large amount of sewer pipework in the 1960's and 70's was constructed of asbestos cement which was best practice at the time however a lot of which is now in poor condition, brittle and likely to fail during a significant seismic event. Replacing and duplicating pipelines with modern materials such as HDPE which are ductile and perform well under seismic events provides resilience to the network. HDPE pipe installed in Christchurch remained undamaged following the 2010/11 earthquakes where settlement and lateral spreading caused deflections of up to 2 metres.

The City Centre Pump Station (PS 20) rising main to Tangare Drive Pump Station (PS34) extends over the Ohariu Fault and may be subject to surface rupture during a significant seismic event.

Duplicating trunk mains with a parallel pipe allows for operational resiliency as the new duplicate pipe can be used where the old one fails.

Ground shaking around the Porirua Harbour is High and liquefaction potential is High or Variable (refer attachment A & B) and settlement and lateral spreading is a risk during a significant seismic event. Pump stations constructed in these areas such as PS 20, PS 34, Paremata and Paremata Crescent are at risk and could render them inoperable. Specific geotechnical investigations and assessments for each pump station site would be required to determine the risks. All the conveyance solutions involve constructing a number of new pump stations and as they are replaced, they would be designed to mitigate the effects of settlement from liquefaction.

New pump station designs would also mitigate the risks of sea level/groundwater level rise as a result of climate change.

Where duplicate pump stations are constructed for Greater Conveyance i.e. City Centre, this would provide operational resilience through its redundancy.

Climate change effects on rainfall have been taken into account in the network model with Inflow & Infiltration (I/I) increased by 17 % to account asset deterioration and climate change.

2.2 NETWORK STORAGE

The WCS network modeling show that the optimum storage locations are at City Centre, North Wellington, North Plimmerton and Whitby. The City Centre location has a Variable risk of liquefaction during a significant event. For Twin Storage sub-option (a) up to 16 ML of storage is required and Twin Storage sub-option (b) up to 12 ML. Storage & Conveyance reduces the City Centre Storage volume significantly. For all tank sizes, ground improvements and the installation of stone columns or similar construction is likely to be required to mitigate this risk.

At City Centre there is a high risk of ground shaking due to the proximity to the Ohariu Fault and ground conditions. Structural design will need to account for the proximity to the fault.

Typically, storage options will result in an improvement in operational resilience as storage can be used during times of pump station outages.

2.3 DISCHARGE OPTIONS

All discharge options involve construction on the rocky shoreline and in the case of the ocean outfall the sediment seabed.

There are no known fault lines, liquefaction zones or seismic high ground shaking areas for the discharge options.

A new shoreline outfall at Round Point provides some operational resilience because of the redundancy that would be provided with the existing outfall retained as a back-up.

The existing outfall and new ocean outfall do not provide any benefit for operational resilience.

The outfall options are not impacted by sea level rise as the treatment plant has an elevation of 30m above sea level and there is a high hydraulic head. The existing outfall tunnel exists to the tunnel portal structure 6m above sea level and any rise in sea level would just increase the water level in the de-aeration structure that would be required for the ocean outfall.

3. COMPARATIVE ASSESSMENT OF OPTIONS

Scores have been assigned to the network options and discharge options separately as the resilience for each of the scheme components could score quite differently. The two scores have then been averaged to form an overall score for the options 1 to 9.

The comparative assessment of the resilience criteria of the 3 network options is shown in Table 3.

Table 3: Scoring for Network Options

	Score	Reason
Greater conveyance	4	Duplication of gravity mains and rising mains provides redundancy New trunk sewers with ductile materials have seismic resilience Duplicate pump station at City Centre provides operational resilience New pump stations would be designed for liquefaction and settlement New pump stations would be designed to mitigate sea level rise
Storage & Conveyance	4	Duplication of gravity mains and rising mains provides redundancy New trunk sewers with ductile materials have seismic resilience Duplicate pump station at City Centre provides operational resilience New pump stations would be designed for liquefaction and settlement New pump stations would be designed to mitigate rise of sea level Storage tanks would be designed for liquefaction and settlement
Twin Storage	4	As for Storage & Conveyance

The comparative assessment of the resilience criteria of the 3 discharge options is shown in Table 4.

Table 4: Scoring for Discharge Options

	Score	Reason
Existing shoreline outfall	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise
New shoreline outfall	5	No known fault lines, liquefaction zones or seismic high ground shaking areas Provides some operational resilience because of the redundancy Not impacted by sea level rise
New ocean outfall	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise

Table 5 presents the combined resilience scores for the options 1 to 9. The scorings have been calculated by taking an average of the network score and the conveyance score, with no weightings applied.

Table 5: Scoring Summary

	Greater Conveyenance	Conveyenance + Storage	Twin Storage
Existing shoreline outfall	1. 4	2. 4	3. 4
New shorelne outfall	4. 4.5	5. 4.5	6. 4.5
New Ocean outfall	7. 4	8. 4	9. 4

Appendix 8 – Natural Character and Landscape

Memo

To:	Richard Peterson Wellington	From:	Linda Kerkmeester (Boffa Miskell)
File:	Porirua WWTP Comparative Assessment of Network options – Landscape and Natural Character	Date:	June 11, 2019

Porirua Wastewater Network & WWTP – Preliminary scoring of Landscape, Visual Amenity and Natural Character effects for CMA Workshop

1. INTRODUCTION

This memo outlines a comparative qualitative assessment and scoring of the Porirua wastewater network and wastewater treatment plant short listed options against the following assessment criteria;

> Natural character and landscape – including effects on natural character of the coastal environment, landscape fabric, landscape character and visual amenity.

The short list includes 9 options which comprise three network and three discharge options in various combinations. These are summarized in Table 1.

Table 1: Shortlisted network and WWTP discharge options 1 to 9 (Stantec, March 2018).

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

1.1 AUTHORS CREDENTIALS

This assessment has been prepared by Linda Kerkmeester and reviewed by Boyden Evans (Boffa Miskell). Linda is a landscape architect and a Principal of Boffa Miskell with a Bachelor of Landscape Architecture (Hons) from RMIT Melbourne. She has over 25 years' experience and has worked for Boffa Miskell for the past 4 years. Linda has extensive experience in infrastructure planning for large scale projects in the Wellington region, assessing environmental effects with respect to landscape and visual matters. She is familiar with the district, having lived in the Porirua area for over 20 years and was involved in the Porirua Landscape Assessment study in 2018 to identify outstanding and significant amenity landscapes for Porirua City Council in 2018.

Boyden is a landscape architect and Partner in Boffa Miskell. He has a BSc in botany and pedology and a post graduate Diploma in Landscape Architecture. He has worked for Boffa Miskell for over 30 years and has widespread experience in landscape planning and assessment, particularly with respect to district-wide landscape resource and assessment studies and for large scale infrastructure projects, such as roads, wind farms and transmission lines. He carried out the 1992 district-wide Porirua Landscape Study for Porirua City Council and was also involved in the 2018 Porirua Landscape Study; he was part of the Boffa Miskell team that carried out the Assessment of the Natural Character of the Coastal Environment for the Council.

1.2 TECHNICAL INFORMATION USED IN ASSESSMENT

The following technical information and briefing material has been used in this assessment:

- Indicative plans of network - Figures 2 – 4 showing 3 broad scenarios prepared by Wellington Water and WCS Engineering (Porirua Phase 1 Optimisation, Solutions A-C, Conveyance and I/I reduction)
- Option information from briefing meeting for report authors 18th April 2018 at Stantec office, Wellington
- For details on Natural Character: *Porirua Coastal Study, Natural Character Evaluation of the Porirua City Coastal Environment*, Boffa Miskell (2018)
- Memo to Richard Peterson (Wellington Water) from Boffa Miskell ref: *Porirua Wastewater Consenting Programme. – Landscape assessment and Natural Character implications for 3 outfall options* (7 February 2019)
- Various discussions and emails with Ron Haverland and Richard Peterson, including site visit on 6 November 2018, to view coastal outfall options and photographs of potential project components from other projects

1.3 LIMITATIONS TO ASSESSMENT

The options presented are concept designs and are based on desk top studies with limited site-specific information and therefore the assessment of the landscape criteria is high level. Detailed site investigations, planning and feasibility assessments are required to further refine the options. This high-level assessment does not constitute an assessment of landscape, natural character and visual effects. This comparative assessment, together with similar memos prepared for other relevant criteria, will form the basis for further discussion at the Multi-criteria Analysis (MCA) workshop with the wider Collaborative Group.

2. APPROACH TO ASSESSMENT

This assessment is a high-level evaluation of 9 options, constituting 3 broad network options combined with 3 outfall options as outlined at **Table 1** above.

The broad criteria on which the scoring is based were first determined by assigning the criteria for landscape, visual and natural character effects. The various components of the network and outfall options were then considered against these criteria to determine the level of potential visual and physical change that these components would bring.

A 5-point scale (ranging from 1= high to 5= low effect) was used to assess each network and outfall option against the sub-criteria outlined in Table 1 (i.e. Landscape, Visual and Natural Character). The network and outfall options were considered separately from the network options at the outset. This was to allow specific recognition of the outfall components by giving them 50% of the weighting due to their location within the coastal environment and CMA with specific matters of national importance to be addressed. These are discussed further in the section on planning considerations. (NZCPS policies 13 and 15).

Having assessed each network and outfall option separately, the scores were then aggregated to arrive at a composite score where network and outfall scores were added and divided by 2 to provide the average score, giving both network and outfall scores equal weighting of 50%. Although relatively small in scale in the project context (compared to the more extensive range of the network options) it was considered that the outfall options needed to be assessed separately in the context of their potential Natural Character effects to be addressed under the NZCPS provisions.

A description of the scoring approach for each of the sub-criteria for landscape character, visual amenity and natural character as applied to the network components and outfall options is summarized in **Table 2**. Examples of the matters considered in applying the scores is provided in the section which follows.

For the purpose of this study, a score of 1 to 5 has been used to signify the level of effect with 1 being the highest effect possible and five being negligible effect. In the case of this assessment, there were no effects that were found to fall into these highest or lowest scores of 1 or 5 – with all falling somewhere between 1.5 up to 4.5. Refer **Tables 3** and **4:** Scoring of Landscape effects for Network Components and Discharge Options.

Table 2: Scoring approach for Porirua Wastewater Programme Short List Assessment:

Landscape, Visual and Natural Character effects

Criteria	Description	One	Two	Three	Four	Five
		Significant adverse effect	High adverse effect	Moderate adverse effect	Low adverse effect	Negligible adverse effect
Visual Amenity	Effects on landscape character, level of visibility and visual amenity	Level of visibility of new components which are out of character and scale with the receiving environment. Permanent effects that cannot be mitigated.	High level of visibility that affects visual amenity values of the area. E.g. Large scale structure above ground, single use, high number of viewers/recreational users, creates permanent change, appears incongruous to its surroundings.	Partial loss or modification of key landscape elements i.e. new components of moderate scale, inside a cabinet – structure does not appear incongruous or uncharacter-istic of the area.	Minor modification with small scale elements - mostly below ground. Can be integrated into existing environment or street infrastructure, characteristic of the area.	Little material change, not uncharacter-istic of the area and is able to be well integrated with the existing environment.
Landscape	Effects on landform and vegetation cover	High level of modification to landform, vegetation in the form of earthworks, vegetation removal. New structures are prominent and permanent.	Modification of several key landscape elements. Effects are prominent and permanent. Effects are difficult to mitigate through design or screening.	Partial loss or modification of landform, vegetation that may be obvious for some time until mitigation/ planting takes effect.	Minor modification to one or more landscape elements but not necessarily uncharacteristic of the area.	Minor adverse effect with small scale, negligible or no change to landform or vegetation.
Natural character	Including effects on waterbodies	Significant change to areas of High	Modification of several key elements or	Components within the coastal	Minor modification to one or	Little material change, not uncharacteristic

Criteria	Description	One	Two	Three	Four	Five
	(including water quality), natural character of the inland Coastal Environment, CMA and streams.	or Very High Natural character in the CMA. Any structures or disturbance within the CMA including both abiotic (water quality) and biotic(living) factors of waterbodies. Effects on sea floor include disturbance of benthic layers and affect sediment movement to benthic layers.	characteristics within the Coastal Environment. New structure in coastal (terrestrial) or riparian environment of significant scale.	environment (terrestrial) or stream margin of a moderate scale, type, and intensity but natural character values are maintained. Built elements are subservient to the dominant natural character values of the area.	more key character values but built elements are subservient to the dominant natural character values of the area.	and able to be fully reinstated on completion of works.

The landscape effects were grouped into three broad matters; visual amenity, landscape / biophysical, and natural character. These are described in the following sections.

2.1 VISUAL AMENITY EFFECTS

The level of visibility of an element (such as pump stations, storage tanks, pipework above ground) arises from the combination of several factors; the factors that potentially influence the level of effect are:

- The scale or size of components
- Whether elements are above or below ground (less visible)
- How compatible they are with the surrounding environment (e.g. a new structure above ground in an unmodified environment will potentially have greater adverse effect on visual and amenity values than upgrading of an existing structure in an already modified environment with low visual amenity)
- Construction effects of earthworks, e.g. for pipework below ground, although acknowledging that these effects are likely to be temporary but would require an easement which would limit any substantial vegetation over the pipework in the long term.

2.2 LANDSCAPE / BIOPHYSICAL EFFECTS

The level to which any components (pump stations, storage tanks, pipework) require the landform to be permanently modified - through earthworks, and/or vegetation removal (indigenous terrestrial or amenity planting) which will have a potentially adverse effect on landscape character.

The primary factors that influence this are:

- The extent of earthworks and the level to which the landform can be reinstated to blend in with the surrounding landform (including rock excavation at outfall sites)
- Removal of any existing vegetation characteristic of the area and the ability to reinstate planting.

2.3 NATURAL CHARACTER OF THE COASTAL ENVIRONMENT, RIVERS, LAKES AND STREAMS

The NZCPS (Policy 13) requires identification of areas of high natural character of the coastal environment by mapping or otherwise identifying at least areas of high natural character (NZCPS Policy 13, 1.c.) In addressing this policy, Boffa Miskell were part of the team that carried out the Assessment of the Natural Character of the

Coastal Environment for the Council in 2018[1]. This was part of a technical study which has yet to go through the public planning process. Appendix 1 includes a memo of the planning considerations relevant to the discharge options with a map (Fig. 1) showing the Natural Character Rating (High to Very High) for 'Proposed Outfall Alignment Location Plan'.

The map (Fig. 1) shows both the existing Rukutane Point and potential Round Point shoreline outfall sites are located within the defined inland extent of the Coastal Environment that has a "High" level of natural character. In addition, the new ocean outfall option extends s into an area of "Very High" natural character of the CMA. The location of any new structures in these environments will potentially have high visual and landscape effects. Water quality is also a matter to be considered, in this instance to avoid any significant adverse effects on natural character. It is noted that there are no parts of the network or outfall options that fall within any areas of outstanding natural character. It is considered that any change in water quality arising from the new outfall option is not likely to be significant given the level of dispersal along the proposed outfall pipeline as compared to the current discharge point which the outfall would replace. In all options the natural character effects of the WWTP discharge options are not likely to change the existing high natural character condition, except that the shoreline options will be more visible which does have a low adverse effect on visual amenity.

The Porirua Stream and coastal edge are considered water bodies under the Proposed Natural Resources Plan (PNRP) and as such have policies of relevance to the proposed outfall alignment options and any elements located within the defined inland extent of the Coastal Environment. This includes the area along the coast around the Porirua Harbour where several pump stations and structures relating to rising mains and other related structures are located.

The primary factors that influence the effects on Natural Character are:

- The location of structures in the Coastal Environment
- The degree of change or modification of the sea floor arising from the outfall in the Coastal Marine Environment (CMA)

In relation to the last item, the long outfall option extends into an area of very high natural character with key characteristics (i.e. largely unmodified seabed with sub-tidal and submerged rocky reefs and relative abundance of fish, paua and crayfish). The Porirua Natural Character of the Coastal Environment Study identifies this area as Coastal Marine Area D: Rocky Reef South with high experiential qualities that contribute to the high level of natural character (i.e. "a sense of wildness, remoteness and ruggedness"). While it rates 'very high' it does not rank as 'outstanding' in terms of Policy 13 1.a. The point to address here is whether the effects of the ocean outfall will affect the existing 'very high' and 'high' natural character. Given that the outfall will likely be elevated on weighted concrete plinths above the sea floor, the effect on natural processes (sediment flow and aquatic life), along with visual effects, will be confined to one limited stretch below the sea surface. It is therefore considered to have a moderate-low effect on the existing condition and at a broader scale the long outfall option does not change the existing high or very high natural character rating of this area.

In this coastal environment with high to very high natural character, any existing element that can be removed or reinstated close to its natural, unmodified state will have a potential beneficial effect. The map at Fig.1 shows the existing shoreline outfall at Rukutane Point as having a high natural character rating. There is potential for the existing coastal outfall condition to be enhanced as part of the option to duplicate this outfall. It may be removed entirely if the Round Point option is selected. It has been assumed however, that the existing outfall would likely be retained as back up even if the Korowhiwa Bay shoreline outfall were to proceed. Any enhancement would need to be balanced against the higher adverse effects of a new structure in a largely unmodified location at Korowhiwa Bay which would outweigh any net benefit derived from enhancements from removing the Rukutane Point outfall. This would then result in adverse effects for both shoreline options to the extent that it would affect the high natural character at Korowhiwa Bay to a moderate extent.

2.4 OTHER PLANNING CONSIDERATIONS

Section 6 (b) of the RMA protects outstanding natural features and landscape from inappropriate subdivision use and development. Natural features and landscape that do not meet the criteria of outstanding can be required to be maintained and 'enhanced' either as 'amenity values' or part of the wider environment at

[1] Boffa Miskell Ltd (2018). *Porirua Coastal Study Natural Character Evaluation of the Porirua City Coastal Environment*

Section 7 (c) or Section 7 (f) of the RMA. NZCPS Policy 15 relates to the identification and protection of Outstanding Natural Features and Outstanding Natural Landscapes.

In 2018, Boffa Miskell undertook the Porirua Landscape Evaluation study to identify Outstanding natural Features and Landscapes and Special Amenity Landscapes within Porirua City. The evaluation identifies and maps the landscapes as required by the Wellington RPS. Both this study and the Coastal Study Natural Character Evaluation have informed the Porirua City Draft District Plan, currently out for public consultation. While the draft District Plan does not include any maps of these areas, it does include draft policies in relation to areas of high and outstanding natural character and special amenity landscapes.

The map at Fig. 1 indicates that the two shoreline discharge options are located in an area currently classified as PCC Local Purpose Reserve (Environmental Purposes) under the Reserves Act 1977. The area is also covered by a PCC Landscape Protection Area with specific policies to control subdivision, use and development The guiding document for reserves is the Porirua City Reserves Management Plan (2016) which sets out general polices that apply to all reserves in Porirua. In relation to utilities within reserves, it requires that utility maintenance and operations protect reserve values, and that any necessary new utilities are sited carefully to avoid future problems for both reserve and utility management. The WWTP is classed as a "critical" utility and the policy notes that "New works related to critical city water supply and sewers are likely to be appropriate and may need to be secured by an easement".

Other policies of relevance include Section 3.3 Natural Heritage: Reserves adjacent to the coast and streams which may affect network options particularly with respect to those within the Porirua Stream corridor to protect riparian values and prevent shoreline and streambank erosion favoring 'soft' engineering options.

The area of Round Point is identified as a Heritage Site by the District Plan with archaeological values on the headland and Korowhiwa Bay which was used as a whaling station from 1837. Policies seek to minimise any adverse environmental effects of buildings and activities on the coastal margin.

2.5 ASSUMPTIONS

The following broad assumptions have been made with respect to those elements that have the potential to affect landscape, visual or natural character values.

- New pump stations less than 100 L/s will be located in a wet-well below ground, with access covers at street level in the footpath, or flush with the ground. Includes an above ground electrical cabinet nearby (2.0m x 0.8m x 1.7m high)
- New pump stations greater than 100 L/s will be above ground, housed in a small building (4m x 1m x 2.8m high)
- Where there are design options yet to be confirmed, the worst case scenario has been applied e.g. 16ML storage tank used rather than 11ML, or coastal outfall sitting close to seabed - (which may have some effect on coastal processes or benthic layer).
- Components will be located within road reserve (legal road); or where they may be located in a school or park (with greater amenity values), they would be scored with greater effects.
- Appropriate levels of mitigation will occur with respect to design and placement of components including screen planting and reshaping of earthworks to blend with surrounding levels
- In relation to item above, scale and number of above ground components will be minimized or co-located to avoid visual 'clutter'

The following table (Table 3) outlines the scoring of the various network components with potential for landscape effects. Each component is scored and then added up and divided by the number of scores to give an average for each network option. The components were given broadly equal weighting, with most components occurring in various combinations in all options but to various degrees (e.g. pump stations, storage tanks, upgrades to parallel mains). The exception was the large storage tank option at the city centre for the Twin Storage option which scored with a higher adverse effect than any other single component.

Table 3: Scoring of Network Components
Note: (5no.) 4 stands for no. of pump stations (5) with effects rating of 4 (low)

COMPONENT with potential Landscape Effects			OPTIONS			COMMENTARY
			Greater Conveyance (Options 1, 4, 7)	Conveyance + Storage (Options 2, 5, 8)	Twin Storage (Options 3, 6, 9)	
Pump Station	New Pump Stn (below ground)	-100 L/s	(11no.) 4	(10no.) 4	(10no.) 4	Pump stations in all options will be of a small scale and below ground – integrated into street infrastructure. Low effects for all options, similar numbers.
	New Pump Stn (above ground)	+100 L/s	(8no.) 3.5	(5no.) 4	(4no.) 4	Greater conveyance will require more new pump stations above ground and one large one at City centre so slightly higher effect than the other options. Low to mod-low effects.
	Upgrade Existing		(5no.) 4	(8no.) 4	(6no.) 3.5	Upgrading of p/s are generally small scale <100L/s in already modified, but mostly coastal locations. Similar number for all options except conveyance and storage which has more upgrades than new ones but low effects overall.
Storage Tank	Storage Tank (m^3)	(Nth Plim) 3520L	-	3.5	3.5	Potentially located in open space (school) area with visual amenity effects.
		(Whi) 360L	-	4	4	Relatively small scale integrated into existing street infrastructure so low effects.
		(Pare)4838L	-	3	3	The 2 storage options require a new pump station near the coast at Paremata – assume predominantly below ground with some visible components. High visual amenity area but potential to be integrated into carpark and boat launching area - moderate effects.
		(CC) 20ML	-	-	2.5	Large scale storage tank, partially above ground on edge of Porirua Stream – between SH1 and railway. High effects but potential for mitigation.
		(CC) 5198L	-	3.5	-	Conveyance & storage option requires two tanks in City Centre & Kenepuru – largely below ground with potential for multi-use as carparking.
		(Nth Wgtn) 5212L	-	3.5	-	As above – both with mod-low effects.

Tangere Drive Pump Station	Upgrade rising main, tunnel portal, pump station		4	4	-	Two options require upgrades but generally contained within existing pump station building or already modified locations with existing structures – low effects.
Treatment Plant Upgrade	New stormflow treatment process		4	4.5	4.5	Existing treatment plan at Rukutane Pt is upgraded in all option with greater conveyance up to 2,639 L/s and storage/conveyance 1,269 and 1,500l/s respectively. Low effects, as extending an existing structure in an already modified environment. Upgrade to treatment plant with UV panels and drop structure with low effects at the plant where extending an existing structure. Moderate effect of new drop structure where no above ground structures currently exist in a coastal environment with few structures present.
Parallel Main (temporary effects)	Parallel gravity main		4	4	4	Excavation for upgrade of gravity main will be similar for all options – moderate effect during construction, reducing to low on completion of works.
	Parallel pressure main		3	3	3	All options will require ground excavation works to install pressure mains in the coastal environment where already modified. Effects will be high during construction but assume can be integrated into street network on completion.
TOTAL AGGREGATE SCORE (Averaged)			(26.5 div 7 = 3.8) **4.0**	(45 div 12= 3.75) **4.0**	(36 div 10 = 3.6) **3.5**	

Table 4: Scoring of Landscape effects for Discharge Options

	Visual & Amenity	Landscape/ Biophysical	Natural Character	AGGREGATE SCORE	Comments
Existing shoreline discharge	**3**	**3**	**3**	**3**	Assessment based on increase in effect on existing structure – duplication of pipe at outfall for greater conveyance option. For 'conveyance & storage' and 'twin storage' options, duplication of shoreline strucutre is not require, only land based components (UV treatment to vortex drop structure) need upgrading. Given that all network options for existing shoreline structure are within an area already modified, the level of change to the existing environment is likely to have a moderate adverse effect – to a similar scale for all options, thus all have similar scores. Opportunity to enhance extg outfall as part of duplication and upgrade of land based components.
New shoreline discharge	**2**	**2**	**2**	**2**	New industrial character structure of moderate scale located in a largely unmodified, natural coastal environment in an area of high natural character. Will require rock excavation for new drop structure with potentially high adverse landscape and visual effects.
New ocean outfall	**3**	**2**	**2**	**2.5**	Ocean outfall from Rukutane Point to a depth of 15m will extend into area of High Natural Character at the shoreline and out to Very High Natural Character at a distance of 695m from the shoreline. Potential moderate effects on seafloor with placement of raised concrete block plinths to support the new outfall pipe – perforated along last 150m to disperse and dilute the effluent, resulting in low effect on water quality. Potential moderate adverse effects on coastal processes (sediment movement and aquatic life) during installation and until sediment settles and new aquatic life takes hold on plinths, reducing to moderate-low biophysical effect. Visual effect limited to seafloor with no visible components at the surface. Closer to surface at shoreline with some visual effects. Adverse effects will be balanced by the positive effect of replacing the existing shoreline outfall with an ocean outfall that is not visible from the shore or sea surface. This option has potential to reduce the adverse visual effects of the coastal environment by allowing the existing shoreline outfall to be returned to a more natural state.

Table 5: Composite Scoring of Network and Discharge options for Porirua WWTP: LANDSCAPE, VISUAL & NATURAL CHARACTER

		NETWORK OPTIONS			
		Greater Conveyance	Storage & Conveyance	Twin Storage	Comments
DISCHARGE OPTIONS	Existing shoreline discharge	1. 3.5	2. 3.5	3. 3	• Option with 16ML storage tank above ground has a mod-high effect due to large scale of structure at edge of Porirua Stream. • Earthworks excavation required for pipework will have a temporary adverse landscape and visual effect until reinstated to natural ground.
	New shoreline discharge	4. 2.5	5. 2	6. 1.5	• All network options will have a similar level of moderate effect on natural character where components are located around the harbor edge – within the defined inland extent of the Coastal Environment. • New shoreline structure at Korohiwa will have an adverse natural character effect in a relatively unmodified coastal environment with high landscape and visual amenity values.
	New ocean outfall	7. 3.5	8. 3	9. 2	• Encroachment into areas of High or Very High natural character in the Coastal Environment or CMA will be confined to a limited stretch below the sea surface. Encroachment into areas of High or Very High natural character in the Coastal Environment or CMA will be confined to a limited stretch below the sea surface. • At a broader scale the long outfall option has a moderate-low effect but does not change the existing high or very high natural character rating of this area.

