Beachlands Wastewater Scheme Resource Consent Project

Alternatives Assessment Report

June 2024

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PREPARED FOR:

Watercare

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Stantec

Revision Schedule

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Abbreviations

Abbreviations	Full Name
AUP	Auckland Unitary Plan Operative in part (Updated 16 February 2024)
AMP	Watercare's Asset Management Plan 2021-2024
BNR	Biological Nitrogen Removal
BPO	Best Practicable Option
CMA	Coastal Management Area
HUE	Housing Unit Equivalents
I&I	Inflow and Infiltration
MAR	Managed Aquifer Recharge
MCA Watercare	Multi-Criteria Analysis Watercare Service Ltd
NPS-FM2020	National Policy Statement for Freshwater Management 2020
PE	Population Equivalent
PPC88	Private Plan Change 88
RMA	Resource Management Act 1991
TBC	To be confirmed
WW	Wastewater
WWTP	Beachlands Wastewater Treatment Plant

Executive Summary

Background

Watercare Services Ltd (Watercare) current consent for the discharge of treated wastewater from the Beachlands Wastewater Treatment Plant (WWTP) is nearing expiry. The discharge volume is nearing the consent limit of 2,800m^3 per day and the condition that restricts the population serviced by the WWTP to 10,000 people is at this limit or potentially exceeded. There is significant growth projected for the Beachlands Maraetai area. By 2059 the population is projected to be 30,000 people.

Due to growth pressures, limitations of the current discharge consent, capacity constraints of the existing WWTP and that components of the plant are coming to the end of their design life, Watercare has initiated a process to investigate options for the future treatment and discharge of the wastewater from the Beachlands and Maraetai communities. Through the process Watercare can effectively and efficiently plan how it will continue providing wastewater services to the Beachlands and Maraetai communities.

Watercare has proposed that the process to identify the preferred option for the future treatment and discharge needs to determine that the preferred option is the Best Practicable Option (BPO) as defined under the Resource Management Act 1991 (RMA).

Purpose

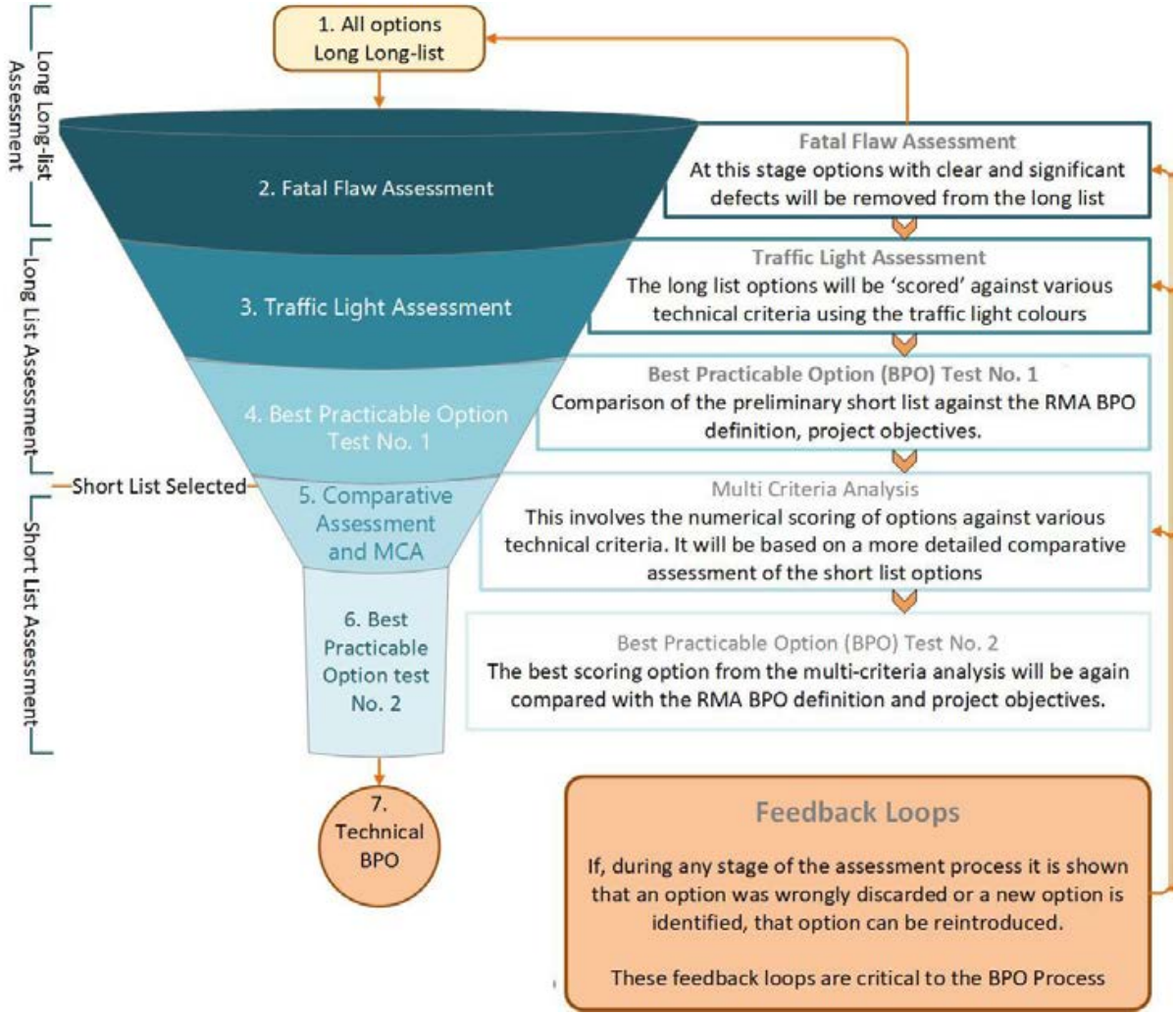
The purpose of this report is to summarise the alternatives (options) assessment process that was followed to determine the BPO for the treatment and discharge of wastewater and to demonstrate that the process has been thorough and robust.

The alternatives assessment that is described in this report is a technical assessment. Watercare has undertaken separate processes with Ngāi Tai ki Tāmaki and the Beachlands Maraetai community in considering the options for the future treatment and discharge of the wastewater. The outcomes of these processes will be integrated with this technical BPO assessment process, allowing Watercare to then determine the preferred option for the future treatment and discharge of the wastewater.

Methodology

The methodology designed for the technical BPO assessment is set out in the diagram below. It involves:

1. The development of a Long Long list of options.
2. Fatal Flaw assessment that removed options with significant defects from the Long Long list to identify a Long List of options.
3. Traffic Light assessment of the Long List of options to identify a preliminary Short List of options.
4. BPO Test No 1 to confirm the Short List of options.
5. Short List assessment to identify a preliminary technical preferred option / BPO.
6. BPO Test No 2 to confirm a technical preferred option / BPO.



Fatal Flaw Assessment

This involved assessing the Long Long List of 32 options against seven fatal flaw criteria. An option only had to meet one of the criteria to be fatally flawed. A total of 13 options were fatally flawed resulting in a Long List of 19 options. The options that were fatally flawed primarily involved the conveyance of raw, partially treated and fully treated wastewater to other Watercare wastewater treatment plants.

Traffic Light Assessment

The 19 Long List options taken forward for the traffic light assessment comprised options involving discharge to the tributary of the Te Puru Stream, options involving discharge to other freshwater bodies, options involving discharge to the Coastal Marine Area (CMA), options involving discharge to land and groundwater and options involving discharge to a combination of these receiving environments. The options also included a range of potable and non-potable reuse combinations including a supplementary supply for the Hunua Dams.

This stage of the assessment involved the development of assessment criteria (eight in total), technical expert assessment and traffic light scoring of each option against the criteria the experts were responsible for, and a Long List workshop that used the Traffic Light assessment to identify a preliminary Short List of options (5 in total).

BPO Test No 1

This involved assessing the preliminary Short List of options against BPO criteria based on the RMA BPO definition and against the Project Objectives developed for the project. The BPO and objectives assessments were reasonably well aligned with the Short List Traffic Light assessment and did not identify any additional red traffic light scores which would direct an option to not be progressed for further consideration.

All five of the preliminary technical Short List of options passed the Best Practicable Option Test No. 1 and were taken forward to the Short List assessment stage.

Short List Assessment

The five options taken forward for the short list assessment comprised a diffuse discharge to the tributary of the Te Puru Stream, a direct discharge to the tributary of the Te Puru Stream, the discharge of 100% of the treated wastewater to land (approximately 750 ha) in the vicinity of the WWTP, a combination of discharging the treated wastewater to land (approximately 300 ha) in the vicinity of the WWTP during dry weather and a discharge to the tributary of the Te Puru Stream at other times, and a discharge to the Hauraki Gulf north of Beachlands in the Tāmaki Strait via a 2.9km offshore ocean outfall.

This stage of the assessment involved the technical expert assessment and 1 to 5 scoring (1 best 5 worst) of each option against the criteria the experts were responsible, and multi-criteria assessment (MCA) workshops to identify a preliminary technical BPO.

BPO Test No 2

This stage followed a similar process to the BPO Test No 1 and involved the BPO and Project Objectives assessment of the preliminary technical BPO in comparison with the other Short List Options. The BPO Test No 2 confirmed the option involving the diffuse discharge to the tributary of the Te Puru Stream should be recommended to Watercare as the technical BPO.

1. Introduction

1.1 Watercare Background

Watercare Services Ltd (Watercare) is a council-controlled organisation that provides water and wastewater services to the Auckland region. Watercare's obligations to deliver water and wastewater services for Auckland are established under Part 5 and section 57(1) of the Local Government (Auckland Council) Act 2009. This section requires Watercare, as an Auckland water organisation, to manage its operations efficiently with a view to keeping the overall costs of water supply and wastewater services to its customers (collectively) at the minimum levels consistent with the effective conduct of its undertakings and the maintenance of the long-term integrity of its assets[1].

Watercare's Asset Management Plan (2021 – 2041) (AMP) sets out Watercare's investment plan to meet the water and wastewater needs of Auckland. The AMP gives effect to Auckland Plan outcomes and also contributes to Auckland Council's Long-Term Plan and infrastructure strategy. The purpose of the AMP is to:

- Cater for a growing Auckland;
- Develop a resilient and diverse water system for tomorrow;
- Protect the environment;
- Adapt to climate change impacts and reduce emissions; and
- Deliver value for money by running an efficient operation.

Watercare aims to cater to planned growth and participates in growth planning exercises such as the Auckland Council Future Development Strategy.

1.2 Project Background

The Beachlands and Maraetai communities are currently serviced by a wastewater network service that connects to the Beachlands Wastewater Treatment Plant (WWTP). There are around 3,400 existing wastewater-only connections (there is no reticulated water supply) in Beachlands and Maraetai; around 2,500 connections are in Beachlands, with the remainder in Maraetai. The sampling undertaken in 2023 to confirm the current connected population estimated the population of Beachlands and Maraetai to be between 10,000 and 12,000.

Wastewater from the Beachlands and Maraetai communities is processed and treated at the Beachlands WWTP located approximately 5 km south of the communities at 100 Okaroro Drive, Beachlands. Part of this site is designated in the Auckland Unitary Plan Operative in part (Updated 16 February 2024) (AUP) for Wastewater Treatment Purposes. Figure 1-1 below shows the extent of the designation.

Figure 1-1: Beachlands WWTP Designation

[1] Sourced from the Watercare website: Watercare - Who we are (https://www.watercare.co.nz/About-us/Who-we-are)

The WWTP was commissioned in 1994. The original treatment process was an aerated lagoon followed by a series of partially mixed aerated lagoons and wetlands, with the treated wastewater discharged into a tributary of the Te Puru Stream. The WWTP was upgraded in 2009 to convert the aerated lagoon into an activated sludge biological nitrogen removal (BNR) process incorporating chemical phosphorus removal, tertiary filtration, and UV disinfection. The plant's most recent upgrade was in 2020 with the installation of a diffused aeration system to boost aeration capacity in the bioreactor lagoon. Treated wastewater is discharged into a tributary of the Te Puru Stream via a marshy overland flow area and pond.

Plan Change 88 – Beachlands South (PPC88) was publicly notified on 26 January 2023. On 2 April 2024 Independent Commissioners of behalf of Auckland Council approved PPC88. PPC88 proposes to rezone 307 hectares of land from rural and countryside living zones to urban and future urban zones. PPC88 states that the area of land to be re-zoned with a "live" urban zone, has a potential residential yield of 3,000 dwellings[2]. PPC88 concept design proposes a private pressure sewer system with a separate wastewater treatment facility.

The current consents that apply to the existing WWTP at 100 Okaroro Drive, Beachlands are:

- Discharge of treated domestic wastewater to the Te Puru Stream via ground soakage, Consent Number 26875 - initially granted in November 2004 with the appeal to the permit determined by way of a consent order in August 2005. The consent has a maximum daily discharge volume limit of 2,800m³/day and restricts the population to be serviced by the WWTP to 10,000 people. It expires on 31 December 2025.
- Discharge of contaminants to air associated with the operation of a WWTP, Consent Number 26876 which expires on 31 December 2026.

Due to the above growth pressures, limitation of the existing discharge consent and the fact that the existing WWTP is coming to the end of its design life, Watercare has initiated a process to explore options for reconsenting the discharge. Through the process Watercare can effectively and efficiently plan how it will continue providing wastewater services to the Beachlands and Maraetai communities.

Watercare has proposed that resource consent application for the wastewater discharge be prepared based on the treated wastewater discharge option that is determined to be the Best Practicable Option (BPO) through an alternatives assessment process. The receiving environment for the discharge will dictate the treatment standard that must be met.

1.3 Purpose of this Report

The purpose of this report is to summarise the process that was followed to assist Watercare to determine the BPO for the treatment and discharge of wastewater from the Beachlands / Maraetai communities and to demonstrate that the process has been thorough and robust.

BPO is defined in the Resource Management Act 1991 (RMA) and in relation to a discharge of a contaminant or an emission of noise to mean:

> *"…the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*
>
> *(a) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
>
> *(b) the financial implications, and the effects on the environment, of that option when compared with other options; and*
>
> *(c) the current state of technical knowledge and the likelihood that the option can be successfully applied"*

The Long List and Short List assessment processes are technical processes that have not incorporated inputs from Mana Whenua. Watercare is undertaking a separate process with Mana Whenua and in particular Ngāi Tai ki Tāmaki (Ngāi Tai). The outcomes from this process will be integrated with the outcomes from the technical assessment to enable Watercare to confirm the BPO solution for the management of the wastewater from the Beachlands / Maraetai community.

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[2] Sourced from the Auckland Council website: pc88-private-plan-change-request.pdf (aucklandcouncil.govt.nz) (https://www.aucklandcouncil.govt.nz/UnitaryPlanDocuments/pc88-private-plan-change-request.pdf)

In this report the words ‘Alternative’ and ‘Option’ are used interchangeably.

The report describes:

- The methodology for developing and assessing the options.
- The development of the options.
- The results of the assessment process being the Fatal Flaw assessment, the technical Long List / Traffic Light assessment and the technical Short List assessment.
- The BPO tests and project objectives assessments of the Short List and the Preferred Technical Option
- The integration of Mana Whenua into the process and how their feedback has been taken into account.
- The process of inputting stakeholder engagement outputs into the assessment of alternatives process.

1.4 Project Objectives

The Project Objectives have been specifically developed for this Project. The Project Objectives have been used to inform the development of the criteria for assessing the Long and Short List of options and to assist in the confirmation of the Short List of options and the preferred option (BPO).

The Project Objectives are:

Work in partnership with the Mana Whenua and engage with the community to identify the best practicable option (BPO) to provide wastewater services for the Beachlands and Maraetai community. The BPO must:

- Recognise the significance of the Hauraki Gulf and the historic, traditional, cultural, and spiritual relationship of the tangata whenua with the Hauraki Gulf and its islands[3].
- Give effect to Te Mana o te Wai[4].
- Keep our communities healthy.
- Protect the health of our environment, particularly the life supporting capacity of land, air, and water.
- Provide a solution that caters for planned growth that keeps the overall costs of service to customers (collectively) at sustainable levels.
- Be sustainable and resilient and minimise whole-of-life carbon emissions and optimise resource recovery[5].

1.5 Requirements of the RMA for the Consideration of Alternatives

1.5.1 Relevant Provisions

There are a number of circumstances when the RMA requires an assessment of alternatives (options) to be undertaken. Relevant to this application, these include:

a. Section 105(1)(c) which requires decision makers when considering applications for discharge permits or coastal permits involving discharges “to have regard to any possible alternative methods of discharge, including discharge into any other receiving environment”.

b. When preparing an assessment of environmental effects (AEE) if the proposal is likely to have a significant adverse effect on the environment, Schedule 4 of the RMA provides that the AEE must describe alternative locations and methods for undertaking the activity. Likewise, if the proposal involves the discharge of contaminants the AEE will need to address alternative methods of discharge and locations.

In the context of this project s105(1)(c) will definitely apply as the proposal will involve discharges (of treated wastewater and air) to the environment. Adopting a conservative approach, the Schedule 4 requirement noted above could apply.

[3] Section 3 (Purpose) of the Hauraki Gulf Marine Park Act
[4] Policy 1 NPS-FM, Water Services Act
[5] Recognises the carbon component of 40/20/20

1.5.2 Case Law Guidance

There is an extensive body of case law regarding the consideration of alternatives. While this mainly relates to designations and the consideration of alternatives as required by s171(1)(b) of the RMA, the principles established by this case law can be applied in the context of resource consents.

A decision of the Environment Court[6] in respect of a designation sought by Watercare for a reservoir noted the relevant principles from earlier case law relating to the consideration of alternatives were gathered together in the final report and decision of the Board of Inquiry into the Upper North Island Grid Upgrade Project. The Court adopted these principles, and they are set out below.

a. The focus is on the process, not the outcome: whether the requiring authority (applicant) has made sufficient investigations of alternatives to satisfy itself of the alternative proposed, rather than acting arbitrarily, or giving only cursory consideration to alternatives. Adequate consideration does not mean exhaustive or meticulous consideration.

b. The question is not whether the best route, site or method has been chosen, nor whether there are more appropriate routes, sites or methods.

c. That there may be routes, sites or methods which may be considered by some (including submitters) to be more suitable is irrelevant.

d. The Act does not entrust to the decision-maker the policy function of deciding the most suitable site; the executive responsibility for selecting the site remains with the requiring authority.

e. The Act does not require every alternative, however speculative, to have been fully considered.

f. The requiring authority is not required to eliminate speculative alternatives or suppositious options[7].

In terms of undertaking multi criteria assessments (MCAs) the High Court in the Basin Bridge decision[8] provides useful guidance on using a MCA to evaluate alternatives. In summary the High Court decision states:

a. An MCA analysis of alternatives should be transparent and replicable.

b. If any weightings are applied to the "raw" MCA scores, it may be necessary for those weightings to be available to the decision maker in order to be satisfied that adequate consideration has been given to alternatives.

c. If weightings are used in an alternatives assessment (such as an MCA) they should be "*infused*" with Part 2 matters and decisions to allocate weight to different evaluative criteria is subject to Part 2.

The High Court Basin Bridge decision confirms that a more careful consideration of alternatives may be required where there are more significant adverse effects.

1.6 Best Practice Approaches

The following provides general guidance based on the findings of the Courts and previous project experience on best practice approaches for assessing options:

a. Any assessment of options needs to be robust, defensible, transparent, genuine, undertaken with an open mind and well documented from the outset.

b. Any option evaluation process should be “fit for purpose” i.e. of a detail that corresponds with the scale and significance of the options including the adverse effects that the options may have on the environment.

c. The process must have a clear RMA focus in order to meet the requirements of the Act and principles established through case law.

d. The assessment of options needs to be undertaken in a structured and methodical manner.

[6] Pukekohe East Community Society Inc v Auckland Council Decision No. [2017] NZEnvC 027
[7] Pukekohe East Community Society Inc v Auckland Council [2017] NZEnvC 027 at [21 and 22]
[8] NZ Transport Agency v Architectural Centre [2015] NZHC 1991. Also known as the Basin Bridge decision, at [175] – [198]

e. The process should use a consistent methodology as far as possible. If changes to the approach are required, the reasons for these must be well documented to avoid accusations of “engineering a desired outcome”.

f. Comprehensive documentation of the assessment process and decision making is essential, particularly to ensure transparency.

g. The right experts (i.e. ideally those who may later be witnesses) must be involved in providing information on the options being assessed and the assessment and decision-making processes to ensure the process is evidence based and robust.

h. Where weightings are applied to criteria these need to be agreed through a consultative process, infused with Part 2 of the RMA, and recorded in the final presentation of results.

i. When undertaking an alternatives assessment process, it is important to be clear on who owns and is responsible for the process. Preferably whoever that is should be involved from the beginning to the end and preferably an expert in options assessment processes and the requirements of the RMA.

j. Key principles from RMA case law state:

- The focus is on the process not the outcome.
- The applicant does not have to choose the best option.
- The Act does not require every alternative, however speculative, to have been fully considered.
- It is the responsibility of the applicant to select the option not the decision maker.

These best practice approaches have been adopted in developing the process to determine the BPO to manage the wastewater from Beachlands and Maraetai.

In order to determine the BPO to manage the wastewater from Beachlands and Maraetai options have been developed and assessed which entail alternative discharges (such as re-use), discharge locations and treatment plant locations. Alternative treatment processes will be assessed once the BPO for the discharge has been developed.

1.7 Project Technical Team

The project technical team is made up of Watercare staff and other technical experts. The current members of the project team are set out below:

Table 1-1: Project Technical Team

Name	Organisation	Expertise
Tanvir Bhamji	Watercare	Project Manager
Luke Faithfull	Mitchell Daysh	Project Manager
Jim Bradley	Stantec	Public Health / Wastewater Schemes
Andrew Slaney	Stantec	Wastewater Treatment Specialist
Paula Hunter	Stantec	Planning
Katja Huls	Stantec	Planning
Mark James	Aquatic Environmental Sciences Ltd	Overall Environmental Lead
Shane Kelly	Coast and Catchment Environmental Consultants	Marine waters
Alan Pattle	PDP	Land, Groundwater
Rebecca Stott	NIWA	QMRA
John Oldman	DHI	Oceanographic Modelling

Name	Organisation	Expertise
Gary Teear	OCEL	Ocean Outfalls
Padraig McNamara Warren Bangma	Simpson Grierson	Legal

2. Assessment Methodology

2.1 Overall Methodology

A process for assessing alternatives that reflects the relevant statutory provisions, and best practice as set out in relevant case law, has been designed for this project and is described in Figure 2-1 below.

A wide range of potential options were developed at the beginning of the assessment process. These options were referred to as the Long Long List and are set out in Table 2-1. A fatal flaw assessment of the Long Long List as shown in Figure 2-1 was then undertaken by the project technical team. The fatal flaw criteria and process are set out in Section 4.

Following the fatal flaw assessment, the Long List of options was confirmed by the project technical team. The Long List was then subject to a more detailed technical assessment using a “traffic light” scoring process which is described in Section 5 below. The technical Long List assessment criteria are described in Section 5.2.1 below. The criteria were developed in accordance with the best practice principles set out in Section 1.6 and to address Part 2 of the RMA.

The technical Long List / Traffic Light assessment identified a potential Short List of options, these options were subject to a BPO and project objectives assessment check as shown in Figure 2-1 to confirm the technical Short List of options to be taken forward for a more detailed assessment. This technical Short List assessment process adopted a more detailed multi-criteria analysis (MCA) approach which is set out in Section 6 of this report.

The technical Short List assessment process identified a preliminary preferred option which was then subject to the BPO and project objectives assessment check as shown in Figure 2-1 to confirm the preferred technical option.

As shown in Figure 2-1 the assessment process, provides (by way of feedback loops) for the reassessment of options that were previously discarded if new information identifies that an option should be reconsidered. If this is the case, the option can be reintroduced into the assessment process at whatever stage it was discarded (fatal flaw, Long List, Short List).

The methodology set out in Figure 2-1 makes sure that the assessment is progressively more detailed to ensure that the process is both robust and efficient.

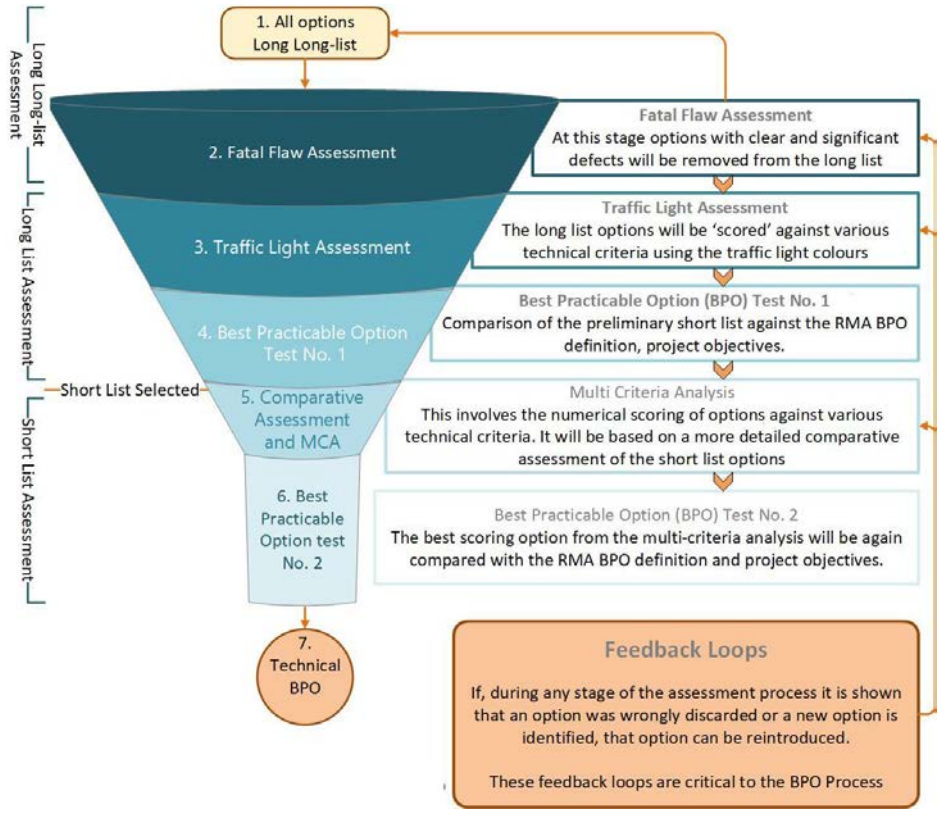


Figure 2-1: Technical Assessment Methodology

2.2 Project Timeline

The following table sets out the timeline for key components of the project and who was responsible for inputting into these components.

Table 2-1: Project Timeline

Timing	Project Phase	Inputs
Workshop 1 29th August 2023	Project problem statement, Project Objectives, fatal flaw criteria, Long List assessment criteria confirmed	Wider project team[9] (Workshop 1)
	Long Long List developed and confirmed	Wider project team (Workshop 1)
4th October 2023	Fatal Flaw Assessment	Project Technical Team
4th October 2023	Long List confirmed	Project Technical Team
Workshop 2 13 October 2023	Long List / Traffic Light Technical Assessment	Wider project team (Workshop 2)
	Preliminary Technical Short List	Wider project team (Workshop 2)
26th October 2023	Community Information Session 1 and Online Survey	Watercare engagement team
1st November	Site visit with Ngāi Tai ki Tāmaki Taiaomaurikura representative	Watercare project lead
1st November 2023	BPO and Objectives Test 1	Project Technical Team
2nd November 2023	Confirmation of the technical Short List	Project Technical Team
Workshop 3 7th November 2023	Short List Technical Assessment (Preliminary)	Wider project team and representative from Ngāi Tai ki Tāmaki (Workshop 3)
7th - 30th November 2023	Further investigations and updating to assessments	Project Technical Team
22nd November 2023	Community Information Session 2	Watercare engagement team
Workshop 4 5th December 2023	Short List Technical Assessment	Wider project team and representative from Ngāi Tai ki Tāmaki (Workshop 4)
Workshop 4 5th December 2023	Preliminary Preferred Technical Option	Wider project team (Workshop 4)
15th December 2023	BPO and Objectives Test 2	Project Technical Team
15th December 2023	Preferred Technical Option confirmed	Project Technical Team
22th February 2024	Site visit with Ngāi Tai ki Tāmaki Taiaomaurikura representatives	Watercare Project lead
18th March 2024	Further hui with Ngāi Tai ki Tāmaki Taiaomaurikura representatives on Preferred Option	Watercare Project lead
2nd April 2024	Further hui with Ngāi Tai ki Tāmaki Taiaomaurikura representatives on Preferred Option	Watercare Project lead

[9] Project technical team and additional Watercare personnel

3. Methodology for Developing Options

3.1 Introduction

The Long Long List of options was based on receiving environments for the discharge of treated wastewater. It was assumed the WWTP would remain at the Okaroro Drive site (except where options relied on treatment occurring at other Watercare WWTPs). Wastewater management options in the network apply to all options e.g. wastewater reduction, inflow & infiltration (I&I), alterative collection systems.

3.2 Components of a Wastewater Scheme

In developing an option, the typical components of a wastewater scheme need to be taken into account. A typical wastewater servicing system requires up to four components, or 'building blocks', namely:

1. **Collection System or Local Wastewater Network**: to collect wastewater from groups of properties and transport it to a wastewater treatment plant or to a common point for connection to a conveyance system.

2. **Conveyance**: to transport raw wastewater from a collection system to a wastewater treatment plant for treatment and subsequent reuse and/or discharge.