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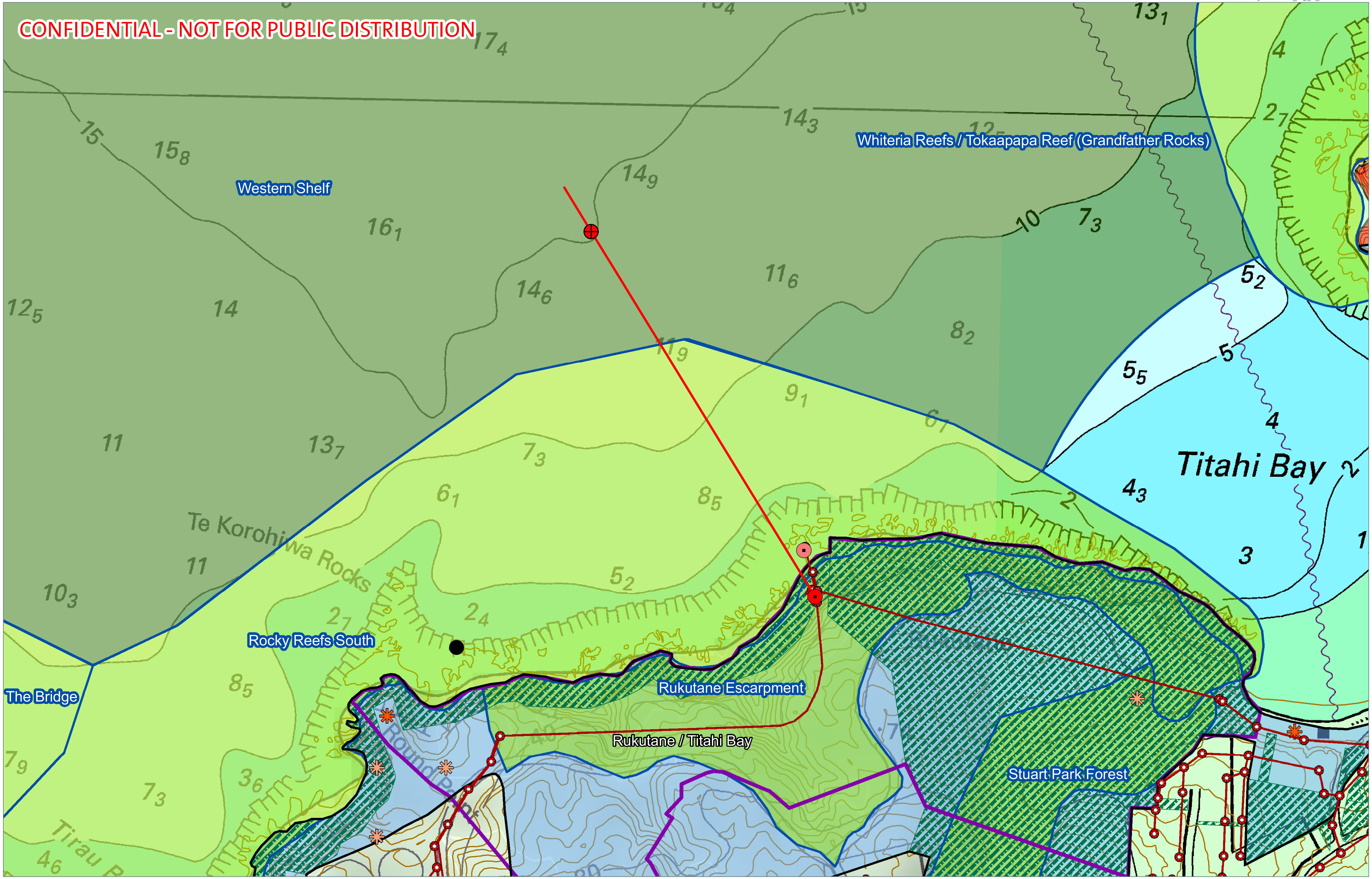

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Data Sources:

Projection: NZGD 2000 New Zealand Transverse Mercator

0 100 m
1:5,000 @ A3

DRAFT

Legend

- Ocean Outfall Diffuser
- Existing Ocean Outfall
- Option1 - Existing Outlet Portal
- Option2 - Round Point Discharge
- Pipeline_1
- Sewer node
- Sewer manhole
- Sewer main
- Archaeological Sites
- Plan Change 15 Heritage
- PCC Landscape Protection Area
- Natural Character Component
- PCC Reserves

Natural Character Component Rating

- High
- Very High
- Special Amenity Landscape
- 5m contours

PORIRUA WASTEWATER TREATMENT OPTIONS
Outfall Options
Location Plan showing Natural Character rating
Date: 11 June 2019 | Revision: 1
Plan prepared for Wellington Water by Boffa Miskell Limited
Project Manager: **linda.kerkmeester@boffamiskell.co.nz** | *Drawn:* EMc | *Checked:* LKe

Figure 1

Appendix 9 – Financial Cost

Memo

To:	Richard Peterson Stantec	From:	Ron Haverland (Connect Water)
File:	Porirua WWTP Collaborative Assessment	Date:	June 6, 2019

Reference: **Porirua Wastewater Network & WWTP – Preliminary Scoring of Costs**

1. INTRODUCTION

This memo presents a preliminary assessment of the costs for the Porirua wastewater network and WWTP shortlisted options. The shortlist includes three network options for the management of wet weather overflows, and three WWTP discharge options. Combining the three network and three discharge options results in the nine permutations shown in Table 1. For the Storage & Conveyance and Twin Storage options, there are sub-options which define the location of the storage and where the greater conveyance occurs. These sub-options are further defined in notes 2 and 3 in Table 1.

Table 1: Shortlisted Network and WWTP Discharge Options 1 to 9 (Stantec, March 2018).

		Network Shortlist[1]		
		Greater conveyance	Combination of storage and conveyance[2]	Twin storage[3]
WWTP Shortlist[4]	Discharge to the CMA from the existing shoreline outfall[5] + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
WWTP Shortlist[4]	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
WWTP Shortlist[4]	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Table 1 notes:

1. All network shortlist options probably will be designed to accommodate a flow event with a 6 month average return interval (the return interval is to be confirmed)
2. This option includes two sub-options: sub-option (a) greater conveyance in the north + storage in the City Centre; sub-option (b) storage in the north and greater conveyance in the City Centre
3. This option includes two sub-options: sub-option (a) storage in the north + storage in the City Centre; sub-option (b) storage in Wellington and storage in the north or Porirua
4. All WWTP shortlist options involve secondary treatment and UV disinfection up to 1,500 l/s, plus partial treatment of flows above this level. The nature of the partial treatment for flows above 1,500 l/s is yet to be determined
5. Under these options the existing shoreline outfall will need to be duplicated to convey anticipated flows from the WWTP

In accordance with the instructions to authors on comparative assessments (R Peterson email 1 April 2019), this assessment will not use the traffic light scoring approach as for the other criteria because the options will be scored on the basis of their actual cost. The costs will be entered into the MCA spreadsheet which will calculate a score based on a ratio of the option's cost to the cost of the most expensive option (which is given the score of 1). Sensitivity testing will be undertaken on this approach to converting the cost estimates to MCA scores.

1.1 AUTHORS CREDENTIALS

This assessment has been prepared by Ron Haverland (Connect Water) and reviewed by Steve Hutchison (Wellington Water). Ron has a Bachelor of Civil Engineering (Hons) from Canterbury University and has worked for Beca Ltd (Connect Water partner) for over 20 years and has nearly 30 experience in the consulting industry. He is a Senior Associate – Wastewater Specialist with Beca and has extensive experience in the investigation, planning and options assessment of wastewater projects in New Zealand.

Steve has a Bachelor of Technology (Hons) from Massey University and is a Chartered Professional Engineer. He has worked in the consulting industry for most of his career and has extensive experience as a wastewater specialist working in this field for over 20 years. He is currently Chief Advisor Wastewater for Wellington Water.

1.2 TECHNICAL INFORMATION USED IN ASSESSMENT

The following technical information and cost data has been used in this assessment;

- Porirua Wastewater Catchment Alternatives Optimisation Phase 1, WCS Engineering, April 2019
- Porirua WWTP Storm Flow Treatment to 3000 L/s, Feasibility Design Report, Connect Water, December 2018
- Porirua Outfall Options Review Update and Preliminary Cost Estimates, Stantec, April 2019
- Porirua Wastewater Catchment Future Populations, Application of Growth Data to Wastewater Models, Wellington Water, March 2019
- PCC Wastewater Network Improvement Plan, PS20 - Attenuation Feasibility Study, GHD, July 2018
- PCC Wastewater Network Improvement Plan, 5137408-REP-003: PS20, New PS Feasibility Report GHD, February 2019
- PCC Wastewater Network Improvement Plan, 5137408-REP-005: PS34 - Tangare Drive, PS Upgrade Feasibility Report, September 2018
- Cost Estimation Manual, Wellington Water, July 2017

1.3 LIMITATIONS OF ASSESSMENT

The cost estimates are order of magnitude values for the purpose of comparing options for this MCA only and not for setting budgets for projects, or any other purpose. The provision of cost estimates does not imply the feasibility of the options.

The cost estimates are based on desk top studies with limited site-specific information. Detailed site investigations, confirmation of design flows, and the requirements arising from environmental, planning and feasibility assessments are required to further refine the cost estimates. Estimates provided are 2019 values with no allowance for future inflation.

1.4 NETWORK OPTIONS

Wellington Water engaged WCS Engineering to evaluate and optimise wastewater network improvements for the Porirua catchment. This study applies an optimisation technology, Optimizer™ to evaluate system improvement alternatives (conveyance, storage, Inflow and Infiltration (I/I) reduction and treatment) for the updated 2057 population scenario (128,000). Secondary objectives include performing sensitivity analyses for key assumptions such as the effectiveness of I/I reduction in Cannons Creek and running optimisation scenarios for different average recurrence interval (ARI) design storms.

This assessment uses the outputs from the Phase 1 of the optimisation which is a high-level analysis of conveyance, storage, I/I reduction and treatment alternatives for a range of ARI design storms. The Phase 1 solution is not intended to be refined in detail; however, it does indicate which improvement options provide the greatest opportunity for life-cycle cost savings and improved system performance. Phase 2 of the project which is on-going will include a more detailed analysis of improvement alternatives (including feasibility and location-specific cost rates), interim population growth scenarios, refined level of service objectives and prioritisation of capital improvements.

Following the WCS analysis, for the option of Storage + Conveyance (sub-option (a); (greater conveyance in the north + storage in City Centre) was discarded because without conveyance from City Centre, this option becomes equivalent to Twin Storage sub-option (a); (storage in the north + storage in City Centre).

1.5 WWTP UPGRADES

The WWTP with a current capacity of 1000 L/s will be upgraded to an ultimate capacity of 1,500 L/s which will include upgrading the UV disinfection plant with a second UV channel in the 2019/20 year. The aeration feedpipe upgrade will also be upgraded in the near future to increase the plants biological treatment capacity to 1,500 L/s. This MCA assessment excludes the costs of these upgrades and excludes Operation & Maintenance costs associated with the WWTP, as these costs are constant for each of the options and therefore are not included in the comparison. Likewise upgrades to treatment capacity for the design horizon population load (aeration upgrades, sludge handling upgrades etc.) have not been included in this assessment as they are also constant for each option.

Where peak flows delivered to the WWTP exceed its capacity of 1,500 L/s, the excess flow would receive treatment in a storm flow treatment process located at the north end of the WWTP. The storm flow process requires screening and UV disinfection and potentially primary treatment. The costs of the storm flow process are only included in the Greater Conveyance options to treat a peak flow of 2,900 L/s as network flows to the WWTP for other option are limited to 1,500 L/s.

Discharge Options

Connect Water prepared conceptual designs for the three discharge options with order of magnitude level cost estimates. The capacity of the outfall from the WWTP is contingent on the conveyance option chosen; for Greater Conveyance the peak flow is 2,900 L/s and for Conveyance + Storage and Twin Storage the capacity is 1,500 L/s. Table 2 summarises the discharge flows and locations for each of the network options.

For options that discharge to the existing outfall location (existing shoreline discharge and new ocean outfall), the section of outfall pipe from the UV plant to the outfall drop structure (capacity of 1,000 L/s) requires upgrading to either 1,500 L/s or 2,900 L/s. This is all land based infrastructure.

For a new shoreline discharge at Round Point, the existing outfall infrastructure would not be required, and this would be used as a backup discharge location.

Table 2: WWTP Discharge Option Summary

	Greater Conveyenance	Conveyenance + Storage	Twin Storage
Existing shoreline discharge	Duplicate shoreline discarge for 2,900 L/s Upgrade UV to drop structure	Existing shoreline outfall for 1,500 L/s Upgrade UV to drop structure	Existing shoreline outfall for 1,500 L/s Upgrade UV to drop structure
New shoreline discharge	Discharge at Round Point for 2,900 L/s	Discharge at Round Point for 1,500 L/s	Discharge at Round Point for 1,500 L/s
New ocean outfall	Ocean outfall from Rukutane Point to a depth of 15m for 2,900 L/s Upgrade UV to drop structure	Ocean outfall from Rukutane Point to a depth of 15m for 1,500 L/s Upgrade UV to drop structure	Ocean outfall from Rukutane Point to a depth of 15m for 1,500 L/s Upgrade UV to drop structure

2. BASIS OF COSTS

Cost estimates for the network options are determined using the Optimizer™ software as noted above and are based on network upgrades to a 6 month Average Recurrence Interval (or 2 Event per Year). The software uses unit rates to evaluate system capital costs of gravity sewers, pressure mains, storage facilities, pump stations, and I/I reduction. O & M costs were included for storage facilities and pump stations. The unit rates adopted for the optimisation analysis are planning level estimates developed by GHD and scaled to match the available costs from recent Wellington Water projects.

Location-specific costs were applied for the City Centre and the Tangare Drive Pump Station and the pump station rising mains, as a specific feasibility design for these projects was prepared by GHD.

2.1 SEWER AND PRESSURE MAIN

Unit costs are assuming open cut construction and a local road surface. The costs include complete installation of pipes, other ancillary structures and surface restoration. Trenchless crossing costs are not applied in the current estimates.

2.2 PUMP STATION

Costs are for new and upgraded pump stations. New pump station costs are applied when the required capacity of the existing pump station upgrade exceeds 1.4 times the capacity of the existing pump station.

2.3 STORAGE TANK

Costs are based on underground, gravity-in/pump-out storage tanks inclusive of pump costs. The only exception is the City-Centre storage site that requires pump-in for volumes above 5,000 m^3 and has an additional new pump cost applied based on the peak inflow rate.

2.4 WWTP STORM FLOW PROCESS

Plant is based on a concept design and assumes that screening, primary treatment and UV disinfection is required. Estimates for two total conveyance design flows 2,250 L/s and 3,000 L/s were prepared and adopted in the optimisation as follows:

- 1,500 L/s up to 2,250 L/s - $23 M
- 2,250 L/s up to 3,000 L/s - $32 M

2.5 INFLOW AND INFILTRATION (I/I)

Reduction is considered only in the Cannons Creek catchment (WCS Engineering, April 2019). This catchment has been identified to have very high I/I. Eastern Porirua is the focus of a major central government funded renewal and intensification project. In this process many sewers and house connections will be replaced which will reduce I/I.

2.6 OUTFALL OPTION

estimates are based on a project in 2009 with similar site exposure and construction conditions. Unit rates derived from that project have been applied to the quantities and component types required for each option proposed. Additional allowance has been made for the site-specific civil, mechanical and electrical components required. Costs from this 2009 project have been escalated by 133% to 2019 values in accordance with the CGPI index (All Construction) to provide inflation adjustment. Assumptions include:

- Onshore and nearshore conditions are rock
- Offshore seabed (beyond rock shelf) is sediment suitable for trenching or pile installation to secure outfall pipeline
- Rukutane Point options can be connected to the existing vortex drop structure and tunnel conveyance components

2.7 TOTAL OUT-TURN COSTS

Options were used based on the following;

- Contingency 30%
- Funding risk 20%
- Design and construction management fees 15%
- Wellington Water management fee 5%

2.8 NET PRESENT VALUES (NPV)

Were calculated to determine the discounted present value of the options to include the O & M costs over a 50-year period. The calculations use a nominal weighted average cost of capital (WACC) of 8% based on *Public Sector Discount Rates for Cost Benefit Analysis, July 2008, The Treasury, NZ Government.*

All NPV assume that the capital cost is expended in year 1. The network and outfall options will be implemented as a staged process over a number of years. This will be the case for all options however some options, i.e. storage is likely to provide greater benefits from staging. When staging of the projects is investigated and planned in more detail at a later date, the NPV rankings of the options may change due to the discounted cost of expenditure in the future.

3. SUMMARY OF OPTIONS AND COSTS

Table 3 presents the capital costs and NPVs for the network and WWTP storm treatment options.

Table 3: Network and WWTP Storm Treatment Options and Costs

	Greater Conveyenance	Conveyenance + Storage (b)	Twin Storage (a)
Gravity, rising mains	$192 M	$159 M	$141 M
Pump Stations	$91 M	$29 M	$15 M
Storage	0	$83 M	$122 M
WWTP Storm Treatment	$32 M	0	0
I/I Reduction	$16 M	$16 M	$16 M
Total Capex	$331 M	$287 M	$294 M
Total NPV	$347 M	$299 M	$306 M

Table 4 presents the capital costs and NPVs for the WWTP discharge options for a capacity of 1500 L/s.

Table 4: WWTP Discharge Options and Costs for 1500 L/s

	Existing shoreline outfall	New shoreline outfall	New ocen outfall
UV to drop structure duplication	$2 M	0	$ 2 M
Pipeline and outfall	0	$8 M	$25 M
Total Capex	$2 M	$8 M	$27 M
Total NPV	$3 M	$9 M	$28 M

Table 5 presents the capital costs and NPVs for the WWTP discharge options for a capacity of 2600 L/s.

Table 5: WWTP Discharge Options and Costs for 2900 L/s

	Existing shoreline outfall	New shoreline outfall	New ocen outfall
UV to drop structure duplication	$2 M	0	$2 M
Pipeline and outfall	$4 M	$9 M	$27 M
Total Capex	$6 M	$9 M	$29 M
Total NPV	$7 M	$10 M	$30 M

Table 6 presents the NPVs for the combined options 1 to 9.

Table 6: Combined NPV Costs for Options 1 to 9

	Greater Conveyenance 2900 L/s	Conveyenance + Storage (b) 1500 L/s	Twin Storage (a) 1500 L/s
Existing shoreline outfall	1. $354 M	2b. $302 M	3a. $308 M
New shorelne outfall	4. $357 M	5b. $308 M	6a. $314 M
New Ocean outfall	7. $377 M	8b. $327 M	9a. $333 M

Attachment G:Combined Short List MCA Workshop Record

Porirua Wastewater Programme - Collaborative Group Meeting Record
Short List Multi Criteria Analysis Workshop

25 June 2019, 8.00 am – 3.30 pm

Puna Ora, Takapuwahia, Porirua

Attendees:

Ilze Rautenbach – Stantec	Zeke Hudspith – Kensington Swan
Tristan Reynard – WWL	Kara Dentice – WWL
Sharli-Jo Soloman – Ngāti Toa	Anna Hector – WWL
Grant Baker – Porirua Harbour Trust	Claire Conwell – Greater Wellington Regional Council
Steve Hutchison – WWL	Jude Chittock - Greater Wellington Regional Council
Paul Gardiner – WWL	Linda Kerkmeester – Boffa Miskell
Abby Jensen – Connect Water	Ron Haverland – Connect Water
Jill McKenzie – Regional Public Health	Mike Fisher – Regional Public Health
Graeme Jenner – Connect Water	David Cameron – Stantec
Rob Greenaway – Rob Greenaway & Associates	Seb Bishop – Latitude Strategy & Communication
Josie Burrows – Greater Wellington Regional Council	Matt Trlin – Connect Water
Rachel Boisen Round – Greater Wellington Regional Council	Richard Peterson – Stantec
Nigel Clark – PCC	

Introduction & context

The meeting began with a karakia by Kara. Sharli-Jo then welcomed the Collaborative Group to Puna Ora. This was followed by a round of introductions.

Richard then spoke to the context slides in the presentation attached to this meeting record. He reminded the group of:

- The objectives for the Porirua Wastewater Programme
- The options assessment process that has been followed
- The short list options (see Table 1 below)
- The assessment criteria agreed by the Collaborative Group at its meeting on 30 November 2018
- The criteria weighting agreed by the Collaborative Group at its meeting on 25 March 2019.

Richard then discussed the purpose of multi-criteria analysis (MCA), specifically noting that it is a tool to help understand the overall findings from the comparative assessments and provides a numerical summary of the pro's and con's of the options. The MCA does not make the decision on the preferred option. This decision will be made by the City Councils having consideration to the outcomes of the MCA.

The workshop then proceeded to discuss the findings of each comparative assessment (presented by the relevant expert) and determine if consensus could be reached on the scores that should be given to the options. The preliminary or suggested scores provided by the experts were then confirmed or amended by the Collaborative Group.

Table 1 - Porirua Wastewater Programme Shortlist Options

		Network Shortlist		
		Greater conveyance	Combination of storage and conveyance	Twin storage
WWTP Shortlist	Discharge to the CMA from the existing shoreline outfall + existing standard of treatment	1. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from the existing shoreline outfall	2. Combination of storage and conveyance in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment	3. Twin storage in the network, plus discharge to the CMA from the existing shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new shoreline outfall + existing standard of treatment	4. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new shoreline outfall	5. Combination of storage and conveyance in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment	6. Twin storage in the network, plus discharge to the CMA from a new shoreline outfall + existing standard of treatment
	Discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	7. Greater conveyance in the network, plus existing standard of treatment at the WWTP + discharge to the CMA from a new offshore ocean outfall	8. Combination of storage and conveyance in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment	9. Twin storage in the network, plus discharge to the CMA from a new offshore ocean outfall + existing standard of treatment

Water Quality

The first criterion considered by the group was water quality and ecology. David provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record).

He discussed the current overflow situation during 3-month rainfall events, outlining the frequency of such overflows, their volume and the contaminant levels in the overflow discharges. With respect to the wastewater treatment plant (WWTP), David described the current bypasses of the secondary treatment process which occur when flows to the WWTP exceed 950 l/s. He noted that these bypasses occur relatively frequently, however the upgrade works currently underway to increase the WWTP capacity to 1,500 l/s would eliminate them.

Rob asked whether the comparative assessment used indicator species to assess the effect on the different receiving environments (freshwater, harbour, open coast and terrestrial). David said that such an approach had not been attempted as the level of information is not available. Claire noted that she does not think a single indicator species could be identified as you do not get the same species uniformly throughout each receiving environment.

Matt asked whether consideration had been given to how staging of the network options might impact the significance of adverse effects and the option scores. David noted while an assumption has been made that all options will be long term projects and their benefits will not be immediate, he didn't have the level of detail to determine whether the progressive implementation of one option would be better from a water quality and ecological perspective than the progressive implementation of another option.

Rob asked if there are any issues with contaminants that bio-accumulate. David noted that accumulation is not an issue in the streams as the contaminants quickly flush to the harbour. There is accumulation in the harbour, which is shown in the harbour sediment monitoring undertaken by GWRC. On the coast again accumulation is unlikely to be an issue. Claire noted the contaminants which might accumulate in the harbour, e.g. heavy metals, are more directly associated with stormwater than wastewater.

Claire asked whether the monitoring of wastewater network discharges sampled during low level rain events. David noted that the focus of this monitoring has been on heavy rain events when pump station 20 in the City Centre is expected to be overflowing. Claire noted that there is a wastewater issue in low level rain events, i.e. the City's streams and harbour are impacted by contaminants from wastewater reasonably continuously. Steve acknowledged that this project doesn't address the dry weather water quality issues. Grant asked that when the results of this workshop are reported to the City Councils that this limitation is explicitly identified.

Sharli-Jo asked what base line information is available to determine how effective pipe renewals will be in relation to water quality, e.g. how can we tell how beneficial the re-development of eastern Porirua might be for water quality. Steve noted that there are two monitoring sites in the Kenepuru Stream which will enable water quality improvements to be measured.

Matt asked why there is a difference between the terrestrial scores for options 1, 4 and 7 in the comparative assessment. (See table 12 of the water quality and ecology comparative assessment in the MCA briefing report.) Having reviewed the comparative assessment, David agreed that the terrestrial scores for options 4 and 7 should be the same as option 1. This is because all of these options require the duplication of the rising main from the pump station at Tangare Drive to the tunnel, which will result in construction effects on an area of regenerating bush. This altered the overall scores.

The Collaborative Group therefore agreed to change the scores for option 4 (2.0 to 1.5) and option 7 (2.5 to 2). All other scores recommended in the comparative assessment were adopted by the Collaborative Group.

Public Health

Graeme provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). He noted that the assessment focussed on the risk to contact recreation and in doing so recognises the significant recreation values in the receiving environment. Like the water quality assessment, the public health assessment has assumed that the option will take time to implement, however the scoring has been based on effects of the completed option.

Graeme noted that the current network overflows result in high concentrations of enterococci downstream of overflow points, but these high concentrations tend to recede in tidal flushing and as the overflows reduce. Graeme noted that GWRC monitoring indicates the water quality in the harbour and Titahi Bay is 'moderate' in relation to risk of illness. Claire noted that there is poor water quality at rowing club and Wi Neera Drive due to the wind driven system, but this is not directly related to overflows, the source of this can be stormwater and leaking wastewater pipes.

Anna asked if, under the greater conveyance options, it would make sense to put the partially treated storm flows through UV disinfection. Graeme noted that to do so effectively would require that the transmissivity of the partially treated wastewater is reduced to appropriate levels. Ron followed this up by confirming that the storm flow treatment has been assumed to include primary treatment and blending the partially treated wastewater with the fully treated wastewater would not occur until after both flows have been separately disinfected using UV. However, it was noted that if the Councils select a greater conveyance option then further work will need to be done to confirm if the transmissivity of the partially treated wastewater can be reduced to a level that would make UV disinfection beneficial.

In terms of scoring network options, Graeme noted that he has assumed that there will be a similar outcome for contact recreation arising from all three network options and that it is unlikely that current risks for shellfish gathering will be reduced. This assumption relating to shellfish gathering is because there are other contaminant sources (not addressed by this project) which contribute to this risk. For scoring the WWTP discharge options it has been assumed that discharges from the existing outfall (under option 1) may cause some problems during storm events above 1,500 l/s, relocating the outfall further south would provide some benefit for Titahi Bay and installing an off-shore outfall would significantly reduce the bacterial concentrations at the shoreline.

Zeke queried whether the difference in the recommended scores for combined storage and conveyance options and twin storage options was warranted (if it is assumed that all discharges from the WWTP will be fully treated under both options). Graeme noted that he considers that the options are similar but that a small difference in scores is warranted because of the greater volume of treated wastewater that will be discharged from the WWTP at peak times under the combined storage and conveyance options. On reflection Graeme considered that this difference may not warrant a full point difference in the scores, as was recommended in the comparative assessment. Therefore, the scores for the combined conveyance and storage options 2 and 5 were increased from 2.5 to 3. This reduces the difference from the twin storage options (3 and 6) to only a half mark.

Ron asked how the benefit of dealing with wet weather flows would compare with dealing with dry weather leakage. Graeme noted that he hasn't seen a whole lot of data on the dry weather issues, but suspects that dry weather leakage is probably as important as, if not more important than, wet weather overflows in terms on public health risk. Jill supported this view noting that public health risk is about the level of exposure to the contaminants and it would be expected that people have more exposure to contaminants from dry weather leaks than they do to contaminants from wet weather overflows. It was noted however that this project was initiated to address the wastewater network's wet weather issues.

Zeke asked about the reasoning behind the 1.5 point difference between existing outfall option 3 and offshore option 9. Graeme noted that the offshore outfall is expected to reduce adverse public health effects to a negligible level, while there would remain some risk to contact recreation (particularly on the adjacent shoreline) if the existing outfall is retained.

Sharli-Jo asked if there has been dye testing done at the outfall. Steve noted that this had been done as part of the dispersion modelling work undertaken by DHI.

Sharli-Jo asked whether the offshore outfall would be separated from the bridge. Graeme confirmed that it would. Sharli-Jo also asked whether shellfish along the coast are impacted by the WWTP outfall impacts. Graeme noted that there is a lack of filter feeders (such as mussels, cockles and pipis) along the open coastline in the vicinity of the existing WWTP outfall and the alternative discharge sites. Shellfish such as paua are grazers and do not tend to accumulate contaminants such as pathogens. As such, the risk to consumers in these circumstances is relatively low.

Anna asked what difference the existing outfall and the offshore outfall would have in terms of ecological effects. David noted the existing outfall is causing some very localised adverse effects, while the adverse effects from the off-shore outfall would be expected to be negligible. Claire noted that the preliminary assessment of options undertaken by Cawthron indicated very low effects in very localised area (not extending more than 10m) around the existing outfall. This assessment is based on their expert judgement and experience rather than fieldwork at this point.

As noted above the Collaborative Group agreed to change scores for option 2 and option 5 to 3. All other scores recommended in the comparative assessment were adopted by the Collaborative Group.

Tangata Whenua Values

Sharli-Jo provided the group with a briefing on the relevant comparative assessment. She noted that the assessment generally aligned with water quality and public health. She also stated that Ngāti Toa find the discharge of human waste to water abhorrent, and therefore the assessment is a significant compromise on their values. For the comparative assessment the options were evaluated against 7 values. A score out of 5 was awarded for each value and the combined score averaged. The comparative assessment identified option 9 as being the best in relation to the values evaluated.

Rob asked what the reason is for relatively lower scores for options 4,5 & 6. Sharli-Jo noted that the historical values of the area was a key driver of these lower scores.

Rob asked if there is a difference in the significance of the harbour effects versus the effects on coastal waters. Sharli-Jo noted that harbour is very degraded and off-shore coastal environment less so. Notwithstanding she noted that option 9 will likely improve coastal waters. She stressed that it is important that health of the harbour improves over time but whether that will be achieved in next 50 years remains in question.

Rob asked whether there is a theme in assessments that coastal water will improve but the harbour will not due to other contaminant sources. Sharli-Jo noted that option 9 would improve coastal waters and the harbour is unlikely to change significantly due to other contaminant sources. Ngāti Toa can no longer gather kai moana from the harbour which is a hugely significant effect on the iwi and their values. Option 9 will at least ensure that use of the open coast is available to the iwi. A significant number of issues would need to be addressed to enable kai moana to be taken from the harbour.

Rachel asked whether the scores adequately reflect Ngāti Toa's preference for a long outfall. Sharli-Jo considered that the scores do appropriately reflect this preference and noted that the report pulls together a whole range of issues into scores.

Matt asked whether the assessment evaluated whether the options are able to achieve benefits in short term. Sharli-Jo noted that addressing overflows is very important, they are a key reason why Ngāti Toa left the Te Awarua-o-Porirua Whaitua process.

Following the discussion, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Growth

Matt provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). He noted that all options deal with long term growth, and therefore the key question is whether options can respond to growth in the medium term. Matt described the criteria and the scoring scale that he has applied.

Matt described how he has assessed the options against Wellington and Porirua City Council growth projections, which include high growth expectations for Porirua. He noted that these are the projections that we need to plan for in this project, notwithstanding uncertainty associated with them.

Matt noted that his recommended scoring for growth is heavily influenced by the network element of each option. Options 1, 4 and 7 involve greater conveyance as the network element. This element would not provide for medium term growth as well as either combined conveyance and storage or twin storage.

Anna asked whether twin storage should score better than combination storage and conveyance. Matt noted that he's assumed that these options can both use storage to match growth demands. Steve noted that twin storage includes quite a bit of conveyance so is not hugely different in that respect to the combination conveyance and storage option.

Zeke asked how the WWTP by-passes, that would occur under greater conveyance options, were taken into account. Matt noted that he has assumed that the installation of the WWTP storm flow treatment process would be timed to coincide with WWTP inflow exceeding its full treatment capacity of 1,500 l/s. He also explained that he had treated the partial/stormflow treatment that would occur beyond 1,500 l/s under the Greater Conveyance options as still fully meeting long term growth needs (noting they would likely attract different scores under other assessment criteria).

Sharli-Jo asked why the city would keep growing if its infrastructure cannot cope. Matt noted that this is a discussion for the City Council if they can't afford to upgrade network to cope with projected growth. This project needs to develop options which can deal with growth and present these to the Councils.

Following the discussion, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Social and Community

Matt provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). He described the various components that he's taken into account in the assessment and noted that he considered how the effects of options will change over time depending on how readily the options can be staged.

Rob asked how the assessment combined the absolute social effects and the consideration of community perception. Matt noted that there is a difficult marrying of social effects and community perception under this criterion. To do this a judgement has had to made on the level of understanding the community would have of potential effects and how such effects will be perceived. It was noted that some community perceptions may not necessarily be aligned with the actual significance of social effects. Matt noted that community perception has had a significant influence over the recommended scores.

Steve asked whether there may be a negative perception from having a big storage tank. Matt noted that he's assumed that people may not be aware of the function of the structure (as it would be below ground or otherwise largely hidden), so he's assumed that there would not likely be a significant negative perception.

Matt noted that he has assumed that there will not be significant adverse effects on the heritage values near Round Pt arising from the new shoreline outfall. He made this assumption as he considers that significant adverse effects could be avoided or adequately mitigated.

Zeke said he understood the rationale for a score of 5 for the WWTP element of option 9, but queried whether it was warranted for the option as a whole i.e. including the network element of that option, which would still involve overflows to the harbour. Matt noted that he thinks a score of 5 is appropriate as he feels the effects would be within the narrative description for a score of 5.

Anna asked whether option 7 warranted a score of 3 with a long outfall, i.e. is this score too low. Matt noted that this was driven by the network element of the option which would result in the continuation of partially treated discharges to the CMA. These discharges are likely to result in a strong negative public perception. In addition, the presence of the ocean outfall combined with the discharge of partially treated wastewater may have an impact on the recreation fishery offshore. Graeme noted that there is likely to be on-shore signage associated with a long outfall and potentially markers near the end of the outfall which would raise public awareness of the outfall and potential create negative community perceptions.

Following the discussion, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Technology

Ron provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). He noted that key aspects of this criterion are whether the option provides an enduring solution, is proven, reliable and able to be constructed and provides staging and flexibility. Ron noted that he has scored the network elements and WWTP elements separately and then averaged these scores to get the overall recommended score.

Under the conveyance option Ron noted that there are large construction challenges, so therefore while infrastructure is well understood and proven he has scored it 3. Storage tanks are well proven, reliable and offer some flexibility for staging. Therefore Ron noted that he has scored both the combination of storage and conveyance options and the twin storage options a 4.

For the WWTP discharge elements, Ron noted that the need to duplicate the existing outfall under option 1 presents some construction challenges in the coastal environment, but these challenges are not significant, so he has scored this option a 4. The new shoreline outfall has been scored a 3 as it is complex due to terrain and hydraulic challenges associated with controlling the flow due to the elevation of the WWTP above sea level. The new offshore outfall again presents fairly complex construction challenges, so Ron also recommends that this is scored a 3.

Tristan asked whether the challenges associated with the new shoreline outfall would be more complex than the offshore outfall. Steve noted that both have different complexities. Graeme noted that he thinks that they'll be similar, although with the shoreline outfall there is the added complexity of the hydraulics. Ron/Graeme both noted that either new outfall option may be more challenging than other outfall examples in NZ. Anna noted for example that Moa Point was directly off a Road, whereas in this case access will be via a relatively steep single lane accessway.

Rachel asked if there is any difference in terms of the maintenance requirements for the shoreline and offshore outfalls. Ron noted that the offshore outfall is largely maintenance free and would have a 100-year design life. The shoreline outfall would also have a 100-year design life however would require mechanical and electrical equipment to control the flow, having a 20-year design life. Overall it was considered that while there is potentially some greater challenges associated with the new shoreline outfall this is not sufficient to warrant a difference in scoring from the offshore outfall.

Following the discussion, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Resilience

Ron provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). He noted that he scored the network and WWTP discharge elements separately, and then averaged these scores.

Claire asked whether the likely increase in extreme weather arising from climate change has been taken into account. Ron noted that this has been included in the network modelling used to determine expected flows to the WWTP and used to estimate the capacity and cost of the network elements.

Linda asked whether under the new shoreline and offshore outfall options it is likely that the existing outfall would be kept. Ron noted that the existing outfall would likely be retained to provide a back-up.

Jill asked whether conveyance aspects of the network element would involve replacement or duplication of pipes. And if its replacement wouldn't this assist to reduce dry weather leakage, at least to small extent. Ron noted that replacement (rather than duplication) could offer some benefit for dry weather leakage issues. However the extent of the benefit is not possible to estimate now as a decision on whether to duplicate or replace pipes won't be made until detailed investigations have been undertaken.

Following the discussion, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Natural Character, landscape and visual amenity

Linda provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record). She described the difference between the three elements covered in the assessment (natural character, landscape and visual amenity). She noted that she has assessed network elements and WWTP discharge elements separately and then averaged these scores. Linda noted that this approach gives equal weighting to the WWTP discharge element and the network element. She considers that even though the network element of the options have numerous different components which may impact on this criterion, it is appropriate to give equal weight to the WWTP element because this is located in a coastal environment with relatively high natural character and because of the importance placed on these values in the New Zealand Coastal Policy Statement.

Graeme asked whether the existence of the former whaling station near Round Point influenced the scores. Linda noted that this heritage value was taken into account in the assessment. Richard also noted that heritage values were covered more directly in the 'Social and Community' comparative assessment.

Rob asked if the reduction in overflows is a landscape issue. Linda noted that natural character takes into account natural processes and therefore water quality issues are captured under this part of the assessment. However, these effects haven't had a significant influence on the recommended scores when compared to the natural character effects of the proposed structures.

Ron asked why the ocean is a very high natural character area. Linda noted that this is because there is limited modification as you move away from the immediate shoreline.

It was noted that there are some typos in table 5 of the comparative assessment, which sets out the composite scores by averaging the results in tables 3 and 4. These numbers were corrected as follows:

Option	1	2	3	4	5	6	7	8	9
Score	3.5	3.5	3	3	3	2.5	3.5	3	3

Aside from correcting the typos, the Collaborative Group did not make any changes to the recommended scores for this criterion.

Cost

Ron provided the group with a briefing on the cost estimation process that has been undertaken on the shortlist options (see presentation slides attached to this meeting record). He noted that to provide cost estimates for the network elements an optimisation model has been used, with agreed unit rates for the different elements.

The costs do not include the planned upgrade to increase the capacity of the WWTP to 1,500 L/s as this upgrade is common to all options, and therefore do not influence the scoring.

Nigel asked whether there would be a reduction in the capital cost of options if there was a larger investment in an Inflow and Infiltration Programme (I&I). Steve noted that experience around New Zealand shows that the efficacy of I and I varies. WWL would therefore be very careful about making it a more significant component of the options.

Abby noted that most of the capital cost of the network options relates to addressing the current level of service, i.e. growth projections do not have a significant influence on the network costs.

Tristan asked whether land purchase costs have been considered. Abby noted that these have not been specifically included in the estimates but are covered in contingency allowance.

The Collaborative Group did not make any changes to the cost estimates for each option.

Richard noted that the estimated Net Present Values (NPV) for each option are converted to a score from 1 to 5 using the following approach:

1. Identify the option with the highest NPV and give this option a score of 1
2. Calculate the score for the other options using this standard formula:

   Score for option A = ((1 - (NPV of option A / highest NPV)) x 4) + 1

   The formula creates a ratio between the option NPV and the highest NPV. It then inverts this ratio by subtracting it from 1. This is done to ensure that an option with a high NPV is awarded a low score. This is consistent with the scoring of other criteria in which the most negative outcomes have been given the lowest scores. Finally, the formula converts the ratio into a score between 1 and 5 by multiplying it by 4 and adding 1 (the score already awarded to the option with the highest NPV).

Applying this formula to the estimated NPVs results in the following 'cost' scores for each option:

Option	1	2	3	4	5	6	7	8	9
Estimated NPV	$354M	$302M	$308M	$357M	$308M	$314M	$377M	$327M	$333M
Score	1.24	1.80	1.73	1.21	1.73	1.67	1.00	1.53	1.47

Richard noted that because the range of the NPVs is not wide, the scores also do not have wide range and cluster between 1 and 2. These low scores not only reflect the relative similarity of the NPVs, they also reflect the very high cost of all options.

The NPVs for the network elements has a significant influence on the cost scores. This is because the network elements make up the vast majority of the total cost of the options. The NPVs for the WWTP discharge elements have a much wider range. However, these costs are less than 10% of the NPVs of the network elements and therefore this variation is not reflected in the overall cost score for the options.

Summary of the MCA outcome & next steps

Following a break Richard set out how the options rank when an overall MCA score is calculated using weighting scenario ‘Base weighting 1’ (see Figure 1 below). Under this weighting scenario option 9 is the highest ranking option, with option 8 ranked second and option 3 ranked third.

Matt asked how different the overall scores are for these options. Richard noted that range in the overall scores for the top three options is not large (there is less than 0.3 difference between the first and third ranked options under this weighting scenario).

Richard noted that he would run the scores through the MCA tool using all weighting scenarios agreed at the Collaborative Group meeting on 25 March 2019 and include the results as an attachment to the meeting note (see attachment 2). This will help us understand how sensitive the rankings are to different weighting scenarios.

The option ranks under ‘Base Weighting 1’ are shown in the blue numbers on the figure below.

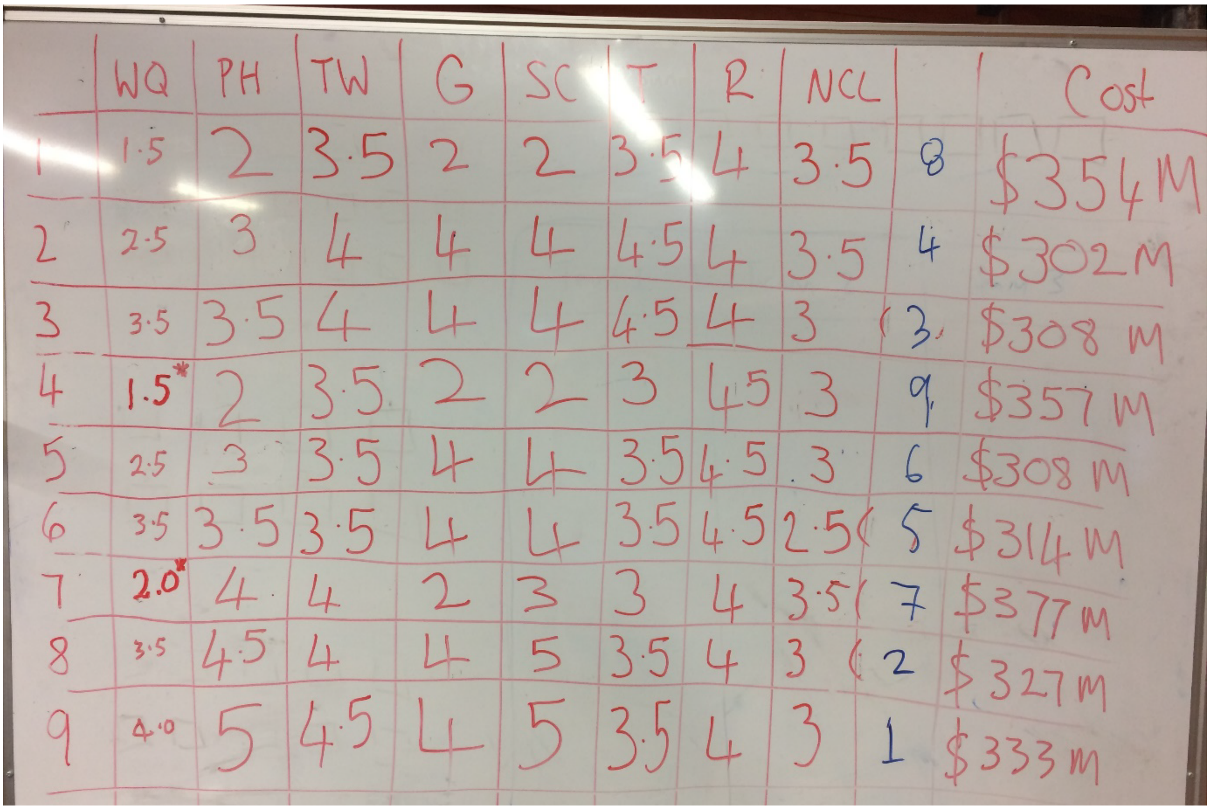


Figure 1 - MCA scores awarded by the Collaborative Group at its workshop on June 25, 2019 (Blue numbers are the option ranking having applied the scores to the MCA tool using weighting scenario 'Base Weighting 1')

Steve then discussed next steps. He noted that Wellington Water would present the results of the MCA to the next Wastewater Treatment Plant and Landfill Joint Committee meeting in early August. He noted that given that the estimated costs of all options are significantly higher than existing LTP budgets for the project it remains unclear how the Committee will react to the outcome. Steve noted that he expected there will be a direction to consider how to reduce costs, including by considering a change to the assumed Annual Return Interval for the network elements.

Paul then thanked the Collaborative Group for their participation in the workshop and Ngāti Toa for providing the venue. Sharli-Jo closed the workshop with a karakia.

Attachment 1 – MCA Workshop Briefing Slides

Attachment 2: MCA results applying various weighting scenarios

This attachment sets out the overall MCA scores and options rankings when the different weighting scenarios are applied to the scores agreed by the Collaborative Group at the workshop on 25 June 2019.

Approach to weighting of criteria

At its meeting on 30 November 2018 the Collaborative Group agreed to determine the weight to be given to cost in the overall MCA score, and then weight the non-cost criteria based on how important each criterion is.

The Collaborative Group agreed that the base weighting for cost in the overall MCA score should be 25%. It also agreed to test the sensitivity of this by also applying a 0% weight to cost and a 50% weight to cost.

The weighting scenarios for the non-cost criteria that were agreed by the Collaborative Group at its meeting on 25 March 2019 and are set out in Tables 1 and 2 below.

Table 2 - Importance Weightings (out of 10) Agreed for the Qualitative Criteria by the Collaborative Group

	Criteria							
Scenario	Public Health	Water Quality & Ecology	Tangata Whenua Values	Growth	Social & Community	Technology	Resilience	Natural Character & Landscape
Base weighting 1 ('Growth at 10')	10	10	10	10	7	5	7	7
Base weighting 2 ('Growth at 8')	10	10	10	8	7	5	7	7
Higher weight to technology (Base scenario 1)	10	10	10	10	7	7	7	7
Higher weight to technology (Base scenario 2)	10	10	10	8	7	7	7	7
Lower weight to technology & resilience (Base scenario 1)	10	10	10	10	7	3	5	7
Lower weight to technology & resilience (Base scenario 2)	10	10	10	8	7	3	5	7
Equal weighting to all criteria	10	10	10	10	10	10	10	10

Table 3 – Qualitative (Non-cost) Criteria Percentages (%) Based on the Agreed Importance Weightings

Scenario	Criteria							
	Public Health	Water Quality & Ecology	Tangata Whenua Values	Growth	Social & Community	Technology	Resilience	Natural Character & Landscape
Base weighting 1 ('Growth at 10')	15.2	15.2	15.2	15.2	10.6	7.6	10.6	10.6
Base weighting 2 ('Growth at 8')	15.6	15.6	15.6	12.5	10.9	7.8	10.9	10.9
Higher weight to technology (Base scenario 1)	14.7	14.7	14.7	14.7	10.3	10.3	10.3	10.3
Higher weight to technology (Base scenario 2)	15.2	15.2	15.2	12.1	10.6	10.6	10.6	10.6
Lower weight to technology & resilience (Base scenario 1)	16.1	16.1	16.1	16.1	11.3	4.8	8.1	11.3
Lower weight to technology & resilience (Base scenario 2)	16.7	16.7	16.7	13.3	11.7	5.0	8.3	11.7
Equal weighting to all criteria	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5

Overall MCA Scores

Table 3 sets out the overall MCA scores and associated option ranks having applied the weighting scenarios to the scores agreed at the MCA workshop on June 25, 2019.

Table 3 indicates that the MCA outcome has a low sensitivity to the different weighting scenarios. It shows that the different weighting scenarios do alter the overall MCA scores. The most significant changes to the overall MCA scores occur under the scenarios with 0% and 50% weight to cost. When 0% weight is given to cost the overall scores are the highest, and when 50% weight is given to cost they are the lowest (given the cost scores are clustered around 1-2, giving greater weight to cost drags down the average or overall scores). Changes to the weighting of non-cost criteria only have a marginal effect on the overall MCA scores.

There is only a limited number of scenarios in which the ranking of options varies. Again, the rank only changes in scenarios where cost is weighted at 0% and 50%. Under scenarios with cost at 0%, option 2 is the 5th ranked option, whereas otherwise it is the 4th ranked option and option 6 is the 4th ranked option whereas otherwise it is the 5th ranked option. Under scenarios with cost at 50% option 3 is ranked 2nd, whereas otherwise it is 3rd ranked and option 8 is ranked 3rd, whereas otherwise it is 2nd ranked. Changes to the weighting of non-cost criteria does not alter option ranks.

Under all weighting scenarios option 9 has the highest overall MCA score. The margin between it and the next highest ranked option does vary. The margin is highest (0.24) under the 'Base weighting 2 with cost at 0%' scenario. The margin is lowest (0.07) under the 'Base weighting 1 with cost at 50%' scenario.

Table 4 - MCA scores and option ranks under different weighting scenarios

WEIGHTING SCENARIO	OPTIONS								
	1	2	3	4	5	6	7	8	9
Base weighting 1 with cost at 25%	2.29	3.15	3.27	2.25	3.02	3.14	2.62	3.35	3.51
	8	4	3	9	6	5	7	2	1
Base weighting 1 with cost at 0%	2.64	3.61	3.78	2.60	3.45	3.63	3.16	3.96	4.19
	8	5	3	9	6	4	7	2	1
Base weighting 1 with cost at 50%	1.94	2.70	2.76	1.91	2.59	2.65	2.08	2.75	2.83
	8	4	2	9	6	5	7	3	1
Base weighting 2 with cost at 25%	2.30	3.14	3.26	2.27	3.01	3.13	2.65	3.35	3.51
	8	4	3	9	6	5	7	2	1
Base weighting 2 with cost at 0%	2.66	3.59	3.77	2.62	3.44	3.62	3.20	3.96	4.20
	8	5	3	9	6	4	7	2	1
Base weighting 2 with cost at 50%	1.95	2.69	2.75	1.91	2.58	2.64	2.10	2.75	2.83
	8	4	2	9	6	5	7	3	1
Higher weight to technology (Base scenario 1)	2.31	3.17	3.28	2.26	3.02	3.14	2.62	3.34	3.49
	8	4	3	9	6	5	7	2	1
Higher weight to technology (Base scenario 2)	2.32	3.16	3.28	2.27	3.01	3.13	2.64	3.34	3.50
	8	4	3	9	6	5	7	2	1
Lower weight to technology & resilience (Base scenario 1)	2.23	3.12	3.25	2.20	3.00	3.12	2.60	3.36	3.53
	8	4	3	9	6	5	7	2	1
Lower weight to technology & resilience (Base scenario 2)	2.25	3.11	3.24	2.21	2.98	3.11	2.63	3.36	3.54
	8	4	3	9	6	5	7	2	1
Equal weighting to all criteria	2.37	3.21	3.29	2.32	3.06	3.14	2.64	3.34	3.46
	8	4	3	9	6	5	7	2	1

Attachment H: WWTP Short List Comparative Assessments and MCA workshop record

Porirua Wastewater Programme – Meeting Record

Wastewater Treatment Options, Short List Multi Criteria Analysis (MCA) Workshop-2

28 August 2019, 8.30 am – 12.00 pm

Stantec Offices, 80 The Terrace, Wellington

Attendees:

Mary O'Callahan – WWL
Ilze Rautenbach – Stantec
Miria Pomare – Cultural Assessment
Steve Hutchison – WWL
Graeme Jenner – Connect Water
Rob Greenaway – Rob Greenaway & Associates
David Down – PCC
Zeke Hudspith – Kensington Swan
Anna Hector – WWL
Linda Kerkmeester – Boffa Miskell
Matt Trlin – Connect Water
David Cameron – Stantec
Richard Peterson – Stantec

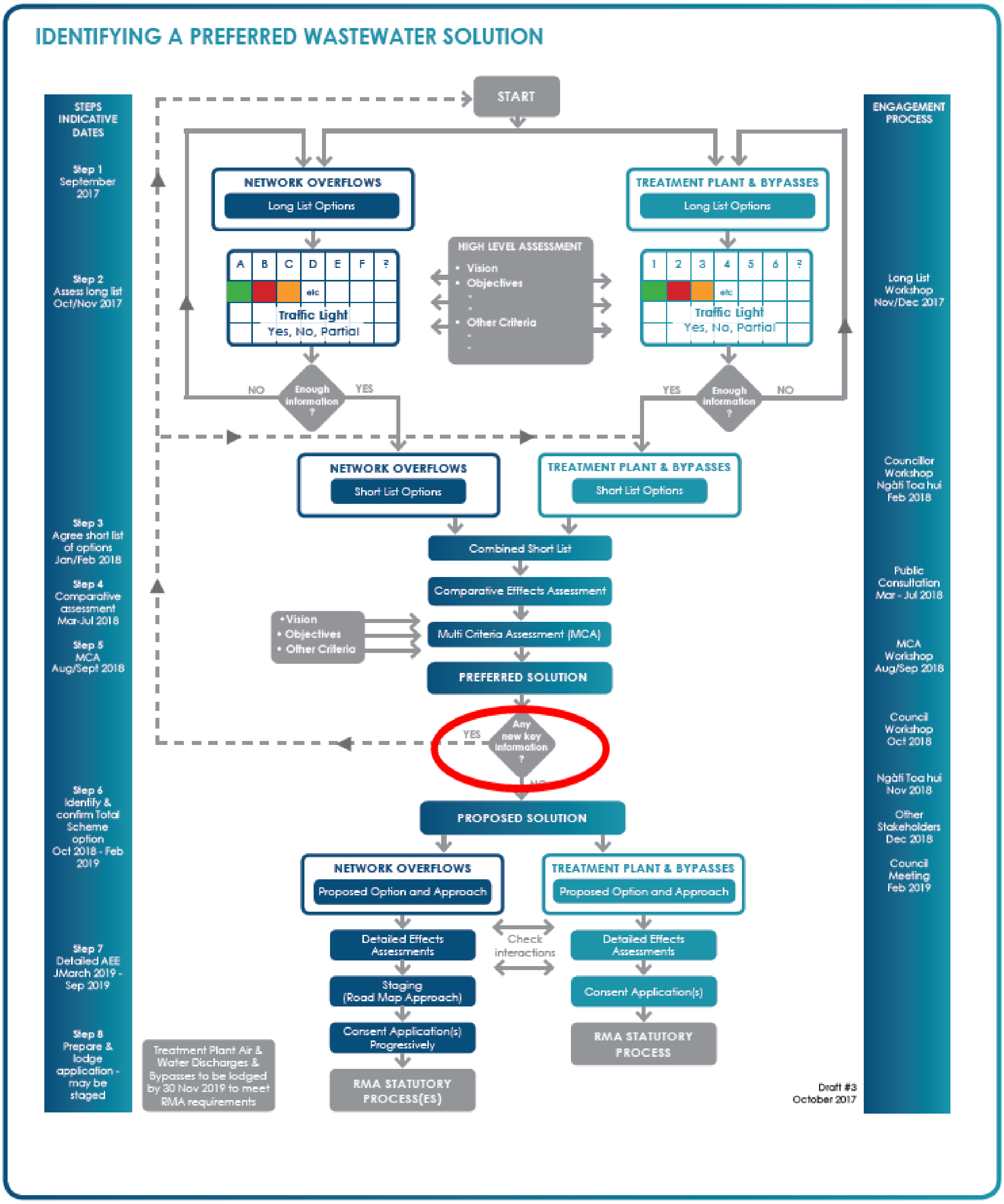
Apologies: Ron Haverland – Connect Water

Introduction & context

Everyone was welcomed to the meeting followed by a round of introductions.