3. **Treatment**: to change the wastewater characteristics to meet the standards required for reuse and/or discharge to the environment. The disposal of sludge/biosolids arising from the treatment process is also required.

4. **Reuse and / or Discharge of Treated Wastewater**: discharge pipework is required to return fully treated wastewater to the environment and / or to a reuse system.

These four 'building blocks' (components) of wastewater systems are illustrated in Figure 3-1: Components of a Wastewater System below.

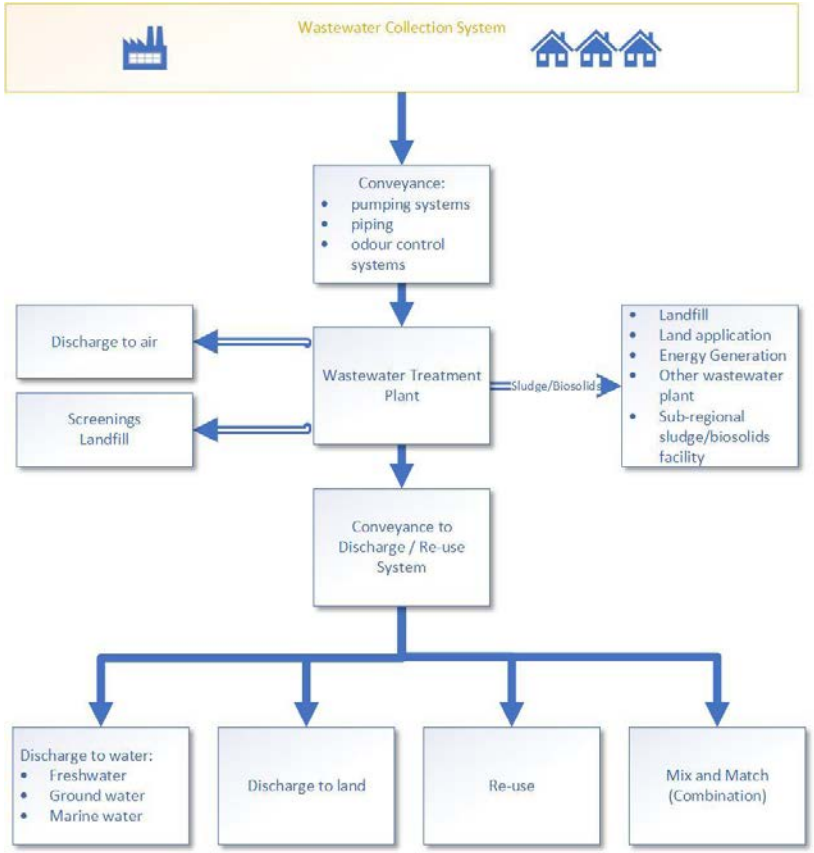


Figure 3-1: Components of a Wastewater System

3.3 'Status Quo' Option

This option would entail retaining the WWTP, the current volume and quality limits and the existing indirect discharge to the tributary of the Te Puru Stream via the current overland flow/pond treatment system. Because the WWTP is nearing the end of it economic life and is reaching capacity, and because there is a clear intent to urbanise new areas of land in Beachlands by developers as well as the population growth predictions, the status quo cannot be advanced and therefore, has not been included in the Long Long List of options.

3.4 Wastewater Treatment Plant Location

Changing the WWTP location has not been considered except in options conveying wastewater to other Watercare wastewater schemes. This is because:

- The Beachlands site has been used for wastewater treatment purposes since 1994.
- There is sufficient land holding to accommodate an upgraded / new WWTP.
- The land on which the WWTP and the overland flow area is designated for wastewater treatment purposes under the Auckland Unitary Plan (AUP).
- The land surrounding the WWTP is zoned Rural Production and Mixed Rural under the AUP, with the nearest dwellings some 300 m northeast of the WWTP site boundary, this reduces the risk associated with reverse sensitivity issues.

4. Fatal Flaw Assessment

4.1 Description of Long Long List Alternatives Considered

A wide range of potential options were developed by the project team, using the methodology described in Section 3. Eleven main options were identified with 27 variations on these options resulting in a total of 32 options considered. A broad range of options ensured that the project team considers established and innovative solutions.

Table 4-1 below sets out the Long Long List of options adopted for the fatal flaw assessment. These options were confirmed by the wider project team in Workshop 1.

Table 4-1: Long Long-list Options

Option	Option Name	Option Description[10]
1a	Mangere (East Tamaki) Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 16km to East Tamaki and connect into the existing Watercare wastewater network.
1aa	Mangere (East Tamaki) Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 16km to East Tamaki and connect into the existing Watercare wastewater network.
1ab	Mangere WWTP Outfall Fully Treated	Construct new pump station and pipeline to enable fully treated wastewater from the Beachlands WWTP to be pumped 30km via East Tamaki or 28km via Flatbush to the Mangere WWTP outfall.
1b	Mangere (Flatbush) Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 14km to Flatbush and connect into the existing Watercare wastewater network.
1ba	Mangere (Flatbush) Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 14km to Flatbush and connect into the existing Watercare wastewater network.
1c	Pukekohe WWTP Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 50 km to the existing Watercare wastewater network that connects to Pukekohe WWTP.
1ca	Pukekohe WWTP Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 50 km to the existing Watercare wastewater network that connects to Pukekohe WWTP.

[10] Conveyance distances are approximate only.

Option	Option Name	Option Description[10]
1cb	Pukekohe Discharge Structure Fully Treated	Construct new pump station and pipeline to enable fully treated wastewater from the Beachlands WWTP to be pumped 50 km to the existing Watercare wastewater network that connects to the Pukekohe WWTP.
1d	South-West WWTP Raw	Construct new pipeline, pump stations and collection points to enable raw wastewater from Beachlands / Maraetai to be pumped 40 km to the existing Watercare wastewater network that connects to the new South-West WWTP (near Glenbrook Beach).
1da	South-West WWTP Partially Treated	Construct new pipeline, pump stations and collection points to enable partially treated wastewater from the Beachlands WWTP to be pumped 40 km to the existing Watercare wastewater network that connects to the new South-West WWTP (near Glenbrook Beach).
1db	South-West WWTP Outfall Fully Treated	Construct new pipeline, pump stations and collection points to enable fully treated wastewater from the Beachlands WWTP to be pumped 40km to the existing Watercare wastewater network that connects to the new South-West WWTP (near Glenbrook Beach).
2a	Over Land Flow (diffuse discharge) to Tributary of Te Puru Stream (Upgraded Existing System)	Maintain the existing indirect discharge to a tributary of the Te Puru Stream via the existing overland flow land treatment system expanded to accommodate increased flows - with or without the pond.
2b	Tributary to Te Puru Stream – direct discharge	Direct discharge to a tributary of the Te Puru Stream, could include land contact, rock bed structure e.g. gabion baskets
2c	Wairoa River	Convey treated wastewater 12 km to a new outfall in the Wairoa River. Discharge on the out-going tide?
2d	Turanga Creek	Convey treated wastewater 10 km to a new outfall in the Turanga Creek / Awa. Discharge on the out-going tide?
3	100% Land	Apply all of the treated wastewater to land.
3a	Land / Stream	A combination of Option 3 with one of Option 2. Seasonal/weather and/or river flow conditions for discharge route. Discharge to land over summer and when stream flow is below minimum allowable. Discharge to stream over winter and when stream flow is above minimum allowable.
4aa	Hauraki Gulf - Pine Harbour Short	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Whitford with a short outfall.
4ab	Hauraki Gulf – Pine Harbour Mid	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Whitford with a mid length outfall.

Option	Option Name	Option Description[10]
4ac	Hauraki Gulf – Pine Harbour Long	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Whitford with a long outfall.
4ad	Hauraki Gulf - Tāmaki Short	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Maraetai with a short outfall.
4ae	Hauraki Gulf - Tāmaki Mid	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Maraetai with a mid length outfall.
4af	Hauraki Gulf - Tāmaki Long	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Maraetai with a long outfall.
4b	Land / Hauraki Gulf	A combination of Options 3 and 4. Seasonal/weather conditions for discharge route. Discharge to land over summer; discharge to Hauraki Gulf over winter and when land is unavailable to accept treated wastewater.
4ba	Land / Hauraki Gulf / Tributary of Te Puru Stream	A combination of Options 3a and 4. Seasonal/weather and/or river flow conditions for discharge route. Discharge to land over summer; Discharge to a tributary of Te Puru stream over winter and when stream flow is above minimum allowable flow. Discharge to Hauraki Gulf over winter and when land is unavailable to accept treated wastewater and when stream flow is below minimum allowable flow for treated wastewater discharge.
5	Managed Aquifer Recharge	Discharge to an aquifer using a Managed Aquifer Recharge (MAR). i.e. high quality water must be used for a groundwater replenishment scheme to purposefully recharge aquifers.
6	100% Reuse – Potable	Direct re-use by supplying drinking water from reclaimed wastewater to the Beachlands / Maraetai community.
7	100% Re-use – Non-Potable	Convey 100% of the treated wastewater to a “purple pipe” reticulation network. Use for domestic (toilets, garden watering, washing machines) irrigation of verges, parks, golf courses, sports fields, industrial reuse etc. A backup discharge route would still be needed as a contingency should re-use demand drop or become unavailable.
8	100% Reuse – Non-Potable - Transition to Potable	Water is treated to a potable standard but not used for that for domestic purposes immediately but is used for other purposes. The non-potable use is retained as per Option 7. Potential to require dual distribution network (Beachlands, Maraetai and Whitford Servicing Strategy June 2023).
9	Supplement supply for the Hunua Dams	Convey treated wastewater 27 km to Hunua water supply dam. Conveyance of the treated wastewater to an appropriate reclaimed standard to the Hunua Dams to supplement the water supply source. Assume 100% of the treated wastewater is discharged.

Option	Option Name	Option Description[10]
10	Tankering	Removal of excess wastewater using tankers and transporting the wastewater to another treatment plant.
10a	Owhanake WWTP Raw	Construct new pipeline, pump stations and collection points to enable raw wastewater from Beachlands Maraetai to be pumped 11km to the Owhanake WWTP on Waiheke Island.
Enhancement (Add-on) Options (can be added to Long List Options Following Fatal Flaw)		
Option 11 This is not a stand alone option	Partial Reuse - Non-Potable	A combination of Option 7 and one of Options 2, 3 or 4. (This option can be explored should one of these receiving environments be selected, as an enhancement to the base scheme). The location of the discharge will dictate the discharge route and the seasonal and/or demand conditions the volume. The volume to non-potable reuse is maximized to meet demand, the remainder is discharged to the receiving environment. Typical examples include verges, reserves, golf courses, industrial re-use, nurseries etc

4.2 Fatal Flaw Criteria

The Long Long List options were assessed against the 'fatal flaw' criteria set out below. This is stage 2 of the assessment process shown in Figure 2-1. The Long Long List of options and the fatal flaw criteria were agreed in the first project team Workshop held on 29/08/23. It was agreed at the workshop that if one of the criteria represents a fatal flaw for an option, the option is removed from the list and any further consideration. This is standard practice for fatal flaw assessments.

The project team carried out an initial fatal flaw assessment which was confirmed by the wider project team.

The fatal flaw criteria are:

- Increase in public health risk
- Significant increase in adverse effects on the natural environment and the community
- Unproven technology
- Prevents growth and economic development (includes allocated capacity)
- Whole of life costs are unsustainable
- Not able to be constructed and/or impractical
- Significantly fails to meet statutory requirements
- Very objectionable to mana whenua

4.3 Results of the Fatal Flaw Assessment

The results of the fatal flaw assessment are set out in Table 4-2 below.

Table 4-2: Results of the fatal flaw assessment

Option	Option Name	Option Description	Reasons for Fatal Flaw
1a	Mangere (East Tamaki) Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 16km to East Tamaki and connect into the existing Watercare wastewater network.	Whole of life costs are unsustainable • Requires both a pump station and a pipe which will incur high costs and the economies of scale of treatment and staging will be substantially reduced. • Costs associated with odour management and septicity controls will be ongoing and significant. • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1aa	Mangere (East Tamaki) Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 16km to East Tamaki and connect into the existing Watercare wastewater network.	Not able to be constructed and/or impractical. • Partially treating wastewater to then be mixed with raw sewage in the network is impractical. Any treatment benefits will be lost through mixing the treated wastewater with raw sewage. The cost of treatment for no benefit is not viable. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1ab	Mangere WWTP Outfall Fully Treated	Construct new pump station and pipeline to enable fully treated wastewater from the Beachlands WWTP to be pumped 30km via East Tamaki or 28km via Flatbush to the Mangere WWTP outfall.	Whole of life costs are unsustainable • Pressure loss along rising main will require additional pump stations which have high costs. Not able to be constructed and/or impractical • Rising main would need to traverse existing urban areas which would be very challenging to construct. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1b	Mangere (Flatbush) Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 14km to Flatbush and	Whole of life costs are unsustainable • Requires both a Pump Station and a pipe which will incur high costs and

Option	Option Name	Option Description	Reasons for Fatal Flaw
		connect into the existing Watercare wastewater network.	the economies of scale of treatment and staging will be substantially reduced. • Costs associated with odour management and septicity controls will be ongoing and significant. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1ba	Mangere (Flatbush) Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 14km to Flatbush and connect into the existing Watercare wastewater network.	Not able to be constructed and/or impractical • Partially treating wastewater to then be mixed with raw sewage in the network is impractical. Any treatment benefits will be substantially lost through mixing the partially treated wastewater with raw sewage flow to Mangere. This is an inefficient option form a cost perspective. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1c	Pukekohe WWTP Raw	Construct new pump station and pipeline to enable raw wastewater from Beachlands / Maraetai to be pumped 50 km to the existing Watercare wastewater network that discharges to Pukekohe WWTP.	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Not able to be constructed and/or impractical • Raw wastewater will have a long residence time in the pipe which will negatively impact the WWTP. High odour / corrosion risk due to septic conditions in rising main. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.

Option	Option Name	Option Description	Reasons for Fatal Flaw
1ca	Pukekohe WWTP Partially Treated	Construct new pump station and pipeline to enable partially treated wastewater from the Beachlands WWTP to be pumped 50 km to the existing Watercare wastewater network that discharges to Pukekohe WWTP.	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Whole-of-life costs are unsustainable • Requires both a WWTP and a pipe which will incur high costs and the economies of scale of treatment staging will be lost. • Pressure loss along rising main will require additional pump stations which are cost heavy. Not able to be constructed and/or impractical • Wastewater will have a long residence time in the pipe which will negatively impact the WWTP. High odour / corrosion risk due to septic conditions in rising main. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1cb	Pukekohe Discharge Structure Fully Treated	Construct new pump station and pipeline to enable fully treated wastewater from the Beachlands WWTP to be pumped 50 km to the existing Watercare wastewater discharge structure associated with the Pukekohe WWTP.	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Whole-of-life costs are unsustainable • Requires both a WWTP, pump station and a long pipe which will incur high costs and the economies of scale of treatment will be lost. • Pressure loss along the pipe will require additional pump stations which have high costs. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.

Option	Option Name	Option Description	Reasons for Fatal Flaw
1d	South-West WWTP Raw	Construct new pipeline, pump stations and collection points to enable raw wastewater from Beachlands / Maraetai to be pumped 40 km to the existing Watercare wastewater network that discharges to the new South-West WWTP (near Glenbrook Beach).	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Not able to be constructed and/or impractical • Raw wastewater will have a long residence time in the pipe which will negatively impact the WWTP. High odour / corrosion risk due to septic conditions in rising main. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
1da	South-West WWTP Partially Treated	Construct new pipeline, pump stations and collection points to enable partially treated wastewater from the Beachlands WWTP to be pumped 40 km to the existing Watercare wastewater network that discharges to the new South-West WWTP (near Glenbrook Beach).	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Whole-of-life costs are unsustainable • Requires both a WWTP and pump station and a long pipe which will incur high costs and the economies of scale of treatment staging will be lost. • Pressure loss along rising main will require additional pump stations which have high costs. Not able to be constructed and/or impractical • Wastewater will have a long residence time in the pipe which will negatively impact the WWTP. High odour / corrosion risk due to septic conditions in rising main. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.

Option	Option Name	Option Description	Reasons for Fatal Flaw
1db	South-West WWTP Outfall Fully Treated	Construct new pipeline, pump stations and collection points to enable fully treated wastewater from the Beachlands WWTP to be pumped 40km to the existing Watercare wastewater network that discharges to the new South-West WWTP (near Glenbrook Beach).	Prevents growth and economic development (includes allocated capacity) • Takes up allocated capacity for growth that has been provided for a different community. Whole-of-life costs are unsustainable • Requires both a WWTP and a long pipe which will incur high costs and the economies of scale of treatment will be lost. • Pressure loss along the pipe will require additional pump stations which are high in cost. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
10	Tankering	Removal of excess wastewater using tankers and transporting the wastewater to another treatment plant.	Not able to be constructed and/or impractical • Impractical due to high vehicle movements, noise, carbon emissions and lack of resilience. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.
10a	Owhanake WWTP Raw	Construct new pipeline, pump stations and collection points to enable raw wastewater from Beachlands / Maraetai to be pumped 11km to the Owhanake WWTP on Waiheke Island.	Prevents growth and economic development (includes allocated capacity) Takes up allocated capacity for growth that has been provided for a different community. Very objectionable to mana whenua • The transfer of wastewater out of the Beachland / Maraetai service area is not supported by mana whenua.

From the 32 Long Long List of options, 13 options were fatally flawed.

5. Long List / Traffic Light Technical Assessment

5.1 Long List Description

After the completion of the fatal flaw assessment process, 20 options were carried forward as the Long List options for the Traffic Light Assessment.

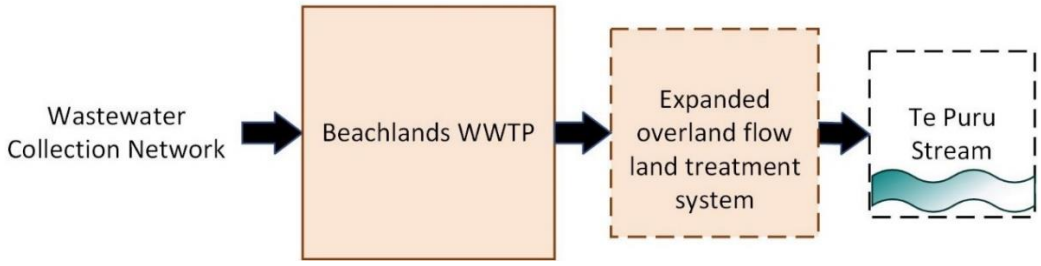
The following provides a description and a schematic of each of the Long List of options. This information was provided to the project's technical experts to assist them in undertaking their Long List assessments. These assessments then informed the Long List / Traffic Light technical assessment (refer to the steps in Figure 2-1).

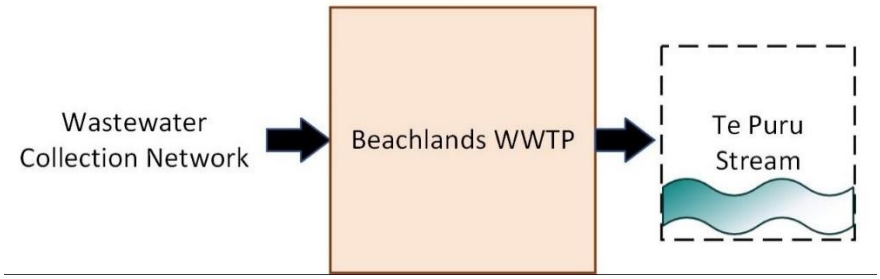
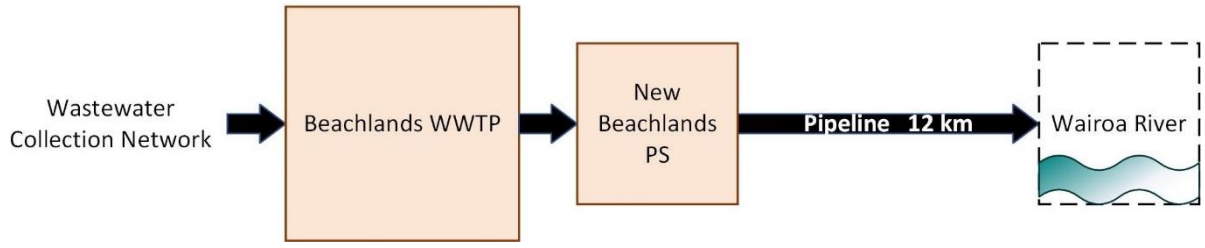
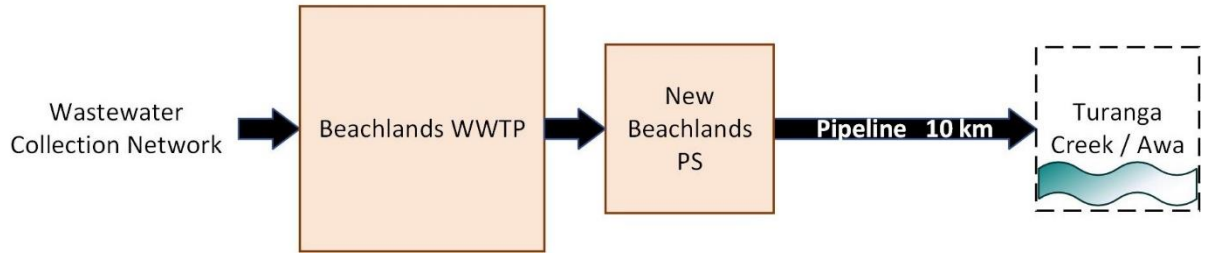
5.1.1 Discharge Location Alternatives

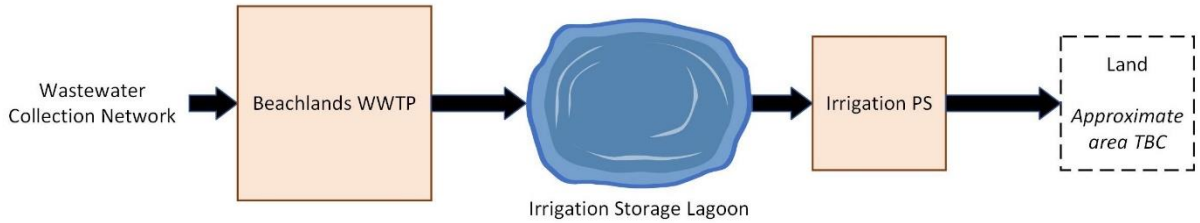
The following options all assess discharging wastewater from an upgraded Beachlands WWTP to alternative receiving environments. Note that Option 2a is similar to the status quo, but with an upgraded WWTP and expanded overland flow treatment system.

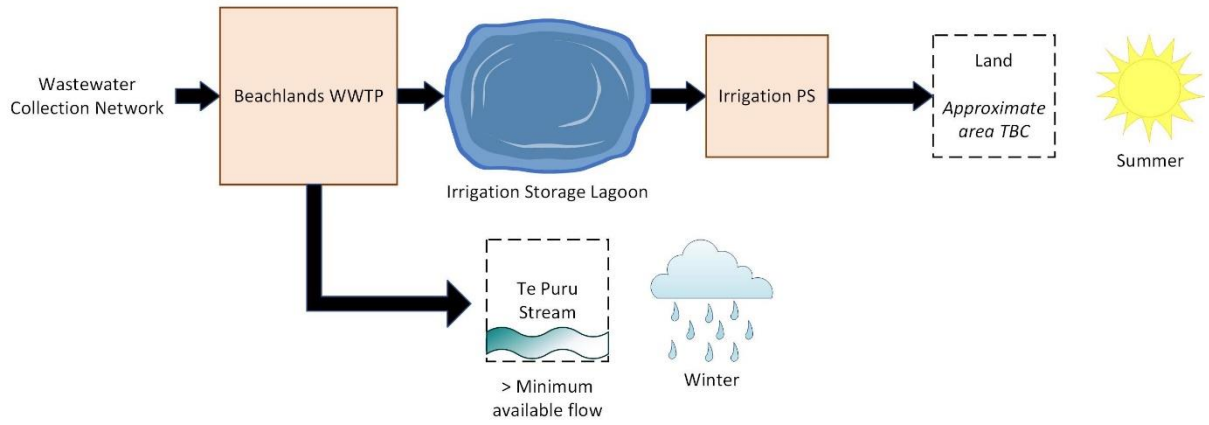
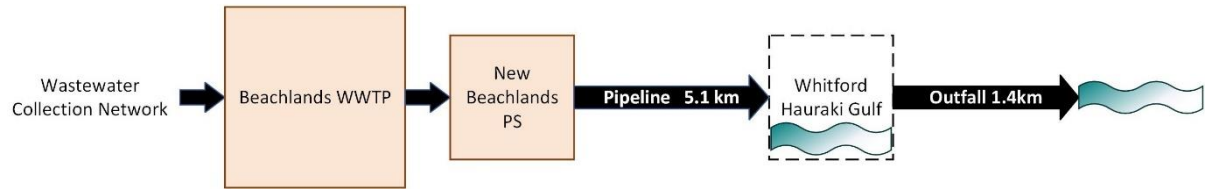
While specific treatment options were not specified at this Long List stage, it was assumed that the treatment processes are available and affordable to meet the necessary discharge quality standards for the respective receiving environments.

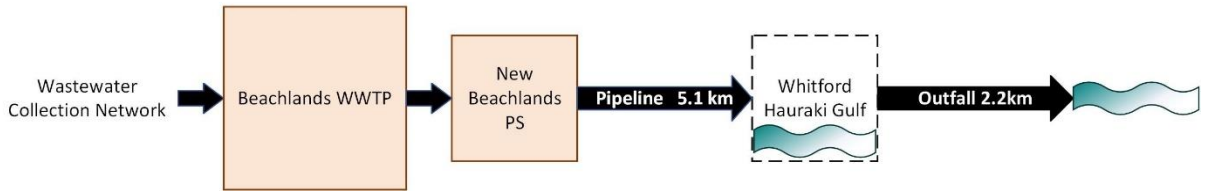
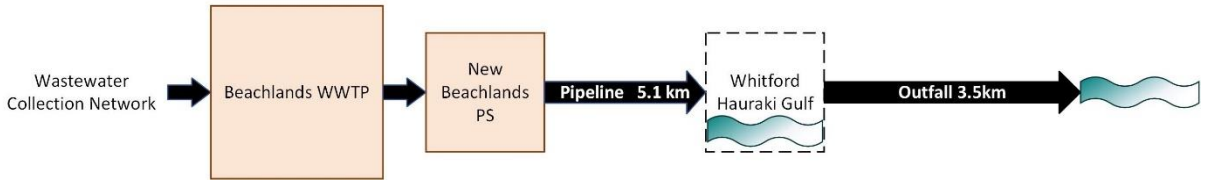
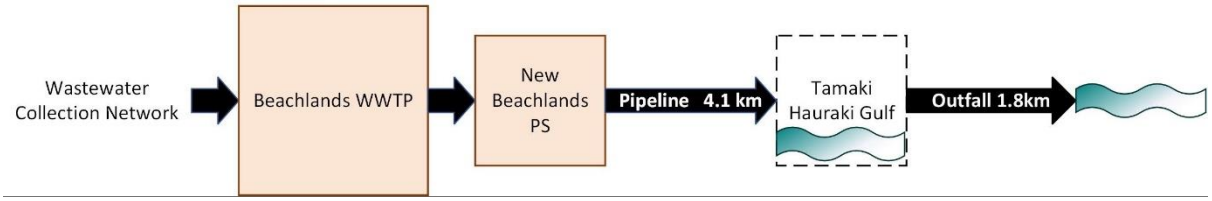
Table 5-1: Discharge Location Long List Options

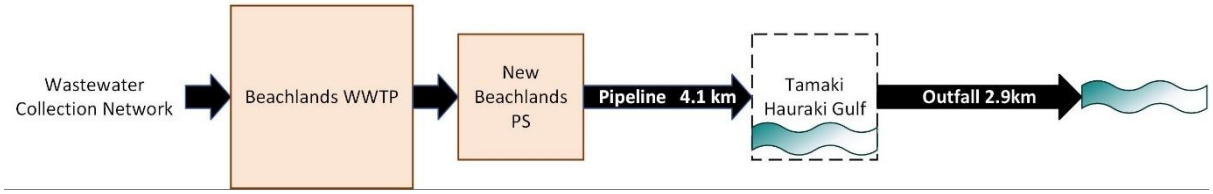
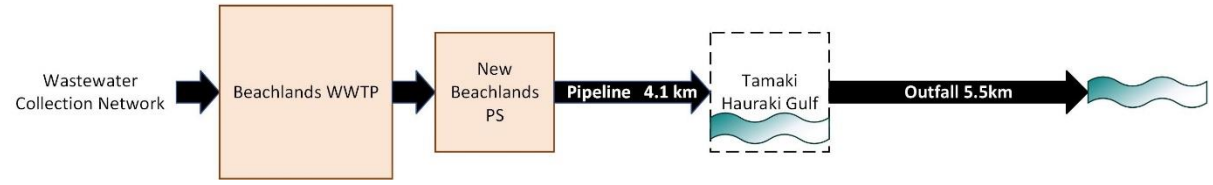
Option	Option name	Description of Option	Summary of Infrastructure Components
2a	Overland Flow (diffuse discharge) to Tributary to Te Puru Stream (Upgraded Existing System)	Maintain the existing indirect discharge to Te Puru Stream via the existing overland flow land treatment system expanded to accommodate increased flows - with or without the pond.	Upgraded Beachlands WWTP Expanded overland flow treatment system
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
2b	Tributary of Te Puru Stream – direct discharge	Direct discharge toa tributary of the Te Pura Stream, could include land contact, rock bed structure e.g. gabion baskets	Upgraded Beachlands WWTP New discharge structure o Land contact or o Rock bed structure or o Gabion baskets or o Direct pipe discharge
		Key Treatment Parameters	Appropriate Treatment Processes

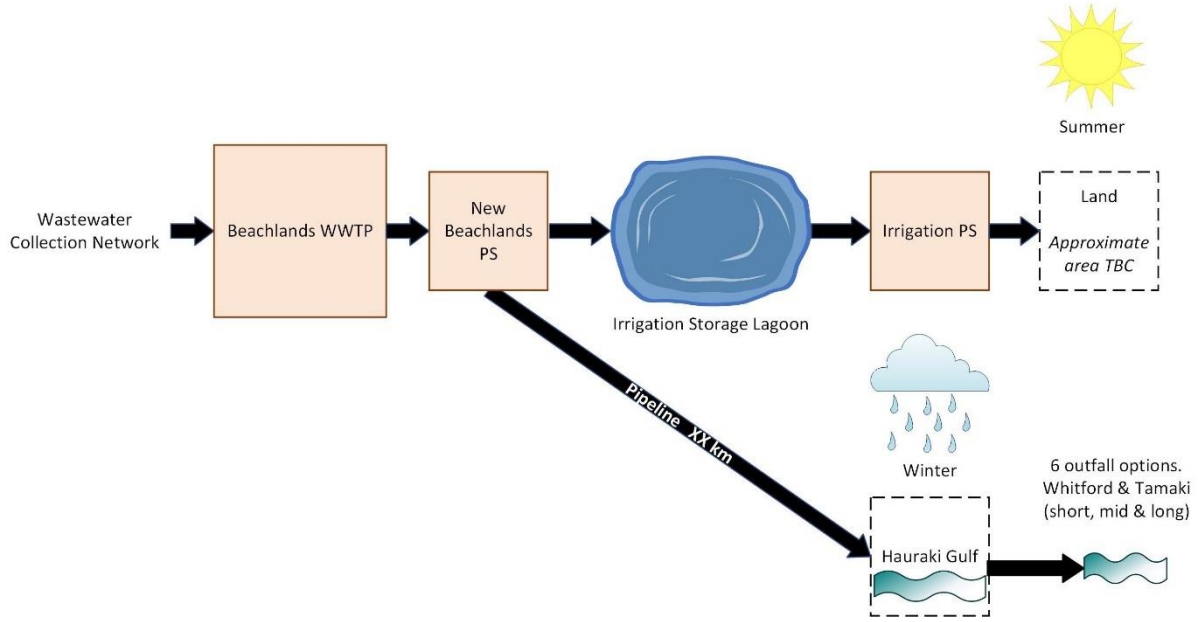
Option	Option name	Description of Option	Summary of Infrastructure Components
		TBC	TBC
			
2c	Wairao River	Convey treated wastewater **12 km** to a new outfall in the Wairoa River. Discharge on the out-going tide?	Upgraded Beachlands WWTP New Beachlands pump station New 12km pipeline New discharge structure
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
2d	Turanga Creek / Awa	Convey treated wastewater **10 km** to a new outfall in the Turanga Creek / Awa. Discharge on the out-going tide?	Upgraded Beachlands WWTP New Beachlands pump station New 10km pipeline New discharge structure at the Turanga Creek / Awa
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			

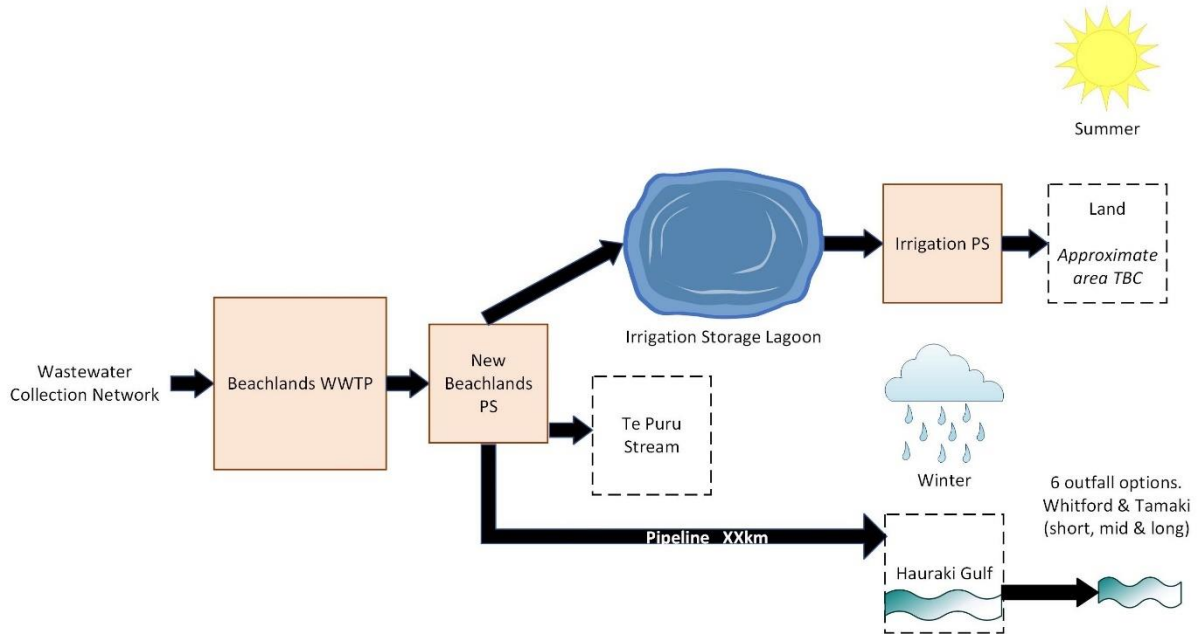
Option	Option name	Description of Option	Summary of Infrastructure Components
3	100% Land Irrigation	Irrigation of all the treated wastewater to land.	Upgraded Beachlands WWTP New irrigation Storage Lagoon New irrigation pump station New pipeline to land application system New land application system
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
3a	Land Irrigation and Tributary of Te Puru Stream Discharge	A combination of Option 3 with one of Option 2. Seasonal/weather and/or river flow conditions for discharge route. Discharge to land over summer and when stream flow is below minimum allowable. Discharge to stream over winter and when stream flow is above minimum allowable.	Upgraded Beachlands WWTP New irrigation Storage Lagoon New irrigation pump station New pipeline to land application system New land application system Discharge structure o Land contact or o Rock bed structure or o Gabion baskets; or o Or direct pipe discharge. Or expanded overland flow treatment system
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

Option	Option name	Description of Option	Summary of Infrastructure Components
			
4aa	Hauraki Gulf – Pine Harbour Short	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Pine Harbour with a short outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈5.1km conveyance pipeline New short outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
4ab	Hauraki Gulf – Pine Harbour Mid	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Pine Harbour with a mid-length outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈5.1km conveyance pipeline TBC New mid-length outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

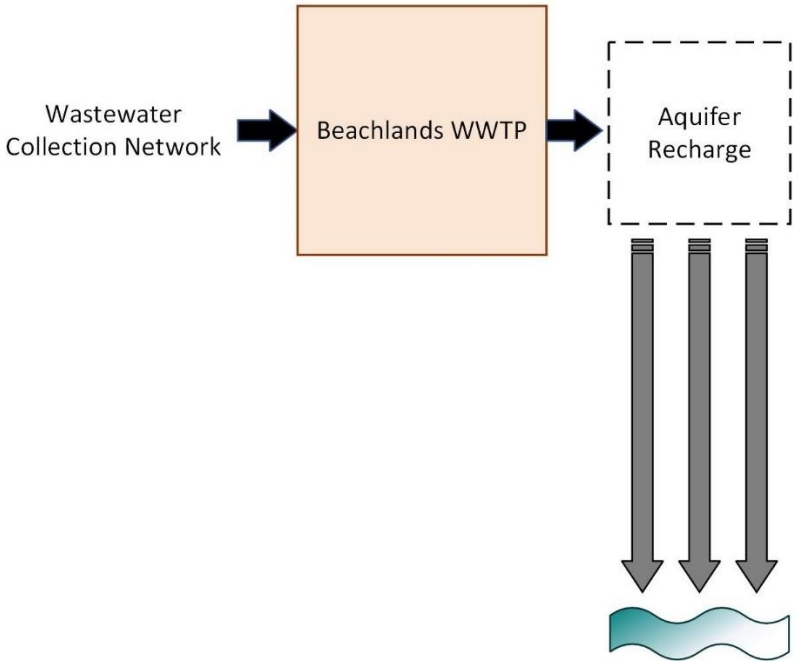
Option	Option name	Description of Option	Summary of Infrastructure Components
			
4ac	Hauraki Gulf - Pine Harbour Long	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Pine Harbour with a long outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈5.1km conveyance pipeline New long outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
4ad	Hauraki Gulf - Tāmaki Strait Short	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Beachlands with a short outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈4.1km conveyance pipeline New short outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
4ae	Hauraki Gulf - Tāmaki Strait Mid	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Beachlands with a mid-length outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈4.1km conveyance pipeline

Option	Option name	Description of Option	Summary of Infrastructure Components
			New mid-length outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
4af	Hauraki Gulf - Tāmaki Strait Long	Convey treated wastewater to a new marine outfall into the Hauraki Gulf off the coast of Beachlands with a long outfall.	Upgraded Beachlands WWTP New Beachlands pump station New ≈4.1km conveyance pipeline New long outfall pipeline and offshore marine outfall structure/diffuser
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
4b	Land Application and Hauraki Gulf Discharge	A combination of Options 3 and 4. Seasonal/weather conditions for discharge route. Discharge to land over summer; discharge to Hauraki Gulf over winter and when land is unavailable to accept treated wastewater.	Upgraded Beachlands WWTP New Beachlands pump station XXkm pipeline to Hauraki Gulf TBC New irrigation Storage Lagoon New irrigation pump station New pipeline to land application system New land application system New XXkm outfall pipeline and offshore marine outfall structure/diffuser TBC.
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

Option	Option name	Description of Option	Summary of Infrastructure Components
			
4ba	Land Application, Hauraki Gulf Discharge and Tributary of Te Puru Stream Discharge	A combination of Options 3a and 4. Seasonal/weather and/or river flow conditions for discharge route. Discharge to land over summer; Discharge to a tributary of the Te Puru stream over winter and when stream flow is above minimum allowable flow. Discharge to Hauraki Gulf over winter and when land is unavailable to accept treated wastewater and when stream flow is below minimum allowable flow.	Upgraded Beachlands WWTP New Beachlands pump station XXkm pipeline to Hauraki Gulf TBC New irrigation Storage Lagoon New irrigation pump station New pipeline to land treatment system New XXkm outfall pipeline and offshore marine outfall structure/diffuser New land application system Te Puru Stream possible discharge structure o Land contact or o Rock bed structure or o Gabion baskets; or o Direct pipe discharge Tributary of Te Puru Stream expanded overland flow treatment system
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

Option	Option name	Description of Option	Summary of Infrastructure Components
			
5	Managed Aquifer Recharge	Discharge to an aquifer using a Managed Aquifer Recharge (MAR). i.e. high quality water must be used for a groundwater replenishment scheme to purposefully recharge aquifers.	Upgraded Beachlands WWTP New XXkm conveyance pipeline to aquifer recharge system New groundwater recharge system
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

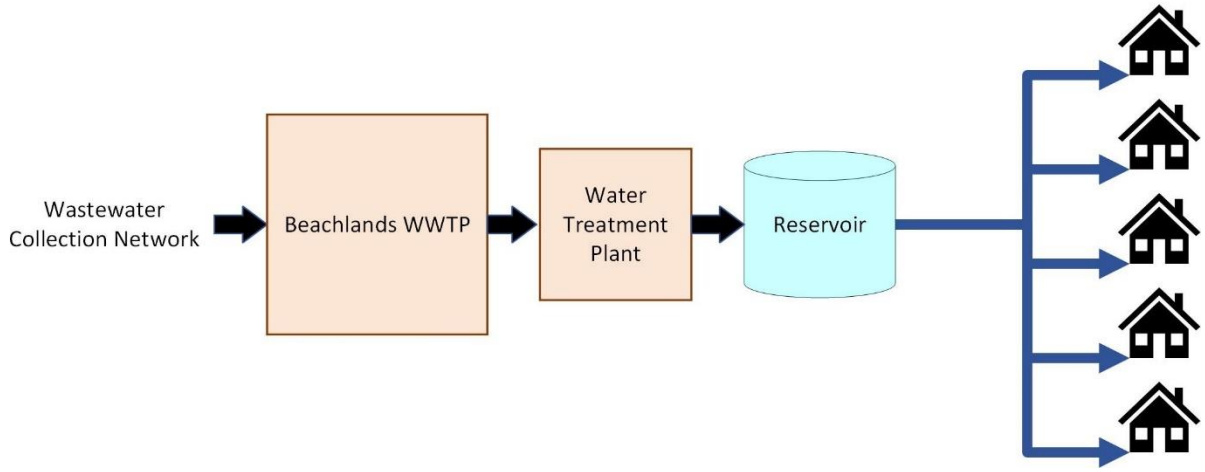
Option	Option name	Description of Option	Summary of Infrastructure Components

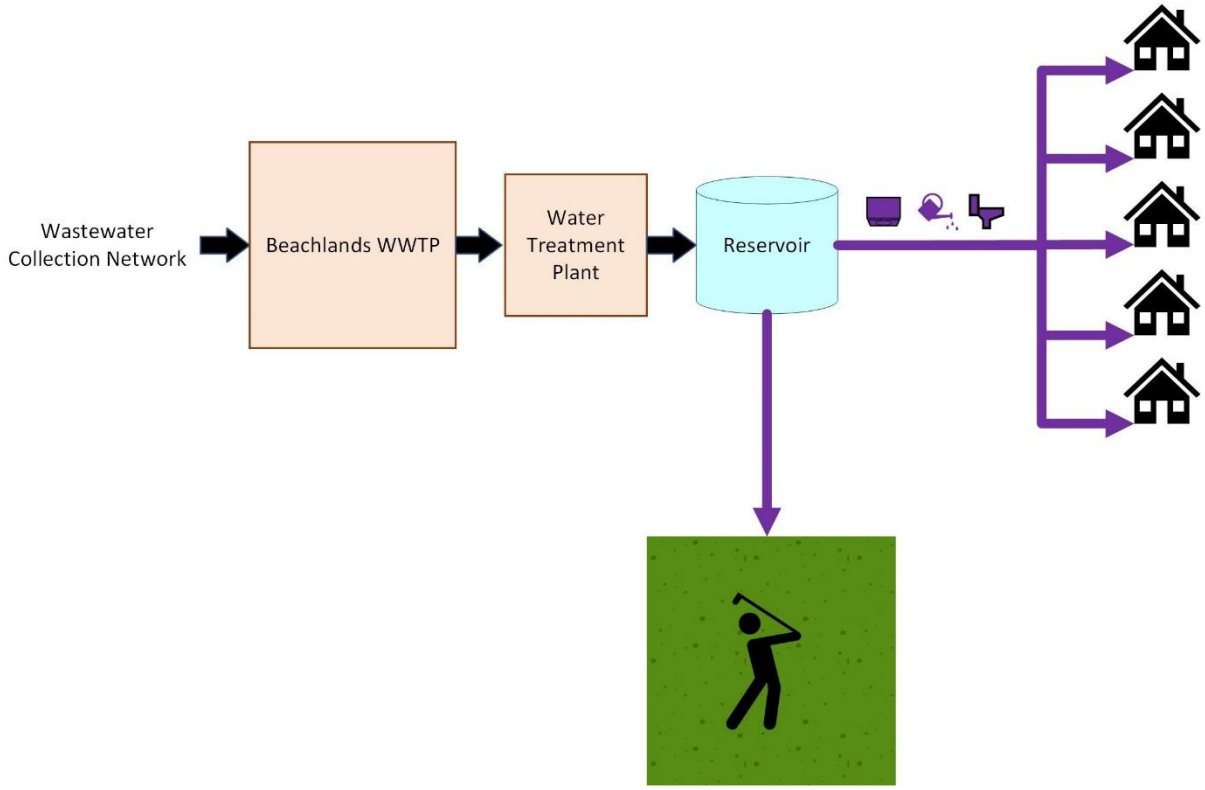


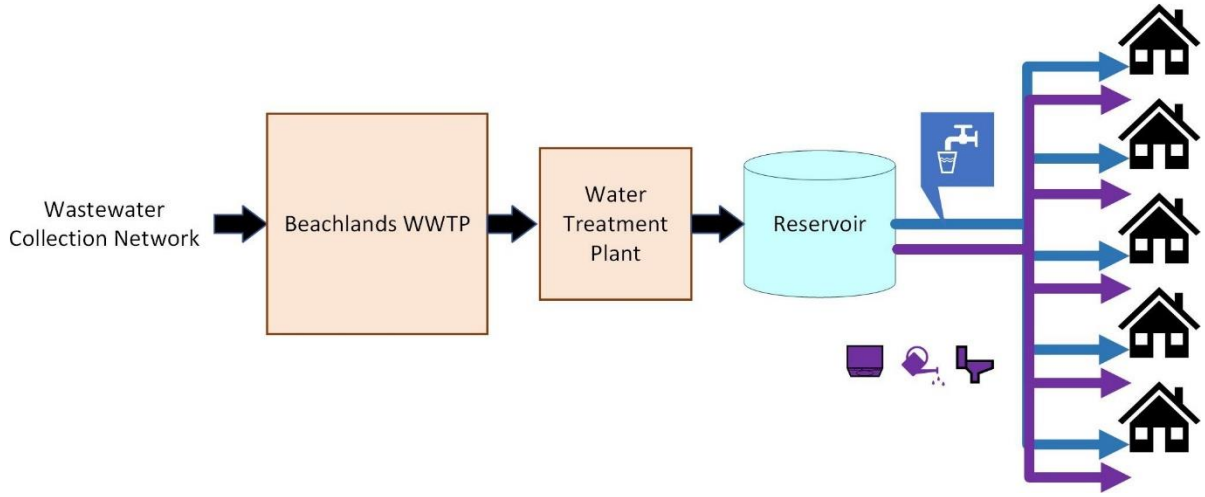
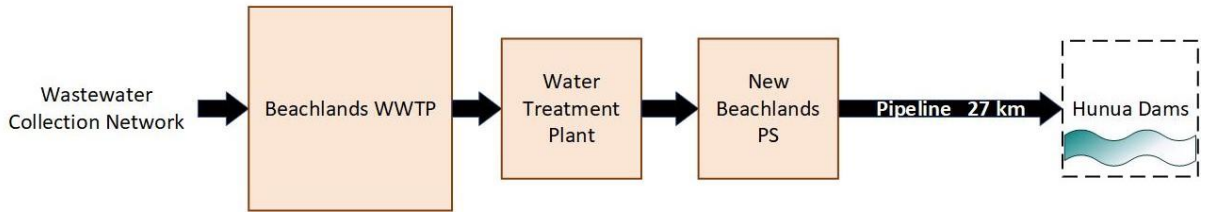
5.1.2 Wastewater Management Alternatives

Table 5-2: Wastewater Management Long List Options

Option	Option name	Description of Option	Summary of Infrastructure Components
6	100% Reuse - Potable	Direct re-use by supplying potable drinking water from reclaimed wastewater to the Beachlands/Maraetai community.	Upgraded Beachlands WWTP New water treatment plant New reservoir New water supply network Backup discharge route for (any) balance of treated wastewater
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

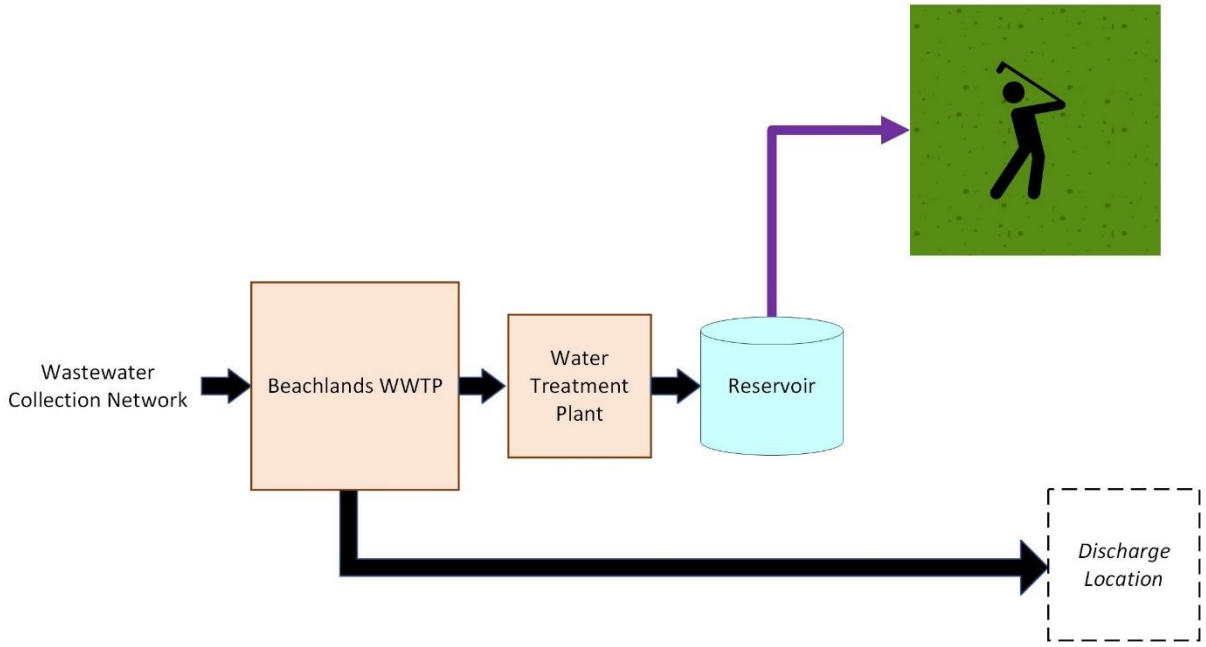
Option	Option name	Description of Option	Summary of Infrastructure Components
			
7	100% Re-use – Non-Potable	Convey 100% of the treated wastewater to a “purple pipe” reticulation network. Use for domestic (toilets, garden watering, washing machines?) irrigation of verges, parks, golf courses, sports fields, industrial re-use, nurseries, agricultural irrigation etc. A backup discharge route would still be needed as a contingency should re-use demand drop or become unavailable.	Upgraded Beachlands WWTP New water treatment plant New reservoir New water supply network
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

Option	Option name	Description of Option	Summary of Infrastructure Components
			
8	100% Reuse – Non-Potable - Transition to Potable	Water is treated to a potable standard but not used for that for domestic purposes immediately but is used for other purposes. The non-potable use is retained. Potential to require dual distribution network (Beachlands, Maraetai and Whitford Servicing Strategy June 2023).	Upgraded Beachlands WWTP New water treatment plant New reservoir New purple pipe water supply network Possible new potable pipe water supply network
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC

Option	Option name	Description of Option	Summary of Infrastructure Components
			
9	Supplement supply for the Hunua Dams.	Convey treated wastewater 27 km to Hunua water supply dam. Conveyance of the treated wastewater to an appropriate reclaimed standard 27km to the Hunua Dams to supplement the water supply source at the Hunua Dams. Assume 100% of the treated ww is discharged to the Hunua Dams.	Upgraded Beachlands WWTP New water treatment plant New water pump station New 27km treated water pipeline New discharge point to a Hunua Dam/reservoir.
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC
			
11[11]	Enhancement options: Partial Reuse - Non-Potable	A combination of Option 7 and one of Options 2, 3 or 4. (This option can be explored should one of these receiving environments be selected, as an enhancement to the base scheme). The location of the discharge will dictate the discharge route and the seasonal and/or demand	Upgraded Beachlands WWTP New water treatment plant New reservoir New water supply network New pipeline – XX km – to discharge location. New discharge facilities.

[11] Option 11 was not scored by the experts as it comprises enhancements that can be incorporated into a range of options.

Option	Option name	Description of Option	Summary of Infrastructure Components
		conditions the volume. The volume to non-potable reuse is maximised to meet demand, the remainder is discharged to the receiving environment. Typical examples include verges, reserves, golf courses, industrial re-use, nurseries etc	
		Key Treatment Parameters	Appropriate Treatment Processes
		TBC	TBC



5.2 Approach to Long List / Traffic Light Technical Assessment

As shown in Figure 2-1, the Long List / traffic light technical assessment involved technical experts being allocated a criterion and undertaking a high-level assessment of each of the Long List of options against their respective criteria. At the Long List workshop each technical expert then presented their score and the justification for the score. The workshop participants discussed the options scores and agreed the final score.

To ensure a consistent and repeatable approach of the Long List assessment, the technical experts were provided with assessment templates for the criterion they were responsible for and with workshop briefing notes. The experts were required to:

1. Use the bespoke template for each criteria the expert was responsible for. The template recorded:
    - The experts involved in undertaking the assessments
    - Information relied on
    - Assumptions
    - Traffic Light scores and reasons for the scores

Assess each option against the criteria as Red, Orange, or Green (Traffic Light) in accordance with the Traffic Light definitions for the relevant criterion set out in Table 5-3 below and record reasons for each score.

Determine an option's recommended traffic light 'score' by first scoring each of the criterion's sub-criteria separately (a full description of the sub-criteria was contained in the assessment template). Determine an overall score by comparing the range of sub-criteria scores and giving an overall score. A qualitative expert judgement approach was followed in determining the scores for the Long List assessment rather than a quantitative approach.

5.2.1 Assessment Criteria

The following principles were applied in developing the Long List assessment criteria:

a. Criteria must assist in differentiating options (e.g. there is no point in including a criterion relating to natural hazards if none of the options will be affected by natural hazards).

b. Criteria need to be designed to address the local context within which the options are located e.g. urban, rural, natural hazards, open space.

c. Criteria need to be easily understood and clearly describe the matters to be assessed.

d. Double counting i.e. assessing the same or similar matters under different criteria should be avoided, where possible.

e. There should not be too many or too few criteria.

The following table sets out the criteria used for the traffic light assessment, the various categories for each of the criterion, an overall description for each of the criterion and the relevant section of Part 2 of the RMA that the criterion addresses. The assessment criteria were agreed by participants at Workshop 1. As previously discussed, the traffic light / longlist assessment is a technical assessment and consequently does not include criteria relating to cultural matters.

Table 5-3: Long List Assessment Criteria

Criteria	Criteria categories / Sub criteria	Description	RMA Part 2 matters addressed
Public Health Protection	Microbiological quality of treated wastewater Risk of public exposure to waterborne pathogens and other contaminants through: • Direct contact with the conveyance or treatment process. • Direct contact with the receiving environment, for example through contact recreation. • Indirect exposure – commercial operations, food gathering (shellfish, fish, watercress etc.) and groundwater use. Spray irrigation / aerosols • Risk of public exposure to pathogens and other contaminant from spray irrigations. Treated wastewater reuse • Risk of contamination of reclaimed water for potable and non-potable reuse.	Degree of public exposure to health risks from treated wastewater discharge (including through land application or re-use options).	Section 5 – enables people and communities to provide for their health and safety.
Natural Environment	Coastal environment • Effects on life supporting capacity - water quality, marine ecology, indigenous biodiversity. • Effects on foreshore and seabed. • Effects on natural character, features and landscapes. • Ability to meet the requirements of s107 of the RMA. Freshwater • Effects on Te Mana o te Wai. • Alignment with NPS-FM compulsory values, other values, national bottom lines. • Ability to meet the requirements of s107 of the RMA. Groundwater • Effects on Te Mana o te Wai.	Potential adverse environmental effects on the receiving environments associated with the options. Ability to meet s107 of the RMA and align with the values and bottom lines of the NPS-FM.	• Section 5 – safeguarding the life-supporting capacity of air, water, soil, and ecosystems. • Section 6(a) - the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development. • Section 6(b) - the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development.

Criteria	Criteria categories / Sub criteria	Description	RMA Part 2 matters addressed
	• Alignment with NPS-FM compulsory values, other values, national bottom lines. Land • Effects on terrestrial ecology • Effects on highly productive land. • Effects on natural inland wetlands.		• Section 6(c) - the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna. Section 7(d) - intrinsic values of ecosystems. Section 7(f) - maintenance and enhancement of the quality of the environment. Section 7 (h) - the protection of the habitat of trout and salmon.
Social and Community	Amenity values • Nuisance effects (e.g., odour, noise, visual). • Effects on sensitive activities Recreation and food gathering • Effects on recreation activities and values, and food gathering. • Effects on public access to the CMA, rivers, and streams. Heritage and archaeology • Effects on archaeology (non-Māori). • Effects on heritage buildings and sites. Rural and commercial activities • Effects on rural activities. • Effects on commercial operations in the marine environment.	Potential adverse effects on social and community values relating to amenity, recreation and food gathering, archaeology and heritage. Impact on Public access to and along the coastal marine area, and rivers and streams. Impact on rural activities and commercial operations.	• Section 5 – enables people and communities to provide for their social and economic well being. • Section 6(d) - the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers. • Section 6(f) - the protection of historic heritage from inappropriate subdivision, use, and development. • Section 7(c) - the maintenance and enhancement of amenity values. • Section 7(f) - maintenance and enhancement of the quality of the environment.
Financial Implications	Capital cost • Capital cost of the total scheme including any land acquisition costs, capital gains and product net revenue. Operating and maintenance cost	Comparative capital, operating and maintenance, whole of life costs of the options. Where relevant to the option, land acquisition costs, capital gains and product net revenue. Affordability –	• Section 5 - enables people and communities to provide for their economic well being.