Richard then spoke regarding the context slides in the presentation attached to this meeting record as well as the explanation he sent via his email of 15 August. He reminded the group of:

- The objectives for the Porirua Wastewater Programme
- The assessment criteria agreed by the Collaborative Group at its meeting on 30 November 2018
- The criteria weighting agreed by the Collaborative Group at its meeting on 25 March 2019
- The 9 short list options that were agreed to and assessed through the first multi-criteria analysis (MCA) workshop held on 25 June 2019, where both Network and Treatment options were considered.
- The reasons why the two streams have now been separated going forward and the reasons for this additional MCA workshop based on the assessment framework explained in the below diagram.
- The options assessment process that has been followed through the project. Description and diagram below.



In discussion the process diagram, Richard noted that the box highlighted with the red line was purposively positioned just prior to selecting the 'proposed solution' as a final check in the process and asks the question whether any new key information has been identified. If the answer is yes, then the opportunity is provided to return to either the very start of the process, or to the start of the short list assessment. Richard noted that there is clearly 'new key information' as follows:

1. The cost of the network options has increased very substantially – at the long list phase none of the network options scored worse than 'orange' for affordability, indicating costs were estimated as not more than 50% above LTP 30 year budgets, and all network options that were

carried forward to the shortlist scored 'green' under this criterion, i.e. they were estimated to be within LTP 30 year budgets. As we know the cost estimates finalised in the last few months show these options to now be several times greater than the LTP budgets initially.

2. The Whaitua objectives have been confirmed in 2019 and include the objective to improve the attribute state for E. coli and enterococci from the current E and D state to A, B or C state by 2040. The very substantial investment required to address network overflows will not meaningfully contribute to the achievement of this objective and an opportunity cost of making such a substantial investment in the network overflow issue will be that there is very limited, if any, ability to invest in the 3 waters network to help achieve the Whaitua objective.

Given these factors, Richard noted that Wellington Water has decided to exercise the 'return loop' in the process diagram, and to do so differently for the network and WWTP element of the Porirua wastewater programme. As the 'new key information' raises the most significant issues for the network, it has been decided to exercise the full return loop for this element of the programme, i.e. return to the start of the process. This enables the scope of the problem to be reconsidered and importantly reframed in the context of the Whaitua objectives. For the WWTP element of the programme, it's been decided to exercise the return loop back to the start of the short list phase and re-evaluate the three outfall options as a standalone assessment. These options are:

1. Discharge from the <u>existing shoreline outfall</u>, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from a new <u>Round Point shoreline outfall</u>, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from a new <u>offshore ocean outfall</u>, existing level of treatment but capacity upgrades so all wastewater is fully treated

<u>Questions and Discussion on Context:</u>

David Down asked whether the % in the Whaitua objectives are the targets to be achieved overtime or the actual %, for what was showing on the slide? Richard answered that they are targets to be achieved by 2040.

David Down further stated in the relation to the objectives for the marine parts of the catchment, are the Whaitua objectives outside of GWRC responsibility? Richard answered, no, the marine water quality is part of GWRC's responsibility, it's part of the PRNP document.

David Down then spoke about the fact that PCC cannot afford the 300M+ as it doesn't fit into PCC's current budgets or funding especially now that we are looking only at a 20-year consent. David Down further mentioned that PCC needs some input from WCC and that they are currently in discussions on some better options for cost sharing because the Porirua WWTP is under joint ownership. They are also further considering government funding as; government did build large sections of the Porirua Network as well. Notwithstanding this, David stressed that the WWTP options process needs to run its course and whatever comes out of it, needs to be considered (whether it's the high or low-cost option) and will be taken to the Council in complete integrity of the MCA process.

Mary O'Callahan mentioned that a new piece of work is being scoped in relation to the Porirua network. This then will fully test a long list options, reframed in the context of the Whaitua objective, for different levels of service and costs. It will consider how we can move forward using different ways (I&I, overflow options etc) to optimise the overall network over time.

Before starting the assessment of the three WWTP options, Richard reminded the group of the two main components of the MCA scoring approach. These are:

1 - raw scores of each option against each criterion

2 - weighting the scores (25% of the final score to go on costs and 75% going to the other criteria)

The workshop then proceeded to discuss the findings of each comparative assessment (presented by the relevant subject matter lead) and determine if consensus could be reached on the scores that should be given to the options.

Water Quality

David Cameron took us through his assessment. He looked mainly at two subcategories for this MCA namely; Coastal and Terrestrial, noting that:

- We now have Cawthron's marine ecology report
- this report concludes that there is no clear impact on the marine environment at the existing outfall
- Even if we are to move to a new shoreline outfall, it would have the same impacts
- The long outfall should have better mixing efficiency and thus cause slightly less impacts than the existing outfall
- if the portion of the outfall located from the UV facility to the start of the tunnel is duplicated, it is unlikely to have any meaningful terrestrial effects. Construction impacts would also be temporary.
- Lastly, the reference in his comparative assessment to 200m, is relating to the 200m mixing zone used as basis for the existing resource consent.

Rob wished to note that in other examples of similar ocean outfalls they have provided good habitat. David also mentioned that the Cawthron Report suggested that it could result in less variety of species overall but not to have a significant diverse impact.

Miria noted that the Cawthron Report talks about putting the outfall below the shoreline, but it is a very rocky area and would be difficult to do. Could we add rocks around it to help with habitat establishment. David Cameron indicated that it is normally just left to nature to take its course and it would rehabilitate and add more habitat over years to come.

All scores recommended in the comparative assessment were agreed amongst the group[1].

Public Health

Graeme provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record), noting that:

- The Cawthron Report has clarified that the key public health matters are more in relation to recreational contact rather than shellfish consumption.
- These is a lack of filter feeding shellfish (such as green shell mussels, cockles and pipis) in the area of the three outfall options. Cawthron noted the presence of dense mats of little black mussels which are too small for human consumption. Some paua observed around outfall. However, these are grazers and unlikely to accumulate contaminants such as pathogens in the gut. The gut of paua is also not typically consumed.

[1] See Table 1 on page 12 for all agreed scores.

- The risk of aerosolization of pathogens through wave and wind action on the surface wastewater plume after discharge was not considered in his memo for the June 25 Workshop. He however noted that aerosol generation and subsequent inhalation by walkers could be an issue for the shoreline options. For completeness, this issue has been qualitatively considered in his memo. Also noting that DHI will also further quantify the actual aerosolization risks in the QMRA to be complied for the resource consent application.
- Scoring is largely the same as within MCA-1 memo, with only slight changes. Which meant, for round point it has scored slightly better (0.5) as the new outfall would be further away from the Titahi Bay, where more recreation mostly takes place.

Rob wanted to know if other shellfish such as limpets and cats' eyes (sea snail) are a big issue? Graeme understood that these are grazers like paua and he did not think that they were very popular for human consumption.

Mary wanted to know what the difference is between the guidelines on bathing risk under normal dry weather circumstances versus that during peak flows. Is the modelling only looking at the current flows? If we are then adding the UV dose and treatment, what does this mean regarding to the guidelines?

Graeme indicated that the initial DHI modelling considered discharge of both dry weather and peak flows (of 1500L/s) from the existing Rukutane outfall, as well as sites at Round Point and two offshore sites. Both the current flow and future 1500l/s flow scenario will receive full secondary treatment plus UV disinfection, (ie there will be no discharge of partially treated overflows). The modelling was based on a wastewater discharge microbiological quality of 1000 *Enterococc*i/100mls. The Proposed Natural Resources Plan (PNRP) identifies a criterion in marine bathing waters of 500 *Enterococci/*100mls *as a 95th percentile.* The modelling considered the impacts of the discharge (from a dilution and dispersion perspective), at a number of sites along the coast including at sites 200m east and 200m southwest of the existing outfall. These 200m sites are where shoreline monitoring of *enterococci* currently occurs for the purposes of the consent. The initial DHI modelling results show that If the plant is treating and disinfecting current daily flows or peak flows of 1500L/s, the PNRP criterion of 500 *enterococci* /100mls is not exceeded. The modelling did not consider sites on the shoreline closer to the existing discharge than 200m east or southwest. Therefore, compliance with the PNRP criterion between these two sites cannot be assessed from the modelling. The DHI modelling also assumes no plant failure / or operational upset during normal or storm events which could impact on the microbiological quality of the wastewater discharge.

The initial DHI work provides the basis for an essentially qualitative assessment of public health risks of the different discharge options based on the expected compliance with the PNRP *enterococci* criterion for marine waters. This criterion is based on the *Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas* prepared by the Ministry for the Environment (MfE 2003). These guidelines state that a 95-percentile value of *enterococci* greater than 500 organisms/100mls indicates a "*significant risk of high levels of minor illness transmission*", which is generally considered an unacceptable level of risk. Further the guidelines state that they should not be directly applied when assessing the microbiological quality of water that is impacted by discharges of wastewater, as there is a potential for the relationship between bacterial indicators (such as *enterococci*) and pathogens (such *norovirus* which can cause gastric illness) to be altered by the treatment and disinfection process. For example, UV disinfection which causes genetic damage and prevents reproduction, is most effective on bacteria which are larger and more genetically complex. However, specific viruses (eg *norovirus* or *adenoviruses* that can cause respiratory disease), which are simpler genetically, are more resistant and require higher doses of UV for inactivation. The relationship between bacterial indicators and pathogens therefore needs to be established before the public health risks of a discharge can be quantified. A Quantitative Microbial Risk Assessment (QMRA) will therefore need to be carried out to more fully quantify the public health risks of the discharge.

David Down asked if it is correct that the overall pathogen levels are all ok - or at low risk and that there is only the possible exceedance of the MfE bathing guidelines under future peak flows. However, from the community groups, they do not make a distinction between the outfall and the mixing zone, everything for them will be in the 200m mixing zone, and within Titahi Bay.

Graeme then indicated that compliance with the PNRP *enterococci* criterion for marine waters is different to the actual public health risk (see discussion above). We need to look at the risk regarding viruses and to what level they are inactivated within the WWTP, but we will only know this after the QMRA has been completed. As noted above, the DHI modelling doesn't allow us to make assumptions about meeting the PNRP criterion between the 200m SW and 200 E sites.

The initial DHI modelling was necessarily based on a number of assumptions. The dry weather flows and the 1500l/s scenarios flows were assumed to be continuous. The peak flow modelling duration was assumed to be 12 hours. However, in reality, there could be variations in peak flow duration. Currently, the peak flow of 1500l/s cannot reach the WWTP. However, this may be possible after network upgrading - although this would be offset to some extent by the inclusion of storage.

The quality of the discharge could also vary a little (eg the UV disinfection system is based on achieving an *enterococci* limit of 1000 organisms as a 95th percentile). Thus, if there was a plant/equipment failure, concentrations of *enterococci* in excess of 1000 could occur.

It was agreed that Option1 is slightly less favourable than Option 2, and Option 2 again less favourable than Option 3. All scores recommended in the comparative assessment were agreed amongst the group.

Tangata Whenua Values

Miria noted that Cawthron's Report was very helpful for her assessment and scoring. From her first MCA memo not too, much has changed but her arguments made are now much clearer. She noted that:

- The underlining assumption regarding peak bypass overflows is that the throughout the potential consent period all flows to the plant will be within the capacity of the full treatment process, removing the requirement for partial treatment of stormflows and eliminating bypass discharges to the coastal environment.
- Ngāti Toa have high cultural and spiritual concerns with regards to untreated wastewater, but if all wastewater is going to be treated fully, it is of a lessor concern
- Scoring is thus as follows:
    - <u>Option 1:</u> At the existing outfall, improving the shoreline water quality, as mentioned within the Ecological Reports in the vicinity of the existing outfall and in Titahi Bay, it is anticipated that the adverse effects on cultural heritage values are considered extremely unlikely.
    - <u>Option 2:</u> At round point, a significant reduction of shoreline water quality is expected in the vicinity of the new outfall (at Te Korohiwa Rocks). Our heritage values associated with waahi tupuna and/or sites of cultural significance in the vicinity of Te korohiwa Rocks could be adversely affected from construction and operation of the new outfall therefore this is our least favourable option of the three.
    - <u>Option 3</u>: At the new long outfall, it is anticipated to have better treatment (due to capacity upgrades) and enhanced effects as it is significantly further away from Titahi Bay and the coastline, which makes this the most preferred option.

Following the discussion, the group did not make any changes to the recommended scores for this criterion. However, after discussions later in the workshop regarding retaining the existing outfall or decommissioning it as part of Option 2, Miria provided the following explanation via email about whether her scores would change for Option 2:

Having given this issue some further thought, I have concluded that my scores would not change.

While retention of the existing outfall at Rukutane Point as a redundancy option for both the WWTP (during times of plant failure) and the network (as a back-up for the Tangere Drive pump station) would obviously limit opportunities for the reinstatement and/or reversion of the coast to a more natural state, it would not preclude these opportunities altogether.

Given that the outfall would only be used extremely infrequently (approx. once every 3 or more years? according to Steve's estimations), there would still be enhanced opportunities for kaitiakitanga and some form of ecological/natural character enhancement of the outfall area under options 2 & 3. I am assuming that it would only be during these infrequent emergency discharge events that the public/NGati Toa would be restricted from the outfall area and that for the vast majority of the time this part of the coastline would be open to public/Ngati Toa access and use.

So while Ngati Toa's preference would naturally be for the decommissioning of the existing outfall and restoration of the coastal environment (under options 2 & 3), I don't think retention of the outfall as a redundancy warrants a full half point deduction from my original scores and therefore I have decided to keep the scores as they are. This is however based on the assumption that emergency discharges will occur extremely infrequently and that there will still be opportunities under options 2 & 3 for enhancement of ecological and cultural values in the relation to the existing outfall (albeit to a lesser degree). Also, reducing my scores for options 2 & 3 (by half a point) would skew the outcome in favour of option 1 (by bringing options 1 & 3 into parity) which does not accurately reflect Ngati Toa's preferred option.

Growth

Matt provided the group with a briefing on the relevant comparative assessment (see presentation slides attached to this meeting record).

- He noted that all options previously dealt with long term growth (20 years +), and therefore the key question is whether options can respond to growth in the medium term.
- WWL now looks at the short-medium growth term as being 0-15 year and high projection / long-term of 15 year +
- During this period there would be an increase in the WWTP’s catchment population from approximately 84,000 residents (2018) to 121,000 (2043).
- Since the WWTP capacity will be increased as part of all options so that it can fully treat all wastewater arriving into the plant, it will be working at optimum rates and can accommodate all the current predicted growth adequately.
- PWWTP will be able to treat all received flows to current LOS throughout a 20-year period, up to 2043.

Therefore, the scoring is the same for all three options as it is not affecting them any differently. The scores recommended in the comparative assessment were agreed amongst the group.

Social and Community

Matt provided some context to the scoring criteria of his assessment and how each option is likely to affect 'social and community values' where social and community values generally include:

- local amenity values (excluding visual amenity),
- recreation values
- heritage values, and
- community perceptions of effects on these values (excluding Tangata Whenua values).

For the purpose of this assessment, effects on social and community values included:

- Positive and/or negative effects of option construction, operation and management on identified values,
- Short to medium term 'temporary or interim' effects (0-15 years) on identified values
- Long term or 'permanent' effects (15years +) on identified values.

Another key criterion is that the community is looking at the current or existing environment as being the environment as it exists today with the presence of the existing discharge.

The community will assess the impact of any WWTP discharge upgrade option against this present day base, assessing each option on the extent to which it improves accessibility to and use of the coastal environment by removing or reducing discharges, removing or reducing the presence of discharge structures (and the stigma associated with their presence in the coastal environment), and/or on the extent to which it holds or reduces discharge volumes and/or significantly improves discharge quality and consistency.

Matt noted that this is different to concept of the 'existing environment' that is applied under the RMA where the existing environment is defined as the environment that would exist without the WWTP discharge.

In assessing how the community will view the effect of each WWTP discharge option on social and community values Matt has therefore applied the community perspective, rather than the strict RMA based approach.

In this respect Matt noted:

- Even when the current wastewater is treated to a very high standard, the continued activity of discharging treated wastewater to the coastal environment will be seen as being 'bad', impacting how the community perceives it can access, use and enjoy the area affected by the discharge
- By moving the discharge point further south along the coast, this may open the section of the coast subject to existing discharges to greater access and use by the community, however it will affect the new section of coastline, reducing the current and potential use, access to and enjoyment of that location.
- The new offshore long outfall (option 3) on the other hand will be notably more favourable than option 1 and 2, due to it moving the discharge point away from the sensitive and accessible shoreline. Removal of the shoreline discharge will create a perception of the coastal edge being more available for use and enjoyment.
- The boating community might be less favourable to the long outfall, but in terms of the comparatively small marine area affected, the further dilution of discharges associated with outfall mixing, the largely 'invisible' presence of the offshore outfall, and the smaller number

of people being affected, the social and community effects of this discharge would be far less than those associated with a continued shoreline discharge

Miria asked whether any marine or other recreational activities would be restricted by the long outfall? Matt said that provided the offshore outfall discharge continued to be treated to a very high standard and the outfall location was not within a specifically recognised offshore site or specific location of high value or significance, then the social and community effect of the long offshore outfall discharge should not be significant, and an improvement to the existing shoreline discharge alternative.

It was assumed that there would be a 'no anchoring zone area' around the outfall. This should still not have a significant impact on the activities in the area, given the relatively small spatial area a no anchoring area would affect relative to the wider offshore coastal environment. It would be unfair to give this factor a comparative or greater 'effect' weighting relative to the other options considered.

Zeke wanted to know if the scores still showed the same ratings as with when the network options were included (i.e. are the scores the same as the score recommended at the June MCA).

Matt noted that the three treatment plant options had been assessed purely on their own merits.

He further noted that the adverse effects of the existing outfall would be improved because of the WWTP plant capacity upgrades. However, community perceptions will persist of discharges effecting values along the coast (related to the stigma associated with wastewater- treated or otherwise) despite how well the upgrades are communicated.

Rob asked that when comparing Graeme's Report with Matt's Report, why the existing outfall is not downgraded slightly more.

Matt indicated that his assessment had recognised that the quality of discharges from the WWTP would be improved under all options with the upgraded capacity of the treatment plant. All discharge options essentially removed untreated or partially treated overflow or by pass discharge events (except as otherwise might occur in an emergency or with a process failure at the plant).

Rob indicated that he thought that the scores with options 1 and 2 were still probably too high and might not accurately reflect likely community perceptions. He suggested that it would be appropriate to drop the scores for both Option 1 and 2 by 0.5, and Option 3 by 0.5.

Initial scores for Option 1 and 2 were: 4 → 3.5 now, and Option 3 scored: 5 → 4.5 now

Following these discussions, the Group were happy with the change in scores.

<u>Post meeting note:</u>

Following the workshop completion Matt provided an update to his assessment for option 2 (new shoreline discharge).

Matt noted that if option 2 involved the retention of existing shoreline discharge structure for backup emergency discharge, the continued presence of the existing outfall (used or otherwise) combined with the new shoreline discharge site would result in option 2 having greater impact on social and community values than option 1. The continued presence and occasional use of the existing outfall site – regardless of the standard of discharge treatment- would continue to stigmatise the locality as a wastewater outfall site. This would continue to limit social and community access to, use and enjoyment of this area. On this basis Option 2 scoring was amended to be a further 0.5 lower than option 1.

Technology

In Ron's absence, Steve Hutchison (reviewer of Ron's Report) presented the findings of the technology assessment.

Steve provided some context regarding the new modelling of the plant when adding the additional 44% growth in population, means that the current plant can still meet the existing consent limits Currently it's at levels around 5-12mg/L BOD and is estimated to go up to 15-20mg/L BOD, which is still well below the concentration number set in the consent limit.

Graeme raised the issue of Ammonia limits and whether a limit might be set within a future consent? Steve indicated that there is not a current consent limit on Ammonia levels and that the PWWTP is the only plant currently configured to try and reduce it. David Cameron mentioned that there is no indication that Ammonia toxicity is or will be an issue at this stage. Graeme said we should however just be mindful to this aspect.

When discussing the technology scoring, Steve noted that:

- Option 1: The existing outfall had the highest score with no major changes required meaning there is little technological challenge for this option, scoring at 5
- Option 2: Round point will be more complex requiring both the construction of a new shoreline outfall in an environment with limited access, but also requiring the installation, operation and maintenance of an energy dissipation mechanism, scores a 3
- Option 3: Similarly, the long outfall will also have a score of 3, but with different reasons, as it would be difficult technology to construct.

Miria wanted to know whether long ocean outfalls are more reliable than the shoreline ones? Steve said, no and that they are very much the same, all have very good technology. Very robust to last a long time. Richard also mentioned that Option 2 would be less resilient due to the need for electrical equipment and valve components, which will have a shorter lifespan than pipe work.

Rob wanted to know whether the former outfall drop structure, which puts the discharge below the water line would be replaced. Steve indicated that they lost a part of that structure in a storm but does not think it is playing a significant part in the dilution of the wastewater. There would only be some improvement at the immediate 10m section, but not overall. Visually there is not a significant problem on the shoreline. There are also some challenges in replacing this aspect of the outfall as it would require the discharged to be stopped for a period of time.

Anna mentioned that there were some community comments regarding odour at the existing outfall during the public meeting. Steve stated that it's probably more likely to be from decaying seaweeds that are causing the odour as most of the wastewater are treated and does not smell. Richard mentioned that there is no need to have an air consent at the outfall, as we are doing a reconsent for the air discharge at the plant itself, which is currently underway.

Graeme further wanted to know if there could potentially be some aerosol spray effects at the outfall. Steve should not think so, as the outfall is maybe at a 0.5m drop.

Steve thus concluded that there are technical challenges for both Options 2 and 3, it is just different to each other but gets to the same score. The existing outfall definitely has the least technological challenges and thus the highest score out of the three options in relation to this criterion.

David Down raised the issue of consentability and the process of determining that. Also wanted to know how does this come into the works, such as will we get the different technology consented?

Zeke mentioned that it will be difficult to answer this now, as there are a lot of assumptions. After the AEE – we will be able to see if it would be consentable or not. However, Richard noted that the range of criterion being applied through the MCA are intended to provide some guidance on the consentability of the options, i.e. if options score very poorly across several of the RMA related criteria then this would provide an indication that obtaining resource consent for the option may be very difficult.

Following the discussion, the Group did not make any changes to the recommended scores for this criterion.

Resilience

Steve further presented the resilience criterion across all three options. All discharge options involve construction on the rocky shoreline and in the case of the ocean outfall the sediment seabed. All will have relatively high resilience due to being concrete structures, waterproof and able to be submerged.

When looking at natural hazards, there are no known fault lines, liquefaction zones or seismic high ground shaking areas for any of the discharge options. Steve noted that the resilience assessment has assumed the retention of the existing outfall as part of option 2. As a result, option 2, i.e. a new shoreline outfall at Round Point, provides some form of added operational resilience because of the redundancy that would be provided with the existing outfall retained as a back-up.

This point resulted in discussion amongst the workshop attendees. It was identified that in the social and community, tangata whenua values and natural character and landscape reports it had been assumed that under option 2 the existing outfall would be removed.

Miria wanted to know if the existing outfall is not removed will maintenance checks be required over its lifetime. Steve indicated that it will not really need any maintenance, only yearly checks, if and when required. It will potentially only be used during maintenance work on the Option 2 outfall, on rare occasions such as maybe once in five years or so.

Matt mentioned that retaining the existing outfall as backup under option 2 might change the community scores, as it might change community perception on having two outfalls with no bypass vs having no back up. Miria and Linda concurred in terms of the Tangata whenua values and landscape assessments.

As a result of this discussion, the group agreed that the base assumption that should be applied is that the existing outfall is retained. Additional scores for the social and community, Tangata whenua values, resilience, landscape and natural character and cost criterion will be provided based on the alternative assumption that the existing outfall is not retained under option 2. These alternative scores would be used for sensitivity analysis.

In terms of the resilience criterion Steve noted that Option 2 would score a 5 if the existing outfall is retained as backup, but would only score 4 if the existing outfall is removed and therefore the operational resilience of the option reduced.

No changes were made to the scores for options 1 and 3.

Natural Character, landscape and visual amenity

Linda took us through her assessment and indicated again what natural character and landscape means, namely that it includes effects on natural character of the coastal environment, landscape fabric, landscape character and visual amenity.

Linda indicated that very limited impacts will occur during construction for the upgrade and existing options. Option 1 therefore should go up to a score of 4 and Option 2 then goes up to score of 3. Also, the existing outfall is part of the existing landscape and then there would be minimum changes and impacts. The new outfall at round point will have quite a bit of new construction and impacts with structures (relating to energy dissipation) not currently there, which would then score a 2.

Zeke raised the question if the natural character of the area takes into effect what is currently there, and then what changes are proposed? Or is it based on the concept of 'existing environment' used under the RMA. Linda indicated that she looked at the level of change in the existing landscape, thus it includes all existing structures in the current state and what changes will occur from there.

Mary stated that all construction work for the existing or long outfall will primarily be temporary and either underground or under the shoreline, correct? Steve said that this is correct and that it would have less impact on the area than the new outfall at round point (i.e Option 2).

Miria wanted to know if the structure would allow public access to the new round point. Steve said that it would not prevent access outright, but some infrastructure may need to be fenced which would prevent access to very localised areas within the small bay. These would likely be back from the foreshore.

Linda indicated that the pipe may be on the seabed / medium height and pinned to secure it on or below the seabed. Then the impacts need to assume any of these aspects. Matt raised that the costing will also be affected from these different options is that correct? Steve answered yes it this has been taken into account. David Cameron mentioned that Cawthron has indicated that the character changes from the first 150m from rocky to last 50m as sandier.