Criteria	Criteria categories / Sub criteria	Description	RMA Part 2 matters addressed
	• Cost effectiveness of operations and maintenance. Whole of life cost • Combination of capital and operation and maintenance costs over the life of the assets. Financial risk • Is the option affordable even if growth does not occur as predicted. • Cost to the community, business and trade waste dischargers.	community, business, and trade waste dischargers	• Section 7(b) - the efficient use and development of natural and physical resources.
Resilience	• Natural hazards • Land stability and erosion affecting infrastructure. • Flooding affecting infrastructure. • Wildfires affecting infrastructure (land application in forests). Climate change • High intensity rainfall peaks affecting the infrastructure. • Prolonged wet weather periods affecting the infrastructure. • Prolonged dry periods affecting the infrastructure. • Prolonged dry periods resulting in an increase of low flows in streams and rivers. • Sea level rise and coastal storm inundation affecting infrastructure (ocean outfall). • Carbon – addressing the carbon component of 40/20/20. Operational resilience • Power supply reliability – effect of outages and rapid changes to electricity pricing. • Scheme complexity leading to operational problems. • Third party damage to infrastructure, e.g., digger hitting cables, pipes etc. • Crop failure/contamination.	Degree to which the option is resilient to natural hazards and climate change, offers operational resilience, addresses the carbon component of 40/20/20. Flexibility to accommodate changes in flows and loads, ability to respond to changes in regulatory standards, changes in technology.	• Section 5 – enables people and communities to provide for their health and safety. • Section 7(i) – the effects of climate change.

Criteria	Criteria categories / Sub criteria	Description	RMA Part 2 matters addressed
	• Loss of market for land application products e.g., cut and carry products, forestry production. • Flexibility • Ability to accommodate changes in flows and loads. • Ability to respond to changes in regulatory standards e.g., emerging contaminants, endocrine disrupting compounds. • Ability to respond to changes in technology.		
Technology and Infrastructure	Reliable and proven technology • Uses reliable, robust and proven technology. Staging and timing • Can the option be staged. • Is the option able to be constructed within the required timeframe. Constructability • Is the option able to be constructed e.g., geotechnical conditions, presence of groundwater, contaminated land. • Is there sufficient land available to accommodate the option and can the land be secured. • Potential to maximise the use existing infrastructure that has a valuable remaining life. • Presence of existing other infrastructure. Capacity • Does the option have capacity to accept projected flows and loads. • Carbon Footprint / Greenhouse gas emissions • Comparative carbon footprint GHG emissions for operation and construction.	Degree to which the option – uses proven technology, existing infrastructure; can be constructed, staged, constructed in the required timeframes; has sufficient capacity, secure land, available infrastructure.	• Section 5 - sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations. • Section 7(b) - the efficient use and development of natural and physical resources.
Statutory Risks and Conflicts	Barriers to options proceeding • Risk of an option not proceeding due to legislative changes and outcomes of legislative processes e.g., potentially	Legislative processes that could restrict the ability of an option to proceed, scale of consenting complexity and consent	• Sections 5, 6, 7, 8.

Criteria	Criteria categories / Sub criteria	Description	RMA Part 2 matters addressed
	successful applications for customary title under the Takutai Moana Act. Complexity and compliance • Risk of complex consenting processes including s91 deferrals. • Risk of complex compliance requirements and costs. Conflicts with statutory direction • Conflict with the direction of key planning instruments e.g., non-complying activity classification with a supporting "avoid" policy.	compliance. Conflicts with the direction of key planning instruments.	
Opportunities and Benefits	Resource recovery • Treated wastewater beneficial reuse. • Sludge and biosolids beneficial reuse • Nutrient removal	Provides opportunities for resource recovery including beneficial reuse, energy generation, nutrient recovery / reuse.	• Section 5 – sustainable management of resources. • Section 7(b) - the efficient use and development of natural and physical resources. • Section 7 (ba) - the efficiency of the end use of energy.

5.2.2 Traffic Light Definitions

Table 5-4: Traffic Light definitions

sets out the traffic light definitions (scores) that were adopted for each of the assessment criterion. Green is the best and Red is the worst.

Table 5-4: Traffic Light definitions

Criteria	Green	Orange	Red
Public Health Protection	Low degree of public exposure to risk	Medium degree of public exposure to risk	High degree of public exposure to risk
Natural Environment	Low potential adverse effects	Medium potential adverse effects	High potential adverse effects
Social and Community	Low potential adverse effects	Medium potential adverse effects	High potential adverse effects
Financial Implications	Low financial implications	Medium financial implications	High financial implications
Resilience	High degree of resilience	Medium degree of resilience	Low degree of resilience
Technology and Infrastructure	High degree of alignment	Medium degree of alignment	Low degree of alignment
Statutory Risks and Conflicts	Low risks and conflicts	Medium risks and conflicts	High risks and conflicts
Opportunities and Benefits	High opportunities and benefits	Medium opportunities and benefits	Minimal opportunities and benefits

5.2.3 Responsibilities

Appendix A sets out the technical experts who were responsible for each criterion along with other experts who provided additional technical support or reviewed the assessments.

Copies of the technical expert's Long List assessments are attached as Appendix B.

5.2.4 Summary of Preliminary Technical Long List Scores

Table 5-5 is a collation of the overall scores provided by the technical experts in advance of the Long List / Traffic Light workshop. A low overall Traffic Light score is best and a high score is worst. Green = 1, Orange = 2, Red = 3.

Where a traffic light score in the table below is identified as preliminary this indicates the wish of the expert either to draw on the collective knowledge of the workshop participants to help inform the score or the need to undertake further work to confirm the score.

Table 5-5: Preliminary Technical Expert Assessment Summary of Long List Scores (pre workshop)

Option / Criteria	Public Health Protection	Natural Environment	Social and Community	Financial Implications	Resilience	Technology and Infrastructure	Statutory Risks and Conflicts	Opportunities and Benefits	Overall Traffic Light
2a: Overland Flow (diffuse discharge) Tributary of Te Puru Stream		Preliminary							11
2b: Tributary to Te Puru Stream – direct discharge		Preliminary							12
2c: Wairoa River		Preliminary							18
2d: Turanga Creek / Awa		Preliminary							19
3: 100% Land Application		Preliminary	Preliminary						12
3a: Land Application + Tributary of Te Puru Stream		Preliminary							12
4aa: Hauraki Gulf Pine Harbour Short		Preliminary							16
4ab: Hauraki Gulf Pine Harbour Mid		Preliminary							16
4ac: Hauraki Gulf Pine Harbour Long		Preliminary							16
4ad: Hauraki Gulf Tāmaki Strait Short		Preliminary							16
4ae: Hauraki Gulf Tāmaki Strait Mid		Preliminary							11
4af: Hauraki Gulf Tāmaki Strait Long		Preliminary							13

Option / Criteria	Public Health Protection	Natural Environment	Social and Community	Financial Implications	Resilience	Technology and Infrastructure	Statutory Risks and Conflicts	Opportunities and Benefits	Overall Traffic Light
4b: Land Application + Hauraki Gulf		Preliminary							15
4ba: Land Application + Hauraki Gulf + Tributary of Te Puru Stream		Preliminary							15
5: Managed Aquifer Recharge		Preliminary							14
6: 100% Reuse - Potable		Preliminary							14
7: 100% Reuse – Non-Potable		Preliminary							14
8: 100% Reuse – Non-Potable Transition to Potable		Preliminary							15
9: Supplement Supply for Hunua Dams		Preliminary							14

5.3 Long List / Traffic Light Workshop

5.3.1 Purpose and Process

The purpose of the Long List / Traffic Light workshop was to reduce the Long List to a Short List of options.

The process followed at the workshop was that each technical expert responsible for a criterion presented their sub-criteria scores and overall scores for each option and their reasons for the scores. The workshop participants asked questions of the experts and in some cases challenged the experts' scores. Where alternative scores were proposed these was discussed and agreed with the expert and the workshop participants. The changes that were made to the experts' scores are explained in Section 5.3.2 below.

Appendix C contains a list of the workshop participants.

5.3.2 Changes to Specialist Scores

Table 5-6 sets out the changes that were made to the overall scores for each option when assess against each of the criteria as a result of the workshop discussions. Table 5-7 records the reason for the change to the overall score.

Where provisional scores were recorded by the experts in their pre-workshop assessments these were confirmed at the Long List / Traffic Light workshop though either additional information or the collective knowledge of the workshop participants.

Table 5-6: Preliminary Technical Expert Assessment Summary of Long List Scores (updated scores)

Option / Criteria	Public Health Protection	Natural Environment	Social and Community	Financial Implications	Resilience	Technology and Infrastructure	Statutory Risks and Conflicts	Opportunities and Benefits	Overall Traffic Light
2a: Overland Flow (diffuse discharge) Tributary of Te Puru Stream		Changed from green to orange							11 12
2b: Tributary of Te Puru Stream – direct discharge									12
2c: Wairoa River									18
2d: Turanga Creek / Awa									19
3: 100% Land Application			Changed from orange to green	Changed from orange to red					12 (no change)
3a: Land Application + Tributary of Te Puru Stream									12
4aa: Hauraki Gulf Pine Harbour Short									16
4ab: Hauraki Gulf Pine Harbour Mid									16
4ac: Hauraki Gulf Pine Harbour Long									16
4ad: Hauraki Gulf Tāmaki Strait Short									16
4ae: Hauraki Gulf Tāmaki Strait Mid									11
4af: Hauraki Gulf Tāmaki Strait Long									13

Option / Criteria	Public Health Protection	Natural Environment	Social and Community	Financial Implications	Resilience	Technology and Infrastructure	Statutory Risks and Conflicts	Opportunities and Benefits	Overall Traffic Light
4b: Land Application + Hauraki Gulf									15
4ba: Land Application + Hauraki Gulf + Tributary of Te Puru Stream									15
5: Managed Aquifer Recharge									14
6: 100% Reuse - Potable							Changed from green to orange		~~14~~ 15
7: 100% Reuse – Non-Potable									14
8: 100% Reuse – Non-Potable Transition to Potable								Changed from green to orange	15 16
9: Supplement Supply for Hunua Dams							Changed from green to orange		~~14~~ 15

Table 5-7: Traffic Light Score Changes and Reasons

Criterion	Traffic Light Score Change	Reason
Natural Environment	Option 2a changed from green to orange	Most recent data indicates that some standards may not be met downstream.
Social and Community	Option 3 changed from orange to green	New information about the location of the land irrigation area reduced the risk of adverse effects.
Financial Implication	Option 3 changed from orange to red.	The increase in the area required for land irrigation.
Statutory Risks and Conflicts	Option 6 and Option 9 changed from green to orange	There are currently no standards that apply to the reuse of treated wastewater. This could potentially lead to disputes over appropriate standards to be met and loss of public confidence.
Opportunities and Benefits	Option 8 changed from green to orange	The need to remove nutrients for drinking water supply reduces the ability for nutrient recovery and reuse.

5.3.3 Analysis of Preliminary Technical Expert Assessment

As can be seen from Table 5-6, the options that scored the worst were those that involved discharges to the Wairoa River and the Turanga Creek / Awa (Options 2c and 2d). This was primarily due to financial implications, issues with public health protection and effects on these freshwater bodies, particularly the Turanga Creek / Awa. Both options also had issues with constructability, capacity of the receiving environment to assimilate the projected flows and loads and the embodied carbon in the conveyance infrastructure.

The other options that did not score well were those involving the discharge to the Hauraki Gulf in the vicinity of Pine Harbour (Options 4aa, 4ab, 4ac) and the short outfall to the Tāmaki Straight (Option 4ad). This was primarily due to issues with public health protection and effects on the marine environment. The long outfall to the Tāmaki Straight (Option 4af) did not score so well when compared to the medium outfall (Option 4ae) primarily for financial implications due to the length of the outfall.

Options involving the 100% reuse of the wastewater, managed aquifer recharge, supplementary supply for the Hunua Dams (Option 5, 6, 7, 8 and 9) and options involving combination of discharges to land, Hauraki Gulf and the tributary of the Te Puru Stream (Options 4b and 4ba) did not score well due to a combination of financial implications and resilience and constructability issues.

The options that scored the best were those involving the continued discharge to the Tributary of the Te Puru Stream (Options 2a, 2b), primarily for high level of public health protection, minor effects on social and community activities and low financial implications. Other options that scored well were the 100% land irrigation, the combination of land irrigation and discharge to the Tributary of the Te Puru Stream (Options 3 and 3a) and the mid length ocean outfall to the Tāmaki Strait (Option 4ae). The reasons why these options scored well were primarily because of their low risk to public health, minor effects on the natural environment and on social and community activities. The ocean outfall also scored well in terms of resilience, constructability and capacity of the receiving environment to accept projected flows and loads.

5.4 Preliminary Technical Short List

Following the Long List / Traffic Light workshop and the confirmed updates to the overall scores by the experts, the technical team reviewed the five best scoring options. As the five options involved discharges to a range of receiving environments (freshwater, land, marine waters and a combination of land and freshwater) it was determined that the five

best scoring options should be the preliminary technical Short List of options and should be subject to a BPO test and assessed against the Project Objectives.

As can be seen from the preliminary technical Short List of options set out in Table 5-8 below, all the options were scored very similarly but Option 4ae: Hauraki Gulf Tāmaki Strait Mid scored slightly better than the other four options.

Table 5-8: Preliminary Technical Short List

Option / Criteria	Public Health Protection	Natural Environment	Social and Community	Financial Implications	Resilience	Technology and Infrastructure	Statutory Risks and Conflicts	Opportunities and Benefits	Overall Traffic Light
2a: Overland Flow (diffuse discharge) Tributary of Te Puru Stream									12
2b: Tributary of Te Puru Stream – direct discharge									12
3: 100% Land Application									12
3a: Land Application + Tributary of Te Puru Stream									12
4ae: Hauraki Gulf Tāmaki Strait Mid									11

5.5 Best Practicable Option Test No. 1[12]

As set out in the Assessment Methodology diagram (Figure 2-1), the next step in the Long List / traffic light assessment process was to take the preliminary technical Short List of options and test them against the RMA BPO definition and the Project Objectives. As this phase is still part of the Long List assessment process the Traffic Light Assessment has been adopted for the BPO Test No 1.

5.5.1 Best Practicable Option Assessment

Section 2 of the RMA defines BPO as:

> *'best practicable option, in relation to a discharge of a contaminant or an emission of noise, means the best method for preventing or minimising the adverse effects on the environment having regard, among other things, to—*
>
> (a) *the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
>
> *(b) the financial implications, and the effects on the environment, of that option when compared with other options; and*
>
> *(c) the current state of technical knowledge and the likelihood that the option can be successfully applied.'*

The following BPO assessment criteria and scores were developed and adopted for the assessment.

Table 5-9: BPO Assessment Criteria and Scoring Guide

BPO Source	Criterion	Description	Score Guide		
RMA BPO definition (a)	Nature of discharge and receiving environment sensitivity	What is the nature of the discharge, and how sensitive is the receiving environment to adverse effects?	Low sensitivity	Medium sensitivity	High sensitivity
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the social and economic effects?	Low effect	Medium effect	High effect
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the cultural effects?	Low effect	Medium effect	High effect
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the biophysical effects?	Low effect	Medium effect	High effect
RMA BPO definition (b)	Comparative financial implications	How do the cost (capital, operational, whole of life) implications of each of option compare with the other options?	Low cost	Medium cost	High cost

[12] The BPO assessment also includes an assessment of the Project Objectives as shown in the Assessment Methodology diagram 2-1

BPO Source	Criterion	Description	Score Guide		
RMA BPO definition (c)	Likelihood that option can be successfully applied	Can the options be successfully implemented e.g. how complex is each option to construct, operate and successfully be applies when compared with the other options?	Low complexity / uncertainty	Medium complexity / uncertainty	High complexity / uncertainty
RMA BPO definition (c)	Technical knowledge	Are the technologies reliable / proven?	Proven, common use	Proven internationally and some use in NZ	Unproven or emerging

The table below provides a summary of the outcomes of the BPO assessment of the preliminary technical Short List of options. An analysis of the assessment is set out in Section 5.5.3 below. As this part of the BPO assessment was a technical assessment, the cultural comparative effects of the shortlisted options and the cultural sensitivities associated with the receiving environments were not taken into account at this stage of the process.

Table 5-10: BPO Assessment of the Preliminary Technical Short List

BPO Criteria	Assessment	Option Scores				
		2a	2b	3	3a	4ae
(a) Receiving environment sensitivity	Both the marine environment and the Te Puru stream are considered to be sensitive receiving environments, however the level of treatment of the discharge can be managed to minimise effects. Land is considered to be the least sensitive receiving environment. This has influenced the score for Option 3a noting that the discharge to land will occur when the Te Puru Stream is at low flow. Note that advice on cultural sensitivities associated with the receiving environments was not available when undertaking the assessment.					
(b) Comparative effects assessment – social and economic	The social and community criterion assessment for the long list options has been relied on for this assessment.					
(b) Comparative effects assessment – cultural						
(b) Comparative effects assessment – natural	The natural environment criterion assessment for the long list options has been relied on for this assessment.					
(b) Comparative financial implications	The financial implications criterion assessment for the long list options has been relied on for this assessment.					
(c) Technical knowledge - complexity	Options 2a and 2b are the least complex to construct and operate as they do not require conveyance to other receiving environments.					

BPO Criteria	Assessment	Option Scores				
		2a	2b	3	3a	4ae
	The other options have a medium level of complexity as they involve conveyance and discharges to other receiving environments.					
(c) Technical knowledge - proven	The technology and infrastructure assessment criterion sub criterion reliable and proven technology assessment for the long list options has been relied on for this assessment.					

5.5.2 Project Objectives Assessment

The following scoring was adopted for assessing the preliminary technical Short List of options against the Project Objectives.

Table 5-11: Approach to Project Objective Scoring

Green	Orange	Red
High degree of alignment	Medium degree of alignment	Low degree of alignment

Table 5-12: Objectives Assessment below provides a summary of the outcomes of the objectives assessment of the preliminary technical Short List of options. An analysis of the assessment is set out in Section 5.5.3 below. Because this was a technical assessment only, the objective relating to recognising the significance of the Hauraki Gulf and the relationship of tangata whenua with the Hauraki Gulf was not scored, and the objective relating to Te Mana o te Wai was only assessed from a technical perspective.

Table 5-12: Objectives Assessment

Objectives	Assessment	Option Scores				
		2a	2b	3	3a	4ae
Work in partnership with the Mana Whenua and engage with the community to identify the best practicable option (BPO) to provide wastewater services for the Beachlands and Maraetai community. The BPO must:						
Recognise the significance of the Hauraki Gulf and the historic, traditional, cultural, and spiritual relationship of the tangata whenua with the Hauraki Gulf and its islands						
Gives effect to Te Mana o te Wai	The options that discharge to receiving environments other than freshwater have a high degree of alignment with Te Mana o te Wai. Option 3a has also been assessed as a high degree of alignment given that the during periods of low flow in the stream					

Objectives	Assessment	Option Scores				
		2a	2b	3	3a	4ae
	most if not all of the treated wastewater will be discharged to land. Options that only discharge to freshwater have been assessed as having a medium degree of alignment based on the very high level of treatment.					
Keep our communities healthy	The public health protection criterion assessment for the Long List options has been relied on for this assessment.					
Protect the health of our environment, particularly the life supporting capacity of land, air, and water.	The natural environment criterion assessment for the Long List options has been relied on for this assessment.					
Provide a solution that caters for planned growth that keeps the overall costs of service to customers (collectively) at sustainable levels.	The financial implications criterion assessment for the Long List options has been relied on for this assessment. All options have been developed to ensure they will provide for projected growth for up to 35 years, but availability of land a potential risk to growth (Option 3)					
Be sustainable and resilient and minimise whole-of-life carbon emissions and optimise resource recovery	The resilience and opportunities and benefits criteria assessments for the Long List options has been relied on for this assessment.					

5.5.3 Analysis

As can be seen from the assessments set out in Table 5-10 and

Table 5-12, all the preliminary technical Short List of options scored a medium or a low score against the BPO assessment criteria and the project objectives except for Option 3.

Option 3 scored high on cost considerations against the BPO comparative financial implications and low degree of alignment against the objective relating to keeping the overall costs of service to customers (collectively) at sustainable levels due to the large irrigation area required (approximately 750ha) and the high cost of land. However, Option 3 scored well against the other BPO criteria and project objectives.

The BPO and objectives assessments were reasonably well aligned with the traffic light assessment and did not identify any additional red traffic light scores which would direct an option to not be progressed for further consideration.

From the above analysis it was considered that all five of the preliminary technical Short List of options passed the Best Practicable Option Test No. 1 and could therefore be taken forward to the technical Short List assessment stage.

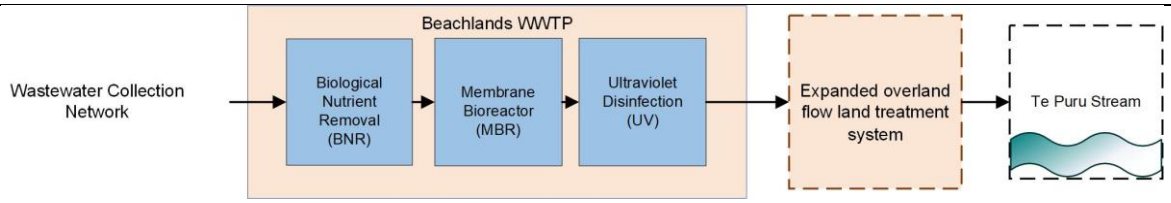
6. Technical Short List Assessment

This is Stage 5 of the assessment as shown in Figure 2-1 (Assessment Methodology). It involved the numerical scoring (1 to 5) of the options against the assessment criteria and was informed by a more detailed comparative assessment of the technical Short List options.

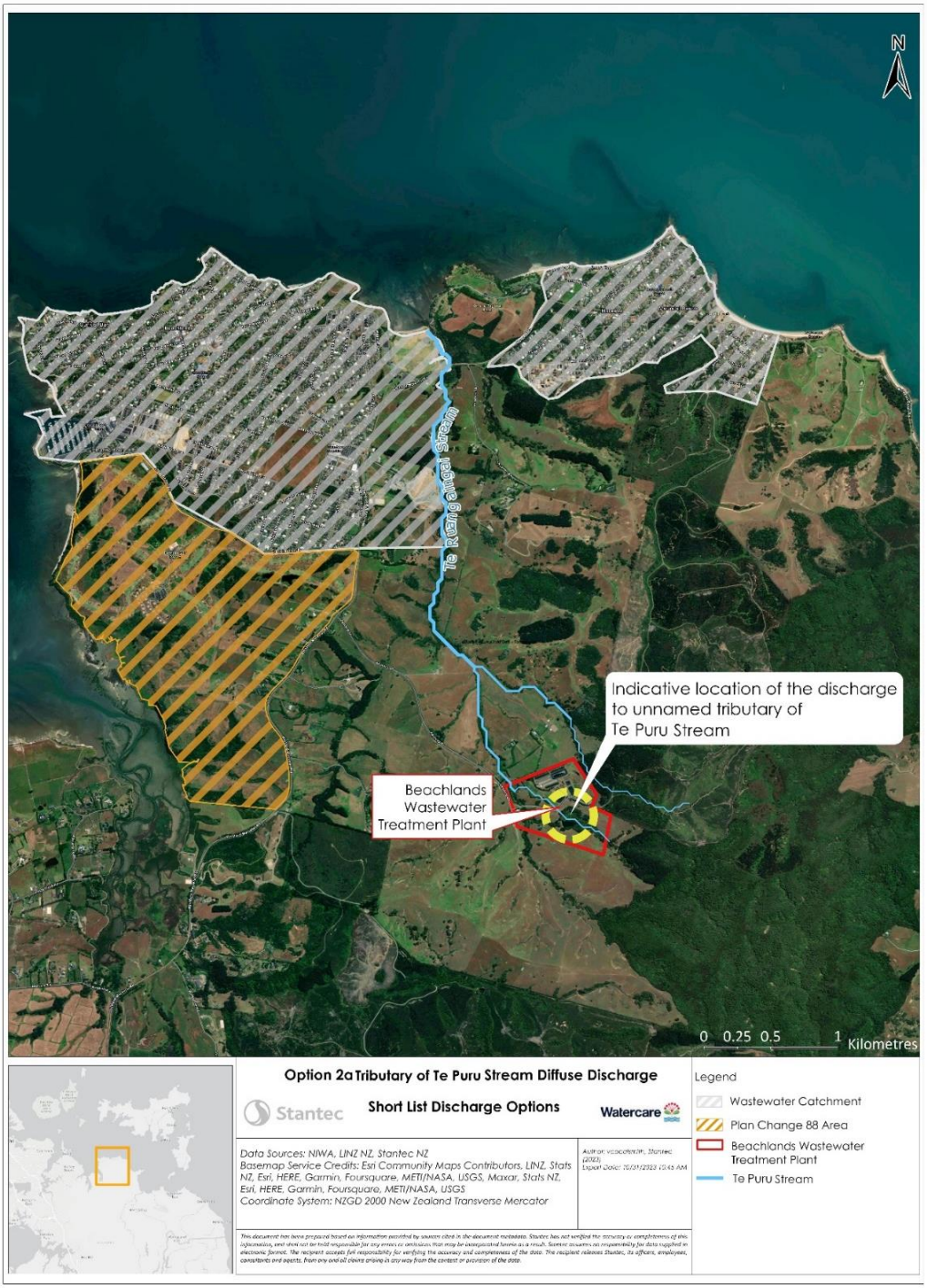
6.1 Short List Option Information

To enable a more detailed comparative assessment of the technical short list options a more comprehensive description of the options was developed to assist the technical experts with their Short List assessments. The following tables sets out the information provided to the technical experts.

Option 2a: Tributary of the Te Puru Stream - Diffuse Discharge

Item	Description	
Option Name	2a: Tributary of Te Puru Stream Diffuse Discharge	
Discharge Location	Unnamed Tributary of Te Puru Stream	
Treatment Option	• Biological Nutrient Removal (BNR) • Membrane Bioreactor (MBR) • Ultraviolet disinfection (UV) • BNR + MBR + UV disinfection	
Treatment Location	Existing Beachlands Wastewater Treatment Plant (WWTP) site	
Process Diagram		
		
Typical treated water quality		
Population Equivalent	30,000	
Per Capita Average Daily Flow (ADF)	200 l/p/d (litres per head)	
Average Daily Flow (ADF)	6,000	
Parameter	Median Concentration mg/L	Average Load kg/day
Biological Oxygen Demand (BOD)	1.0	6.0
Total Suspended Solids (TSS)	0.0	0.0
Total Nitrogen (TN)	3.50	21
Total Phosphorus (TP)	0.10	0.6
Faecal Coliforms	<1 cfu/100ml	n/a
Note: The intention is to frame treated wastewater discharge consent on both a load and a concentration dependent basis, depending on the effects of various parameters. This will facilitate staging and flexibility in terms of some concentration limits over the proposed 35 year consent duration.		
Key Components		
Item	Description	
Conveyance system	Outlet to stream via the existing discharge point.	
Treatment system	Existing Beachlands WWTP site BNR + MBR + UV disinfection	
Discharge system	Outlet to stream via the existing overland flow land treatment system expanded to accommodate increased flows; with or without the pond.	

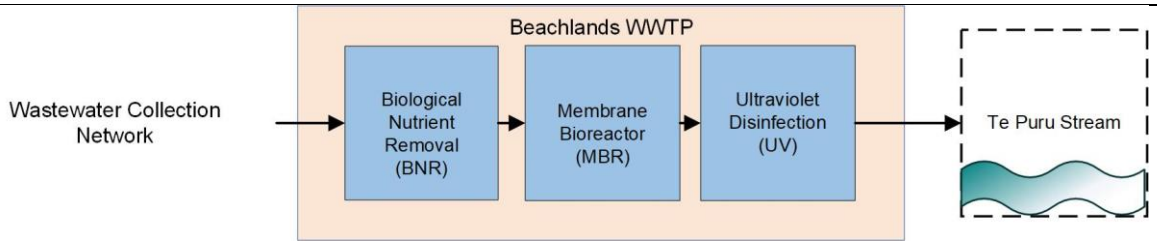
Locality Map



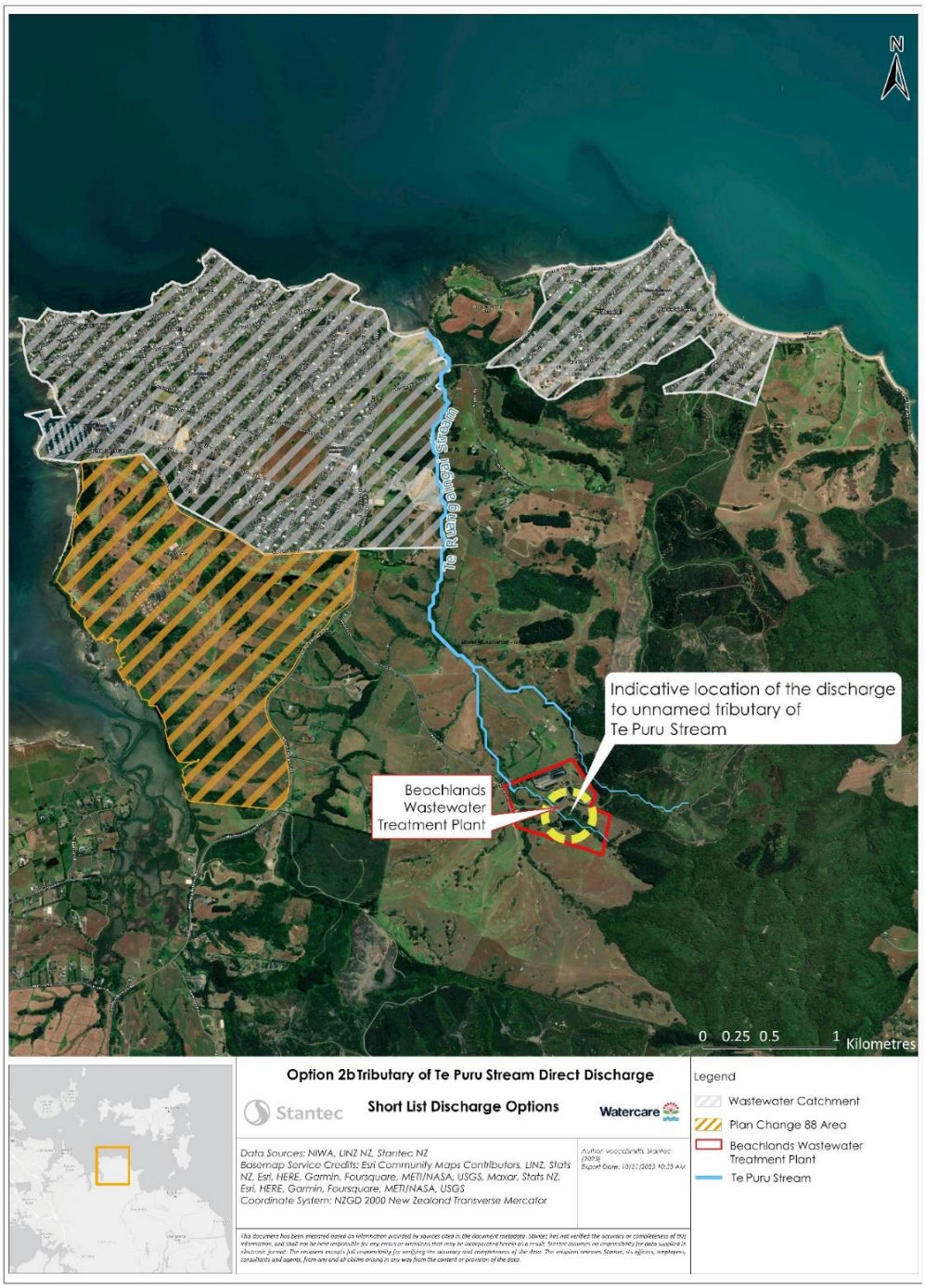
Note:

1. The discharge location is indicative only and may alter pending further investigations.
2. The wastewater catchment is the current reticulated catchment.
3. The Plan Change 88 area is not yet confirmed.

Option 2b: Tributary of the Te Puru Stream - Direct Discharge

Item	Description	
Option Name	2b: Unnamed Tributary of Te Puru Stream Direct Discharge	
Discharge Location	Unnamed Tributary of Te Puru Stream	
Treatment Option	• Biological Nutrient Removal (BNR) • Membrane Bioreactor (MBR) • Ultraviolet disinfection (UV) • BNR + MBR + UV disinfection	
Treatment Location	Existing Beachlands Wastewater Treatment Plant (WWTP) site	
Process Diagram		
		
Typical treated water quality		
Population Equivalent	30,000	
Per Capita Average Daily Flow (ADF)	200 l/p/d	
Average Daily Flow (ADF)	6,000	
Parameter	Median Concentration mg/L	Average Load kg/day
Biological Oxygen Demand (BOD)	1.0	6.0
Total Suspended Solids (TSS)	0.0	0.0
Total Nitrogen (TN)	3.50	21
Total Phosphorus (TP)	0.10	0.6
Faecal Coliforms	<1 cfu/100ml	n/a
Note: The intention is to frame treated wastewater discharge consent on both a load and a concentration dependent basis, depending on the effects of various parameters. This will facilitate staging and flexibility in terms of some concentration limits over the proposed 35 year consent duration.		
Key Components		
Item	Description	
Conveyance system	Conveyance to a new discharge structure, potentially downstream of current discharge.	
Treatment system	Existing Beachlands WWTP site BNR + MBR + UV disinfection	
Discharge system	Discharge direct to an unnamed tributary of Te Puru Stream with a new discharge structure.	

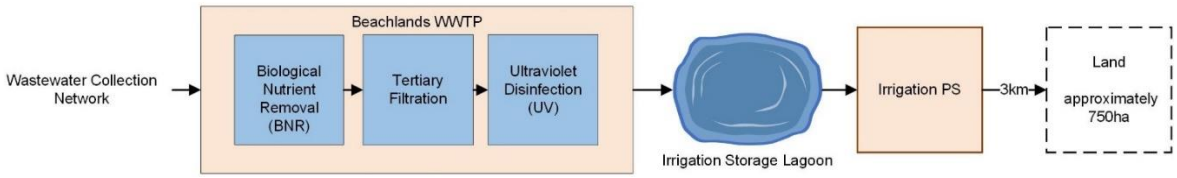
Locality Map



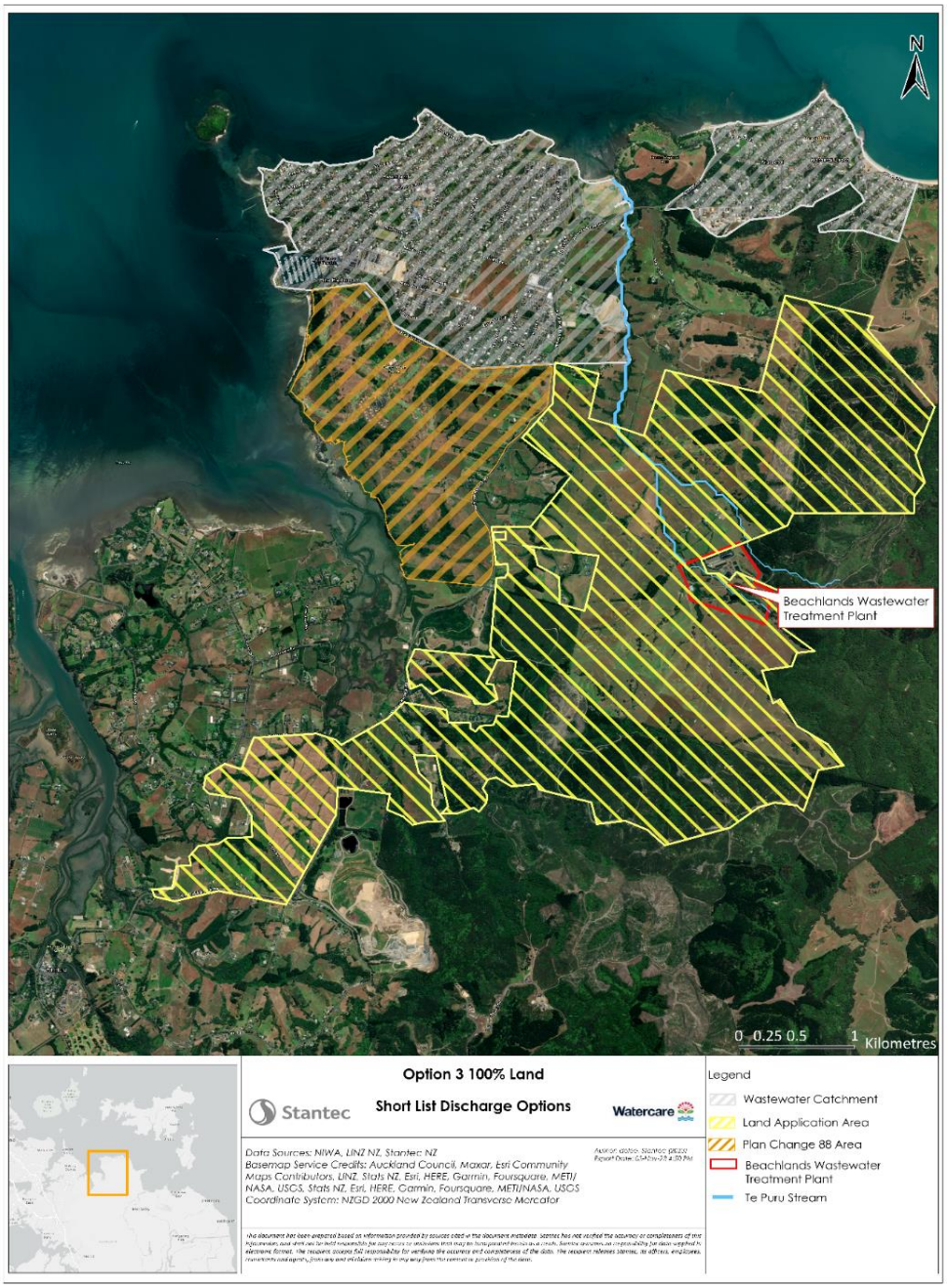
Note:

1. The discharge location is indicative only and may alter pending further investigations.
2. The wastewater catchment is the current reticulated catchment.
3. The Plan Change 88 area is not yet confirmed.

Option 3: 100% Land

Item	Description	
Option Name	100% Land	
Discharge Location	750 ha of land in the vicinity of the Beachlands Wastewater Treatment Plant (WWTP)	
Treatment Option	• Biological Nutrient Removal (BNR) • Tertiary Filtration • Ultraviolet disinfection (UV) • BNR + Tertiary Filtration + UV disinfection	
Treatment Location	Existing Beachlands Wastewater Treatment Plant (WWTP) site	
Process Diagram		
		
Typical treated water quality		
Population Equivalent	30,000	
Per Capita Average Daily Flow (ADF)	200 l/p/d	
Average Daily Flow (ADF)	6,000	
Parameter	Median Concentration mg/L	Average Load kg/day
Biological Oxygen Demand (BOD)	2.0	12.0
Total Suspended Solids (TSS)	5.0	30.0
Total Nitrogen (TN)	7.0	42
Total Phosphorus (TP)	5.0	30.0
Faecal Coliforms	<10 cfu/100ml	n/a
Key Components		
Item	Description	
Conveyance system	Convey wastewater to suitable land surrounding the WWTP.	
Treatment system	Existing Beachlands WWTP site. BNR + Tertiary Filtration + UV disinfection	
Discharge system	Low pressure sprinklers to rural land.	

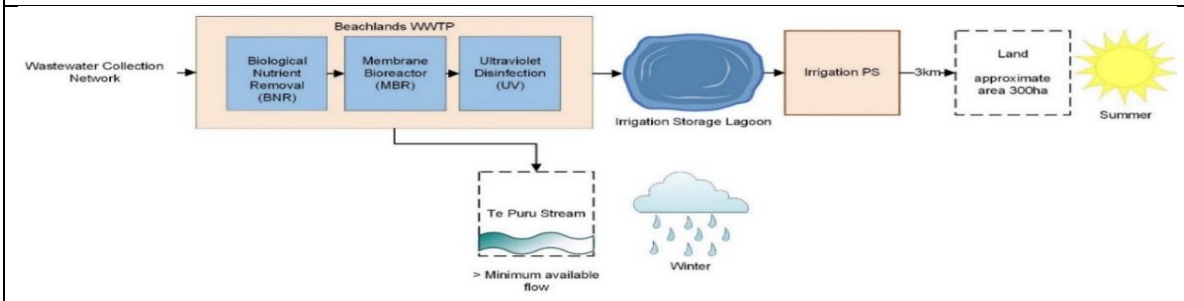
Locality Map



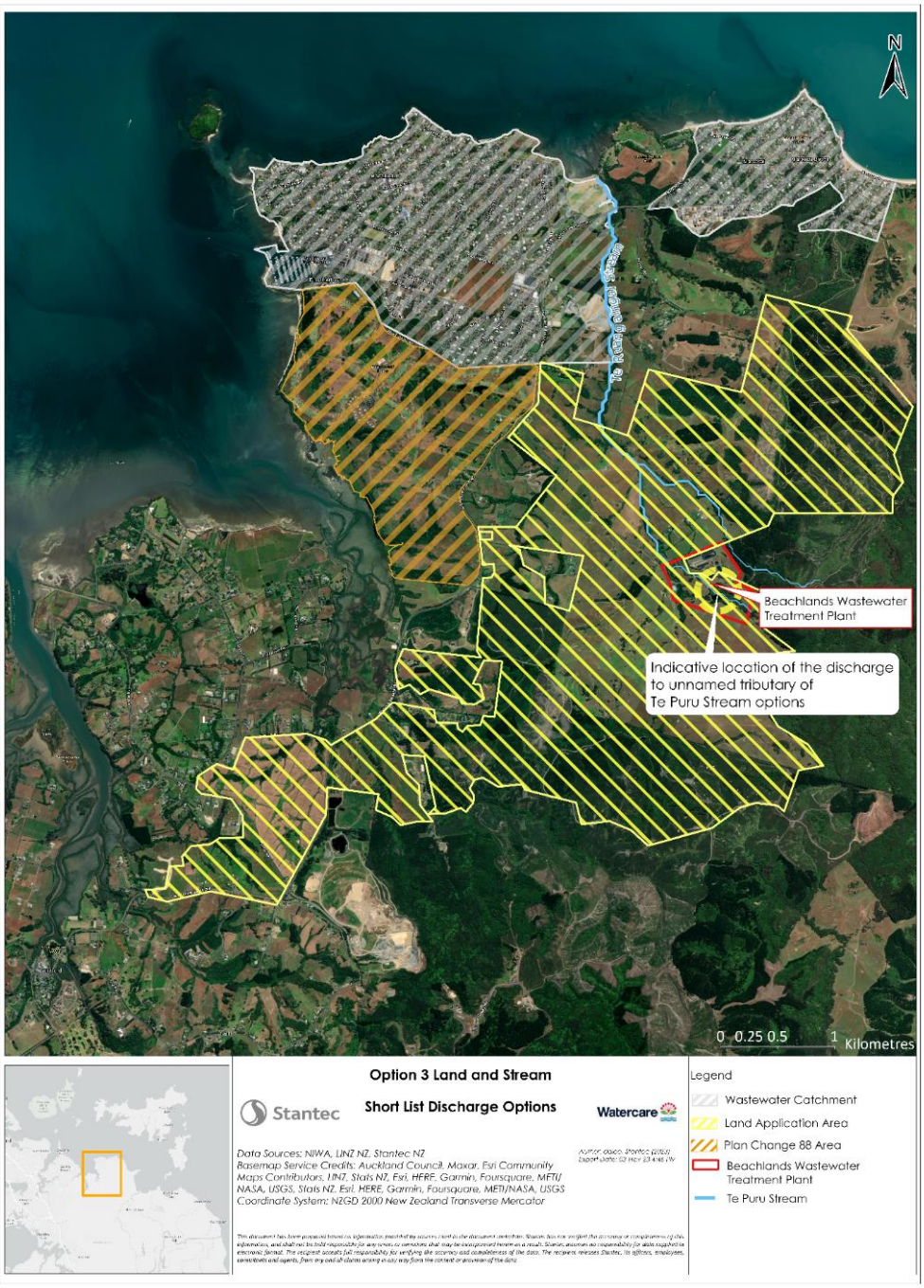
Note:

1. The discharge location is indicative only and may alter pending further investigations.
2. The wastewater catchment is the current reticulated catchment.
3. The Plan Change 88 area is not yet confirmed.
4. The land area indicated is less than 750ha. Remaining land application area is yet to be identified.

Option 3a: Land/Stream

Item	Description	
Option Name	Land/Stream	
Discharge Location	300 ha of land in the vicinity of the Beachlands WWTP	
Treatment Option	• Biological Nutrient Removal (BNR) • MBR • Ultraviolet disinfection (UV) • BNR + MBR + UV disinfection	
Treatment Location	Existing Beachlands Wastewater Treatment Plant (WWTP) site	
Process Diagram		
		
Typical treated water quality		
Population Equivalent	30,000	
Per Capita Average Daily Flow (ADF)	200 l/p/d	
Average Daily Flow (ADF)	6,000	
Parameter	Median Concentration mg/L	Average Load kg/day
Biological Oxygen Demand (BOD)	1.0	6.0
Total Suspended Solids (TSS)	0.0	0.0
Total Nitrogen (TN)	3.50	21
Total Phosphorus (TP)	0.10	0.6
Faecal Coliforms	<1 cfu/100ml	n/a
Note: The intention is to frame treated wastewater discharge consent for the stream discharge on both a load and a concentration dependent basis, depending on the effects of various parameters. This will facilitate staging and flexibility in terms of some concentration limits over the proposed 35 year consent duration.		
Key Components		
Item	Description	
Conveyance system	Convey wastewater to suitable land surrounding the WWTP. New discharge structure direct to stream or via the existing overland flow land system.	
Treatment system	Existing Beachlands WWTP site BNR + MBR + UV disinfection	
Discharge system	Low pressure sprinklers to rural land. Outlet direct to stream or via the existing overland flow land system.	

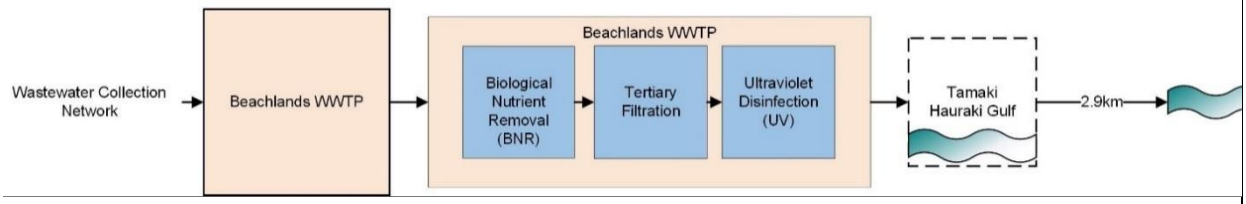
Locality Map



Note:

1. The discharge location is indicative only and may alter pending further investigations.
2. The wastewater catchment is the current reticulated catchment.
3. The Plan Change 88 area is not yet confirmed.

Option 4ae: Hauraki Gulf – Tamaki mid

Item	Description	
Option Name	Hauraki Gulf – Tamaki Mid	
Discharge Location	Tamaki Strait north of Beachlands	
Treatment Option	• Biological Nutrient Removal (BNR) • Tertiary Filtration • Ultraviolet disinfection (UV) • BNR + Tertiary Filtration + UV disinfection	
Treatment Location	Existing Beachlands Wastewater Treatment Plant (WWTP) site	
Process Diagram		
		
Typical treated water quality		
Population Equivalent	30,000	
Per Capita Average Daily Flow (ADF)	200 l/p/d	
Average Daily Flow (ADF)	6,000	
Parameter	Median Concentration mg/L	Average Load kg/day
Biological Oxygen Demand (BOD)	2.0	12.0
Total Suspended Solids (TSS)	5.0	30.0
Total Nitrogen (TN)	7.0	42
Total Phosphorus (TP)	1.0	6.0
Faecal Coliforms	<10 cfu/100ml	n/a
Note: The intention is to frame treated wastewater discharge consent on both a load and a concentration dependent basis, depending on the effects of various parameters. This will facilitate staging and flexibility in terms of some concentration limits over the proposed 35 year consent duration.		
Key Components		
Item	Description	
Conveyance system	Convey wastewater 5.6km to Te Puru Park/Lee Auton Reserve and discharge via 2.9km ocean outfall.	
Treatment system	Existing Beachlands WWTP site BNR + Tertiary Filtration + UV disinfection	
Discharge system	Mid-length ocean outfall into the Tamaki Strait.	

Locality Map

Note:

1. The discharge location is indicative only and may alter pending further investigations.
2. The wastewater catchment is the current reticulated catchment.
3. The Plan Change 88 area is not yet confirmed.

6.2 Approach to Short List Assessment

The Short List assessment process as shown in Figure 2-1 (Assessment Methodology) was basically the same as the Long List assessment process except that a score of 1 to 5 was adopted for assessing the options.

6.2.1 Assessment Criteria

The assessment criteria adopted for the Short List assessments were the same as those used for the Long List assessments and are set out in Table 5-3.

6.2.2 Approach to Short List Scoring

A more fine-grained approach to scoring the Short List options was adopted. This involved using a 1 to 5 score with 1 being the best score and 5 the worst. The table below provides a description of the scores for each criterion and the score colour.

Table 6-1: Short List Scoring Approach

Criterion / Score	1	2	3	4	5
Public Health Protection	Low degree of public exposure to risk	Medium to low degree of public exposure to risk	Medium degree of public exposure to risk	Medium to high degree of public exposure to risk	High degree of public exposure to risk
Natural Environment	Low (less than minor) potential adverse effects	Medium to low (minor) potential adverse effects	Medium (more than minor) potential adverse effects	Medium to high (significant) potential adverse effects	High (significant and unlikely to be mitigated) potential adverse effects
Social and Community	Low (less than minor) potential adverse effects	Medium to low (minor) potential adverse effects	Medium (more than minor) potential adverse effects	Medium to high (significant) potential adverse effects	High (significant and unlikely to be mitigated) potential adverse effects
Financial Implications	Low financial implications	Medium to low financial implications	Medium financial implications	Medium to high financial implications	High financial implications
Resilience	High degree of resilience	Medium to high degree of resilience	Medium degree of resilience	Medium to low degree of resilience	Low degree of resilience
Technology and Infrastructure	High degree of alignment	Medium to high degree of alignment	Medium degree of alignment	Medium to low degree of alignment	Low degree of alignment
Statutory Risks and Conflicts	Low risks and conflicts	Medium to low risks and conflicts	Medium risks and conflicts	Medium to high risks and conflicts	High risks and conflicts
Opportunities and Benefits	High opportunities and benefits	Medium to high opportunities and benefits	Medium opportunities and benefits	Medium to low opportunities and benefits	Low / minimal opportunities and benefits

6.2.3 Responsibilities

Appendix D sets out the technical experts who were responsible for each criterion along with other experts who provided additional technical support or reviewed the assessments.

Copies of the technical expert's Short List assessments are attached as Appendix E.

6.3 Summary of Preliminary Technical Short List Scores

Table 6-2 is a collation of the overall scores provided by the technical experts in advance of the first Short List workshop.

Table 6-2: Preliminary Technical Expert Assessment Summary of Short List Scores (pre workshop)

Option / Criteria	Public Health Protection	Natural Environment	Social & Community	Financial Implications	Resilience	Technology & Infrastructure	Statutory Risks & Conflicts	Opportunities & Benefits	Overall Score
2a: Tributary to Te Puru Stream – diffuse discharge	1	2	2 Provisional	1	1	2	3	3	15
2b: Tributary to Te Puru Stream – direct discharge	1	3	2 Provisional	1	1	2	3	3	16
3: 100% Land	1	1	2 Provisional	5	3	4	2	1	19
3a: Land / Tributary to Te Puru Stream	1	1	2 Provisional	4	3	3	3	2	19
4ae: Hauraki Gulf Tāmaki Mid	1	2	3 Provisional	2	1	2	3	4	18

6.4 Initial Short List Workshop

6.4.1 Purpose and Process

The purpose of the initial Short List workshop was for the technical experts to present their initial assessments and scores to the workshop participants and provide information to Ngāi Tai ki Tāmaki, via its Taiaomaurikura representative at the workshop, to assist the preparation of their feedback for Watercare.

The process followed at the workshop was similar to that followed for the Long List / Traffic Light workshop. Each technical expert responsible for a criterion presented their sub-criterion scores, overall criterion scores for each option and their reasons for the scores. The workshop participants then asked questions of the experts. Scores were not discussed in detail and the workshop participants were asked to provide further feedback and any new information for the expert's consideration post the workshop.

Appendix F contains a list of the workshop participants.

6.4.2 Further Reviews and Updates to Specialist Scores

The technical specialists were provided with further feedback from the workshop participants following the initial Short List workshop along with updates to some of the treated wastewater median parameters following inputs from Watercare. In response, the specialists updated their assessments and scores in readiness for the next Short List workshop.

Table 6-3 sets out the updates that were made to the overall score for each option as a result of the first Short List workshop discussions, the further review and feedback process and new information. Table 6-4 also records the reason for the change to the overall score.

Where provisional scores were recorded by the experts in their pre-workshop assessments these were confirmed either at the Short List workshop or through the further review process.

Copies of the technical experts' updated Short List assessments are attached as Appendix G.

Table 6-3: Preliminary Technical Expert Assessment Summary of Short List Scores (updated post Short List Workshop 1)

Option / Criteria	Public Health Protection	Natural Environment	Social & Community	Financial Implications	Resilience	Technology & Infrastructure	Statutory Risks & Conflicts	Opportunities & Benefits	Overall Score
2a: Tributary to Te Puru Stream – diffuse discharge	1	2	2	1	1	2	3 ~~2~~ Changed from 3 to 2	3	~~15~~ 14
2b: Tributary to Te Puru Stream – direct discharge	1	3	2	1	1	2	3 ~~2~~ Changed from 3 to 2	3	~~16~~ 15
3: 100% Land	~~1~~ 2 Changed from 1 to 2	1	2	5	3	4	2	1	~~19~~ 20
3a: Land / Tributary to Te Puru Stream	~~1~~ 2 Changed from 1 to 2	1	2	4	~~3~~ 2 Changed from 3 to 2	3	3	2	19 No Change
4ae: Hauraki Gulf Tāmaki Mid	1	2	3	2	1	2	~~3~~ 4 Changed from 3 to 4	4	~~18~~ 19

Table 6-4: Overall Score Changes and Reasons

Criterion	Score Change	Reason
Public Health Protection	Option 3 changed from 1 to 2. Option 3a changed from 1 to 2.	Lower level of treatment for Option 3 so higher risks than Options 2 and 2a. Options 3 and 3a potential for aerosols drift with pathogens/other contaminants
Resilience	Option 3a changed from 3 to 2	Because this option includes land as a backup the risks of flooding effects, land slips and high intensity rainfall effecting the operation of the scheme are reduced when compared to Option 3.
Statutory Risks and Conflicts	Option 2a changed from 3 to 2. Option 2b changed from 3 to 2. Option 4ae changed from 3 to 4	For options 2a and 2b the Water Services Act 2021 is of limited relevance as it relates primarily to the provision of drinking water rather than wastewater services. The Hauraki Gulf Marine Part Act has implications for Option 4ae which were not previously considered.

6.5 Short List Workshop

The purpose of the second Short List workshop was to determine the preliminary technical preferred option / BPO. The workshop also provided a further opportunity for Ngāi Tai ki Tāmaki Taiaomaurikura representatives to receive information on the technical option assessments, to assist them in preparing their feedback to Watercare.

The process followed at the workshop was similar to previous workshops. Each technical expert responsible for a criterion presented their sub-criterion scores, overall criterion scores for each option and their reasons for the scores. The workshop participants asked questions of the experts. Where alternative scores were proposed these was discussed and agreed with the expert and the workshop participants. The changes that were made to the experts' scores are explained in Section 6.5.1 below.

Appendix H contains a list of the participants at second Short List workshop.

6.5.1 Changes to Expert Scores

The only change made to an overall criterion score for the technical Short List option assessment as a result of the workshop discussions is set out in Table 6-5 below.

Table 6-5: Overall Score Changes and Reasons

Criterion	Score Change	Reason
Public Health Protection	Option 2b changed from 1 to 2.	Option 2b is a direct discharge to the Te Puru Stream and does not have the attenuation benefits when compared to Option 2a which has the overland flow process.

6.5.2 Final Technical Short List Scores

The following table sets out the final technical overall scores for each short list option from the Short List workshop. As shown in Table 6-6, based in it receiving the lowest overall score, the preliminary technical preferred option / BPO was identified as Option 2a being the diffuse discharge to a tributary of the Te Puru Stream.

Table 6-6: Expert Overall Scores from Short List Workshop

Option / Criteria	Public Health Protection	Natural Environment	Social & Community	Financial Implications	Resilience	Technology & Infrastructure	Statutory Risks & Conflicts	Opportunities & Benefits	Overall Score
2a: Tributary to Te Puru Stream – diffuse discharge	1	2	2	1	1	2	2	3	14
2b: Tributary to Te Puru Stream – direct discharge	2	3	2	1	1	2	2	3	16
3: 100% Land	2	1	2	5	3	4	2	1	20
3a: Land / Tributary to Te Puru Stream	2	1	2	4	2	3	3	2	19
4ae: Hauraki Gulf Tāmaki Mid	1	2	3	2	1	2	4	4	19

6.5.3 Analysis of the scores

As shown in Table 6-6, Option 2a had the best overall technical score (14) because it scored 1 when assessed against the Public Health Protection, Financial Implications and Resilience criteria and 2 when assessed against the Natural Environment, Social and Community, Technology and Infrastructure, and Statutory Risks and Conflicts criteria. The worst score for Option 2a was 3 for the Opportunities and Benefits criterion.

The option that had the second best overall technical score (16) was Option 2b. This option did not score so well in terms of the Public Health Protection and Natural Environment criteria when compared to Option 2a. This is because it is a direct discharge to the tributary of the Te Puru Stream and does not have the contamination attenuation benefits of the diffuse discharge of Option 2a.

The option that scored the worst (20) was Option 3, primarily to do with the cost and challenges of securing 750ha of land for the irrigation of the treated wastewater and the lack of resilience associated with the need to discharge 100% of the discharge to land for all of the time.

Options 3a and 4ae equally scored the second worst (19). For Option 3a this was primarily to do with the cost and complexities associated with the provision of infrastructure and management of two receiving environments. Option 4ae had limited opportunities and benefits and medium to high statutory risks.

6.6 Best Practicable Option Test No. 2[13]

As set out in the Assessment Methodology Figure 2-1, the next step in the Short List assessment process was to undertake a BPO and Project Objectives assessment of the preliminary technical preferred option / BPO in comparison with the other Short List Options. The process followed was the same as that used in the BPO Test 1 except for this process a 1 to 5 score was adopted (1 = best 5 = worst).