Linda further noted that Option 3 would have potentially moderate adverse effects on coastal processes (sediment movement and aquatic life) during installation and until sediment settles and new aquatic life takes hold on plinths, reducing to moderate-low biophysical effect. The visual effects are limited to seafloor with no visible components at the sea surface. Closer to surface at shoreline with some visual effects.

Further to this Linda indicated that the adverse effects will be balanced by the positive effect of replacing the existing shoreline outfall with an ocean outfall that is not visible from the shore or sea surface, and because the operation of the long outfall would have less effect on water qaulity and ecology as indicated by Dave Cameron's assessment. This option has potential to reduce the adverse visual effects of the coastal environment by allowing the existing shoreline outfall to be returned to a more natural state.

After some discussion it was agreed that Option 2 score will be 2.5 if the existing outfall is retained, whereas Option 2 will score a 3 if the existing outfall is decommissioned. Scores for options 1 and 3 were agreed to as recommended.

Cost

Richard mentioned that Ron presented the same costs as per MCA for Treatment options, and that this does not include the WWTP capacity upgrades as the funding for these is already committed. He also noted that the cost estimates assume that the upgrade to the outfall between the UV and tunnel will be required. The need for this upgrade is yet to be confirmed.

David Down indicated that the community at the public meeting saw different costs to these: 40M vs 28M for the long outfall. David Down further mentioned that these are 100-year-old structures, which will have some costs associated but well minimizing over time. Only Capex. No operational maintenance costs are included.

Based on this discussion and the discussion that occurred earlier in relation to option 2 the group agreed to ASK Ron to update the cost estimates for the options taking into account the following:

1. Review all costs estimates to ensure that they align with Wellington Water's latest policy on calculating contingency
2. Review all cost estimates to ensure that they include the cost of the committed WWTP capacity upgrades

3. Provide an alternative cost estimate for option 2 based on the assumption that the existing outfall is removed.

Summary of the MCA outcome & next steps

The criterion scores agreed at the workshop are set out in the following table. The numbers in brackets for option 2 are scores if the existing outfall was to be removed as part of the option.

Table 1 - Criterion Scores Agreed at Workshop

Option	Public Health	Water quality & ecology	Tangata whenua values	Growth	Social & community	Technology	Resilience	Natural Character & landscape
1	3.5	4	4	5	3.5	5	4	4
2	4	4	3.5	5	3 (3.5)	3	5 (4)	2.5 (3)
3	4.5	5	4.5	5	4.5	3	4	3.5

Richard noted that he would run the scores through the MCA tool using all weighting scenarios agreed at the Collaborative Group meeting on 25 March 2019 and also test the sensitivity of the outcome to alternative assumptions regarding the retention of the existing outfall as a backup in option 2. This will help us understand how sensitive the option rankings are to different assumptions.

Richard noted that as the cost estimates and the small number of other scores need to be revised by the comparative assessment authors it is not possible to provide overall MCA scores for each option as this point[2].

What happens now:

- Write up meeting notes
- Update costs and contingencies
- Compile MCA-2 Summary report
- Meet with Collaborative Group incl. with NGati Toa and provide feedback on MCA-2
- Meet with 3W Committee and obtain final option approvals, then going through to the JV Committee.

Richard then thanked everyone for their participation in the workshop.

[2] The overall MCA results are set out in the *"Porirua Wastewater Programme – WWTP MCA Outcomes"* report.

Attachment 1 – MCA Workshop Briefing Slides

Porirua Wastewater Programme

WWTP Multi Criteria Analysis Workshop

28 August 2019

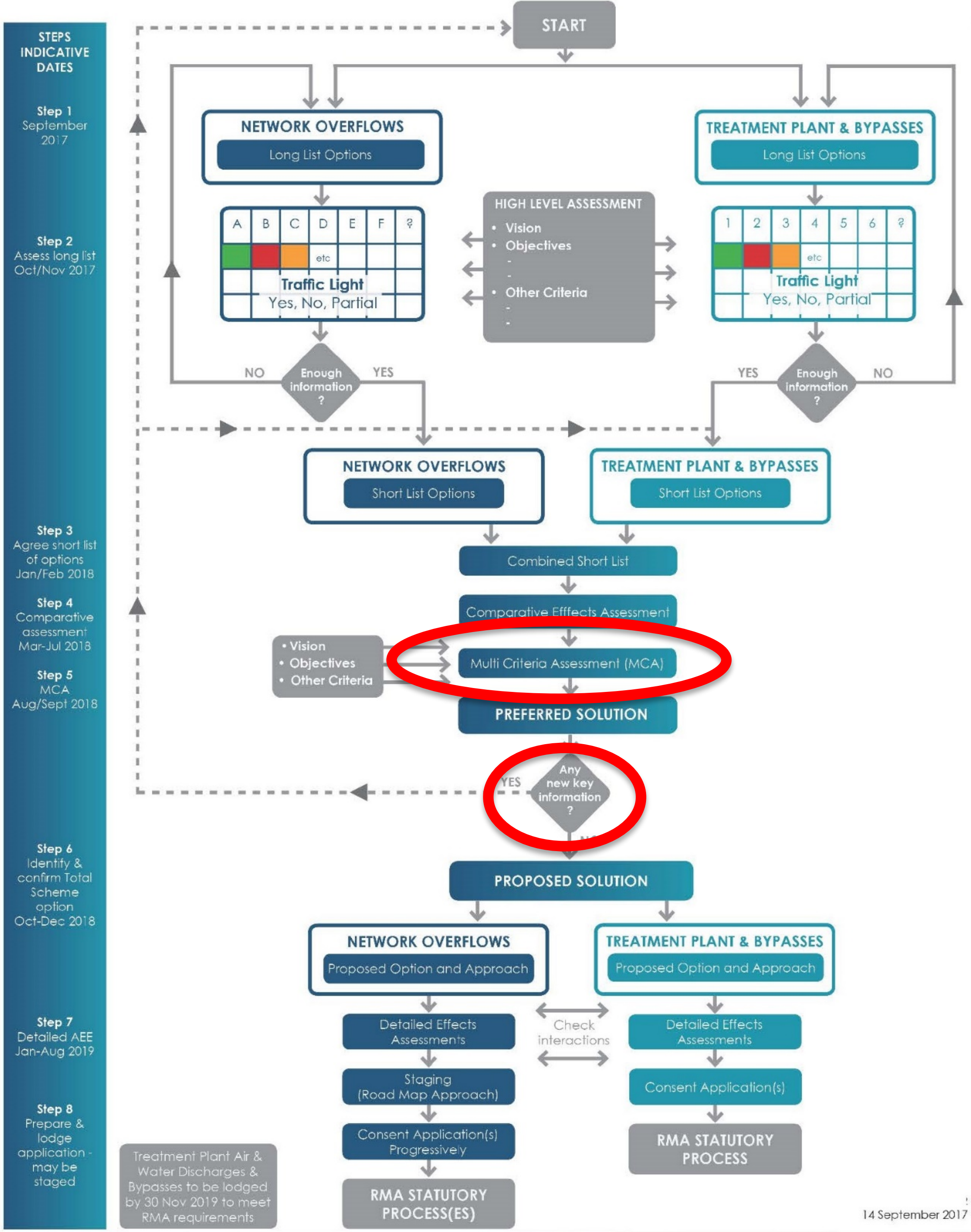
Wellington Water

Our water, our future.

Agenda

1. Context
2. Comparative assessments & recommended scores
3. Sensitivity Analysis

Context



Wellington Water

Background to today's MCA

Our water, our future.

Key new information

Wellington Water

1. Te Awarua-o-Porirua Whaitua

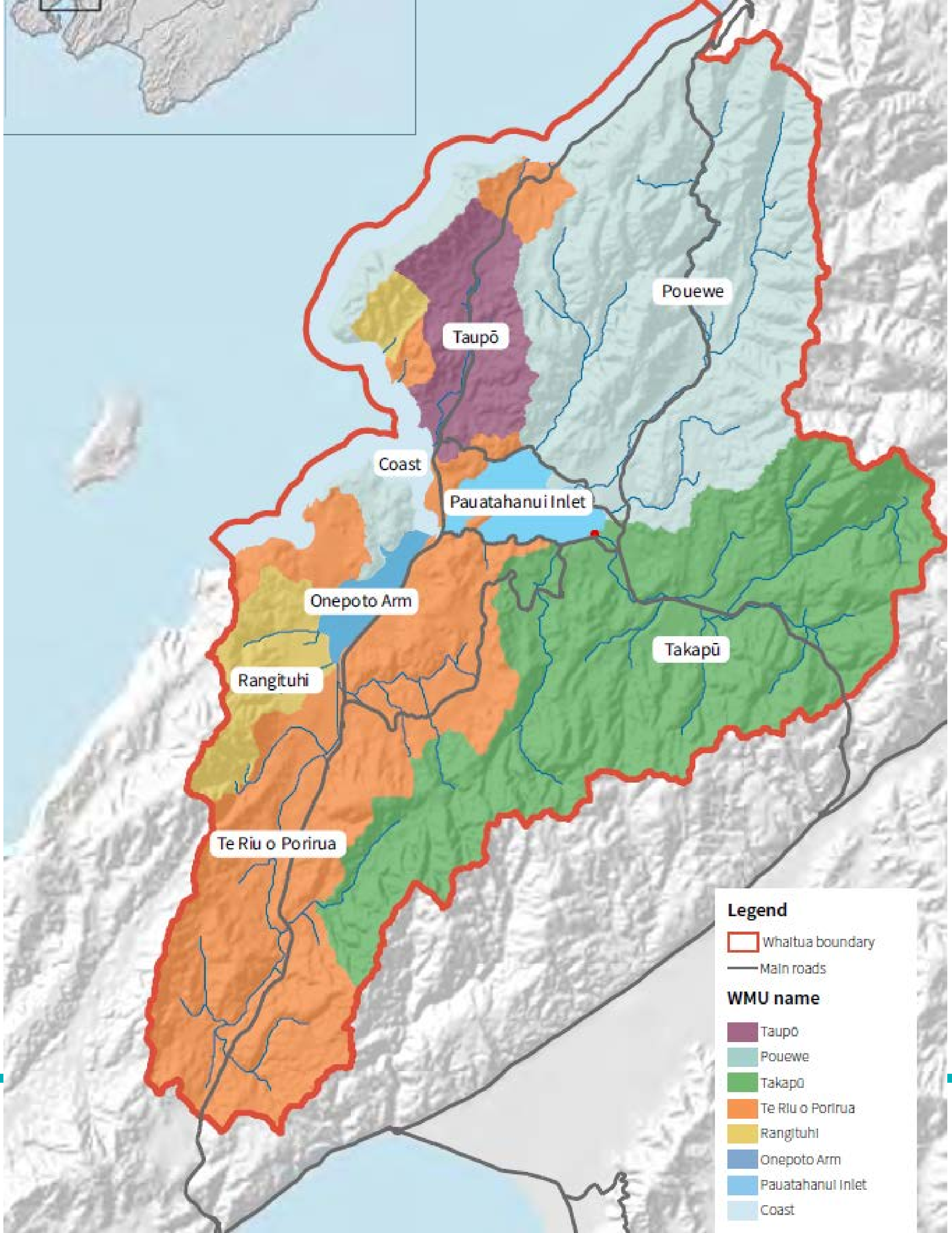
Freshwater WMU group			Taupō	Rangituhi	Pouewe	Takapū	Te Riu o Porirua
E. coli	CURRENT STATE		E	E	E	E	E
	FRESHWATER OBJECTIVE	OBJECTIVE STATE	B	A	B	C	C
		% EXCEEDANCES 540cfu/100mL ≤	10%	5%	10%	20%	20%
		% EXCEEDANCES 260cfu/100mL ≤	30%	20%	30%	30%	30%
		MEDIAN CONCENTRATION (*E. coli*/100mL) ≤	130	130	130	130	130
		95TH PERCENTILE CONCENTRATION (*E. coli*/100mL) ≤	1000	540	1000	1200	1200
		OBJECTIVES TO BE MET BY	2040	2040	2040	2040	2040

Key new information

Wellington Water

1. Te Awarua-o-Porirua Whaitua

Coast WMU group			Onepoto Arm		Pauatahanui Inlet		Coastal
			Intertidal	Subtidal	Intertidal	Subtidal	
Enterococci	CURRENT STATE		D		D		B
	COASTAL OBJECTIVE	OBJECTIVE STATE	C		B		B
		EXCEEDANCES 500cfu/ 100mL ≤	20%		10%		10%
		95TH PERCENTILE CONCENTRATION (ENTEROCOCCI/ 100mL) ≤	500		200		200
		OBJECTIVES TO BE MET BY	2040		2040		M



Wellington Water

Our water, our future.

Key new information

Wellington Water

2. Option cost

- Cost of all 9 short listed option $300-400M
- Network elements account for approximately 90% of this estimated cost
- Significant increase in estimates for network elements of the options during the long list phase
- At long list phase all network options carried through the short list scored ‘green’ – within LTP budgets
- Significant opportunity cost to address other sources of contamination (dry weather & stormwater)

Weighting

Wellington Water

- Agreed by Collaborative Group
- Base weighting:
  - Cost = 25% of final score
  - Qualitative criteria = 75% of final score
- Weight of individual qualitative criteria determined by importance
- Sensitivity analysis on weighting of cost (0%, 25%, 50%) and qualitative criteria

Weighting

Wellington Water

Scenario	Criteria							
	Public Health	Water Quality & Ecology	Tangata Whenua Values	Growth	Social & Community	Technology	Resilience	Natural Character & Landscape
Base weighting 1 ('Growth at 10')	15.2	15.2	15.2	15.2	10.6	7.6	10.6	10.6
Base weighting 2 ('Growth at 8')	15.6	15.6	15.6	12.5	10.9	7.8	10.9	10.9
Higher weight to technology (Base scenario 1)	14.7	14.7	14.7	14.7	10.3	10.3	10.3	10.3
Higher weight to technology (Base scenario 2)	15.2	15.2	15.2	12.1	10.6	10.6	10.6	10.6
Lower weight to technology & resilience (Base scenario 1)	16.1	16.1	16.1	16.1	11.3	4.8	8.1	11.3
Lower weight to technology & resilience (Base scenario 2)	16.7	16.7	16.7	13.3	11.7	5.0	8.3	11.7
Equal weighting to all criteria	12.5	12.5	12.5	12.5	12.5	12.5	12.5	12.5

Water Quality & Ecology

Table 1: Water quality and ecology scoring categories from one to five

Criteria	Description	One	Two	Three	Four	Five
Water quality & ecology	Including the coastal environment and terrestrial ecology	High adverse effects	Moderate to high adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Improved water quality in CMA close to existing outfall compared with status quo due to elimination of bypass discharges. Low ecological effects beyond 200m [-1.0].
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Construction effects for new shoreline outfall localised and temporary [0] Reduced water quality in CMA close to new outfall, especially in terms of nutrients and salinity, but Low ecological effect beyond 200m. Improved conditions near the existing outfall. [-1.0]
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	4.5	Construction of new outfall involves extensive but temporary seabed disturbance, plus some permanent changes if the pipeline remains exposed. [-0.5] Improved water quality in CMA due to higher mixing efficiency and better separation from sensitive rocky reef habitats. Negligible ecological effect beyond 20m [0]

Public Health

Wellington Water

Table 2-1 Public Health Effects/Outcomes Scoring Categories

Criteria	Description	One	Two	Three	Four	Five
Public Health Risk	Direct physical health risk associated with contact recreation and food gathering	High public health risk	Moderate to high public health risk	Moderate public health risk	Low to moderate public health risk	Low public health risk

Wellington Water

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	3.5	Improved microbiological shoreline water quality near existing outfall and in Titahi Bay. Compliance with PNRP bathing criterion but possible exceedance of MfE bathing guidelines under future peak flows. Moderate risk to shoreline bathers and possibly walkers near outfall site.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Improved microbiological shoreline water quality near existing outfall and in Titahi Bay (ie greater than for Option 1). However, reduction in water quality near outfall approximately 500m to west. Compliance with PNRP bathing criterion but possible exceedance of MfE bathing guidelines under future peak flows. Moderate risk to shoreline bathers and possibly walkers near new outfall site.
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	5	Significantly improved microbiological shoreline water quality at all shorelines sites result in either very low (10m) or negligible (15m) risks to shoreline bathers and walkers. Compliance with PNRP bathing criterion and MfE bathing guidelines under future peak flows.

Wellington Water

Tangata Whenua values

Table 1: Scoring Thresholds for Porirua Wastewater Programme Short List Assessment

Criteria	Description	One	Two	Three	Four	Five
Tangata Whenua Values	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa.	High adverse effects	Moderate to high adverse effects.	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

Option	Total score	MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	29	4	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Improved shoreline water quality is anticipated in the vicinity of the existing outfall and in Titahi Bay • Adverse effects on cultural heritage values are considered to be extremely unlikely. • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • Avoidance of any new adverse effects as no construction or modification work would be required for the continued operation of the existing outfall.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	25	3.5	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Improved water quality is anticipated near the existing outfall and in the vicinity of Titahi Bay • However, a significant reduction of shoreline water quality is expected in the vicinity of the new outfall (at Te Korohiwa Rocks).

			• Heritage values associated with waahi tupuna and/or sites of cultural significance in the vicinity of Te korohiwa Rocks could be adversely affected from construction and operation of the new outfall. • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • The establishment of a new shoreline outfall will generate new effects on the coastal environment, including potentially adverse effects on cultural values (e.g. kaimoana & mahinga kai).
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	31	4.5	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Significantly improved water quality is anticipated at all shoreline sites • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • Adverse effects on cultural heritage values are considered to be extremely unlikely. • Dispersal and dilution of wastewater discharges to the marine environment will be significantly enhanced (compared with shoreline options), and no reduction of shoreline water quality is anticipated. • A new ocean outfall would be significantly separated from Titahi Bay, further reducing any adverse water quality effects in the area.

Growth

MCA Scoring

Wellington Water

- Three WWTP shortlist options were scored.
- The scoring categories range from one to five depending on the predicted level of adverse effect.

Criteria	Description	One	Two	Three	Four	Five
Growth	Supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures	Would not fully support long term growth needs, and would not support medium term growth needs	Fully supports long term growth needs but does not even partially support medium term growth needs	Fully supports long term growth needs and partially supports medium term growth needs	Fully supports long term growth needs and largely supports medium term growth needs	Fully supports long and medium term growth needs

Projected Growth

Wellington Water

Porirua WWTP catchment area (Porirua City and North Wellington, Johnsonville and Paparangi north) projected to experience high population and housing growth :

Population growth scenarios

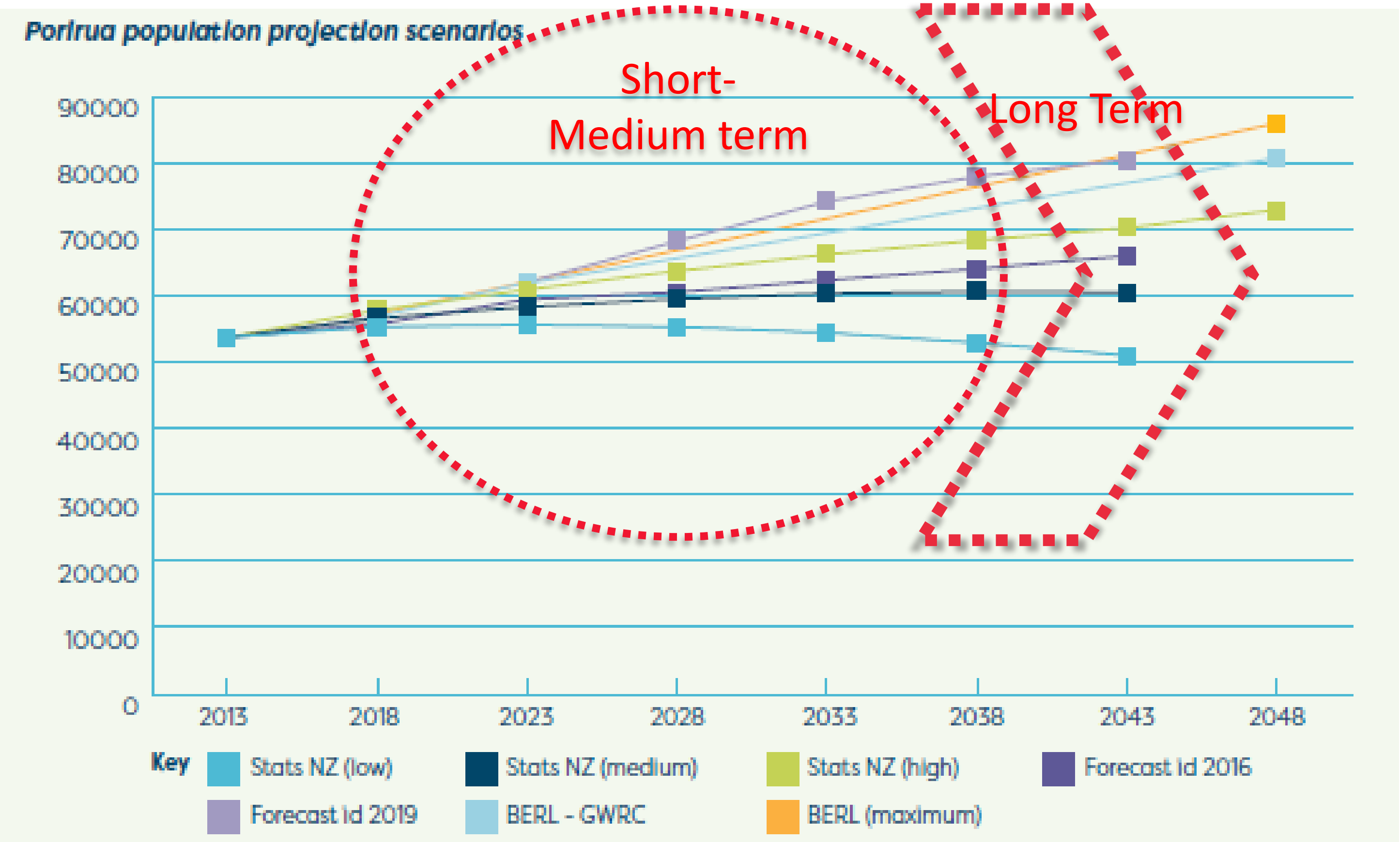
- +15-20% population (2018-2043) **medium** projection
- **~+44%** population (2018-2043) **high** projection
- **~1%-2% p.a.** sustained catchment growth

Planning for growth

- = ~13,000 new homes or +37,000 residents (high projection)

Projected Growth (Porirua City)

Wellington Water



5 BERL's two scenarios (based on Stats NZ high-growth scenario) project Porirua's population to grow by an additional 16, 300 to 17,900.

Projected Growth

Wellington Water

Porirua WWTP catchment:

- Catchment population 84,000 (2018) to **121,000** (2043)

Current WWTP capacity

- Average daily flow @2018 = 306L/s (84,000 population)
- PWWTP peak flow capacity currently 1275L/s

Planned WWTP capacity

- Average daily flow @2043 = 440L/s (121,00 population)
- PWWTP peak flow capacity planned upgrades= 1500L/s

Comparative assessment of options

Option	Assessment 1-5	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	Meets **short- and medium-term growth needs**. Option results in WWTP processing capacity not being exceeded at any time.
1. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	Meets **short- and medium-term growth needs**. Option results in WWTP processing capacity not being exceeded at any time. **Timing/staging of discharge point relocation does not impact WWTP's processing capacity and treatment quality, and its ability to meet processing and treatment demands associated with growth.**
1. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	5	Meets **short- and medium-term growth needs**. Option results in WWTP processing capacity not being exceeded at any time. **Timing/staging of offshore outfall construction and operationalisation does not impact WWTP's processing capacity and treatment quality, and its ability to meet processing and treatment demands associated with growth.**

Social & community

Assessment criteria

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Social and Community criteria considered :

- Local Amenity values (excluding visual amenity)
- Recreation values
- Heritage values
- Other social and cultural activities, practice and perceptions (excl mana whenua)

Assessment criteria

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Social and Community criteria considered :

- Positive and/or negative effects of option on values,
- Short to medium term effects (0-15 years) on values
- Long term effects (15 +) on values.
- Two limbed assessment:
  - Direct effect of option on social and community values
  - Whether option results in any change in effect

MCA Scoring

- Three shortlist options were scored.
- The scoring categories range from one to five depending on the predicted level of adverse effect.

Criteria	Description	One	Two	Three	Four	Five
Social and community	Amenity (Excluding visual), recreation and heritage, including perception	High adverse effects **OR** **No** short, medium- **or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Moderate to High adverse effects **AND/OR** **Minimal – modest** short, medium- **and/or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and/or** the WWTP	Moderate adverse effects **AND/OR** **Modest** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Low adverse effects **AND/OR** **Moderate** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP	Very Low or nil adverse effects **AND** **Moderate to Significant** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWN **and** the WWTP

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Comparative assessment of options

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Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**4**	All WWTP discharges to coast = high standard treatment
1. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	All WWTP discharges to coast = high standard treatment BUT relocation of outfall potentially impacts existing heritage site if not appropriate designed.
1. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	**5**	All WWTP discharges to offshore = high standard treatment Moderate to significant short, medium- and long- term improvement in remedying degraded social and community values

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Technology

Criteria	Description	One	Two	Three	Four	Five
Technology	Enduring, reliable, and providing flexibility for future technology changes and capacity upgrades.	Technology is very complex, proven to not be enduring & to be unreliable, and does not provide any staging / flexibility.	Technology is complex, proven to be enduring or reliable, but not both. The technology also provides only limited staging / flexibility.	Technology is complex, proven to be enduring & reliable, but provides limited staging / flexibility.	Technology is routine, proven to be enduring & reliable, and provides partial staging / flexibility.	Technology is simple, proven to be enduring & reliable, and provides total staging / flexibility.

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	No modifications required for 1500 L/s capacity Simple, proven, enduring, reliable
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	3	Complex technology challenges Technical difficulties/access with the pipeline construction in difficult terrain Drop structure and energy dissipating valves require significant design considerations, but are proven
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	3	Complex but proven and significant investigations and design inputs are required Construction is technically challenging Ocean outfalls are enduring and reliable

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Resilience

Criteria	Description	One	Two	Three	Four	Five
Resilience	Climate change, natural hazards and operation resilience	High risk in the known hazard-scape. Performance will be severely affected by climate change over 50 years.	Moderate to high risk in known hazard-scape. Performance will be moderately to severely affected by climate change over 50 years. No improvement in operational resilience.	Moderate risk in known hazard-scape. Performance will be moderately affected by climate change over 50 years. No improvement in operational resilience.	Low to moderate risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Some improvement in operational resilience as a result of redundancy	Low risk in known hazard-scape. Performance will be unaffected by climate change over 50 years. Improves operational resilience as a result of redundancy

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	No known fault lines, liquefaction zones or seismic high ground shaking areas Provides some operational resilience because of the redundancy Not impacted by sea level rise
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise

Natural character, landscape, visual amenity

Criteria		One	Two	Three	Four	Five
Landscape, Visual & Natural Character		Significant adverse effect	High adverse effect	Moderate adverse effect	Low adverse effect	Negligible adverse effect

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	3	Duplication of pipe at outfall – resulting in Low increase in effect. Shoreline structure within an area already modified – level of change likely to have a Low adverse effect Opportunity to enhance extg outfall as part of duplication and upgrade of land based components. Note: outfall in this location will be retained for redundancy and as back-up for maintenance, regardless of option selected.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	2	New industrial character structure of moderate scale located in a largely unmodified, natural coastal environment in an area of high natural character Will require rock excavation for new drop structure with potentially high adverse landscape and visual effects Coastal location within an area of high visual amenity
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	2.5	Ocean outfall from Rukutane Point to a depth of 15m will extend into area of High Natural Character at the shoreline and out to Very High Natural Character at a distance of 695m from the shoreline. Potential moderate-high effects on seafloor with placement of raised concrete block plinths to support the new outfall pipe – perforated along last 150m to disperse and dilute the effluent, resulting in low effect on water quality. Potential moderate adverse effects on coastal processes (sediment movement and aquatic life) during installation and until sediment settles and new aquatic life takes hold on plinths, reducing to moderate-low biophysical effect. Visual effects limited to seafloor with no visible components at the sea surface. Closer to surface at shoreline with some visual effects.

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Cost

WWTP discharge options and costs for 1500 L/s

	Existing shoreline outfall	New shoreline outfall	New ocen outfall
UV to drop structure duplication	$2 M	0	$ 2 M
Pipeline and outfall	0	$8 M	$25 M
Total Capex	**$2 M**	**$8 M**	**$27 M**
Total NPV	**$3 M**	**$9 M**	**$28 M**

Cost

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1. Identify the option with the highest NPV and give this option a score of 1

2. Calculate the score for the other options using this standard formula:

   Score for option A = ((1 - (NPV of option A / highest NPV)) x 4) + 1

   - The formula creates a ratio between the option NPV and the highest NPV.
   - It then inverts this ratio by subtracting it from 1. This is done to ensure that an option with a high NPV is awarded a low score. This is consistent with the scoring of other criteria in which the most negative outcomes have been given the lowest scores.
   - Finally, the formula converts the ratio into a score between 1 and 5 by multiplying it by 4 and adding 1 (the score already awarded to the option with the highest NPV).

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Option	1	2	3
NPV	$3M	$9M	$28M
Score	4.57	3.71	1

Attachment 2 – Comparative Assessment Technical Memos

Comparative Assessment Report

To:	Wellington Water	From:	Graeme Jenner
File:	Porirua WWTP Comparative Assessment	Date:	23rd August 2019 (updated 12 September 2019)

Reference: Porirua WWTP Options: Comparative Assessment and recommended MCA scores for public health criterion

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on nine combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop, I prepared a comparative assessment of those none options and recommended MCA scores in relation to the public health criterion.

As new key information has arisen, since the evaluation of the short list commenced, it has been decided to re-evaluate the WWTP components of the short list as stand-alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

The assessment report has been prepared by Graeme Jenner (Connect Water). Graeme has a Master of Science (Hons) from Canterbury University and has worked for Beca Consultants Ltd (Connect Water partner) for over 20 years. He is a Senior Associate – Environmental with Beca and has extensive experience in the investigation and assessment of the environmental effects of wastewater discharges throughout New Zealand.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- *Porirua WWTP Consent - Population and Flows*; memo to Stantec from Ron Haverland (Connect Water) dated 22 August 2019
- Draft *Porirua WWTP Outfall: Assessment of Effects of Different Outfall Options on the Marine Environment* (Report No: 3380) dated August 2019; prepared by for Wellington Water by Cawthron Institute.

1.5 LIMITATIONS OF ASSESSMENT

This assessment is based on available information for the purposes of comparing the three shortlist options. It is necessarily a high-level, qualitative assessment and does not constitute an assessment of effects of the quantitative risks to public health (primary/secondary contact recreation or shellfish gathering), in regard to any of the options.

Focus on contact recreation

This assessment focuses on the comparative risk of discharges at three different sites on contact recreation, although it is acknowledged that some shellfish gathering occurs along parts of the coastline. The August 2019 Cawthron draft report confirmed that there is a lack of filter feeding shellfish (such as greenshell mussels, cockles and pipis), that are suitable for gathering and consumption in the vicinity of the three discharge sites. Work carried out by Victoria University biologists indicates that the paucity of mussels relates to a lack of food (suspended particles) in Cook Strait waters. The lack of a suitable habitat and significant current movements along the coastline limits cockles and pipis to some areas -mainly within Porirua Harbour.

However, Cawthron did note that the little black mussel was abundant at the existing outfall and adjacent shoreline locations. Little black mussels can cover rocky shorelines in a dense mat. However, their very small size means that they are not likely to be popular with seafood gatherers. A number of paua were also recorded by Cawthron around the outfall. This higher localised abundance of paua likely reflects an absence, or very low level of gathering, due to the presence of the discharge. Shellfish such as paua are grazers and (unlike filter feeders), are therefore unlikely to accumulate contaminants such as pathogens in the gut. As such, the risks to shellfish gatherers in the area of the three discharge sites is very low. Regardless, for completeness, the QMRA to be prepared for the consent application will assess the risks of consuming shellfish such as mussels.

Few fish were recorded at the sample locations by Cawthron. Consuming fish caught along the coastline represents a similarly low risk as consuming paua.

Small particles such as viruses can be contained in spray droplets generated through wave and wind action on the sea surface. The risk of aerosolization of pathogens through wave and wind action on the surface wastewater plume after discharge was not considered in my memo for the June 25 Workshop. These risks would only be relevant to shoreline users in close proximity to the discharge. For completeness, this issue has been qualitatively considered in this memo - noting that the QMRA will also further quantify the actual aerosolization risks,

DHI modelling and discharge flows

As with my memo prepared for the 25th June Workshop, the comparative effects of the three WWTP options has been re-assessed based on the results of modelling carried out by DHI Ltd (April 2019). These results were compared with the coastal bacteriological criterion (ie 95-percentile value of enterococci less than 500 organisms/100mls), as set out in the Proposed Natural Resources Plan.

The DHI modelling was based on a current day and future average daily flows from the WWTP of 300 L/s and 455 L/s respectively. A future peak wet weather flow of 1500 L/s was also considered. While an overflow scenario (with peak discharge rate of 2,600L/s) was also modelled, this is no longer relevant to the three options now being considered.

The Connect Water memo indicates a revised current average daily flow of 306L/s and a predicted average daily flow of 440L/s in 2043 (ie assuming a 20-year consent is granted). When upgrades are complete, the WWTP will have capacity to treat all flows secondary level plus UV disinfection for flows up to 1500L/s.

The revised existing and future (2043) average daily flows are very similar to those already modelled by DHI and are therefore considered to be appropriate for the purposes of this assessment. However, it is noted that DHI will be re-running their model for the updated flows which will be used as the basis for the QMRA process. The peak flow treatment capacity of 1500L/s has already been modelled.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

The assessment criteria used in my memo to the June 25 Workshop remain relevant to this assessment. However, the risk associated with the aerosolization of pathogens such as viruses has also been included.

Small particles such as viruses can be contained in spray droplets generated through wave and wind action on the sea surface. These risks would only be relevant to shoreline users in close proximity to the discharge. For completeness, this issue has been qualitatively considered in this memo - noting that the QMRA will also further quantify the actual aerosolization risks,

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP will be as set out in the Connect Water memo dated 23 August 2019;
- All flows to 1500L/S will be treated to good secondary level with UV disinfection resulting in a discharge quality *(enterococci*) of 1000 organisms/100mls on a 95th percentile basis (ie assumed worst case);
- The outfall modelling results are as carried out by DHI (April 2019);
- The assessment is based on the discharge of the bacterial indicator organism (*enterococci*). A QMRA is yet to be completed which will better quantify the risks to water and shoreline users from the discharge of pathogenic viruses.

3. CURRENT STATE OF DISCHARGE/RECEIVING ENVIRONMENT

The draft Cawthron Report confirms the lack of filter feeding shellfish such as greenshell mussels in the area of any of the outfall sites. Otherwise, it is assumed that the current state of the discharge and receiving environment (including water quality and recreational use) is as set out in Sections 2.5 and 2.10. of my memo to the 25th July Workshop.

4. COMPARATIVE ASSESSMENT

The new score for the existing outfall is recommended as the same as that for Option 3 (twin network storage and no overflows) in my memo for the June workshop. However, I have increased the score for the Round Point outfall option relative to the score for Option 6 (twin network storage and no overflows) by 0.5 due to the expected improved impact on Titahi Bay water users. The offshore outfall score remains the same as it would result in an expected removal of public health risks to shoreline users.

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	3.5	Improved microbiological shoreline water quality near existing outfall and in Titahi Bay. Compliance with PNRP bathing criterion under future dry weather and peak flows at all sites modelled by DHI (note that nearest sites modelled are 200m SW and 200m E of current discharge). In absence of QMRA, assume moderate risk to shoreline bathers and possibly walkers near outfall site.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Improved microbiological shoreline water quality near existing outfall and in Titahi Bay (ie greater than for Option 1 due to greater distance from Bay). However, reduction in shoreline water quality near new outfall approximately 500m to west of current site. Compliance with PNRP bathing criterion under future dry weather and peak flows at all sites modelled by DHI. In absence of QMRA, assume moderate risk to shoreline bathers and possibly walkers near new outfall site.
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	5	Significantly improved microbiological shoreline water quality at all shoreline sites modelled by DHI. Compliance with PNRP bathing criterion under future dry and peak flow at all sites modelled. In absence of QMRA, assume either very low (10m) or negligible (15m) risks to shoreline bathers and walkers.

Memo

To:	Ilze Rautenbach	From:	David Cameron
	Stantec		Stantec
File:	Porirua WWTP Collaborative Assessment	Date:	August 26, 2019

Reference: **Porirua WWTP Options: Comparative Assessment and recommended MCA scores for Water Quality and Ecology criterion**

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on nine combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those nine options and recommended MCA scores in relation to water quality and ecology criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand-alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. My evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

The assessment report has been prepared by David Cameron (Stantec). David is a Principal Environmental Scientist with Stantec and has worked for Stantec for over 25 years. He has extensive experience in water quality, aquatic ecology and the assessment of effects of wastewater discharges to freshwater and marine habitats.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019
- Connect waters flow memo (due on August 22, 2019)
- Proposed Natural Resources Plan (decision version)

1.5 LIMITATIONS OF ASSESSMENT

This assessment is based on available information for the purpose of comparing the WWTP options. It is necessarily a high-level assessment and does not constitute an assessment of effects.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

The 'Water Quality/Ecology' criteria were broken down into the following two sub-criteria:

- coastal water (water quality & aquatic ecology); and
- terrestrial ecology.

The three options were scored against the coastal and terrestrial sub-criteria according to the categories shown in Table 1. From a starting position of 5, a value between 0 and 5 is subtracted according to the magnitude of effect determined for each sub-criterion. The aggregate 5-(x) gives the final MCA score for each option.

Table 1: Water quality and ecology scoring categories from one to five

Criteria	Description	One	Two	Three	Four	Five
Water quality & ecology	Including the coastal environment and terrestrial ecology	High adverse effects	Moderate to high adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

This assessment differs from the 25 June work where four sub-criteria were scored (freshwater streams, Porirua Harbour, coastal water, terrestrial ecology). The removal of wastewater network options and associated sub-criteria may change the final score in some cases.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP will be as set out in the Connect Water memo dated August 22, 2019
- Projected wastewater flows do not require duplication of the existing outfall under option 1, and do not require increasing the capacity of any land-based infrastructure between the UV facility and the outfall.
- A new shoreline outfall under option 2 is assumed to cause temporary disturbance to a small area with moderate terrestrial ecological value.
- A new offshore outfall under option 3 is assumed to cause temporary disturbance to small area on the landward side with moderate ecological value and temporary disturbance to an area of intertidal and subtidal rocky reef habitat with high ecological value.

3. PROPOSED NATURAL RESOURCES PLAN (DECISION VERSION)

The Objectives and Schedules of the Proposed Natural Resources Plan (PNRP) are as described in a Stantec memo prepared for the June 25 workshop (Cameron, June 7, 2019); the recent decision has not changed these components of the PNRP.

4. CURRENT STATE

The current state of Porirua Coastal Waters is as described in a Stantec memo prepared for the June 25 workshop (Cameron, June 7, 2019). A marine ecology survey report received subsequent to that memo (Cawthron 2019) provided a much improved understanding of the effects of the existing discharge:

> *"The preliminary risk assessment for the present outfall at Rukutane Point (Morrisey 2018) assumed that effects were likely to be similar to those of the discharges of secondary-treated wastewater, and periodic bypass events, at Bluff Point and Karori West. However, the surveys of the intertidal and shallow subtidal hard-substrata around the existing outfall at Rukutane Point, and of equivalent areas away from it (500 m in the case of Round Point and 300 m in the case of the reference location), did not provide any clear evidence that the current discharge has resulted in increased growth of algae, or abundances of grazer invertebrates, as consequence of increased nutrient availability.*
>
> *This lack of observed effects suggests that dispersion and dilution of the discharge at Rukutane Point is sufficient to reduce concentrations of nutrients to ecologically acceptable levels."*

5. COMPARATIVE ASSESSMENT

Table 2 provides a preliminary assessment of the potential impacts on water quality and ecology of three WWTP/Outfall options. The recommended MCA scores indicate low to moderate adverse effects for options 1and 2 and a slightly lesser impact for option 3.

Table 2: Summary of water quality and ecology comparative assessment

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Improved water quality in CMA close to existing outfall compared with status quo due to elimination of bypass discharges. Low ecological effects beyond 200m [-1.0].
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	Construction effects for new shoreline outfall localised and temporary [0] Reduced water quality in CMA close to new outfall, especially in terms of nutrients and salinity, but Low ecological effect beyond 200m. Improved conditions near the existing outfall. [-1.0]
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	4.5	Construction of new outfall involves extensive but temporary seabed disturbance, plus some permanent changes if the pipeline remains exposed. [-0.5] Improved water quality in CMA due to higher mixing efficiency and better separation from sensitive rocky reef habitats. Negligible ecological effect beyond 20m [0]

Memo

To:	Wellington Water	From:	Miria Pomare
File:	Porirua WWTP Comparative Assessment	Date:	August 27, 2019

Reference: Porirua WWTP Options: Comparative Assessment and recommended MCA scores for the Tangata whenua values criterion

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the Tangata whenua values criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

This assessment of WWTP options has been prepared by Miria Pomare, on behalf of Te Runanga o Toa Rangatira. The Runanga is the mandated iwi authority for the descendants of Ngati Toa Rangatira (Ngati Toa), who migrated to the Cook Strait area following their migration south from Kawhia in the 1820's and have continued to exercise exclusive Tangata whenua status in Porirua ever since. Miria is herself a descendant of Ngati Toa and is highly regarded for her local historical knowledge and understanding of tikanga maori. She holds a Masters degree in Political Science and has extensive experience as an iwi practitioner of the Resource Management Act. She has worked closely with her Ngati Toa Iwi for over 20 years in various roles relating to environmental issues and resource management. Over this time, she has developed effective working relationships with local/central government as an advocate for iwi participation in resource management planning and decision-making processes. She is also an accredited RMA Commissioner and has been involved in dozens of hearings to determine resource consent applications and district/regional plan review processes. She was also recently appointed to the Environment Court as a Deputy Commissioner.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019
- Connect waters flow memo (due on August 23)
- Comparative Assessment of Public Health Effects/Outcomes (17 May 2019)
- Summary Results of DHI Outfall Discharge Modelling (Appendix A of Public Health Effects/Outcomes report)
- Comparative Assessment of Water Quality and Ecology Effects (7 June 2019)

1.5 LIMITATIONS OF ASSESSMENT

This assessment is limited to consideration of available information for the purposes of comparing the three outfall options. In particular, the lack of currently available information on the methods of construction and the nature of the infrastructure to be installed in relation to the two new outfall options (options 2 & 3) has constrained any consideration of the construction and ongoing operational effects. As such, this is necessarily a high-level assessment of Tangata whenua values and does not constitute an assessment of cultural effects.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

A similar approach as was undertaken in my previous report for the MCA workshop in June has been adopted in this assessment of WWTP options.

The three proposed outfall options have each been assessed against the seven sub-criteria comprising the Tangata whenua values criterion (including effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa). The MCA scores for each option are attached in Appendix A. The sub-criteria for each option have been allocated individual scores in accordance with the cultural effects thresholds (1-5) provided in Table 1 below.

Table 1: Scoring Thresholds for Porirua Wastewater Programme Short List Assessment

Criteria	Description	One	Two	Three	Four	Five
Tangata Whenua Values	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa.	High adverse effects	Moderate to high adverse effects.	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects

These individual scores have then been tallied up to provide a total score for each option. These total scores have been divided by 7 (being the number of sub-criteria) to provide an aggregate (average) score between 1-5. This gives the overall MCA score for each option provided in Table 2 below.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP will be as set out in the Connect Water memo dated 23 August, 2019
- Projected wastewater flows do not require duplication of the existing outfall under option 1, and do not require increasing the capacity of any land-based infrastructure between the UV facility and the outfall.
- Projected wastewater flows to the WWTP are within capacity of the full treatment process, removing the requirement for partial treatment of stormflows and eliminating bypass discharges to the coastal environment.
- The offshore ocean outfall (option 3) will provide significant dispersal and dilution of wastewater discharges compared with shoreline options (1 & 2).
- No additional construction or modification work will be required for the continued operation of the existing outfall at Rukutane Point (option 1).

3. CURRENT STATE

The 'Current State' or 'Ngati Toa world view' provides the cultural context within which this assessment has been undertaken and is set out in section 2.1 of my earlier report.

4. COMPARATIVE ASSESSMENT

Table 2: Summary of recommended scores for WWTP options against 'Tangata whenua values' criterion

Option	Total score	MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	29	4	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Improved shoreline water quality is anticipated in the vicinity of the existing outfall and in Titahi Bay • Adverse effects on cultural heritage values are considered to be extremely unlikely. • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • Avoidance of any new adverse effects as no construction or modification work would be required for the continued operation of the existing outfall.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	25	3.5	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Improved water quality is anticipated near the existing outfall and in the vicinity of Titahi Bay • However, a significant reduction of shoreline water quality is expected in the vicinity of the new outfall (at Te

			Korohiwa Rocks). • Heritage values associated with waahi tupuna and/or sites of cultural significance in the vicinity of Te korohiwa Rocks could be adversely affected from construction and operation of the new outfall. • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • The establishment of a new shoreline outfall will generate new effects on the coastal environment, including potentially adverse effects on cultural values (e.g. kaimoana & mahinga kai).
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	31	4.5	Adverse effects on Tangata whenua values are anticipated to be **low to moderate** as: • Only fully treated wastewater of high quality will be discharged via the WWTP to the coastal environment. • Significantly improved water quality is anticipated at all shoreline sites • Satisfaction of Ngati Toa's preference for full treatment of wastewater discharges to water (including the marine environment), to mitigate against the likelihood of spiritual/cultural contamination resulting from contact with human waste. • Adverse effects on cultural heritage values are considered to be extremely unlikely. • Dispersal and dilution of wastewater discharges to the marine environment will be significantly enhanced (compared with shoreline options), and no reduction of shoreline water quality is anticipated. • A new ocean outfall would be significantly separated from Titahi Bay, further reducing any adverse water quality effects in the area.

APPENDIX A: SCORES FOR EACH OPTION AGAINST 'TANGATA WHENUA VALUES'

Option 1 – Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated

Table A 1: Option 1

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua valueS	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana				X	
Mahinga kai				X	
Heritage					X
Whakapapa				X	
SCORE			29		

Option 2 – Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated

Table A 2: Option 2

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse Effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri				X	
Mana				X	
Hauora				X	
Kai moana			X		
Mahinga kai			X		
Heritage			X		
Whakapapa				X	
SCORE			25		

Option 3 – Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

Table A 3: Option 3

CRITERIA	ONE	TWO	THREE	FOUR	FIVE
Tangata whenua values	High adverse effects	Moderate to High adverse effects	Moderate adverse effects	Low to moderate adverse effects	Low adverse effects
Mauri					X
Mana				X	
Hauora					X
Kai moana				X	
Mahinga kai				X	
Heritage					X
Whakapapa				X	
SCORE			31		

Comparative Assessment Report

To:	Wellington Water	From:	Matt Trlin (Connect Water)
File:	Porirua WWTP Comparative Assessment: GROWTH	Date:	August 26, 2019

Reference: Porirua WWTP Options: Comparative Assessment and recommended MCA scores for GROWTH criterion

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the GROWTH criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop.

Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

This assessment has been prepared by Matt Trlin (Connect Water) and reviewed by Richard Peterson (Stantec).

Matt is a Principal- Planning at Beca Consultants Ltd (Connect Water partner), and Richard is a Principal Planner at Stantec.

Matt has been with Beca since 2016. Prior to joining Beca Matt worked in local government, including 15 years at Porirua City Council as the Manager Environment and City Planning. Matt has extensive experience in urban and environmental planning and management, strategic planning, district plan development, and water infrastructure planning and consenting.

Richard is a planner with over 20 years' experience. He has worked at Stantec for 4 years and during that time has worked on various infrastructure projects and is currently involved in resource consent projects for three wastewater treatment plants.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Connect waters population and flow memo (August 22, 2019)

1.5 LIMITATIONS OF ASSESSMENT

The short list options presented are concept designs.

This assessment assumes:

- each of the 3 options is able to be technically constructed and operated
- each of the options will involve staging and sequencing elements and may be progressively implemented over a 20-year time frame, with the option being fully rolled out and completed by year 20
- that the 'roll out' or 'staged delivery' of each option will provide sufficient WWTP treatment capacity in advance of any growth in waste water network volumes within the network.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

Table 1 sets out a 5-point scoring system, for the Growth criteria to score each of the 3 short list options.

The assessment considers the extent to which each option will be able to accommodate growth generated increases in waste water volumes conveyed by the network to the WWTP in the short (0-5 year), medium(6-15year) and long term (15year +):

- Without deterioration in the existing standard of waste water treatment at the WWTP,
- Without deterioration in the frequency and/or volume of WWTP bypass or overflow discharge events associated with planned and committed upgrades to the WWTP capacity (to 1500l/s).

Table 1: Scoring approach for Porirua Wastewater Programme Short List Multi Criteria Assessment: GROWTH

Criteria	Description	One	Two	Three	Four	Five
Growth	Supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures	Would not fully support long term growth needs, and would not support medium term growth needs	Fully supports long term growth needs but does not even partially support medium term growth needs	Fully supports long term growth needs and partially supports medium term growth needs	Fully supports long term growth needs and largely supports medium term growth needs	Fully supports long and medium term growth needs

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP are as set out in the Connect Water memo dated 22 August, 2019
- Projected wastewater flows do <u>not</u> require duplication of the existing outfall under option 1, and do <u>not</u> require increasing the capacity of any land based infrastructure between the UV facility and the outfall.

PORIRUA WASTE WATER NETWORK AND WASTE WATER TREATMENT PLANT GROWTH ASSUMPTIONS

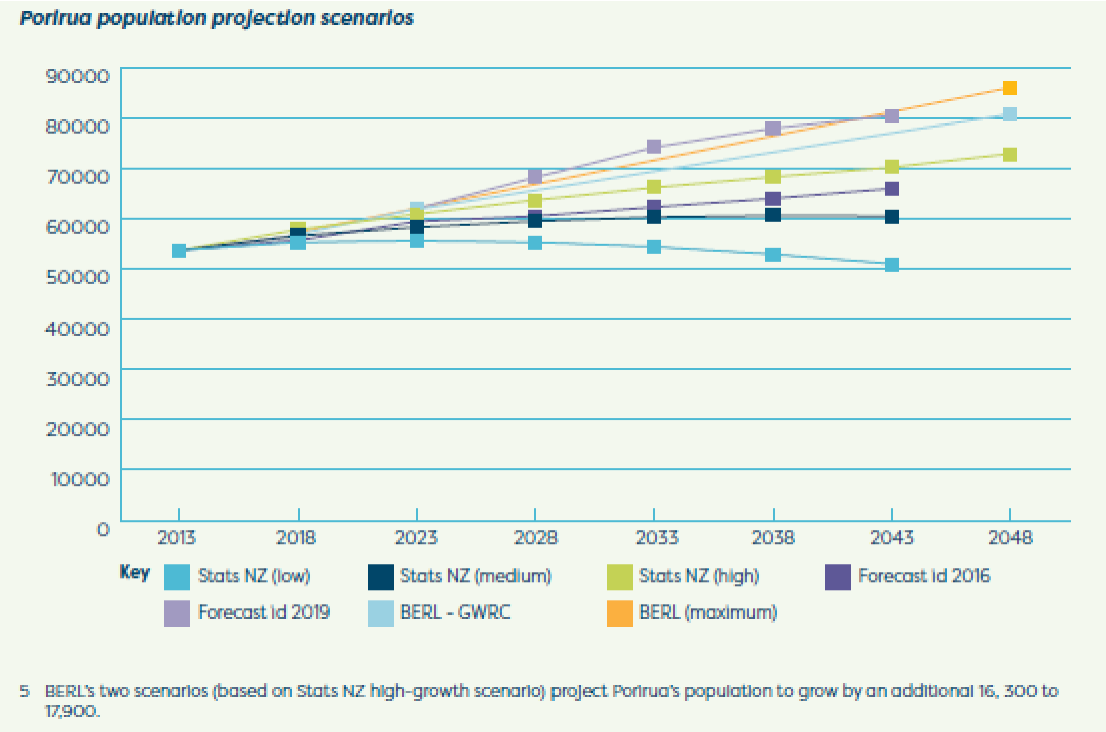
Growth assumptions for residential development and population growth within the Porirua WWTP catchment are described in the **Porirua Growth Strategy 2048** (the growth strategy).

The growth strategy identifies that this growth will lead to increased waste water conveyance and treatment demands on the Porirua Wastewater network and treatment plant

In summary the growth strategy currently identifies (**Table 2**) that the Porirua WWTP catchment area, encompassing Porirua City and north Wellington (encompassing the suburbs of Paparangi and Johnsonville north to Tawa), is likely to experience a sustained period of consistent and potentially high population and housing growth over the 20 year reconsenting life for the WWTP (projected to cover the period 2023-2043).

Population growth within this catchment (currently 1% growth p.a.) may potentially rise to a sustained level of growth 2% p.a. The growth strategy and material contained in Connect Waters memo (22 August 2019) identifies that under a high growth scenario in this catchment ~64% of growth in the WWTP catchment area is likely to occur in Porirua City by 2043.

Table 2: Porirua City population projection scenarios (excludes northern Wellington)



EXISTING DEVELOPMENTS

Key existing green field, brown field and community redevelopment residential growth areas are located within both Porirua and Wellington City.

Within Porirua key greenfield, brownfield and community redevelopment growth areas are located at Aotea, Eastern Porirua (Porirua East, Cannons Creek, Waitangirua, Ascot Park), Whitby, and Kenepuru.

Within Wellington City green field and brown field residential growth areas are located at Stebbings Valley, Lincolnshire farm, and Grenada north.

These existing development areas, based on documented historical development trends and projected Wellington regional urban growth trends (Greater Wellington Regional Council, 2018) are expected to continue to support existing and sustained levels of new housing demand over each of their anticipated development lifecycles.