6.6.1 Best Practicable Option Assessment

To ensure the BPO assessment clearly aligned with the RMA BPO definition (refer Section 5.5.1) and provided a robust test of the preliminary technical preferred option (BPO), the following BPO assessment criteria and scores were developed and adopted for the assessment.

[13] The BPO assessment also includes an assessment of the Project Objectives as shown in the Assessment Methodology diagram 2-1.

Table 6-7: BPO Assessment Criteria and Scoring Guide

BPO Source	Criterion	Description	Score Guide				
RMA BPO definition (a)	Nature of discharge and receiving environment sensitivity	What is the nature of the discharge, and how sensitive is the receiving environment to adverse effects?	1 Low sensitivity	2 Medium to low sensitivity	3 Medium sensitivity	4 Medium to high sensitivity	5 High sensitivity
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the social and economic effects?	Low (less than minor) potential adverse effects	Medium to low (minor) potential adverse effects	Medium (more than minor) potential adverse effects	Medium to high (significant) potential adverse effects	High (significant and unlikely to be mitigated) potential adverse effects
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the cultural effects?	Low (less than minor) potential adverse effects	Medium to low (minor) potential adverse effects	Medium (more than minor) potential adverse effects	Medium to high (significant) potential adverse effects	High (significant and unlikely to be mitigated) potential adverse effects
RMA BPO definition (b)	Comparison of effects on the environment	How do the effects of each of option compare with the other options in terms of the biophysical effects?	Low (less than minor) potential adverse effects	Medium to low (minor) potential adverse effects	Medium (more than minor) potential adverse effects	Medium to high (significant) potential adverse effects	High (significant and unlikely to be mitigated) potential adverse effects
RMA BPO definition (b)	Comparative financial implications	How do the cost (capital, operational, whole of life) implications of each of option compare with the other options?	Low cost	Medium to low cost	Medium cost	Medium to high cost	High cost

BPO Source	Criterion	Description	Score Guide				
RMA BPO definition (c)	Likelihood that option can be successfully applied	Can the options be successfully implemented e.g. how complex is each option to construct, operate and successfully be applies when compared with the other options?	Low complexity/ uncertainty	Medium to low complexity/ uncertainty	Medium complexity/ uncertainty	Medium to high complexity/ uncertainty	High complexity/ uncertainty
RMA BPO definition (c)	Technical knowledge	Are the technologies reliable / proven?	Proven common use	Proven internationally and some use in NZ	Proven internationally but not in NZ	Emerging	Unproven

Table 6-8: BPO Assessment of the Preliminary Technical Preferred Option / BPO below provides a summary of the outcomes of the BPO assessment of the preliminary technical preferred option in comparison with the other Short List Options. Because the BPO assessment was a technical assessment, the cultural comparative effects assessment was not scored and the cultural sensitivities associated with the receiving environments were not taken into account in this part of the process.

Table 6-8: BPO Assessment of the Preliminary Technical Preferred Option / BPO

BPO Criteria	Assessment	Option Scores				
		2a	2b	3	3a	4ae
(a) Receiving environment sensitivity	• Both the marine environment and the Te Puru stream are considered to be more sensitive receiving environments when compared to land. Noting however that the level of treatment of the discharge can be managed to minimise adverse effects. • 2a scores better than 2b. This is because the initial receiving environment for 2a is land, and while the wastewater will ultimately discharge to the stream the initial discharge to land is considered to reduce the receiving environment sensitivity of this option. • Land is considered to be the least sensitive receiving environment. This has influenced the score for Option 3a.	3	4	1	2	4
(b) Comparative effects assessment – social and economic	• The social and community and the public health protection criteria assessment for the Short List options has been relied on for this assessment.	1	2	2	2	2
(b) Comparative effects assessment – cultural	•					
(b) Comparative effects assessment – biophysical	• The natural environment criterion assessment for the Short List options has been relied on for this assessment.	2	3	1	1	2
(b) Comparative financial effects	• The financial implications criterion assessment for the Short List options has been relied on for this assessment.	1	1	5	4	2
(c) Likelihood that option can be successfully applied	• Options 2a and 2b are the least complex to construct, operate and successfully applied as they do not require conveyance to other receiving environments. • Options 4ae has a medium to high level of complexity / uncertainty as it involves conveyance and discharges to the marine receiving environment	1	1	5	5	4

BPO Criteria	Assessment	Option Scores				
		2a	2b	3	3a	4ae
	and the construction of infrastructure associated with this. • Options 3 and 3a have the most complexity / uncertainty. Option 3a involves the construction and management of two receiving environments and securing up to 300ha of land. Option 3 involves conveyance infrastructure and securing an extensive area of land (750ha) which may be difficult to achieve and may not be contiguous.					
(c) Technical knowledge - proven	• The technology and infrastructure assessment criterion sub criterion - reliable and proven technology assessment for the Short List options has been relied on for this assessment.	1	1	3	2	1
Total		9	12	17	16	15

6.6.2 Project Objectives Assessment

The following scoring was adopted for assessing the preliminary technical Short List of options against the project objectives that are set out in Section 1.4.

Table 6-9: Approach to Project Objective Scoring

1	2	3	4	5
High degree of alignment	Medium to high degree of alignment	Medium degree of alignment	Medium to low degree of alignment	Low degree of alignment

The table below provides a summary of the outcomes of the project objectives assessment of the preliminary technical preferred option / BPO in comparison with the other Short List Options. Because this was a technical assessment only, the objective relating to recognising the significance of the Hauraki Gulf and the relationship of tangata whenua with the Hauraki Gulf was not scored, and the objective relating to Te Mana o te Wai was only assessed from a technical perspective.

Table 6-10: Objectives assessment of the Preliminary Technical Preferred Option / BPO

Objectives	Assessment	Option Scores				
		2a	2b	3	3a	4ae
Work in partnership with the Mana Whenua and engage with the community to identify the best practicable option (BPO) to provide wastewater services for the Beachlands and Maraetai community. The BPO must:						

Recognise the significance of the Hauraki Gulf and the historic, traditional, cultural, and spiritual relationship of the tangata whenua with the Hauraki Gulf and its islands						
Gives effect to Te Mana o te Wai	• The options (3 and 4ae) that discharge to receiving environments other than freshwater have a high degree of alignment with Te Mana o te Wai. • Option 3a has a medium to high degree of alignment given that the during periods of low flow in the stream most if not all of the treated wastewater will be discharged to land. • Option 2b has a medium to low level of alignment given it is a direct discharge to freshwater (Te Puru Stream) noting the very high level of treatment. • Options 2a has a medium level of alignment given it is a discharge to freshwater (Te Puru Stream) but noting that is passes through an overland flow area and the very high level of treatment.	3	4	1	2	1
Keep our communities healthy	• The public health protection criterion assessment for the Short List options has been relied on for this assessment.	1	2	2	2	1
Protect the health of our environment, particularly the life supporting capacity of land, air, and water.	• The natural environment criterion assessment for the Short List options has been relied on for this assessment.	2	3	1	1	2
Provide a solution that caters for planned growth that keeps the overall costs of service to customers (collectively) at sustainable levels.	• The financial implications criterion assessment for the Short List options has been relied on for this assessment. • All options have been developed to ensure they will provide for projected growth for up to 35 years, but availability of land (Option 3) and constraints of an ocean outfall (Option 4ae) were considered a potential risk to growth.	1	1	5	4	3
Be sustainable and resilient and minimise whole-of-life carbon emissions and optimise resource recovery	• The resilience, opportunities and benefits criteria assessments and the technology and infrastructure sub-criterion - carbon footprint / greenhouse gas emissions for the Short List options have been relied on for this assessment.	2	2	3	3	3
Total		9	12	12	12	10

6.6.3 Analysis

As can be seen from the assessments set out in Table 6-8 and Table 6-10 the preliminary technical preferred option / BPO (Option 2a) scored the best against both the BPO assessment criteria and against the project objectives.

For the BPO assessment, Option 2a had a total score of 9, with the next closest option being Option 2b with a score of 12. Option 2a was assessed as the best because it scored well in the comparative effects assessment, involves well proven

technology and is likely to be successfully implemented. Option 2b scored well for similar reasons but did not score as well in the comparative effects assessment due to the direct discharge to the Te Puru Stream. The options involving land did not score well primarily due to the uncertainties associated with securing such large areas of land in this locality and with Option 3a, the complexity with managing two receiving environments.

The scores for the objectives assessment were closer than those for the BPO assessment with Option 2a having a total score of 9 followed by Option 4ae with a score of 10. The reason why Option 2a scored better than 4ae was cost and that it had great flexibility in providing for growth.

From the above analysis it was considered that the preliminary technical preferred option / BPO (Option 2a) passed the Best Practicable Option Test No. 2[14] and could therefore be recommended to Watercare to be confirmed as the technical preferred option / BPO.

[14] The BPO assessment also includes an assessment of the Project Objectives as shown in the Assessment Methodology diagram 2-1.

7. Mana Whenua Advice and Input

Watercare has undertaken direct engagement with Ngāi Tai ki Tāmaki, as the only iwi with mana whenua status over Beachlands and Maraetai catchment area, to inform the selection of the BPO, to ensure the project objectives are being met and to inform the final resource consent application. The details of the engagement process to date are set out in the *'Beachlands WWTP – Wastewater Discharge Consent Project – Stakeholder Engagement Report – March 2024'.*

While no formal feedback has been provided by Ngāi Tai ki Tāmaki (i.e. Cultural Values Assessment nor Cultural Impact Assessment), Watercare has understood that the key themes communicated by Ngāi Tai ki Tāmaki include:

- The cultural significance for Ngāi Tai ki Tāmaki of Te Puru Stream, the surrounding whenua and wider cultural landscape and Te Maraetai / Tamaki Strait and the Hauraki Gulf.
- The historical grievance caused by the lack of engagement with Ngāi Tai ki Tāmaki on the original decision to place the discharge from the WWTP into the tributary of Te Puru Stream.
- Ngāi Tai ki Tāmaki has a preference for land based discharges of treated wastewater.
- Opposition to conveyance of wastewater out of the Beachlands service area for treatment and discharge in the rohe of another iwi.
- Opposition to a marine discharge and construction of any new structures within the coastal marine area of the Hauraki Gulf.
- Opposition to direct discharge to Te Puru Stream and other waterways within the Ngāi Tai ki Tāmaki rohe.

Watercare has been guided by the above themes in the selection of the BPO for the discharge application. Further, as a result of ongoing engagement with Ngāi Tai ki Tāmaki following the completion of the Short-List Workshops, Watercare has committed to further investigation and support of the opportunities identified for co-design of the overland flow system for the diffuse discharge and the provision of water supply for a proposed nursery for Ngāi Tai ki Tāmaki beyond the WWTP site.

8. Stakeholder Engagement Feedback

In developing the BPO, Watercare undertook direct engagement with key stakeholder (including the Environmental Defence Society, the Hauraki Gulf Forum and Auckland Regional Public Health), the public and potentially affected landowners via direct engagement, Community Information Sessions and an Online Survey.

While the feedback what parties preferred option was varied depending on the party, the key themes received included:

- Opposition by potentially affected landowner to the acquisition and use of privately owned land for the discharge of treated wastewater;
- Opposition from the public to direct discharges into a tributary of Te Puru Stream;
- General opposition by the public and stakeholders to the discharge of treated wastewater into the Hauraki Gulf at any location;
- Mixture of support and opposition by the public to the use of a combined stream and land discharge option;
- Opposition by the public and stakeholders to any discharge activity which negatively impacted water quality either freshwater or coastal water.

Acknowledging the differing themes and positions set above, to the extent possible, Watercare has taken into account the feedback in the selection of the BPO for the discharge application.

9. Confirmed Preferred Option

Based on the technical option assessment and informed by the engagement with Ngāi Tai ki Tāmaki and the feedback from the community and stakeholder engagement, Watercare confirmed Option 2a as the Preferred Option for the discharge of wastewater from the Beachlands WWTP.

Under the Preferred Option, the wastewater from the Beachlands Maraetai community will be collected and treated at the Beachlands WWTP. The plant will be progressively upgraded as population requires over the requested 35-year consent term. Under the Preferred Option, the WWTP will use technology to produce high-quality treated wastewater suitable for discharge via an expanded overland flow system to a tributary of the Te Puru Stream. When fully implemented, the Beachlands WWTP will provide for wastewater servicing for 30,000 population equivalent (PE).

Appendices

Appendix A List of Technical Experts (Long List)

The following table sets out the technical experts responsible for leading the assessments of the Long List of options along with the other experts who provided additional support or who reviewed the assessments.

Criteria	Lead Responsibility	Support / Review
Public Health Protection	Mark James	Jim Bradley - Reuse Alan Pattle - Land
Natural Environment	Mark James	Shane Kelly - Coastal Alan Pattle - Land Mike Stewart – Freshwater
Social and Community	Katja Huls	Johanna McIntosh – Research Paula Hunter - Review
Financial Implications	Jim Bradley	Andrew Slaney – WWTP, conveyance Alan Pattle – Land, Managed Aquifer Recharge Gary Teear - Ocean outfall
Resilience	Andrew Slaney	Jim Bradley - Review Alan Pattle – Land, Managed Aquifer Recharge Gary Teear - Ocean outfall
Technology and Infrastructure	Andrew Slaney	Jim Bradley - Review Alan Pattle – Land, Managed Aquifer Recharge Gary Teear - Ocean outfall
Statutory Risks and Conflicts	Paula Hunter	Simpson Grierson
Opportunities and Benefits	Jim Bradley	Andrew Slaney - Review

Appendix B Long List Technical Expert Assessments

Public Health Protection Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table

2. Authors and experience

Criterion lead:

Author	Role / Experience	Category
Mark James	Strategic and technical advisor, Aquatic ecology	Microbiology Quality
Jim Bradley	Public Health Engineer	Reuse Options
Alan Pattle	Environmental Engineer	Land Application

3. Information sources

Experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

4. Assumptions

An appropriate level of treatment to reduce the discharge quality to an acceptable level.

Assessment uses the data available

Note that this needs to be run past a microbiologist

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Public Health Protection	Degree of public health exposure to health risks from treated wastewater discharge (including through land application or re-use options).	Low degree of public exposure to risk	Medium degree of public exposure to risk	High degree of public exposure to risk

6. Criterion categories / sub-criteria

Microbiological quality of treated wastewater

Risk of public exposure to waterborne pathogens and other contaminants through:

- Direct contact with the conveyance or treatment process.

- Direct contact with the receiving environment, for example through contact recreation.
- Indirect exposure – commercial operations, food gathering (shellfish, fish, watercress etc.) and groundwater use.

Spray irrigation / aerosols

- Risk of public exposure to pathogens and other contaminant from spray irrigations.

Treated wastewater reuse

- Risk of contamination of reclaimed water for potable and non-potable reuse.

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with higher degree of public exposure to risk effects rather than a lower degree. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Public Health Protection Assessment

Option	Microbiological quality of treated wastewater (Risk to the receiving environment?)	Spray irrigation / aerosols	Treated wastewater reuse	Overall Traffic Light
	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
2a Te Puru Stream – diffuse discharge	Relatively good quality water discharged at present, relatively low in microbes, and similar level to upstream. Should meet standards at least for NBL when considering what additional risk is there. Low risk to downstream shellfish beds due to discharge. (Need to get microbial assessment/QMRA of stream for cattle water supply, shellfish gathering, shellfish sample's from Kellys Bay to confirm?)	NA	NA	
2b Te Puru Stream –direct discharge	Could reduce any effects of birds in pond. Levels in outlet very low (more data needed though)	NA	NA	
2c Wairoa River	As for Te Puru Stream direct discharge, except could be more risk to marine farms in bay	NA	NA	
2d Turanga Creek/awa (Whitford)	As for Te Puru Stream direct, but other inputs already? Only a small creek. Loads could be higher in future. TBD	NA	NA	
3 100% land	Low risk after irrigation and groundwater attenuation	Low potential for aerosols drift with pathogens/other contaminants	NA	
3a Land/stream	Low risk in winter, no direct risk to stream in summer if on to land.	Low potential for aerosols drift with pathogens/other contaminants.	NA	
4aa Hauraki Gulf/Whitford - short	Potential high risk to shellfish gathering and recreation. Plume shows dispersal close to coastline. Loads could be much higher in future. TBD	NA	NA	
4ab Hauraki Gulf/Whitford - mid	Potential high risk to shellfish gathering or contact recreation. Plume shows	NA	NA	

Option	Microbiological quality of treated wastewater (Risk to the receiving environment?)	Spray irrigation / aerosols	Treated wastewater reuse	Overall Traffic Light
	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
	dispersal close to coastline. Loads could be much higher in future. TBD			
4ac Hauraki Gulf/Whitford - long	Medium to low risk for recreation, gathering of biota	NA	NA	
4ad Hauraki Gulf/Tamaki - short	Potential high risk to shellfish gathering and recreation. Plume shows dispersal close to coastline. Loads could be much higher in future. TBD	NA	NA	
4ae Hauraki Gulf/Tamaki - mid	Low risk to shellfish gathering or contact recreation	NA	NA	
4ad Hauraki Gulf/Tamaki - long	Very low risk for recreation, gathering of biota	NA	NA	
4b Land/Hauraki Gulf	Medium risk from land application (assuming ok for stock) and risk reduced even further in winter depending on length of pipe, depends on which option used	Low potential for aerosols drift with pathogens/other contaminants	NA	
4ba Land/HG/ Te Puru Stream	As above for 4b	Low potential for aerosols drift with pathogens/other contaminants	NA	
5 Aquifer recharge	No risk of adverse effects	NA		
6 100% reuse - potable	No risk of adverse effects	NA	No risk if appropriately treated	
7 100% reuse – non potable	Low risk depending on use eg golf course, may be no risk with other uses.	NA	No risk if appropriately treated but potential for cross connection with potable water supply and human contact with garden sprinklers etc	
8 Initial treatment to non-potable - potable	If potable standard then should be no risk	NA	No risk if appropriately treated	

Option	Microbiological quality of treated wastewater (Risk to the receiving environment?)	Spray irrigation / aerosols	Treated wastewater reuse	Overall Traffic Light
	Reasons and Traffic Light	**Reasons and Traffic Light**	**Reasons and Traffic Light**	
9 Supply to Hunua Dam	No risk if well treated (dam?)	NA	NA	
11 Enhancement options – partial reuse	Depends on options, as above	Depends on options		

Colour the Reasons and Traffic Light cells and the Overall Traffic Light cells Red, Orange, or Green depending on the score selected.

Natural Environment Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub criteria
- Method of assessment
- Assessment table
- Updated assessment table of any reasons and / or scores for options that were changed as a result of the Long List workshop discussions.

Authors and experience

Criterion lead:

Author	Role / Experience	Category
Mark James	Strategic and technical advisor	Coastal and freshwater
Shane Kelly	Technical advisor-marine science	Coastal
Mike Stewart	Technical advisor - freshwater	Freshwater
Alan Pattle	Technical advisor – ground water and land	Groundwater and Land

2. Information sources

- Experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

3. Assumptions

- An appropriate level of treatment to reduce the discharge quality to an acceptable level

4. Traffic light definition

Criteria	Description	Green	Orange	Red
Natural Environment (receiving environment)	Potential adverse environmental effects on the receiving environments associated with the options. Ability to meet s107 of the RMA and align with the values and bottom lines of the NPS-FM.	Low potential adverse effects	Medium potential adverse effects	High potential adverse effects

5. Criterion categories / sub-criteria

Coastal environment

- Effects on life supporting capacity - water quality, marine ecology, indigenous biodiversity.
- Effects on foreshore and seabed.
- Effects on natural character, features and landscapes.
- Ability to meet the requirements of s107 of the RMA.

Freshwater

- Effects on Te Mana o te Wai.
- Alignment with NPS-FM compulsory values, other values, national bottom lines.
- Ability to meet the requirements of s107 of the RMA.

Groundwater

- Effects on Te Mana o te Wai.
- Alignment with NPS-FM compulsory values, other values, national bottom lines.

Land

- Effects on terrestrial ecology
- Effects on highly productive land.
- Effects on natural inland wetlands.

6. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – safeguarding the life-supporting capacity of air, water, soil, and ecosystems.
- Section 6(a) - the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.
- Section 6(b) - the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development.
- Section 6(c) - the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.
- Section 7(d) - intrinsic values of ecosystems.
- Section 7(f) - maintenance and enhancement of the quality of the environment.
- Section 7 (h) - the protection of the habitat of trout and salmon.

7. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with higher potential adverse effects rather than the lower effects. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

8. Assessment table

See below:

Natural Environment Assessment (11 October 2023)

Option	Coastal Environment	Freshwater (surface)	Groundwater[15]	Land[16]	Overall Traffic Light
	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	PRELIMINARY
2a Te Puru Stream – diffuse discharge	Quality generally good and with more treatment would meet standards. Microbial levels reasonable and may meet standards now for shellfish etc (TBC). Low adverse effects	Generally, the quality of the current discharge is good and has some land treatment on the edge of the pond, reducing nutrients. Higher nitrogen levels below pond still but as for most parameters reduce downstream to similar levels to upstream and meet current guidelines. Fish and invertebrate diversity/numbers lower below the discharge (conductivity is high) with inverts showing improvement downstream. It is a farmed catchment and habitat could play a part. Low – moderate adverse effects			
2b Te Puru Stream – direct discharge	Lower quality than above. May not meet some standards in estuary. Medium adverse effects	Lower quality than upstream, no land treatment. Does avoid algal growth in pond and bird inputs if no pond. Medium adverse effects (depends on how much the land and pond take out.			
2c Wairoa River	Shellfish beds/farms could be impacted. Potential medium adverse effects.	Would need to see river data but with no land treatment would struggle to meet standards. Similar to 2b depending on other inputs. Potential medium adverse effects.			
2d Turanga Creek/awa (Whitford)	As for 2c, discharge to Whitford estuary could be an issue and is only a small creek. Potential high adverse effects.	Direct to river with no land treatment, different catchment. On top of other discharges into the stream may increase risk of potential adverse effects to unacceptable level.			
3 100% land	With high attenuation of nutrients would be good for coastal environment	With high attenuation of nutrients would be good for surface freshwaters and no **direct** discharge			
3a Land/stream	Would be higher quality water reaching coast than existing	Land treatment/irrigation before discharge in summer, to Te Puru Stream only in winter			
4aa Hauraki Gulf/Whitford - short	Unlikely to be sufficient dilution to meet standards, risk to shellfish beds, coastal biota. Plume shows dispersal close to shore. Potential high adverse effects. In SEA-M2. Need a benthic survey in the area.	No impact on freshwater ecosystems			
4ab Hauraki Gulf/Whitford - mid	Further offshore but still relatively close to coast and risk of effects on shellfish, biota. Plume shows dispersal close to shore. Potential high adverse effects. In SEA-M2.	No impact on freshwater ecosystems			
4ac Hauraki Gulf/Whitford - long	Better dilution than other Whitford options but plume is relatively large and hugs the coast. Close to small reef with reasonably diverse community including kaimoana (mussels).	No impact on freshwater ecosystems			

[15] Alan Pattle provided a presentation at the workshop.
[16] Alan Pattle provided a presentation at the workshop.

Option	Coastal Environment	Freshwater (surface)	Groundwater[15]	Land[16]	Overall Traffic Light
	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	PRELIMINARY
4ad Hauraki Gulf/Tamaki - short	Unlikely to be sufficient dilution to meet standards, risk to shellfish beds, coastal biota. Do need a benthic survey unless existing info? Plume shows dispersal close to shore. Potential high adverse effects.	No impact on freshwater ecosystems			
4ae Hauraki Gulf/Tamaki - mid	Good dilution with rapid dispersal and narrow plume field away from the coast. Little information on habitat quality and biota in the area.	No impact on freshwater ecosystems			
4ad Hauraki Gulf/Tamaki - long	Best dilution with rapid dispersal and narrow, plume field away from the coast. Little information on habitat quality and biota in the area. Very high levels of recreational fishing.	No impact on freshwater ecosystems			
4b Land/Hauraki Gulf	Land treatment/irrigation and discharge to one of Hauraki Gulf options in winter. Depends on option but low risk for mid and long Tamaki Strait outfall options. Medium to high risk of adverse effects for other options.	No **direct** impact on freshwater systems as on land			
4ba Land/HG/ Te Puru Stream	Discharge, to HG in winter or when required. Low risk for mid and long Tamaki Strait outfall options.	Most of discharge to land or HG, Te Puru only a back up so predict little ecological effect.			
5 Aquifer recharge	No effect	No effect			
6 100% reuse - potable	No effect	No effect on ecosystems			
7 100% reuse – non potable	No detectable effect	No **direct** effect on ecosystems			
8 Initial treatment to non-potable - potable	No effect	No effect			
9 Supply to Hunua Dam	No effect	No effect			
11 Enhancement options – partial reuse	Depends on discharge location as above	Depends on discharge location as above			

2a Te Puru Stream – diffuse discharge	Quality generally good and with more treatment would meet standards. Microbial levels reasonable and may meet standards now for shellfish etc (TBC). Low adverse effects. Note loads will go up significantly so could be an issue close to coast at times	Changed from Green to Orange Generally, the quality of the current discharge is good and has Low adverse effects as some land treatment on the edge of the pond, reducing nutrients. Higher nitrogen levels below pond. still but as for most parameters reduce downstream to similar levels to upstream and meet current guidelines. Latest data shows that some parameters such as nitrate and possibly DRP don't comply with standards/guidelines at Site 15 below the pond but do by the time the water reaches Te Puru Park and potentially the quarry. We are waiting for data between these sites to see where it does start to meet standards. (earlier reports were only based on a one-off sampling). Fish and invertebrate diversity/numbers lower below the discharge (conductivity is high) with inverts showing improvement downstream. It is a farmed catchment and habitat could play a part. Low – moderate adverse effects depending on more data and whether any improvement in treatment.			Changed from Green to Orange Based on recent data standards may not be met for some distance downstream (TBC). Would be low effects if improved treatment ensured standards met after mixing zone. Note many parameters will obviously increase in the stream below the pond, even towards the bottom of the stream – so some questions over whether an increase allowed under NPSFM even if it meets standards.

Social and Community Considerations Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Updated assessment table of any reasons and / or scores for options that were changed as a result of the Long List workshop discussions.

2. Authors and experience

Criterion lead: Katja Huls

Author	Role / Experience	Category
Katja Huls	Planner	All
Johanna McIntosh	Research	All

3. Information sources

- 5086-SCTTTP-Marine-Spatial-Plan-WR.pdf (gulfjournal.org.nz)
- "Beachlands: Options for Sustainable Development" (PDF). Archived from the original (PDF) on 18 April 2016. Retrieved 23 November 2017.
- 2018 Census place summary: Te Puru
- Whitford Estuaries Conservation Society
- The Auckland Unitary Plan
- Auckland Council Cultural Heritage Index
- Ministry for Primary Industries – coastal consents

4. Assumptions

- The discharges will not increase erosive flows in the streams and inlets
- Land application sites will be chosen to avoid sensitive sites.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Social and community considerations	Potential adverse effects on social and community values relating to amenity, recreation and food gathering, archaeology and heritage. Public access to and along the coastal marine area, and rivers and streams.	Low potential adverse effects	Medium potential adverse effects	High potential adverse effects

	Impact on rural activities and commercial operations.	

6. Criterion categories / sub-categories

Amenity values

- Nuisance effects (e.g., odour, noise, visual). Visual – outfall structure – depend on design - orange
- Effects on sensitive activities - Red

Recreation and food gathering

- Effects on recreation activities and values, and food gathering. Red. Fishing, swimming, commercial fishing.
- Effects on public access to the CMA, rivers, and streams. Structures – swimming access may be compromised. Depend on outfall structure and pipe bridges.

Heritage and archaeology

- Effects on archaeology (non-Māori).
- Effects on heritage buildings and sites.

Rural and commercial activities

- Effects on rural activities.
- Effects on commercial operations in the marine environment.

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their social and economic well being.
- Section 6(d) - the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers.
- Section 6(f) - the protection of historic heritage from inappropriate subdivision, use, and development.
- Section 7(c) - the maintenance and enhancement of amenity values.
- Section 7(f) - maintenance and enhancement of the quality of the environment.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with a high potential adverse effects rather than lower effects. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Social and Community Assessment (11 October2023)

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
2a Te Puru Stream – diffuse discharge	There are no identified sensitive activities that would be directly impacted by the stream. We are not aware of any complaints regarding the current discharge to the stream.	There are recreation and food gathering activities such as fishing and swimming.	There are recorded middens along Te Puru Stream and the mouth of the stream. There is also a urupa at the mouth of the stream. Advice is needed from mana whenua. This should be addressed in the mana whenua criteria. It is assumed that the increase in flows won't result in effects on the middens.	There are recreation and food gathering based commercial activities such as fishing charters and campgrounds. These are operating currently and are not expected to be affected by any increase in flows. Rural activities are unlikely to be affected.	
2b Te Puru Stream – direct discharge	As above	As above.	As above	As above	
2c Wairoa River	The discharge location is unknown. The Clevedon Scenic Reserve is adjacent to the Wairoa River. There are river-based activities with a view of the river such as the scenic reserve, a sculpture park and a boating club.	The harvest of oysters and other shellfish may be affected by the wastewater discharge. The area is known for wading birds and there are potential bird watching activities. There is a boating club that operates from Clevedon, the Brooklands Boating club.	There is a redoubt on the Wairoa estuary banks and a number of recorded middens. It is assumed that the increase in flows won't result in effects on the middens.	There are commercial enterprises that may be affected by a wastewater discharge. Particularly Clevedon Coast Oysters.	
2d Turanga Creek/Awa	No sensitive activities have been identified.	There is limited information on the recreation values of	There are a number of historic buildings and sites	The area is largely rural and no commercial activities that	

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
		this area, but they're not anticipated to be significant. There is an island with a conservation zoning in the inlet. Depending on the recreation values of the island they may be affected.	around the river and also recorded midden. It is assumed that the increase in flows won't result in effects on the middens.	have been identified as affected.	
3 100% Land	As a site has not been identified this can't be assessed.	Land application would not affect seafood harvest or swimming.	Unable to assess as there are no sites currently identified.	Land application may have an impact on farming activities adjacent to the land application area e.g. horticulture and dairying.	Provisional
3a Land/Stream	We are not aware of any complaints regarding the current discharge to the stream.	As the discharge from the stream would be reduced, the status quo may remain with regard to the effects of the discharge on beaches and inlets.	There are recorded middens along Te Puru Stream and the mouth of the stream. There is also a urupa at the mouth of the stream. It is assumed that the increase in flows won't result in effects on the middens.	There are recreation and food gathering based commercial activities such as fishing charters and campgrounds. These are operating currently and are not expected to be affected by any increase in flows. Land application may have an impact on farming activities adjacent to the land application area e.g. horticulture and dairy farming.	
4aa Hauraki Gulf Whitford Short	No sensitive activities have been identified that may be affected by the discharge. There are currently no identified sites for the outfall structure.	The discharge will be in close proximity to the marina. Shellfish gathering may be affected.	There are currently no identified sites for the outfall structure.	Farming activities are not likely to be affected. The construction of the outfall may affect the operation of the Pine Harbour marina.	

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
	There will be temporary visual effects associated with the construction of the outfall.				
4ab Hauraki Gulf Whitford Mid	As above.	As above	As above	As above	
4ac Hauraki Gulf Whitford Long	As above.	Shellfish gathering may be affected.	As above	As above	
4ad Hauraki Gulf Tamaki Short	No sensitive activities have been identified that may be affected by the discharge. Depending on the construction methodology there may be temporary visual effects.	The short outfall could have adverse effects shellfish gathering and swimming. Depending on the construction methodology there may be temporary effects on beach access.	There are currently no identified sites for the outfall structure.	There is no information on commercial fishing specific to this area. Clevedon Coast Oysters operates in the vicinity. The specific location of the oyster farms is not known.	
4ae Hauraki Gulf Tamaki Mid	As above.	Depending on the construction methodology there may be temporary effects on beach access.	There are currently no identified sites for the outfall structure.	As above.	
4ad Hauraki Gulf Tamaki Long	As above	Depending on the construction methodology there may be temporary effects on beach access.	There is no information on commercial fishing specific to this area.	As above.	
4b Land / Hauraki Gulf	As a site has not been identified for land application this can't be assessed for the land component. The outfall structure will need to be designed sensitively to minimise visual effects.	The Hauraki Gulf options may impact food gathering and swimming.	Unable to assess in part as there are no land application sites currently identified. There is no information on commercial fishing specific to this area.	There is no information on commercial fishing specific to this area. Land application may have an impact on farming activities adjacent to the land application area e.g.	

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
	Depending on the construction methodology there may be temporary visual effects.			horticulture and dairy farming.	
4ba Land / Hauraki Gulf / Te Puru Stream	As a site has not been identified for land application this can't be assessed. The outfall structure will need to be designed sensitively to minimise visual effects.	The Hauraki Gulf and Te Puru stream options may impact food gathering and swimming.	Unable to assess in part as there are no land application sites currently identified. There are recorded urupa and koiwi sites identified for some of the discharge locations. It is assumed increased discharges in the Te Puru stream will not affect these sites in terms of erosive flows.	There is no information on commercial fishing specific to this area. Land application may have an impact on farming activities adjacent to the land application area e.g. horticulture and dairy farming. There are recreation and food gathering based commercial activities such as fishing charters and campgrounds. These are operating currently and are not expected to be affected by any increase in flows.	
5 Managed Aquifer Recharge	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by this option.	Unlikely to be affected.	Unlikely to be affected.	
6 100% Reuse - Potable	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by this option.	Works are likely to occur in existing developed areas where ground has already been disturbed.	There are unlikely to be effects on commercial and rural activities.	
7 100% Re-use – Non-Potable	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by this option.	Works are likely to occur in existing developed areas where ground has already been disturbed.	There are unlikely to be effects on commercial and rural activities.	

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
8 Initial treatment to non-potable - potable	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by this option.	Works are likely to occur in existing developed areas where ground has already been disturbed.	There are unlikely to be effects on commercial and rural activities.	
9 Supply to Hunua Dam	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by this option.	Unlikely to be affected	There are unlikely to be effects on commercial and rural activities.	
11 Enhancement options – partial reuse	No adverse effects have been identified.	Recreation and food gathering is unlikely to be affected by adding this enhancement option.	Works are likely to occur in existing developed areas where ground has already been disturbed.	There are unlikely to be effects on commercial and rural activities.	

Updated Social and Community Assessment (18 October2023)

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Traffic Light
3 100% Land	With new information assessed as Green As a site has not been identified this can't be assessed. The identified land area is largely rural with forestry and quarrying activities. There is a cemetery at the south-west boundary which will need to be avoided.	Land application would not affect seafood harvest or swimming.	With new information assessed as Green Unable to assess as there are no sites currently identified. There is a cemetery at the south-west boundary which will need to be avoided. There are relatively few archaeological sites because sites have been buffered and left out of the potential land application area.	Land application may have an impact on farming activities adjacent to the land application area e.g. horticulture and dairying.	With new information assessed as Green Provisional

Financial Implications Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Updated assessment table of any reasons and / or scores for options that were changed as a result of the Long List workshop discussions.

2. Authors and experience

Criterion lead: Jim Bradley

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Alan Pattle	Land Application Engineer / 40+ years	LA/MAR
Gary Teear	Marine Engineer / 40+ years	Ocean Outfall
Andrew Slaney	Process Engineer / 25 years	All

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Typical NZ wastewater scheme costs from experience.
- Typical NZ outfall costs from experience.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

Note: the financial assessments are *very* high level and comparative with no quantitative estimates undertaken at this stage.

4. Assumptions

- Fresh water discharge options: Bardenpho / MBR treatment process.
- Land / Marine outfall options: Existing treatment process (possible without the disc filter)
- Potable reuse options: MBR plus advanced tertiary water treatment plant (eg reverse osmosis)
- Non-potable reuse options: Depends on water use; domestic would be MBR plus UV plus chlorine.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Financial implications	Comparative capital, operating and maintenance, whole of life costs of the options. Where relevant to the option, land acquisition costs, capital gains and product net revenue. Affordability – community, business, and trade waste dischargers	Low financial implications	Medium financial implications	High financial implications

6. Criterion categories / sub- criteria

Capital cost

- Capital cost of the total scheme including any land acquisition costs, capital gains and product net revenue.

Operating and maintenance cost

- Cost effectiveness of operations and maintenance.

Whole of life cost

- Combination of capital and operation and maintenance costs over the life of the assets.

Financial risk

- Is the option affordable even if growth does not occur as predicted.
- Cost to the community, business and trade waste dischargers.

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - enables people and communities to provide for their economic well being.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with higher financial implications rather than lower implications. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Financial Implications Expert Assessment (11 October 2023)

Option		Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
2a	Te Puru Creek Overland	Assume MBR system for upgraded WWTP for stream discharge	Moderate operating costs (no conveyance)	Combination of first two columns (NPV of capex plus opex).	Can be staged to meet demand.	
2b	Te Puru Creek Direct	Assume MBR system for upgraded WWTP for stream discharge	Moderate operating costs (no conveyance)	Combination of first two columns (NPV of capex plus opex).	Can be staged to meet demand.	
2c	Wairoa River	Assume MBR system for upgraded WWTP. 12 km conveyance. Tidal storage and pumped discharge.	Moderate operating costs plus conveyance pumping.	Combination of first two columns (NPV of capex plus opex).	High conveyance capital cost designed for ultimate population (or duplicate pipeline later).	
2d	Turanga Creek	Assume MBR system for upgraded WWTP. 10 km conveyence. Tidal storage and pumped discharge.	Moderate operating costs plus conveyance pumping.	Combination of first two columns (NPV of capex plus opex).	High conveyance capital cost designed for ultimate population (or duplicate pipeline later).	
3	100% Land	Conventional treatment. Irrigation storage and 150 hectares land application area.	Moderate operating costs plus potential revenue from land scheme (depending on crop eg cut & carry / forestry)	Combination of first two columns (NPV of capex plus opex).	Land can expanded over time to meet demand. But land availability is a risk to growth.	
3a	Land + Te Puru Creek	Similar to above but reduced storage volume and land area due to stream backup option.	Similar but less than 3.	Combination of first two columns (NPV of capex plus opex).	Land can expanded over time to meet demand. But land availability is a risk to growth.	
4aa	Outfall Whitford Short	Whitford Short. Conventional treatment. 5.1 km land + 1.4 km marine outfall (6.5 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land	

Option		Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
			discharge options. Assume gravity discharge to outfall.		based outfall could potentially be staged).	
4ab	Outfall Whitford Mid	Whitford Mid. Conventional treatment. 5.1 km land + 2.2 km marine outfall (7.3 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary discharge options. Assume gravity discharge to outfall.	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land based outfall could potentially be staged).	
4ac	Outfall Whitford Long	Whitford Long. Conventional treatment. 5.1 km land + 3.5 km marine outfall (8.6 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary discharge options. Assume gravity discharge to outfall.	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land based outfall could potentially be staged).	
4ad	Outfall Tamaki Short	Tamaki Short. Conventional treatment. 4.8 km land + 1.8 km marine outfall (6.6 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary discharge options. Assume gravity discharge to outfall.	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land based outfall could potentially be staged).	
4ae	Outfall Tamaki Mid	Tamaki Mid. Conventional treatment. 4.8 km land + 2.9 km marine outfall (7.7 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary discharge options. Assume gravity discharge to outfall.	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land based outfall could potentially be staged).	
4ad	Outfall Tamaki Long	Tamaki Long. Conventional treatment. 4.8 km land + 5.5 km marine outfall (10.3 km total)	Moderate operating costs. Lower level of treatment than Creek / Estuary discharge options. Assume gravity discharge to outfall.	Combination of first two columns (NPV of capex plus opex).	High marine outfall capital cost must be designed for ultimate population (land based outfall could potentially be staged).	
4b	Outfall + Land	Assume a mid-outfall option + land disposal	Slightly higher operating costs than outfall only (managing land system).	Combination of first two columns (NPV of capex plus opex).		
4ba	Outfall + Land + Stream	Assume a mid-outfall option + land disposal + stream disposal	Slightly higher operating costs than outfall only (managing land system).	Combination of first two columns (NPV of capex plus opex).		

Option		Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
5	MAR	MBR plus Advanced tertiary WTP for aquifer recharge + 10 km conveyance pipe + injection bores.	Advanced treatment (high operating costs).	Combination of first two columns (NPV of capex plus opex).		
6	Direct Potable	MBR plus Advanced tertiary WTP plus reticulation network for direct potable use	Advanced treatment (high operating costs).	Combination of first two columns (NPV of capex plus opex).		
7	Non-Potable Reuse	Assume an MBR plus reticulation for non-potable reuse.	Moderate operating costs.	Combination of first two columns (NPV of capex plus opex).		
8	Delayed Direct Potable	Same as 6.	Advanced treatment (high operating costs).	Combination of first two columns (NPV of capex plus opex).		
9	Hunua Dam Recharge	MBR plus advanced tertiary WTP plus 27 km conveyance pipe for dam recharge.	Advanced treatment (high operating costs) plus conveyance pumping costs.	Combination of first two columns (NPV of capex plus opex)..		
11	Non Potable Add-on	Side stream tertiary treatment plant for partial non-potable reuse. (depends on scheme)	Moderate operating costs.	Combination of first two columns (NPV of capex plus opex).		

Updated Financial Implications Expert Assessment (18 October 2023

Option		Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
3	100% Land	Changed to red because of the increase in the land area requirement. Conventional treatment. Irrigation storage and ~~150~~ 300 hectares land application area.	Moderate operating costs plus potential revenue from land scheme (depending on crop eg cut & carry / forestry)	Combination of first two columns (NPV of capex plus opex).	Land can expanded over time to meet demand. But land availability is a risk to growth.	Changed from orange to red

Resilience Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall
Alan Pattle	Marine Engineer / 40+ years	Land application / MAR
Gary Teear	Coastal Engineer	Ocean Outfalls

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions

- Fresh water discharge options: Bardenpho / MBR treatment process.
- Land options: Existing treatment process.
- Marine outfall options: Existing treatment process (possibly without the disc filter
- Potable reuse options: MBR plus advanced tertiary water treatment plant (eg reverse osmosis)
- Non-potable reuse options: Depends on water use; domestic would be MBR plus UV plus chlorine.

Note: the above assumptions for treatment type / associated treated wastewater quality based on anticipated receiving environment requirements based on the experience of the authors. No effects assessments have been carried out at this stage.

The assessments are high level for comparison purposes based on the authors' experience with similar types of wastewater systems throughout New Zealand. No detailed assessments have been undertaken on natural hazards and climate change impacts at this stage other than applying generic approaches.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Resilience	Degree to which the option is resilient to natural hazards and climate change, offers operational resilience, addresses the carbon component of 40/20/20. Flexibility to accommodate changes in flows and loads, ability to respond to changes in regulatory standards, changes in technology.	High degree of resilience	Medium degree of resilience	Low degree of resilience

6. Criterion categories / sub-criteria

Natural hazards

- Land stability and erosion affecting infrastructure.
- Flooding affecting infrastructure.
- Wildfires affecting infrastructure (land application in forests).

Climate change

- High intensity rainfall peaks affecting the infrastructure.
- Prolonged wet weather periods affecting the infrastructure.
- Prolonged dry periods affecting the infrastructure.
- Prolonged dry periods resulting in an increase of low flows in streams and rivers.
- Sea level rise and coastal storm inundation affecting infrastructure (ocean outfall).
- Carbon – addressing the carbon component of 40/20/20.

Operational resilience

- Power supply reliability – effect of outages and rapid changes to electricity pricing.
- Scheme complexity leading to operational problems.
- Third party damage to infrastructure, e.g., digger hitting cables, pipes etc.
- Crop failure/contamination.
- Loss of market for land application products e.g., cut and carry products, forestry production.

Flexibility

- Ability to accommodate changes in flows and loads.
- Ability to respond to changes in regulatory standards e.g., emerging contaminants, endocrine disrupting compounds.
- Ability to respond to changes in technology.

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.
- Section 7(i) – the effects of climate change.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of

those with lower degree of resilience rather than the higher degree. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Resilience Assessment

Option		Natural Hazards	Climate Change	Operational Resilience	Flexibility	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
2a	Te Puru Creek Overland	Creek could be at risk from natural hazards	Resilient to climate change	Simple robust system	Limited capacity of stream	
2b	Te Puru Creek Direct	Creek could be at risk from natural hazards	Resilient to climate change	Simple robust system	Limited capacity of stream	
2c	Wairoa River	Coastal conveyance pipeline risk.	Coastal conveyance pipeline risk.	Simple robust system	Limited capacity of estuary.	
2d	Turanga Creek	Coastal conveyance pipeline risk.	Coastal conveyance pipeline risk.	Simple robust system	Limited capacity of estuary.	
3	100% Land	Land susceptible to natural hazards	Neutral for Auckland rainfall but a higher risk with 100% land application (no backup route).	Managing land application system as well as WWTP. No backup option.	Capacity limited by land availability	
3a	Land + Te Puru Creek	Land susceptible to natural hazards	Neutral for Auckland rainfall and have stream as backup.	Managing land application system as well as WWTP.	Capacity limited by land availability but have stream as backup.	
4aa	Outfall Whitford Short	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	
4ab	Outfall Whitford Mid	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	
4ac	Outfall Whitford Long	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	
4ad	Outfall Tamaki Short	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	
4ae	Outfall Tamaki Mid	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	

Option		Natural Hazards	Climate Change	Operational Resilience	Flexibility	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
4ad	Outfall Tamaki Long	Outfall provides resilience.	Outfall provides resilience.	Simple robust system	Outfall provides high capacity	
4b	Outfall + Land	Outfall provides resilience.	Outfall provides resilience.	More complex system (multiple discharge routes)	Outfall provides high capacity	
4ba	Outfall + Land + Stream	Outfall provides resilience.	Outfall provides resilience.	More complex system (multiple discharge routes)	Outfall provides high capacity	
5	MAR	Pipeline damage. Lack of backup disposal route,	Relatively insulated.	Pipeline damage. Lack of backup disposal route.		
6	Direct Potable			Complex treatment process. Lack of backup disposal route,	Risk of new contaminants / stricter standards.	
7	Non-Potable Reuse		Less demand for irrigation with increased rainfall.		Risk of new contaminants / stricter standards.	
8	Delayed Direct Potable	Same as 6.	Same as 6.	Same as 6.	Same as 6.	
9	Hunua Dam Recharge	Pipeline damage. Lack of backup disposal route,			Risk of new contaminants / stricter standards.	
11	Non Potable Add-on					

Technology and Infrastructure Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall
Alan Pattle	Marine Engineer / 40+ years	Land application / MAR
Gary Teear	Coastal Engineer	Ocean Outfalls

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions

- Fresh water discharge options: Bardenpho / MBR treatment process.
- Land application options: Existing treatment process.
- Marine outfall options: Existing treatment process (possibly without the disc filter).
- It is assumed that the biological trickling filter (BTF) approach used at the marine outfalls for Hastings, Napier, Gisborne and Greymouth is unlikely to be appropriate / acceptable for discharges into the more sensitive Hauraki Gulf environment (this needs confirming from both environmental and cultural / social effects perspectives). If a BTF were acceptable then the cost savings would be significant compared with other treatment options.
- Potable reuse options: MBR plus advanced tertiary water treatment plant (eg reverse osmosis)
- Non-potable reuse options: Depends on water use; domestic would be MBR plus UV plus chlorine.

Note: the above assumptions for treatment type / associated treated wastewater quality based on anticipated receiving environment requirements based on the experience of the authors. No effects assessments have been carried out at this stage.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Technology and infrastructure (whole of scheme)	Degree to which the option - Degree to which the option – uses proven technology, existing infrastructure; can be constructed, staged, constructed in the required timeframes; has sufficient capacity, secure land, available infrastructure.	High degree of alignment	Medium degree of alignment	Low degree of alignment

6. Criterion categories / sub-criteria

Reliable and proven technology

- Uses reliable, robust and proven technology.

Staging and timing

- Can the option be staged.
- Is the option able to be constructed within the required timeframe.

Constructability

- Is the option able to be constructed e.g., geotechnical conditions, presence of groundwater, contaminated land.
- Is there sufficient land available to accommodate the option and can the land be secured.
- Potential to maximise the use existing infrastructure that has a valuable remaining life.
- Presence of existing other infrastructure.

Capacity

- Does the option have capacity to accept projected flows and loads.

Carbon

- Comparative carbon footprint for operation and construction.

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with a lower degree of alignment rather than a higher degree. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Technology and Infrastructure Assessment

Option		Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
2a	Te Puru Creek Overland	Assume MBR system for upgraded WWTP for stream discharge	WWTP can be staged	Relatively straightforward.	Limited assimilative capacity of stream.	Relatively low carbon footprint	
2b	Te Puru Creek Direct	Assume MBR system for upgraded WWTP for stream discharge	WWTP can be staged	Relatively straightforward.	Limited assimilative capacity of stream.	Relatively low carbon footprint	
2c	Wairoa River	Assume MBR system for upgraded WWTP. Tidal storage and pumped discharge.	WWTP can be staged	Relatively straightforward WWTP; conveyance pipeline and tidal storage basin could be difficult.	Limited assimilative capacity of estuary.	Embodied carbon in conveyance pipeline.	
2d	Turanga Creek	Assume MBR system for upgraded WWTP. Tidal storage and pumped discharge.	WWTP can be staged	Relatively straightforward WWTP; conveyance pipeline and tidal storage basin could be difficult.	Limited assimilative capacity of estuary.	Embodied carbon in conveyance pipeline.	
3	100% Land	Conventional treatment. Irrigation storage and pumped discharge.	Acquire land as needed – may need PWA	Difficult to acquire enough land for 100% land application. Large storage volume needed for winter / wet weather.	Unlikely to acquire enough land for 100% land application. Large storage volume needed for winter / wet weather.	Assume forestry (carbon sequestration)	
3a	Land + Te Puru Creek	Similar to above.	Acquire land as needed – may need PWA	Less land needed if stream is available for discharge over winter.	Less land needed if stream is available for discharge over winter.	Assume forestry (carbon sequestration)	

Option		Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
4aa	Outfall Whitford Short	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ab	Outfall Whitford Mid	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ac	Outfall Whitford Long	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ad	Outfall Tamaki Short	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ae	Outfall Tamaki Mid	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ad	Outfall Tamaki Long	Conventional treatment plus outfall	Outfall has to be sized for ultimate population.	Relatively straightforward.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4b	Outfall + Land	Combination of land and outfall.	Outfall has to be sized for ultimate population.	Outfall always available for discharge so land area can be small.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
4ba	Outfall + Land + Stream	Combination of land stream and outfall.	Outfall has to be sized for ultimate population.	Similar to above.	Outfall has high capacity	Embodied carbon in conveyance pipeline.	
5	MAR	Note done in New Zealand. Requires	Land requirements low. WWTP / WTP Construction	Standard construction elements.	Limited by aquifer capacity	High level of treatment (energy and embodied carbon)	

Option		Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
		advanced level of treatment.	timeframe could be long. Approvals and consenting timeframe also.				
6	Direct Potable	Note done in New Zealand. Requires advanced level of treatment.	WWTP / WTP Construction timeframe could be long. Approvals and consenting timeframe also.			High level of treatment (energy and embodied carbon)	
7	Non-Potable Reuse	Non potable reuse is done in NZ and is relatively common in Australia.			Winter demand will be low.	Slightly lower level of treatment than potable.	
8	Delayed Direct Potable	Note done in New Zealand. Requires advanced level of treatment.	WWTP / WTP Construction timeframe could be long. Approvals and consenting timeframe also.	Same as 6.	Same as 6.	High level of treatment (energy and embodied carbon)	
9	Hunua Dam Recharge	Indirect potable reuse, less uncommon than direct potable reuse.	Approvals plus long conveyance pipeline.			High level of treatment (energy and embodied carbon) plus conveyence	
11	Non Potable Add-on	Non potable reuse is done in NZ and is relatively common in Australia.				Slightly lower level of treatment than potable.	

Statutory Risks and Conflicts Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Updated assessment table of any reasons and / or scores for options that were changed as a result of the Long List workshop discussions.

2. Authors and experience

Criterion lead: Paula Hunter

Author	Role / Experience	Category / sub-criteria
Paula Hunter	Planner	All
Simpson Grierson	Legal	Legislative barriers to options proceeding.

3. Information sources

Marine and Coastal Area (Takutai Moana) Act 2011 (MACAA)

MACAA applications

Hauraki Gulf Marine Park Act 2000

New Zealand Coastal Policy Statement

National Policy Statement for Freshwater Management

National Policy Statement for Highly Productive Land

Auckland Unitary Plan

4. Assumptions

Assessments have not been informed by information of effects on Māori cultural values, mauri, mahinga kai, wāhi tapū and sites of significance.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Statutory Risks and Conflicts	Legislative processes that could restrict the ability of an option to proceed, scale of consenting complexity and consent compliance. Conflicts with the direction of key planning instruments.	Low risks and conflicts	Medium risks and conflicts	High risks and conflicts

6. Criterion categories / sub-criteria

Legislative barriers to options proceeding

- Risk of an option not proceeding due to legislative changes and outcomes of legislative processes e.g., potentially successful applications for customary title under the Takutai Moana Act.

Consenting complexity and compliance

- Scale of complexity of consenting processes including s91 deferrals.
- Scale of complexity of compliance requirements and costs.

Conflicts with statutory direction

- Conflict with the direction of key planning instruments e.g., non-complying activity classification with a supporting “avoid” policy.

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Sections 5, 6, 7, 8.

8. Assessment method

An option’s recommended traffic light ‘score’ is developed by first scoring each of the criterion’s categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with higher risks and conflicts rather than those lower risks and conflicts. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Statutory Risks and Conflicts Assessment (11 October 2023)

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Traffic Light
2a: Te Puru Stream – diffuse discharge	No legislative barriers identified	One receiving environment, expanded overland flows system	Potential conflict with NPS-FM - Te Mana o te Wai – putting the health and well being of the Te Pura stream first.	
2b: Te Puru Stream – direct discharge	No legislative barriers identified	One receiving environment, new discharge structure	Potential conflict with NPS-FM - Te Mana o te Wai – putting the health and well being of the Te Pura stream first.	
2c: Wairoa River	No legislative barriers identified	One receiving environment, conveyance infrastructure	Potential conflict with NPS-FM - Te Mana o te Wai – putting the health and well being of the Waioa River first. Wairoa River is a larger water body.	
2d: Turanga Creek / Awa	No legislative barriers identified	One receiving environment, conveyance infrastructure	Potential conflict with NPS-FM - Te Mana o te Wai – putting the health and well being of the Turanga Creek / Awa first.	
3: 100% Land	No legislative barriers identified	Potentially more than one land application area, conveyance infrastructure to land application area, storage	Contributes to putting health and well being of freshwater first (NPS-FM), does not conflict with NPS Highly Productive Land as land will remain in production of some type.	
3a: Land / Te Puru Stream	No legislative barriers identified	Two receiving environments, potentially more than one land application area, conveyance infrastructure to land application area	Potential conflict with NPS-FM - Te Mana o te Wai – putting the health and well being of the Te Pura stream first, but discharge to the stream will only occur in the winter.	
4aa: Hauraki Gulf Whitford Short	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (short), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character.	

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Traffic Light
			Puts health and well being of freshwater first (NPS-FM)	
4ab: Hauraki Gulf Whitford Mid	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (mid), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Puts health and well being of freshwater first (NPS-FM)	
4ac: Hauraki Gulf Whitford Long	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (long), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Puts health and well being of freshwater first (NPS-FM)	
4ad: Hauraki Gulf Tāmaki Short	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (short), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Puts health and well being of freshwater first (NPS-FM)	
4ae: Hauraki Gulf Tāmaki Mid	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (mid), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character.	

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Traffic Light
			Puts health and well being of freshwater first (NPS-FM)	
4af: Hauraki Gulf Tāmaki Long	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	One receiving environment, ocean outfall (long), conveyance infrastructure	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Puts health and well being of freshwater first (NPS-FM)	
4b: Land / Hauraki Gulf	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	Two receiving environments, potentially more than one land application area, conveyance infrastructure to land application area	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Contributes to putting health and well being of freshwater first (NPS-FM)	
4ba: Land / Hauraki Gulf / Te Puru Stream	Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	Three receiving environments, potentially more than one land application area, conveyance infrastructure to land application area	Subject to constraints that should be avoided, need further information to understand construction and operation effects on water quality, recreation values, ecology and indigenous biodiversity, natural character. Contributes to putting health and well being of freshwater first (NPS-FM)	
5: Managed Aquifer Recharge	No legislative barriers identified	One receiving environment, conveyance infrastructure, discharge system	Potential conflict with NPS-FM Te Mana o te Wai – putting the health and well being of groundwater first.	
6: 100% Reuse - Potable	No legislative barriers identified	No receiving environment consents, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Traffic Light
7: 100% Reuse – Non-Potable	No legislative barriers identified	Potential multiple receiving environment consents, backup receiving environment, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	
8: 100% Reuse – Non-Potable Transition to Potable	No legislative barriers identified	Potential multiple receiving environment consents, backup receiving environment, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	
9: Supplement Supply for Hunua Dams	No legislative barriers identified	New WTP, conveyance infrastructure, discharge system	No conflicts with statutory direction identified	
11: Enhancement Options	No legislative barriers identified	Potential multiple receiving environment consents, backup receiving environment, conveyance infrastructure, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	

Updated Statutory Risks and Conflicts Assessment (18 October 2023)

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Traffic Light
6: 100% Reuse – Potable	No legislative barriers identified. Changed from green to red. There are currently no standards that apply to the reuse of treated wastewater. This could potentially lead to disputes over appropriate standards to be met and loss of public confidence.	No receiving environment consents, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	Changed from Green to Orange
7: 100% Reuse – Non-Potable	No legislative barriers identified. Changed from green to orange. There are currently no standards that apply to the reuse of treated wastewater. This could potentially lead to disputes over appropriate standards to be met and loss of public confidence. Issue not so significant for non-potable use.	Potential multiple receiving environment consents, backup receiving environment, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	
8: 100% Reuse – Non-Potable Transition to Potable	No legislative barriers identified. Changed from green to red. There are currently no standards that apply to the reuse of treated wastewater. This could potentially lead to disputes over appropriate standards to be met and loss of public confidence.	Potential multiple receiving environment consents, backup receiving environment, new WTP, reservoir, water supply network	No conflicts with statutory direction identified	
9: Supplement Supply for Hunua Dams	No legislative barriers identified. Changed from green to red. There are currently no standards that apply to the reuse of treated wastewater. This could potentially lead to disputes over appropriate standards to be met and loss of public confidence.	New WTP, conveyance infrastructure, discharge system	No conflicts with statutory direction identified	Changed from Green to Orange
11: Enhancement Options				

Opportunities and Benefits Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Updated assessment table of any reasons and / or scores for options that were changed as a result of the Long List workshop discussions.