Infill growth is also expected to be sustained and, in some cases, increase within Wellington city's existing northern residential communities (Johnsonville and Tawa), and within Porirua's existing older seaside suburbs of Titahi Bay, Plimmerton, Mana, to a lesser extent Paremata.

Inner city residential development and growth may occur within the Porirua City Centre.

TRANSMISSION GULLY MOTORWAY, EASTERN PORIRUA REGENERATION, NORTHERN PORIRUA URBAN GROWTH AREA

The opening of transmission gully motorway in 2020/21 and enhanced accessibility to Eastern Porirua, coupled with the commencement of a new planned urban growth greenfield development north of Plimmerton and central governments $1.5 billion investment into the regeneration of eastern Porirua, is anticipated to drive increased growth activity particularly within the Porirua City portion of the PWWTP catchment. This is expected to drive growth rates in Porirua City that exceed growth projected in Wellington's northern suburbs.

GROWTH ASSUMPTIONS

For the purpose for this assessment, and referencing the forecasts produced by Forecast.id, Stats NZ, it is assumed the PWWTP catchment's residential population, and housing stock, will grow between 2018 and 2043 by **at least 15-20%** (**Medium growth projections** Forecast .id and Stas NZ, 2018.)

Potentially population and housing growth over this period could be **as high as 44%** (**High growth projections** Beryl, 2018; Connect Water memo, 22 August 2019)).

Beryl, 2018, has identified that there are strong regional growth indicators that support planning for high growth within the PWWTP catchment area.

Under a sustained high growth scenario, this could result in up to 13,000 new homes, accommodating up to 37,000 new residents, being constructed within the existing PWWTP catchment area in the next 20 years.

This would increase the WWTP's catchment population from approximately 84,000 residents (2018) to 121,000 (2043).

The effect of this growth will be to increase the level of sustained wastewater conveyance to the PWWTP from a current average daily flow of 306 L/s (2018) to 440L/s (2043), increasing total discharge volumes from the plant.

During peak storm conditions the peak flow to the plant will increase from 1275L/s to 1500L/s with current planned upgrades to conveyance to the plant and plant treatment capacity upgrades.

PLANNING FOR GROWTH

Wellington Water's waste water network improvement plan, infrastructure strategy and its supporting consenting programme currently provides for the possibility of high residential population growth projections not only being met but potentially being sustained over the next 20 years, and long term potentially being sustained out to 2057.

Network planning and consenting must, based on historical development trends and largely corroborating information developed for population and urban growth projections by Stats NZ, Forecast.id and Beryl, assume that medium residential growth projections (at least) will be sustained within the catchment out to 2043.

Under the National Policy Statement on Urban Development Capacity, active provision also needs to be made in city planning, and related waste water network and treatment plant planning, investment and consenting, to not just anticipate but appropriately plan, provide for and include provision for meeting or accommodating high growth projections.

Equally Council's network infrastructure planning and investment planning processes also need to include responsible provision for ensuring that a degree of flexibility is retained in network planning, design and investment staging and upgrade delivery, to ensure that communities are not unduly burdened with developing, servicing and funding assets designed for growth which never arrived.

ECONOMIC DEVELOPMENT

Economic development within urban areas has the potential to increase wastewater flows and contaminant loads in addition to increases associated with residential growth. Potential industrial development, involving trade waste discharges, is of particular relevance to the future contaminant load within a city's wastewater.

Porirua's growth strategy provides for a medium term 'employment' area near the transmission gully interchange at Waitangirua. Long term employment areas are provided for along adjacent to transmission gully motorway and state highway 58.

'Wet' industries (requiring access to large water volumes and related waste water treatment capacity) have not traditionally chosen to locate in the Porirua WWTP catchment area.

This assessment has assumed that the Porirua WWTP catchment area will remain unattractive attract to wet industries. Industrial and commercial waste water growth are also assumed to remain tied to any increase in local population.

WASTE WATER NETWORK AND WASTE WATER TREATMENT PLANT OPTIONS

A short list of 3 Waste Water Treatment Plant improvement options have been developed for assessment, targeted at managing WWTP treatment discharges.

These options have a servicing horizon for meeting urban growth out to at least 2043.

2043 corresponds with a potential 20- year consenting life that may be attached to the reconsenting of the Porirua Waste Water Treatment Plant Discharges.

The 2043-time horizon very conservatively assumes a PWWTP consent lodged in 2020 will be granted by no later than 2023.

3. CURRENT STATE

PORIRUA WASTE WATER SYSTEM PERFORMANCE

The performance of the existing Porirua Wastewater System (encompassing the PWWN and WWTP) is detailed in the Water Quality, Ecology and Public Health criteria assessments.

4. COMPARATIVE ASSESSMENT

Preliminary scores for the 3 WWTP options against the Growth criteria are provided in **Table 3.**

Each option details the various factors that were considered in determining the option score.

Each option includes a **summary assessment statement** which references the score against the scoring criteria in **Table 1**.

Table 4: Porirua Wastewater Treatment Plant options – Growth

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**5**	Option is capable of processing increased average daily flows, generated by growth, to WWTP and peak flow conveyance to the plant (which is constrained by network conveyance delivery capacity to the WWTP). Peak flows are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges or bypasses occur from WWTP under peak flow loadings under this option. PWWTP able to treat all received flows to current LOS throughout a 20-year period, up to 2043. **Summary assessment:** Option **supports short- and medium-term growth needs** by processing and treating growth in average daily waste water flow to the WWTP and processing peak flow loadings delivered to the plant. Option results in WWTP processing capacity not being exceeded at any time.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**5**	Option is capable of processing increased average daily flows, generated by growth, to WWTP and peak flow conveyance to the plant (which is constrained by network conveyance delivery capacity to the WWTP). Peak flows are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges or bypasses occur from WWTP under peak flow loadings under this option. PWWTP able to treat all received flows to current LOS throughout a 20-year period, up to 2043. **Timing/staging of discharge point relocation <u>does not</u> impact WWTP's processing capacity and treatment quality, and its ability to meet processing and treatment demands associated with growth.** **Summary assessment:** Option **supports short- and medium-term growth needs** by processing and treating growth in average daily waste water flow to the WWTP and processing peak flow loadings delivered to the plant. Option results in WWTP processing capacity not being exceeded at any time.

3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	**5**	Option is capable of processing increased average daily flows, generated by growth, to WWTP and peak flow conveyance to the plant (which is constrained by network conveyance delivery capacity to the WWTP). Peak flows are able to remain within the WWTP design treatment capacity providing capacity for short, medium- and long-term growth at current treatment LOS. No partially treated discharges or bypasses occur from WWTP under peak flow loadings under this option. PWWTP able to treat all received flows to current LOS throughout a 20-year period, up to 2043. **Timing/staging of offshore outfall construction and operationalisation does not impact WWTP's processing capacity and treatment quality, and its ability to meet processing and treatment demands associated with growth.** **Summary assessment:** Option **supports short- and medium-term growth needs** by processing and treating growth in average daily waste water flow to the WWTP and processing peak flow loadings delivered to the plant. Option results in WWTP processing capacity not being exceeded at any time.

Comparative Assessment Report

To:	Wellington Water	From:	Matt Trlin (Connect Water)
File:	Porirua WWTP Comparative Assessment: SOCIAL AND COMMUNITY	Date:	August 30, 2019

Reference: Porirua WWTP Options: Comparative Assessment and recommended MCA scores for SOCIAL AND COMMUNITY criterion

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the SOCIAL AND COMMUNITY criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop.

Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

This assessment has been prepared by Matt Trlin (Connect Water) and reviewed by Richard Peterson (Stantec). Matt is a Principal- Planning at Beca Consultants Ltd (Connect Water partner), and Richard is a Principal Planner, Team Leader at Stantec.

Matt has been with Beca since 2016. Prior to joining Beca Matt worked in local government, including 15 years at Porirua City Council as the Manager Environment and City Planning. In this role Matt, working with Porirua City Council's Porirua Harbour Strategy coordinator, oversaw the development, roll out and delivery of the community and stakeholder engagement processes which informed the development of the Te Awarua o Porirua Harbour and Catchment strategy. Matt has extensive experience in urban and environmental planning and management, strategic planning, community and stakeholder engagement and consultation, and district plan development, and water infrastructure planning and consenting.

Richard is a planner with over 20-years' experience. He has worked at Stantec for 4 years and during that time has worked on various infrastructure projects and is currently involved in resource consent projects for three wastewater treatment plants.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop.

New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019
- Connect waters flow memo (August 22, 2019)
- Proposed Natural Resources Plan (decision version)

1.5 LIMITATIONS OF ASSESSMENT

The short list options presented are concept designs.

This assessment assumes:

- each of the 3 options is able to be technically constructed and operated
- each of the options will involve staging and sequencing elements and may be progressively implemented over a 20-year time frame, with the option being fully rolled out and completed by year 20
- that the 'roll out' or 'staged delivery' of each option will provide sufficient WWTP treatment capacity in advance of any growth in waste water network volumes within the network
- that the operation of the treatment plant is not error or risk free, and that waste treatment and discharge quality may vary subject to plant performance and management.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

Table 1 sets out a 5-point scoring system, for the Growth criteria to score each of the 3 short list options.

The scoring criteria assess the extent to which each assessed option is likely to affect recognised 'social and community values'.

Social and community values include:

- local amenity values (excluding visual amenity),
- recreation values
- heritage values, and
- community perceptions of effects on these values (excluding Tangata Whenua values).

For the purpose of this assessment, effects on social and community values include:

- Positive and/or negative effects of option construction, operation and management on identified values,
- Short to medium term effects (0-15 years) on identified values
- Long term effects (15years +) on identified values.

This includes the extent to which an assessed option is likely to result in either an improvement to or degradation of a recognised social and community value/s.

The assessment assumes that the effects of the existing operation of the current WWTP, including consented and unconsented WWTP discharges on the environment, currently define the existing state of the environment (whether accepted by the community or otherwise).

The assessment therefore assumes that social and community perceptions of the effects of each option will be based around the extent to which each option causes either an improvement to, worsening of or no change to the WWTP effects on the environment.

This assessment includes allowing for and recognising effects associated with growth related increases in waste water treatment plant discharged treatment volumes.

It is noted that this assessment approach differs from an assessment that would be taken for a Resource Management Act consenting assessment of effects on the environment. Under a RMA consenting assessment of an option, any assessment would be required to assess the proposal as if any existing discharges from the WWTP and any effects of those discharges on the environment, would not be occurring in the future (pending the outcome of the resource consent process).

For the purpose of this assessment and selecting a preferred option to progress and consent, it is assumed that the community perceptions of each option's effects on social and community values will be based on the relative impact of each option against the current status quo.

WWTP options assessment

This social and community assessment provides an overall judgement of the social and community effects associated with each option.

This assessment considers, within the limitations of the existing information currently available for each of these concept short listed options, the extent to which each option will:

- **Affect sites, places, facilities and activities**: Result in the development of new infrastructure that may directly affect, displace and/or disrupt existing social and community infrastructure, sites, places, facilities and/or activities, including recreational and heritage sites, places and facilities. This includes specific consideration of option effects on any site/s and/or places identified in the current operative District Plan with heritage values (Part HH historic Heritage). Sites of significance to Ngati Toa, and effects on mana whenua values, have been separately assessed as part of the Tangata Whenua values assessment.
- **Affect amenity values and perceptions:** Result in effects on amenity values and perceptions associated with a site, place or facility. This includes effects associated with infrastructure construction and operation affecting social and community perceptions of the values of that environment. This includes effects (excluding visual effects of structures, buildings and any temporary visual effects that may be associated construction activity) associated with providing for or continuing to discharge treated, partially treated and/or untreated waste water to local receiving environments. Effects include potential effects associated with the visual presence of new discharge structures (i.e. the structure is observed and is known to provide a discharge to the local environment.) visual effects associated with discharge residues/litter, and/or potential odour effects associated with the presence of waste water discharges.
- **Result in a change in effects:** Where discharges of treated, partially treated and/or untreated waste water continue the extent to which each option will result in:
    - A change (increase or decrease) to the volume and/or frequency of such discharges, and/or

- o A measurable and/or perceived change or effect on local social and community water based values (i.e. the ability to be able to use water for social and community activities such as bathing and contact recreation, food gathering), and
- o A measurable and/or perceived change or effect on any other identified local social and community amenity and/or recreational values.

Rob Greenaway's recreation assessment report, having considered community perceptions and comments on values and effects impacting recreational users, provides a useful summary of key effects that could be considered as a proxy for the above criteria, recognising that some community groups and individuals have identified that a permanent stigma is associated with the overflow of any waste water into the Te Awarua-o-Porirua's catchment, harbour and coastal environment. Proxy criteria for assessing changes in effects cover the extent to which each option has an effect on:

- o **Health warnings:** The frequency (increase or decrease) of health warnings in the study area for contact recreation
- o **Shellfish harvesting and consumption:** The ability to consume shellfish taken from within the study area (noting that other sources of pollution not related to the operation and management of the waste water treatment plant will continue)
- o **Habitat quality:** the quality of habitat for fish and shellfish

The scoring criteria in **Table 1** therefore includes a two limbed assessment of social and community effects, related to the direct effect of each option on social and community values and/or whether the option results in any change in existing effects on social and community values associated with the current discharge performance of the WWTP, the presence of the existing outfall.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP are as set out in the Connect Water memo dated 22 August, 2019
- Projected wastewater flows:
  - o do not require duplication of the existing outfall under option 1, and
  - o do not require increasing the capacity of any land based infrastructure between the UV facility and the outfall.
- Conveyance capacity to the WWTP will not be upgraded to exceed planned WWTP processing and treatment capacity.
- As a **primary** assumption it is assumed that:
  - o the existing coastal shoreline outfall will be **retained** as an emergency outfall as part of option 2 and will not be removed.
- As a **secondary** assumption it is assumed that:
  - o the existing coastal shoreline outfall will be **removed** as an emergency outfall as part of option 2. Some overflow facility would still need to be retained at this site however for the existing Rukutane Point pump station.

3. CURRENT STATE

PORIRUA WASTE WATER SYSTEM PERFORMANCE

The performance of the existing Porirua Wastewater System (encompassing the Network and Treatment Plant) is detailed in the Water Quality, Ecology and Public Health criteria assessments.

PORIRUA WASTE WATER TREATMENT PLANT CONTEXT AND SETTING

The Porirua Waste Water Treatment Plant (PWWTP) operates in an environment that is heavily-used for a wide variety of coastal and water based recreational and community activities.

The PWWTP discharges to a coastal environment and area that plays a significant role in servicing local and regional recreation needs and provides significant amenity values and services to both the local and regional community.

The report of Greenway and Associates outlines a range of services that are provided by Porirua's open coastline and beaches to the local and regional community.

Titahi Bay is a popular surfing site, particularly for beginners, and an important swimming beach, with the Titahi Bay Surf Lifesaving Club located centre-stage.

Fishing is popular offshore along the Mana Island marine bridge ('The Bridge') and off many rocky coastal areas.

Most of the Porirua coast has easy public access, and almost all has some form of access.

In line with these values PCC maintains an extensive recreational and public access network along and immediately adjacent to the coast designed to integrate with and utilise the amenity and recreation values of this environment.

Similarly, GWRC also maintains a regional park to the north of the existing WWTP discharge point (Whitireia) and in its environment regulatory role undertakes regular water and environmental quality monitoring for bathing, shell fish, and ecological habitat and community monitoring at various sites along the coast.

Social and community values associated with the coastal environment's amenity values and recreation access to and use of the harbour and its edges, also extend up to into the various freshwater catchments that drain to the harbour and coast.

Social and community values attached to the coastal environment relate to its utility, accessibility, shelter, and safety.

Greenaway concludes that the open coastal areas and beaches and margins adjacent to the WWTP are used for recreation, and while some areas may be used less intensely than others there is no area which can be described as low value.

Overall the values of this open coastal environment are **significant**, contributing toward defining Porirua as a place, influencing community wellbeing and defining community identity.

Threats to these values are associated with activities which impact or affect access to and use of the coast, water, water quality, amenity experiences, perceptions of health and safety and the social and recreational amenity experience of the environment.

This community and social value assessment of the 3 short list options for enhancements to the WWTP has considered the impact that each of the listed options is likely to have on these values.

Table 2: Scoring approach for Porirua Wastewater Programme Short List Multi Criteria Assessment: SOCIAL AND COMMUNITY

Criteria	Description	One	Two	Three	Four	Five
Social and community	Amenity (Excluding visual), recreation and heritage, including perception	High adverse effects **OR** **No** short, medium- **or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP	Moderate to High adverse effects **AND/OR** **Minimal – modest** short, medium- **and/or** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP	Moderate adverse effects **AND/OR** **Modest** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP	Low adverse effects **AND/OR** **Moderate** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP	Very Low or nil adverse effects **AND** **Moderate to Significant** short, medium- **and** long-term improvement in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP

4. COMPARATIVE ASSESSMENT

Preliminary scores for the 3 WWTP options against the SOCIAL AND COMMUNITY criteria are provided in **Table 2.**

Each option details the various factors that were considered in determining the option score.

Each option includes a **summary assessment statement** which references the score against the scoring criteria in **Table 1**.

Table 2: Porirua Wastewater Treatment Plant options – SOCIAL AND COMMUNITY

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**3.5**	<u>Short and medium term 0-15yrs:</u> Existing planned and committed WWTP upgrades will enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP at current high levels of treatment. Untreated overflow and/or bypass events are avoided (except in emergencies). This represents a notable improvement in the existing performance of the plant, removing partially treated bypass events and sustaining a high quality treatment and discharge under all but exceptional conditions (i.e plant and/or process failure). **Short to medium term low – moderate adverse effects** are generated on the existing social and community values of the existing coastal environment associated with maintaining fully treated peak flow discharges from the existing WWTP to the coastal foreshore. <u>Long term 15yrs+</u>**:** **Long term no improvement is provided to reducing existing effects of WWTP discharges on the coastal environment.** Existing outfalls are maintained, and overall treated waste water volumes are increased. Coastal environment and social and community values still exposed to risks and effects associated with plant and process failure. Social and community perceptions of discharge effects on social and community values of the coastal environment remain neutral, with acceptance that a retained shoreline discharge will have a continued impact on social and community values and perceptions associated with that environment- continuing to limit some recreation use and enjoyment of this environment irrespective of treatment quality. **However** high quality waste wqter treatment and avoidance of overflows/bypasses and limited use of warning signs, does not deteriorate existing use and enjoyment of environment.

		Summary assessment: Option results in treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal environment. In the **short, medium and long** term the option: • Does not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Improves overall community perceptions of the option positively impacting social and community values, by treating all flows into the WWTP to a high quality standard, providing greater confidence for access to coastal areas and edges, and use of water for recreational activities, including improvement in local amenity values The option results in a **moderate to significant short, medium- and long-term improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP. The option results in **moderate adverse effects** associated with the continued operation and discharge of treated WWTP discharges to the coastal environment, and risk exposure of environment to plant and/or process failure On this basis the option has an overall assessment of **3.5**
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**3.0** (3.5)	Short and medium term 0-15yrs: Consistent with Option 1, existing planned and committed WWTP upgrades enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP at current high levels of treatment. Untreated overflow and/or bypass events are avoided (except in emergencies). As with option 1 this represents a notable improvement in the existing performance of the plant, removing partially treated bypass events and sustaining a high quality treatment and discharge under all but exceptional conditions (i.e plant and/or process failure). **Short to medium term low – moderate adverse effects** are generated on the existing social and community values of the existing coastal environment associated with maintaining fully treated peak flow discharges from the existing WWTP to the coastal foreshore. New outfall location on shore line may or may not change community perceptions of effect of outfall presence on social and community values. It is assumed that some community perceptions will be of lower or improved effects on social and community values, associated with relocating the primary outfall further south, and 'opening' the existing outfall area (even with retained presence of existing outfall as an emergency overflow structure) to improved access and opportunities for community and social activities. Any prospect of reduced impacts on Titahi Bay will be positively received, although they may be undermined by presence of the 'remnant' outfall structures for emergency overflows. Countering any positive relocation benefit, parts of the community may be concerned with the impact of the new outfall location on the round point site.

		Long term 15yrs+**:** **Long term no improvement is provided to reducing existing effects of WWTP discharges on the coastal environment.** While a new shoreline outfall site is developed, this still results in waste water discharges to the coastal environment. Net discharge volumes of waste water to the coast also increased with optimization of WWTP processing capacity. Social and community perceptions of discharge effects on social and community values of the coastal environment remain neutral, with perception that new shoreline discharge results in modest to moderate impact on improving discharge effects on social and community values associated with the use of Titahi bay. Any perceived positive benefits may be tempered by the new outfall location potentially impacting heritage values at round point, and by retention of existing outfall structure for emergency overflow purposes. Presence of outfall also exposes coastal environment and social and community values to adverse discharge effects associated with plant or process failure (even though very low risk). However high level waste wqter treatment and avoidance of overflows/bypasses and limited use of warning signs, does not deteriorate existing use and enjoyment of environment. **Summary assessment:** Option results in continued treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal environment. In the **short, medium and long** term the option: • Does not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Potentially improves overall community perceptions of the option positively impacting social and community values, by relocating outfall further south of Titahi bay. This may provide greater confidence for access to coastal areas and edges around the existing outfall, and use of water for recreational activities, including improvement in local amenity values. However retained presence of existing outfall structures may still stigmatise use of area and neutralize any net benefit for moving outfall south. • A risk exists with option that outfall location and construction impacts on round point heritage site viewed as being additionally detrimental to existing undisturbed heritage values. For this assessment it is assumed that this can be avoided or appropriately mitigated in construction design, but this is a risk factor. The option results in a **moderate to significant short, medium- and long-term improvement** in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP. Assuming any potential outfall construction adverse effect on round point can be avoided or appropriately mitigated, option results in **moderate adverse effects** associated with the continued operation and discharge of treated WWTP discharges to the coastal environment, and retained risk exposure of environment to plant and/or process failure

		On this basis the option has an overall assessment of **3.0** If the existing outfall site was permanently removed or modified to be entirely visually absorbed into the local environment (i.e no stigmatizing presence), then the overall alternative assessment would be **3.5**.
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	**4.5**	Short and medium term 0-15yrs: A new offshore outfall eventually removes all treated waste water discharges from existing shoreline discharge site. Timing of the outfall installation could potentially result in significant short term positive impact by relocating waste water discharge away from shore line. Delays in relocating shore line discharge offshore, to the medium or long term, would result in greater short- and medium-term impact of existing shoreline outfall on social and community values associated with coastal environment. However these effects would be no worse than those assessed for options 1 and 2. Existing planned and committed WWTP upgrades enable the WWTP to fully process and treat all WWN flows capable of being supplied to WWTP. Untreated overflow and/or bypass events are avoided (except in emergencies). Risk of plant or process failure and exposure of environment to these effects means that it is not possible to score a 5. **Short to medium term moderate – significant improvements potentially** generated on existing social and community values of coastal environment by WWTP full treatment of all waste water discharges and construction of offshore outfall. Construction of new outfall results in temporary effects on social and community values, associated with recreation activity displacement and construction impacts on amenity values. Delayed outfall construction results in option having a similar short to medium effect on social and community values as options 1 and 2. Long term 15yr+**:** **Long term significant improvement in existing effects on social and community values associated with new outfall location** removing discharges from shoreline environment and reducing effects on Titahi Bay. Offshore dilution is assumed to not impact existing recreation fishing use of the off shore coastal discharge location, although discharge warnings may be provided. Offshore outfall location may have some effect on social and community perceptions of WWTP outfall impacts on coastal recreational values and use (i.e recreation fishing). **Summary assessment:**

		Option results in treatment, to a high standard, of all waste water conveyed to the WWTP, and of all WWTP discharges to coastal offshore environment. In the **short, medium and long** term option: • reduces warning signs and improves community confidence in accessing and using coast environment. • Does not increase peak discharges to the coastal outfall site, or deteriorate discharge quality • Improves overall community perceptions of the option positively impacting social and community values, by relocating outfall offshore, opening up use of coastal foreshore environment. This provides greater confidence for access to coastal areas and edges, and use of water for recreational activities, including improvement in local amenity values Option results in a **moderate to significant short, medium- and long-term <u>improvement</u>** in remedying or improving existing degraded social and community values resulting from the current operation of the WWTP. Assuming any outfall construction effects can be appropriately mitigated, options result in **moderate to significant improvement** in effects associated with treated WWTP discharges to the coastal environment, recognising that environment still exposed to risk of plant or process failure. On this basis option has an overall assessment of **4.5**

Memo

To:	Wellington Water	From:	Ron Haverland
File:	Porirua WWTP Comparative Assessment	Date:	26 August 2019

Reference: **Porirua WWTP Options: Comparative Assessment and recommended MCA scores for Technology criterion**

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the technology criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.2 AUTHORS' CREDENTIALS

This assessment has been prepared by Ron Haverland (Connect Water) and reviewed by Steve Hutchison (Wellington Water). Ron has a Bachelor of Civil Engineering (Hons) from Canterbury University and has worked for Beca Ltd (Connect Water partner) for over 20 years and has nearly 30 experience in the consulting industry. He is a Senior Associate – Wastewater Specialist with Beca and has extensive experience in the investigation, planning and options assessment of wastewater projects in New Zealand.

Steve has a Bachelor of Technology (Hons) from Massey University and is a Chartered Professional Engineer. He has worked in the consulting industry for most of his career and has extensive experience as a wastewater specialist working in this field for over 20 years. He is currently Chief Advisor Wastewater for Wellington Water.

1.3 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019

- Porirua WWTP Consent – Population and Flows, Connect Water, 22 August 2019

1.4 LIMITATIONS OF ASSESSMENT

The limitations to the assessment are as set out in the previous assessment.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA

The approach to the assessment and criteria are as set out in the previous assessment.

The assessment approach is based on discharge options being limited to a peak flow of 1500 L/s. Network modelling carried out by WCS Engineering includes scenarios for the optimised masterplan solution for the year 2057 and a 6 month ARI for constructed overflows, which limits the peak flow to the WWTP capacity of 1500 L/s.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP are as set out in the Connect Water memo dated 22 August, 2019
- Projected wastewater flows do <u>not</u> require duplication of the existing outfall under option 1
- There is some uncertainty regarding the actual hydraulic capacity of the section of outfall pipe from the UV plant to the outfall drop structure. This is to be confirmed with a calibration during a storm event. The cost estimates include a sum for the upgrade, assuming it is required. This is all land based infrastructure

2.3 ASSESSMENT

Discharge Options

Ocean outfalls are widely used with many cities in New Zealand discharging to shoreline or ocean outfalls. Outfall length will vary depending on the wastewater quality and the sensitivity of the receiving environment. Outfalls in NZ typically range from 500 to 3000 meters long. A multiport diffuser improves mixing and dilutions of 1:100 are typical immediately above ocean outfalls. Conceptual designs for the three discharge options were prepared as follows;

Existing shoreline outfall

The existing shoreline drop structure, tunnel and outfall is suitable for flows of 1500 L/s. Depending on the outcome of the calibration exercise noted in section 2.2, an upgrade of the pipeline from the UV plant to the drop structure may be required.

New shoreline outfall

A new shoreline outfall at Round Point requires the construction of a new outfall pipeline from the WWTP to the rocky shoreline. This coastal area is steep and there is limited opportunity to provide pipeline access to the foreshore and there are technical challenges with the pipeline construction in this difficult terrain. The drop in elevation from the treatment plant at around 30m to sea level requires either a drop structure or energy dissipating valves to reduce this energy. A drop structure requires the excavation of a vertical shaft in rock for the 30m drop. Energy dissipating valves require significant design considerations and careful valve selection, with power to the site and the valves in an enclosed compound in the bay at Round Point. Both these options have significant technology and construction challenges.

New ocean outfall

A new ocean outfall would be constructed with a length of approximately 700m with a diffuser at a depth of 15m. The inlet to the pipeline will require a new de-aeration structure with an excavation to 7m below ground and into rock. The inshore section of the pipeline will require excavation into the outer extent of the rock shelf where it can emerge in the sediment sea bed. This work is very complex and significant investigations and design inputs are required. Construction is technically challenging with managing health and safety, sea conditions and pipe welding. Similar projects have been carried out for Christchurch, Dunedin and Whangaparaoa treatment plant discharges. Outfalls have limited flexibility to increase the capacity however are typically designed with allowance for long term growth for 100 years.

3. COMPARATIVE ASSESSMENT

The table below presents the comparative assessment of the technology criteria of the 3 discharge options.

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	No modifications required for 1500 L/s capacity Simple, proven, enduring, reliable
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	3	Complex technology challenges Technical difficulties/access with the pipeline construction in difficult terrain Drop structure and energy dissipating valves require significant design considerations, but are proven
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	3	Complex but proven and significant investigations and design inputs are required Construction is technically challenging Ocean outfalls are enduring and reliable

Memo

To:	Wellington Water	From:	Ron Haverland
File:	Porirua WWTP Comparative Assessment	Date:	26 August 2019

Reference: **Porirua WWTP Options: Comparative Assessment and recommended MCA scores for Resilience criterion**

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the resilience criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.2 AUTHORS' CREDENTIALS

This assessment has been prepared by Ron Haverland (Connect Water) and reviewed by Steve Hutchison (Wellington Water). Ron has a Bachelor of Civil Engineering (Hons) from Canterbury University and has worked for Beca Ltd (Connect Water partner) for over 20 years and has nearly 30 experience in the consulting industry. He is a Senior Associate – Wastewater Specialist with Beca and has extensive experience in the investigation, planning and options assessment of wastewater projects in New Zealand.

Steve has a Bachelor of Technology (Hons) from Massey University and is a Chartered Professional Engineer. He has worked in the consulting industry for most of his career and has extensive experience as a wastewater specialist working in this field for over 20 years. He is currently Chief Advisor Wastewater for Wellington Water.

1.3 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019

- Porirua WWTP Consent – Population and Flows, Connect Water, 22 August 2019

1.4 LIMITATIONS OF ASSESSMENT

The limitations to the assessment are as set out in the previous assessment.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA

The approach to the assessment and criteria are as set out in the previous assessment.

The assessment approach is based on discharge options being limited to a peak flow of 1500 L/s. Network modelling carried out by WCS Engineering includes scenarios for the optimised masterplan solution for the year 2057 and a 6 month ARI for constructed overflows, which limits the peak flow to the WWTP capacity of 1500 L/s.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP are as set out in the Connect Water memo dated 22 August 2019
- Projected wastewater flows do not require duplication of the existing outfall under option 1
- There is some uncertainty regarding the actual hydraulic capacity of the section of outfall pipe from the UV plant to the outfall drop structure. This is to be confirmed with a calibration during a storm event. The cost estimates include a sum for the upgrade, assuming it is required. This is all land based infrastructure

2.3 ASSESSMENT

All discharge options involve construction on the rocky shoreline and in the case of the ocean outfall the sediment seabed.

There are no known fault lines, liquefaction zones or seismic high ground shaking areas for the discharge options.

A new shoreline outfall at Round Point provides some operational resilience because of the redundancy that would be provided with the existing outfall retained as a back-up.

The existing outfall and new ocean outfall do not provide any benefit for operational resilience.

The outfall options are not impacted by sea level rise as the treatment plant has an elevation of 30m above sea level and there is a high hydraulic head. The existing outfall tunnel exists to the tunnel portal structure 6m above sea level and any rise in sea level would just increase the water level in the de-aeration structure that would be required for the ocean outfall.

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Memo

3. COMPARATIVE ASSESSMENT

The table below presents the comparative assessment of the resilience criteria of the 3 discharge options.

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	5	No known fault lines, liquefaction zones or seismic high ground shaking areas Provides some operational resilience because of the redundancy Not impacted by sea level rise
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	4	No known fault lines, liquefaction zones or seismic high ground shaking areas No benefit for operational resilience Not impacted by sea level rise

Comparative Assessment Report

To:	Wellington Water	From:	Linda Kerkmeester (Boffa Miskell)
File:	Porirua WWTP Comparative Assessment – LANDSCAPE AND NATURAL CHARACTER	Date:	18 September 2019

Reference: Porirua WWTP Options: Comparative Assessment and recommended MCA scores for Landscape, Visual Amenity and Natural Character effects criterion

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA scores in relation to the following criterion:

> Natural character and landscape – including effects on natural character of the coastal environment, landscape fabric, landscape character and visual amenity

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand-alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this report. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

1.3 AUTHORS' CREDENTIALS

The assessment report has been prepared by Linda Kerkmeester. Linda is a landscape architect and a Principal of Boffa Miskell with a Bachelor of Landscape Architecture (Hons) from RMIT Melbourne. She has over 25 years' experience and has worked for Boffa Miskell for the past 4 years. Linda has extensive experience in infrastructure planning for large scale projects in the Wellington region, assessing environmental effects with respect to landscape and visual matters.

1.4 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019

- Proposed Natural Resources Plan (decision version)

1.5 LIMITATIONS OF ASSESSMENT

The options presented are concept designs and are based on desk top studies with limited site-specific information and therefore the assessment of the landscape criteria is high level. Detailed site investigations, planning and feasibility assessments are required to further refine the options. This high-level assessment does not constitute an assessment of landscape, natural character and visual effects. This comparative assessment, together with similar memos prepared for other relevant criteria, formed the basis for further discussion at the Multi-criteria Analysis (MCA) workshop with the wider Collaborative Group.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA AND MCA SCORES

The approach taken for the assessment of the WWTP options only are outlined in the earlier report (Memo dated 11th June 2019). This report included a separate assessment of the Network Components and the three outfall options which were aggregated into a composite score of both network and WWTP options and divided by 2. Each score was given 50% weighting. For the purpose of this memo, only the WWTP scoring has been included.

The three options were scored against three criteria including effects on visual amenity, landscape and natural character. Scores were assessed on categories of one to five for each criterion as follows:

Criteria	One	Two	Three	Four	Five
Landscape, Visual & Natural Character	Significant adverse effect	High adverse effect	Moderate adverse effect	Low adverse effect	Negligible adverse effect

The assessment for the WWTP options remains the same as at the June 25 MCA workshop. It is noted that there was a minor mathematical correction made to the final composite score to correct the average between the network and outfall scores. This affected the scoring of the network components but the scores for the WWTP options remain the same.

For the purpose of this study, a score of 1 to 5 has been used with 1 being the highest effect possible and five being negligible effect. In the case of this assessment, there were no effects that were found to fall into the highest or lowest scores of 1 or 5.

2.2 ASSUMPTIONS

The following assumptions have been made for this comparative assessment:

- Flows to the WWTP will be as set out in the Connect Water memo dated 23 August 2019 – this assumes 1500 l/s for all options.
- Projected wastewater flows do not require duplication of the existing outfall under option 1, and do not require increasing the capacity of any land-based infrastructure between the UV facility and the outfall.
- Appropriate levels of mitigation will occur with respect to design and placement of components including screen planting and reshaping of earthworks to blend with surrounding levels.

3. CURRENT STATE

The current landscape and natural character of the coastal environment of the areas affected by the three outfall options are as described in the earlier report. A map (Fig. 1) was included to show the location of the 3 options relative to the Natural Character rating (high and very high). This shows both the existing Rukutane Point and potential Round Point shoreline outfall sites are located within the defined inland extent of the Coastal Environment that has a “High” level of natural character. The ocean outfall option extends into an area of “Very High” natural character of the CMA.

The location of any new structures in these environments will potentially have high visual and landscape effects. There are no parts of the network or outfall options that fall within any areas of outstanding natural character. Any change in water quality arising from the new outfall option may affect the Natural Character rating. This is considered not likely to be significant given the level of dispersal along the proposed outfall pipeline as compared to the current outfall located at Rukatane Point. In all options the natural character effects of the WWTP discharge options are not likely to change the existing high natural character condition, except that the shoreline options will be more visible which does have a low adverse effect on visual amenity.

4. COMPARATIVE ASSESSMENT

Summary of assessment findings.

The scores for the discharge options are outlined below. These are slightly higher from those presented at the MCA workshop on 25 June 2019. They were adjusted following discussions at the subsequent MCA workshop for the WWTP on 28 August 2019 to ensure consistent scoring relative to other MCA values (where 1 was a worse possible significant effect and 5 being negligible). Reasons for each score are described as follows:

Option	Recommended MCA score	Reasoning
1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**4**	No duplication of pipe at outfall – resulting in Low increase in effect. Assumes no visible additional structures. Shoreline structure within an area already modified - level of change likely to have a Low adverse effect Opportunity to enhance extg outfall as part of upgrade of land based components. Cawthron Study showed coastal flora/fauna effects low due to high energy levels at discharge point Note: outfall in this location will be retained for redundancy and as back-up for maintenance, regardless of option selected.
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated	**2.5 (3) ***	New industrial character structure of moderate scale located in a largely unmodified, natural coastal environment in an area of high natural character. Will require rock excavation for new drop structure with potentially high adverse landscape and visual effects

		Coastal location within an area of high visual amenity and heritage values at Te Korohiwa bay *figure (in brackets) denotes score if existing outfall pipe at Rukatane Point is removed – resulting in a higher score with restoration of the shoreline to a more natural state.
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.	**3.5**	Ocean outfall from Rukutane Point to a depth of 15m will extend into area of High Natural Character at the shoreline and out to Very High Natural Character at a distance of 695m from the shoreline. Potential moderate-high effects on seafloor with placement of raised concrete block plinths to support the new outfall pipe – perforated along last 150m to disperse and dilute the effluent, resulting in low effect on water quality. Potential moderate adverse effects on coastal processes (sediment movement and aquatic life) during installation and until sediment settles and new aquatic life takes hold on plinths, reducing to moderate-low biophysical effect. Visual effects limited to seafloor with some potential visible effect at the sea surface with freshwater appearing as a change in surface texture. Outfall pipe closer to surface at shoreline with some visual effects. Adverse effects will be balanced by the positive effect of replacing the existing shoreline outfall with an ocean outfall that is not visible from the shore or sea surface. This option has potential to reduce the adverse visual effects of the coastal environment by allowing the existing shoreline outfall to be returned to a more natural state.

Memo

To:	Wellington Water	From:	Ron Haverland
File:	Porirua WWTP Comparative Assessment	Date:	18 September 2019

Reference: **Porirua WWTP Options: Comparative Assessment and recommended MCA scores for Cost criterion**

1. INTRODUCTION

1.1 BACKGROUND

On June 25, 2019 a multi-criteria analysis (MCA) was undertaken on 9 combined wastewater treatment plant (WWTP) and wastewater network options. In preparation for that workshop I prepared a comparative assessment of those 9 options and recommended MCA cost estimates in relation to the cost criterion.

As new key information has arisen since the evaluation of the short list commenced it has been decided to re-evaluate the WWTP components of the short list as stand alone options. The network component of the Porirua wastewater programme is being reframed to align with outcomes sought under the Te Awarua-o-Porirua Whaitua Implementation Plan.

To assist with the re-evaluation of the WWTP options, this memo sets out my assessment of each option. It builds upon and should be read in conjunction with the report I prepared for the June 25 workshop. Unless specifically stated in this memo, my evaluation and recommendations remain unchanged, except to the extent that they are now focussed on the WWTP options.

Three WWTP options are assessed in this memorandum. These are:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
2. Discharge from the Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated
3. Discharge from the offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

This memorandum also presents the costs of upgrading the WWTP to provide a full treatment capacity of 1500 L/s. This additional information was requested by the technical team, following the MCA scoring meeting on 28 August 2019.

These cost estimates have been prepared in accordance with the *Wellington Water Cost Estimating Manual,* June 2019.

1.2 AUTHORS' CREDENTIALS

This assessment has been prepared by Ron Haverland (Connect Water) and reviewed by Steve Hutchison (Wellington Water). Ron has a Bachelor of Civil Engineering (Hons) from Canterbury University and has worked for Beca Ltd (Connect Water partner) for over 20 years and has nearly 30 experience in the consulting industry. He is a Senior Associate – Wastewater Specialist with Beca and has extensive experience in the investigation, planning and options assessment of wastewater projects in New Zealand.

Steve has a Bachelor of Technology (Hons) from Massey University and is a Chartered Professional Engineer. He has worked in the consulting industry for most of his career and has extensive experience as a wastewater specialist working in this field for over 20 years. He is currently Chief Advisor Wastewater for Wellington Water.

1.3 INFORMATION SOURCES

I have relied on the same information sources used for my report to the 25 June workshop. New information that I have considered since the 25 June workshop includes:

- Draft 'Porirua Wastewater Treatment Plant Outfall: Assessment of effects of different outfall options on the marine environment', Cawthron Institute, August 2019
- Porirua WWTP Consent – Population and Flows, Connect Water, 22 August 2019

1.4 LIMITATIONS OF ASSESSMENT

The cost estimates for discharge options are for the purpose of comparing options for this MCA only and not for setting budgets for projects, or any other purpose. The provision of cost estimates does not imply the feasibility of the options.

The cost estimates for discharge options are based on desk top studies with limited site-specific information and are therefore defined as Level One Estimates, applying to the Definition Phase as per the *Wellington Water Cost Estimating Manual*. Detailed site investigations, confirmation of design flows, and the requirements arising from environmental, planning and feasibility assessments are required to further refine the cost estimates. Estimates provided are 2019 values with no allowance for future inflation.

2. APPROACH TO ASSESSMENT

2.1 ASSESSMENT CRITERIA

The approach to the assessment and criteria are as set out in the previous assessment.

The assessment approach is based on discharge options being limited to a peak flow of 1500 L/s. Network modelling carried out by WCS Engineering includes scenarios for the optimised masterplan solution for the year 2057 and a 6 month ARI for constructed overflows, which limits the peak flow to the WWTP capacity of 1500 L/s.

2.2 COST ADJUSTMENT FACTORS

Cost adjustment factors in addition to the base estimate are from the *Wellington Water Cost Estimating Manual*, and include the following;

- Contingency 40% (Section 6.3 for Simple Approach)
- Funding risk 60% (Section 6.3 for Simple Approach)
- Consultants fees 18% (Section 7.2)
- Wellington Water management fee 5% (as agreed with Wellington Water)

3. COMPARATIVE ASSESSMENT

The table below presents the capital costs and NPVs for the WWTP discharge options for a capacity of 1500 L/s.

WWTP discharge options and costs for 1500 L/s

	Existing shoreline outfall (Note 2)	New shoreline outfall (Note 4)	New ocen outfall (Note 4)
UV to drop structure duplication (Note 1)	$3 M	0	$3 M
Pipeline and outfall	0	$12 M	$39 M
Total Capex	**$3 M**	**$12 M**	**$42 M**
Total NPV (Note 3)	**$5 M**	**$14 M**	**$44 M**

Notes;

1. There is some uncertainty regarding the actual hydraulic capacity of the section of outfall pipe from the UV plant to the outfall drop structure. This is to be confirmed with a calibration during a storm event. The cost estimates include a sum of $3 million for the upgrade, assuming it is required.
2. The existing outfall has a capacity of 1500 L/s and does not require a capacity upgrade. We have not allowed for the replacement of the missing outfall nosing which brings the outfall below the water level.
3. Based on a 50 year term.
4. Excludes the cost of decommissioning the existing outfall structure which is estimated to be of the order of $1 million.

The table below presents the planned plant capacity upgrades to 1500 L/s in the current Long Term Plan. Upgrades to WWTP equipment and components for maintenance and replacement purposes, including the replacement of the aeration basin manifold line, and milliscreen gallery and bypass chamber concrete condition refurbishments, are excluded. In addition we have not allowed for any costs associated with upgrading the treatment process to allow for the possibility of more stringent discharge standards as a result of the renewal of the discharge consent, or for any costs associated with improvements to sludge drying and disposal.

WWTP planned capacity upgrades to 1500 L/s

	Estimated Cost	Basis of Estiamte
UV Disinfection Upgrade	$2.8 M	UV equipment and transformer packages of work awarded. UV installation under negotiation
Aeration Feed-pipe Upgrade (Note 1)	$3.4 M	Level 1 estimate

Notes;

1. This project is at an optioneering stage and the estimate is based on the highest cost "Alternative Option" of constructing a new bypass and screen chamber.

Attachment I: Record of Collaborative Group Meeting on 29 October 2019

Attachment J: Report to, and Minutes of, Wellington Water's 3 Waters Decision Making Committee

Wellington Water

3 Waters Decision Making Committee

Paper Title: **Porirua WWTP consent scope**

Author: **Mary O'Callahan**

Reviewed By: **Steve Hutchison**

Approved by: **Tonia Haskell**

Date: **8 November 2019**

3 Waters Decision Making role (please tick required actions)

I am requiring **input or guidance** ☒

I am requiring a **technical decision** ☒

I am requiring **investment endorsement** ☐

I am providing **visibility** over a key issue ☒

Link with service goals

Please select a primary and secondary service goal and note how the proposed activity aligns with these:

	We will enhance the health of our waterways and the ocean	*The recommended best practicable option for the WWTP consent renewal provides for the health of the coastal receiving environment.*
	We minimise public health risks associated with wastewater and stormwater	*The recommended best practicable option for the WWTP consent renewal provides for satisfactory public health outcomes.*

Purpose

The purpose of this paper is to confirm the outcome of the multi-criteria (MCA) re-evaluation of the Porirua WWTP consent options following the decoupling of this from the Network Improvement Programme for Wet Weather Overflows (NIP), as confirmed by 3WDMC at its meeting on 22 August 2019.

This paper is intended to:

a) Update the Committee of the outcomes of the MCA re-evaluation, including the options considered and the results of this.
b) Provide a recommended "best practicable option" to proceed with for the RMA consent renewal applications required for the continued operation of the WWTP, based on the outcomes of the recent MCA re-evaluation.

c) Seek approval to the option to take forward in the RMA consent applications.

Background and References

Previously, the project for the re-consenting of the treatment plant was integrated with a project to develop wastewater network improvements to manage the effect of wet weather overflows throughout the network, and consent these. The consenting of the two projects separated, for reasons set out in a 3WDMC paper presented on 22 August 2019. This led to a requirement for re-evaluation of options, before a preferred option for consenting could be confirmed. This work has now been completed.

Option Assessment

The three options that were re-evaluated through the WWTP MCA were:

1. Discharge from the existing shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated

2. Discharge from a new Round Point shoreline outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated

3. Discharge from a new offshore ocean outfall, existing level of treatment but capacity upgrades so all wastewater is fully treated.

Each option was evaluated against the criteria set out in Table 1 below and scored on a scale of 1 to 5 in relation to each criterion.

Table 1: MCA Criteria

Criteria	Description
Public Health Risk	Associated with contact recreation and food gathering
Water quality and ecology	Including streams, harbour, the coastal shoreline and the wider coastal environment, and terrestrial ecology
Tangata whenua values	Effects on mauri, mana, hauora, kai moana, mahinga kai, heritage and whakapapa
Growth	Supports long term growth and investment, and economic development of the city and sub-region, and is responsive to medium term growth needs and pressures
Social & community	Amenity, recreation and heritage, including perception
Technology	Enduring, reliable and providing flexibility for future technology changes and capacity upgrades
Resilience	Climate change, natural hazards and operation resilience
Natural character & landscape	Including effects on natural character of the coastal environment, landscape fabric, landscape character and visual amenity
Cost	The whole-of-life financial cost of the option

MCA Results

The overall MCA scores and associated option ranks were applied with various weighting scenarios, with 25% being the base weighting for cost. Under all weighting scenarios, except those in which the weight given to cost was 0%, Option 1 (discharge from the existing shoreline outfall) had the highest overall MCA score. The outcome of the MCA was sensitive to the weight given to cost, but the findings are very robust as they show Option 1 remains the highest scoring option until the weight given to cost was reduced to around 7-8%.

Based on the MCA summary set out in the attached, it is recommended that Option 1 be adopted as the 'proposed solution' for the WWTP wastewater discharge resource consent. This an appropriate option because:

- The overall MCA score of option 1 is the highest under all weighting scenarios except when the weight given to cost is reduced below 7-8%
- The comparative assessments undertaken for the MCA indicate that Option 1 would not have any adverse effects that are greater than moderate
- While the adverse environmental, cultural and social effects of Option 3 (the extended ocean outfall option) are expected to be lower than those for Option 1, based on the MCA scores it appears that the difference is not significant.

It is noted that the project objectives seek wastewater management solutions that 'are affordable and value for money'. The overall MCA results indicate Option 1 represents value for money and best balances cost, with the other competing project objectives which are set out in Appendix 1.

It is noted however that representatives of Ngāti Toa Rangatira have clearly expressed a preference for the offshore ocean outfall (Option 3) during the earlier June MCA workshop and that this is recorded in the comparative assessments on Tangata whenua values. Aligned with project objectives, the consultant's report recommends that Wellington Water discuss the results of the revised MCA process where Option 1 scores best with Te Runanga o Toa Rangatira before confirming a proposed solution for the WWTP.

WWL subsequently met with Te Runanga o Toa Rangatira on 21 October 2019 to explain the outcomes of the MCA reevaluation process, and again as part of a Collaborative Group meeting on 29 November 2019. In short, both meetings went well, and there were no strong objections expressed on the course of action suggested through the MCA process. However, in neither case, did iwi or the Collaborative Group give its 'approval' to Option 1.

Level of Service and Performance

All short-list options re-evaluated for the WWTP included a plant capacity upgrade sufficient to accommodate the wastewater flows associated with the latest planned urban growth figures. With the plant upgrades proposed, the network can be managed through attenuating flows upstream of the WWTP (including through the central city storage tank when built) to avoid excess flows needing to bypass the treatment plant during peak flows.

Risks

The main risk associated with the recommendation proceed with Option 1, is:

- potential loss of support towards the WWTP consent application by iwi and/or other members of the Collaborative Group and/or the wider public

The above risks are being mitigated through ongoing communication, open days, site visits to the plant etc which have been informed by an updated Communications Plan that reflects the change in circumstances that has arisen.

Financial implications and benefits

The cost for the recommended option to take forward as the WWTP consenting option is.

Legal implications

The MCA reevaluation process that has taken place follows RMA case law and will contribute to consenting of the WWTP discharge.

Consultees

☐ *NS&P* ☐ *ND&D* ☐ *NC&O* ☐ *Finance* ☐ *Risk* ☐ *Other (specify)*	Paper has been reviewed by key team members involved in the WWTP project, as listed above.

Customer and stakeholder implications and benefits

The recommended re-evaluation approach has been communicated to PCC officers at the regular Monday weekly communication meetings. PCC councilors and the JV committee will be informed of WWL's decision to confirm Option 1 for consenting, subject to confirmation of this recommendation by the 3WDMC.

The Collaborative Group, iwi and the wider public have been communicated with the open days held on 7 and 9 November 2019.

Communications plan

An updated Communications Plan was prepared by Latitude, which has informed the current engagement activity.

Health and Safety implications

No specific health and safety implications have been identified with the WWTP consent renewal, which has consisted of desk top evaluation work to date.

Recommendation

It is recommended that:

a) That the Committee confirms Option 1 (discharge from the existing shoreline outfall and capacity upgrades) as the best practicable option (BPO) for the WWTP consent renewal and proceeds to complete its consent application on this basis.

MINUTES

SUBJECT	**3 Waters Decision Making Committee**
WHEN	15 November 2019 1pm
WHERE	Oriental Bay Meeting Room
MEMBERS	Ian McSherry, Chief Advisor, Service Delivery (Chair)
	Rob Blakemore, Chief Advisor, Service Planning
	Ben Fountain, Chief Advisor, Stormwater
	Laurence Edwards, Chief Advisor, Potable Water
	Eugene Stansfield, Manager, Service Planning
	Brian Gosper, Acting Manager, Water Treatment
VISITORS	Fraser Clark, Principal Advisor Strategy,
	Paul Gardiner, Principal Advisor RMA Consents & Environment
	Nicola Chisnall, Principal Advisor Asset Strategy
	Michael Syred, GHD
	Mary O'Callahan, GHD
APOLOGIES	Mark Kinvig, Group Manager, NS&P
	Steve Hutchison, Chief Advisor, Wastewater
	Jeremy McKibbin, Group Manager, NM

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1. Standing Items

1.1 The minutes of the meeting held on were approved with the following addition:

Matters Arising from the minutes

- Increased funding for Tangare Drive: ES advised that we are re-prioritising the programme to fund this and other items.

1.2 Any actions **were not noted.**

1.3 **Health and Safety –**

SWDC H&S risks and observations by WWL board visiting SWDC were raised and the committee and visitors assured that these were being addressed.

The Drug & Alcohol policy is currently being reviewed. Following a paper to SLT in October, the H&S team has more work to do as some grey areas are still to be defined through further workshops.

1.4 **Drinking Water Safety**

Laurence provided an update on recent water supply investigations and risk assessments: 3WDMC - SWDC water supply update

Noted that Genevieve Drake will be leading a summer demand campaign in the SWDC.

Noted Laurence and Rob are attending the Drinking Water Assessors Conference next week presenting on drinking water culture and governance and the link between service goals and political decisions on investment.

1.5 **The committee agreed to change this to: Customer Operations Group Implementation**

2. MATTERS FOR DECISION

2.1 Michael Syred from GHD joined the meeting to discuss and gain approval for a regional approach to the development of a policy for backflow prevention as per 3WDMC - Adopting a Regional Approach to Backflow.decision.

It was noted that the CCR group have been introduced to this approach at the 17 October meeting

Also noted that the administration would be at an equivalent of 1 FTE.

The committee agreed that:

1) A regional approach to backflow be adopted, replacing existing Council-specific policies relating to backflow prevention with a single policy and approach.
2) However there is a need to develop a Business Case: Policy, associated cost, transition and a strategy that can be presented to CCR.

2.2 Mary O' Callahan of GHD spoke to the following:

3WDMC - Porirua WWTP consent scope

190828 WWTP MCA-2 outcomes (final) (attachment to above)

The committee understood that a robust process was used in calculating the MCA scores and associated ranks.

The committee endorses Option 1 and understand that PCC councillors and the JV committee will be informed of WWL decision.

2.2.1 Action: Ben Fountain to draft a MCA guiding principles document for 3WDMC consideration and discussion. Attendees to provide Ben with examples – due early 2020.

3. MATTERS FOR DISCUSSION - no papers submitted for discussion at this meeting

4 ANY OTHER BUSINESS

Noted: the need to run a SWDC lens over all 3WDMC paper going forward.

The committee discussed future agenda items:

- Investment assurance paper -
- 3WDMC Scope / Terms of Reference: To be shared and updated - 2020
- GIS Update Paper – Mapping of investigation reports against assets
- WQ Review – addressing systems and responses (Manager Major Projects)