2. Authors and experience

Criterion lead: Jim Bradley

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Andrew Slaney	Process Engineer / 25 years	All

3. Information sources

- The information sources used for the Opportunities and Benefits Criterion include:
- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Watercare and Stantec personnel's wastewater treatment and management knowledge of the New Zealand sector and overseas
- Assumed (at this stage) technology and infrastructure criteria information

Authors and experience of those involved in this section of the Report.

4. Assumptions

a. Overall Assumptions

The Wastewater Treatment Plan is based on the "Product Factory" concept as depicted below. Concepts and developments within Watercare in recent times have adapted this approach. The approach is consistent with the principles of the circular economy.

b. Treated Wastewater Beneficial Reuse Assumption

a) Assessment based on the quality/degree of treatment of the treated wastewater and the extent/amount of treated wastewater to be beneficially reused

b) Assessment does not take into account "possible people's perceptions" of the beneficial reuse e.g. potable reuse, aquifer recharge of water supply source

c) Consents/other approvals etc can be sought for each of the beneficial reuse means included in the options.

d) The assessment includes nutrient recovery when treated wastewater is applied to land.

c. Sludge and Biosolids Beneficial Reuse Assumptions

a) This assessment based on degree of treatment of liquid phase needed i.e. high degree of treatment, the more sludge/biosolids produced that can be beneficially reused

b) Includes vermiculture, biochar, other reusable sludge/biosolids material

c) Assume no chemicals or other products used in the WWTP processes that render biosolids not beneficially reusable

d) Assumes possible future/pending regulations on Emerging Organic Contaminants (EOC's) and/or microplastics does not limit beneficial reuse on land

d. Energy Generation

Energy generation is not included in the table as it is assumed that based on the design population of the scheme (around 40,000), based on the authors' experience, primary clarifiers and anaerobic digestion are unlikely to be economic and therefore none of the scheme options will provide energy generation possibilities. In addition it is noted that the carbon in primary solids will be needed for biological nitrogen / phosphorus removal as with the current plant and a number of others in New Zealand.

In terms of incineration of sludge / biosolids to produce energy, this possibility is included in the sludge / biosolids beneficial use category.

5. Traffic light definition

Criteria	Description	Green	Orange	Red
Opportunities and Benefits	Provides opportunities for resource recovery including beneficial reuse, energy generation, nutrient removal.	High opportunities and benefits	Medium opportunities and benefits	Minimal opportunities and benefits

6. Criterion categories / sub-criteria

Resource recovery

- Treated wastewater beneficial reuse.
- Sludge and biosolids beneficial reuse
- Energy generation.
- Nutrient removal

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – sustainable management of resources.
- Section 7(b) - the efficient use and development of natural and physical resources.
- Section 7 (ba) - the efficiency of the end use of energy.

8. Assessment method

An option's recommended traffic light 'score' is developed by first scoring each of the criterion's categories separately. An overall score is then identified by comparing the range of category scores and giving an overall score erring on the side of those with a minimum opportunities and benefits rather than higher opportunities and benefits. A qualitative expert judgement approach is followed in determining the scores for the long list assessment rather than a quantitative approach.

9. Assessment table

See below:

Opportunities and Benefits Assessment (11 October 2023)

Option		Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery / reuse	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
2a	Te Puru Creek Overland	Option based on Te Puru Stream discharge – no conveyance line of WWTP site to facilitate reuse	All options produce same quantity of biosolids and have similar opportunities for beneficial use.	No reuse of nutrients.	
2b	Te Puru Creek Direct	Option based on Te Puru Stream discharge – no conveyance line of WWTP site to facilitate reuse		No reuse of nutrients.	
2c	Wairoa River	While likely to be also be high quality treated wastewater (like 2a and 2b) could tap into conveyance line to Wairao River discharge		No reuse of nutrients.	
2d	Turanga Creek	While likely to be also be high quality treated wastewater (like 2a and 2b) could tap into conveyance line to Turanga Creek discharge		No reuse of nutrients.	
3	100% Land	100% to land application so maximise beneficial reuse with appropriate crop(s) and management regime(s) selected		Uptake of nutrients by crops.	
3a	Land + Te Puru Creek	Some treated wastewater to land so maximises the beneficial reuse of that proportion providing appropriate techniques used like Option 3		Uptake of nutrients by crops, but less than option 3a.	
4aa	Outfall Whitford Short	Marine outfall Whitford short, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	

Option		Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery / reuse	Overall Traffic Light
		Reasons and Traffic Light	Reasons and Traffic Light	Reasons and Traffic Light	
4ab	Outfall Whitford Mid	Marine outfall Whitford mid, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	
4ac	Outfall Whitford Long	Marine outfall Whitford long, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	
4ad	Outfall Tamaki Short	Marine outfall Tamaki short, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	
4ae	Outfall Tamaki Mid	Marine outfall Tamaki mid, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	
4ad	Outfall Tamaki Long	Marine outfall Tamaki long, assumes not as highly treated so not the same reuse potential		No reuse of nutrients.	
4b	Outfall + Land	A land component so some beneficial reuse providing appropriate crop(s) and management regimes(s) selected		Some land application / nutrient reuse.	
4ba	Outfall + Land + Stream	A land component so some beneficial reuse providing appropriate crop(s) and management regimes(s) selected		Some land application / nutrient reuse.	
5	MAR	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality		Nutrients are undesirable for drinking water supply but treated to remove most nutrients.	

Option		Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery / reuse	Overall Traffic Light
		Reasons and Traffic Light	**Reasons and Traffic Light**	**Reasons and Traffic Light**	
6	Direct Potable	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality		Nutrients are undesirable for drinking water supply but treated to remove most nutrients.	
7	Non-Potable Reuse	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality			
8	Delayed Direct Potable	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality			
9	Hunua Dam Recharge	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality		Nutrients are undesirable for drinking water supply but treated to remove most nutrients.	
11	Non Potable Add-on	This is a combination of options – reuse depending on method and extent of reuse including seasonal use		Use of nutrients in irrigation systems.	

Updated Opportunities and Benefits Assessment (18 October 2023)

7	**Non-Potable Reuse**	**Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality**		**Some uptake of nutrients – vegetation, crop irrigation.**	
8	Delayed Direct Potable	Formulated on beneficial reuse of treated wastewater that is treated to high/reclaimed water quality		Changed to red. Nutrients are undesirable for drinking water supply but treated to remove most nutrients.	Changed to Orange

Appendix C Long List Workshop Participants

Participant	Organisation
Chris Allen	Watercare
Dean Lawrence	Watercare
Helen Jansen	Watercare
Iris Tscharntke	Watercare
Jonathan Piggot	Watercare
Michael Webster	Watercare
Nathaniel Wilson	Watercare
Priyan Perera	Watercare
Rory Buchanan	Watercare
Tanvir Bhamji	Watercare
Andrew Slaney	Stantec
Jim Bradley	Stantec
Katja Huls	Stantec
Paula Hunter	Stantec
Sharu Delilkan	Stantec
Allan Pattle	PDP
Mark James	Aquatic Sciences
Warren Bangma	Simpson Grierson
Shane Kelly	Coast and Catchment

Appendix D List of Technical Experts (Short List)

The following table sets out the technical experts responsible for leading the assessments of the Short List of options along with the other experts who provided additional support or who reviewed the assessments.

Criteria	Lead Responsibility	Support / Review
Public Health Protection	Mark James	Alan Pattle – Land irrigation Rebecca Stott - Microbiological quality of treated wastewater Jim Bradley - Reuse
Natural Environment	Mark James	Shane Kelly – Coastal and Freshwater Alan Pattle - Land Mike Stewart – Freshwater
Social and Community	Katja Huls	Shane Kelly – recreation and Food Gathering Paula Hunter - Review
Financial Implications	Andrew Slaney	Jim Bradley - Review Alan Pattle – Land irrigation Gary Teear - Ocean outfall
Resilience	Andrew Slaney	Jim Bradley - Review
Technology and Infrastructure	Andrew Slaney	Jim Bradley - Review
Statutory Risks and Conflicts	Paula Hunter	Simpson Grierson - Legislative barriers to options proceeding.
Opportunities and Benefits	Jim Bradley	Andrew Slaney - Review

Appendix E Short List Technical Expert Assessments

Public Health Protection Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Mark James

Author	Role / Experience	Category
Mark James	Strategic and technical advisor, Aquatic ecology	Microbiology Quality
Jim Bradley	Public Health Engineer	Reuse Options
Alan Pattle	Environmental Engineer	Land Application
Rebecca Stott	Microbiology expert, involved in a number of WW discharge projects, QMRA	Microbiological quality of treated wastewater

3. Information sources

Extensive experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

Previous QMRA

Assessment uses the data available, including latest monitoring data for influent, effluent, upstream, after pond, Site 15 with limited data to date for Site E (reference), Site F and Te Puru Park(more data to come for site sin between).

4. Assumptions and limitations

At least the current level of treatment and discharge.

QMRA to be completed on final BPO to confirm level of risk for recreation and food gathering at key sites.

Assume land/stream option will use land for most of year and maybe stream in winter when ground saturated?

5. Public Health Protection Criterion – description and sub-criteria

Description	Sub-criteria		
	Microbiological quality of treated wastewater	Spray irrigation / aerosols	Treated wastewater reuse
Degree of public health exposure to health risks from treated wastewater discharge (including through land application or re-use options).	Risk of public exposure to waterborne pathogens and other contaminants through: • Direct contact with the conveyance or treatment process. • Direct contact with the receiving environment, for example through contact recreation. • Indirect exposure – commercial operations, food gathering (shellfish, fish, watercress etc.) and groundwater use.	• Risk of public exposure to pathogens and other contaminant from spray irrigations.	• Risk of contamination of reclaimed water for potable and non-potable reuse.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low degree of public exposure to risk	1
Medium to low degree of public exposure to risk	2
Medium degree of public exposure to risk	3
Medium to high degree of public exposure to risk	4
High degree of public exposure to risk	5

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher degree of public exposure to risk effects rather than a lower degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Public Health Protection Criterion

Option	Microbiological quality of treated wastewater	Spray irrigation / aerosols	Treated wastewater reuse	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Te Puru Stream – diffuse discharge	Relatively good quality water discharged at present, relatively low in microbes, and similar or reduced level to upstream and reference site. Low level of use – recreation at outlet from Te Puru Stream and in Kellys Bay, shellfish gathering low level Kellys Bay. Should meet standards at least for NBL noting higher microbial levels upstream and at bottom Te Puru Stream to discharge form Pond. Low risk to downstream shellfish beds due to discharge. (Need to get microbial assessment/QMRA of stream for cattle water supply, shellfish gathering, shellfish sample's from Kellys Bay to confirm?) Yet to look at load effects)	NA	NA	
2b: Te Puru Stream – direct discharge	Could reduce any effects of birds in pond (doesnt appear to be an issue). Levels in outlet very low (more data needed though). Proposed limit of <1 cfu/100 ml (?) in discharge should not create any risk downstream even though attenuation not as great as Option 2a.	NA	NA	
3: 100% to land	Lower level of treatment proposed (limit in discharge <10 cfu/100 ml) so higher risk than Options 2 and 2a. Low risk still after irrigation and groundwater attenuation. Levels in gro8ndwater generally very low due to attenuation	Low potential for aerosols drift with pathogens/other contaminants	NA	
3a: Land and Te Puru Stream	Low risk in winter to downstream surface waters as similar to Option 2 or 2a. No risk to stream system in summer if onto land due to added attenuation.	Low potential for aerosols drift with pathogens/other contaminants	NA	
4ae: Hauraki Gulf Tāmaki Mid	Will be rapidly diluted close to discharge (use of appropriate diffuser) Low risk to shellfish gathering or contact recreation as some distance away.	NA		

10. Conclusion

All five options present a low risk to public health for the following reasons:

- The discharge will have very high quality with low levels of microbial contamination. Levels slightly higher for land application and mid Tamaki but there will be further attenuation on land and rapid dilution offshore.
- There is a low level of recreation use in the stream and low levels of recreation and shellfish gathering in Bay. Rapid dilution from mid-Tamaki and will be undetectable by time water reaches shellfish beds.

Natural Environment Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Mark James

Author	Role / Experience	Category
Mark James	Strategic and technical advisor	Coastal and freshwater
Shane Kelly	Technical advisor-marine science	Coastal
Mike Stewart	Technical advisor - freshwater	Freshwater
Alan Pattle	Environmental Engineer	Land

3. Information sources

Extensive experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

Assessments use the data available, including latest monitoring data for influent, effluent, upstream, after pond, Site 15 with limited data to date for Site E (reference), Site F and Te Puru Park(more data to come for site sin between).

Bio-researches annual compliance reports.

4. Assumptions and limitations

- BNR and MBR with discharge of:

	Option 2, 2a, 3a	Option 3	Option 4ae
	BNR +MBR + UV	BNR?? +MBR + UV	BNR, tertiary filtration, UV
BOD	<1 mg/L	<2.0 mg/L	<2.0 mg/L
TSS	0 mg/L	<5.0 mg/L	<5.0 mg/L
Ammoniacal-N	<0.50 mg/L	<0.5 mg/L	<0.5 mg/L
Nitrate	<2.0 mg/L.	<5.0 mg/L	<5.0 mg/L
TN	<3.5 mg/L	<7.0 mg/L	<7.0 mg/L
DRP	<0.10 mg/L	<4.0 mg/L	<0.4 mg/L
TP	<0.10 mg/L	<5.0 mg/L	<1.0 mg/L

- Assumes loads as per Stantec xls (sent 2nd Nov)
- Assume land/stream option will use land for most of year and maybe stream in winter when ground saturated.
- Appropriate extension of land treatment as buffer before stream for Option 2a.
- Waiting for more stream water quality monitoring data especially for sites between Site 15 and the Te Puru mouth.
- Assumes currents are as modelled at Mid-Tamaki site but needs to be confirmed by putting in ADCP (3-4 weeks)
- Assumes nothing special at mid-Tamaki site but needs confirmation from benthic survey.

5. Natural Environment – description and sub-criteria

Description	Sub-criteria			
	Coastal environment	Freshwater Surface	Freshwater Groundwater	Land
Potential adverse environmental effects on the receiving environments associated with the options. Ability to meet s107 of the RMA and align with the values and bottom lines of the NPS-FM.	• Effects on life supporting capacity - water quality, marine ecology, indigenous biodiversity. • Effects on foreshore and seabed. • Effects on natural character, features and landscapes. • Ability to meet the requirements of s107 of the RMA.	• Effects on Te Mana o te Wai. • Alignment with NPS-FM compulsory values, other values, national bottom lines. • Ability to meet the requirements of s107 of the RMA.	• Effects on Te Mana o te Wai. • Alignment with NPS-FM compulsory values, other values, national bottom lines.	• Effects on terrestrial ecology • Effects on highly productive land. • Effects on natural inland wetlands.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low (less than minor) potential adverse effects	1
Medium to low (minor) potential adverse effects	2
Medium (more than minor) potential adverse effects	3
Medium to high (significant) potential adverse effects	4
High (significant and unlikely to be mitigated) potential adverse effects	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – safeguarding the life-supporting capacity of air, water, soil, and ecosystems.

- Section 6(a) - the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.
- Section 6(b) - the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development.
- Section 6(c) - the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.
- Section 7(d) - intrinsic values of ecosystems.
- Section 7(f) - maintenance and enhancement of the quality of the environment.
- Section 7 (h) - the protection of the habitat of trout and salmon.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher potential adverse effects rather than the lower effects. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Natural Environment Criterion

Option	Coastal Environment	Freshwater	Groundwater	Land	Overall Score
	Reasons and Score	**Reasons and Score**	**Reasons and Score**	**Reasons and Score**	
2a: Te Puru Stream – diffuse discharge	The proposed higher level of treatment (BNR+ MBR+UV) along with some attenuation through a land buffer zone would generally improve the quality of the bay that the stream flows into though loads will be higher with the larger population. However, the change is likely to be undetectable for the coast but any increase may not be acceptable. The increase in loads, may offset any improvement to the bay from a higher level of treatment. Medium to low (minor) adverse effects.	The proposed level of treatment (BNR+MBR+UV) will improve the quality of the discharge and potentially the stream. There will be some increase in loads but this will be more of an issue for the coast as the final receiving environment and for the stream will be more than compensated for by the reduced nutrient levels. There are indications that the existing discharge increases the nutrient levels downstream even to Te Puru Park compared with upstream and reference sites, and does not meet guidelines. The proposed level of treatment may mean standards/guideline are met downstream eg at Site 15 below the first confluence but the mixing zone has not yet been determined and could be closer to the discharge from the pond. Fish and invertebrate diversity/numbers are very low below the discharge (conductivity is high) with inverts showing improvement downstream. Communiites at present are “poor” downstream and would not meet the NPSFM NBL. It is a farmed catchment and habitat could play a part as even one of the reference site had low invertebrate scores. Overall, with the new treatment effects are potentially low for water quality. Whether this results in an improvement in biota is yet to be established.	NA?	NA	Note many parameters will obviously increase in the stream below the pond, even towards the bottom of the stream – so some questions over whether an increase allowed under NPSFM even if it meets standards.
2b: Te Puru Stream – direct discharge	Lower quality than above as less attenuation before entering the stream and eventually the estuary. May not meet some standards in stream and estuary. Water quality at the nearest Council monitoring sites (Outer Tamaki and Wairoa Bay) has fluctuated between good and marginal rankings in the past 10 years, but median values for the water quality indicators used for determining these rankings have been below regional water quality guidelines over the past 10 years (note that the WQ rankings are not based on median values). Higher loads would go into the coastal environment although any effects of this may be hard to detect Potentially medium adverse effects due to increase in loads.	Will be lower quality than diffuse discharge and with no land buffer which presently can halve the concentrations and potentially loads of some nutrients. Does avoid algal growth in pond and bird inputs if no pond. Medium to low (minor) adverse effects (depends on how much the land and pond take out and where standards should apply).	NA	NA	
3: 100% to land	85-90% reduction in contaminants, even with higher loads and reduced treatment means very	Assuming the groundwater doesn’t reach surface waters until the estuary/coast the potential adverse effects low. Even if there were some	With low areal loading rates for contaminants and relatively short pathways under irrigation areas	Effects on land likely to be increased saturation in winter (neutral for grass/fodder) but more productive in summer for grass/fodder.	

Option	Coastal Environment	Freshwater	Groundwater	Land	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
	low levels reaching the coast and would take some time. Low potential for adverse effects	contaminants reaching waterways the levels would be significantly reduced going through soils and groundwater.	(500m average) changes to groundwater concentrations unlikely to be detectable		
	There may be issues with capacity of the stream to take 3x the volume (yet to be assessed). High quality discharge should apply to all options and preferably BNR and MBR but note most of contaminants will be removed before reaching waterways.				
3a: Land and Te Puru Stream	If most of the contaminants are removed then low risk of effects on coastal waters. Score depends on which stream option chosen and reductions before water reaches coast.	Land treatment/irrigation before discharge in summer, to Te Puru Stream when soils saturated and natural flows in stream likely to be higher. Low potential for adverse effects with high level of treatment and land buffer before stream.	With low areal loading rates for contaminants and relatively short pathways under irrigation areas (500m average) changes to groundwater concentrations unlikely to be detectable.	Effects on land likely to more productive for grass/fodder	
4ae: Hauraki Gulf Tāmaki Mid	Water quality at the nearest Council monitoring sites (Outer Tamaki and Wairoa Bay) has fluctuated between good and marginal rankings in the past 10 years, but median values for the water quality indicators used for determining these rankings have been below regional water quality guidelines over the past 10 years (note that the WQ rankings are not based on median values). Good dilution with rapid dispersal and narrow plume field, away from the coast. Little information on habitat quality and biota in the area. However, the Gulf is degraded and needs to be improved. The option would increase the input from treated WW to the Gulf by an estimated 3-5% and would be 0.4 % of what is estimated to come from rivers into the HG(TBC) Emerging issues including reduced denitrification and low oxygen in bottom waters at times. Recent arrival of exotic Caulerpa (which is reportedly sensitive to nutrient inputs) would need to be considered. Potentially medium to low effects.	No impact on freshwater ecosystems and would actually improve quality of stream.	NA	NA	
	We consider that a reduction in the level of treatment for offshore cf with stream discharge lowers the score. The Hauraki Gulf is showing signs of degradation that must be addressed and any increase in nutrients especially loads is likely to be unacceptable. The increase in loads would be a concern for nitrogen processes and oxygen levels in bottom waters even if the changes may not be detectable.				

10. Conclusion

- Option 2a Te Puru Stream – diffuse discharge
- Overall minor potential for adverse effects. The main reason for this option not being low is the increase in loads to the coast as the final receiving environment. Whether this will be detectable or have an obvious adverse effect is yet to be determined. The stream on the other hand transfers water relatively quickly to the coast.
- There could be some effect of load on the stream but not as much as at bottom of catchment. It is possible that the improved treatment will result in the stream meeting standards/guidelines but whether this happens quickly enough is yet to be assessed.
- Option 2b Te Puru Stream – direct discharge.
- Loads will be higher than diffuse discharge to the stream and may results in standards/guidelines not being met in the stream or receiving coastal environment. Increased risk of potential adverse effects compared with diffuse discharge. Risk to coastal waters may be medium (more than minor?) but potentially medium to low (minor) for freshwater.
- Option 3 - 100% land
- Positive and negative effects due increased ground saturation in winter but more productive land in summer. Some contaminants (maybe up to 10% discharge load from treatment plant) would still reach waterways over long term (decades for full effect). Generally low level of effects due to attenuation before reaching coast.
- Option 3a – Land and Te Puru Stream
- Generally, a better option as provides better quality water in discharge and potential for attenuation in soils and groundwater. If soils saturated then assume could be put through a small land buffer and into stream as for Option 2a – maybe up to 50% of year. Lower residual load from groundwater to streams – may 1/3 of Option 3.
- Option 4ae – Hauraki Gulf Mid
- Good dilution of contaminants offshore but some question around increased loads to a degraded environment. The lower level of treatment results in potential for minor adverse effects on coastal waters but no effect on stream. Stream quality would improve at least in the upper reaches of the Te Puru Stream.

Social and Community Considerations Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Katja Huls

Author	Role / Experience	Category
Katja Huls	Planner	All
Shane Kelly	Environmental Scientist	Recreation and Food Gathering
Workshop Participants	Confirmation of provisional score	Recreation and Food Gathering

3. Information sources

- The Ministry of Fisheries website
- 5086-SCTTTP-Marine-Spatial-Plan-WR.pdf (gulfjournal.org.nz)
- "Beachlands: Options for Sustainable Development" (PDF).
- Archived from the original (PDF) on 18 April 2016. Retrieved 23 November 2017.
- 2018 Census place summary: Te Puru
- Whitford Estuaries Conservation Society
- The Auckland Unitary Plan
- Auckland Council Cultural Heritage Index
- The Ministry for Primary Industries – coastal consents
- Understanding the Social Impacts of Freshwater Reform: A Review of Six Limit-Setting SIAs, Mike Mackay and Nick Taylor for the Ministry of Environment 2020
- State of our Gulf Report 2017 (State of our Gulf 2017 - Knowledge Auckland (link))
- Use of treated sewage or wastewater as an irrigation water for agricultural purposes – Environmental, health, and economic impacts (link) Science Direct.
- Auckland Region Mountain Biking Trails (link)
- Proposed Plan Change 88 to the Auckland Unitary Plan
- Community Survey and Community Information session report and summary from Watercare Services Ltd 01/11/2023

4. Assumptions and limitations

- The discharges will not increase erosive flows in the streams and inlets.
- Land application sites will be chosen to avoid sensitive sites.
- Engineered Overflow Points in the wastewater network have not been assessed in terms of their location, nor the need for additional overflow points or their effects.
- Cultural effects are within the ambit of this assessment; however, Mana Whenua feedback has not been received yet. Their feedback may impact the scoring.
- A Quantitative Microbial Risk Assessment has not been conducted which may impact the scoring.
- An economic assessment has not been conducted on the impacts of wastewater re-use on rural land.
- A targeted survey of commercial stakeholders has not been conducted.
- Community feedback was received from 61 participants in an online survey and 30 - 40 participants in a community information session. Some may have participated in both sessions.
- An archaeological assessment has not been completed.
- To date recreation surveys have not been undertaken.
- The assessments for the recreation and food gathering sub-criteria are preliminary and will require input from workshop participants.

5. Social and Community Considerations Criterion – description and sub-criteria

Description	**Sub-criteria**			
	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities
Potential adverse effects on social and community values relating to amenity, recreation and food gathering, archaeology and heritage. Public access to and along the coastal marine area, and rivers and streams. Impact on rural activities and commercial operations.	• Nuisance effects (e.g., odour, noise, visual). • Effects on sensitive activities	• Effects on recreation activities and values, and food gathering. • Effects on public access to the CMA, rivers, and streams.	• Effects on archaeology. • Effects on heritage buildings and sites.	• Effects on rural activities • Effects on commercial operations in the marine environment

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low (less than minor) potential adverse effects	1
Medium to low (minor) potential adverse effects	2
Medium (more than minor) potential adverse effects	3
Medium to high (significant) potential adverse effects	4
High (significant and unlikely to be mitigated) potential adverse effects	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their social and economic well being.
- Section 6(d) - the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers.
- Section 6(f) - the protection of historic heritage from inappropriate subdivision, use, and development.
- Section 7(c) - the maintenance and enhancement of amenity values.
- Section 7(f) - maintenance and enhancement of the quality of the environment.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher potential adverse effects rather than the lower effects. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Social and Community Considerations Criterion

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary to Te Puru Stream – diffuse discharge	1 The stream flows approximately 4.5km to Kelly's Beach. The stream channel is tidal here and approximately 12m wide between the mangrove tree lines. Amenity values are unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. The discharge is unlikely to generate any odours associated with the stream environment.	3 (provisional) The Te Puru (Te Ruangaingai) Stream traverses the eastern side of Te Puru Park, which is a sports ground and community facility. It enters the CMA at Kelly's Bay on the eastern side of the Park. Kelly's Bay is tidal with a sandy beach and walkways to Omana Beach to the east and Shelly Bay to the west. The amount of shellfish gathering in Kelly's Beach is not known. MoH and Fisheries NZ and Councils generally advise against gathering shellfish from urban areas. Risks will be assessed further with a Quantitative Microbial Risk Assessment. Land based recreation is unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. Swimming recreation may be affected due to negative perceptions associated with wastewater discharges (feedback from community engagement).	3 The urupa in Te Puru Park could be affected by flood waters that have mixed with the treated wastewater discharge. This matter should be considered and assessed by mana whenua. There are two midden on the banks of the tidal portion of the Te Puru (Te Ruangaingai) Stream near the coast (S11-559 and S11-560). These are not expected to be affected by treated wastewater discharges.	1 Commercial activities other than rural activities are not evident in the vicinity of the Te Puru Stream. It is not expected that treated wastewater discharges in the stream will impact the surrounding rural activities. There is limited commercial fishing in the vicinity of Kelly's Bay.	2
2b: Tributary to the Te Puru Stream – direct discharge	1 The stream flows approximately 4.5km to Kelly's Beach. The stream channel is tidal here and approximately 12m wide between the mangrove tree lines. Amenity values are unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. The discharge is unlikely to generate any odours associated with the stream environment.	3 (provisional) The Te Puru (Te Ruangaingai) Stream traverses the eastern side of Te Puru Park, which is a sports ground and community facility. It enters the CMA at Kelly's Bay on the eastern side of the Park. Kelly's Bay is tidal with a sandy beach and walkways to Omana Beach to the east and Shelly Bay to the west. The amount of shellfish gathering in Kelly's Beach is not known. MoH and Fisheries NZ and Councils generally advise against gathering shellfish from urban areas. Risks will be assessed further with a Quantitative Microbial Risk Assessment. Land based recreation is unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. Swimming recreation may be affected due to negative perceptions associated with wastewater discharges (feedback from community engagement).	3 The urupa in Te Puru Park could be affected by flood waters that have mixed with the treated wastewater discharge. This matter should be considered and assessed by mana whenua. There are two midden on the banks of the tidal portion of the Te Puru (Te Ruangaingai) Stream near the coast (S11-559 and S11-560). These are not expected to be affected by treated wastewater discharges.	1 Commercial activities other than rural activities are not evident in the vicinity of the Te Puru Stream. It is not expected that treated wastewater discharges in the stream will impact the surrounding rural activities. There is limited commercial fishing in the vicinity of Kelly's Bay.	2

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
3: 100% to land	2 The indicative land application area is extensive and includes land zoned Countryside Living which enables rural-residential living activities including lifestyle blocks, “hobby farming”, fruit and vegetable growing and equestrian activities. While the Public Health Protection assessment concludes that there is low potential for aerosols drift from the discharge, residents could consider this as a risk. Sensitive land uses are located in the urban areas and are remote from the identified land application area.	2 (provisional) Equestrian activities occur on the rural land and there are a number of mountain bike trails in the Maraetai and Whitford forests. These could lead to direct contact with the treated wastewater and any pathogens within it. These risks will be assessed further with a Quantitative Microbial Risk Assessment.	1 Known cultural and archaeological sites have been identified and will be excluded from any land application area with a buffer. Heritage buildings and sites are not affected by this option.	4 The indicative land application area is extensive and includes land zoned for rural production activities and Countryside Living. Irrigation with treated wastewater may affect land values for land marketed as rural lifestyle living. Irrigation may improve yield from rural land in dry seasons. There is potential risk associated with effects of the discharge on rural production activities (dairy, fruit, vegetables) and market perceptions. Risks of pathogens will be assessed further with a Quantitative Microbial Risk Assessment.	2
3a: Land and Tributary to the Te Puru Stream	2 The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the land option.	3 (provisional) The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the stream options.	2 The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the stream options.	2 Because this option also involves a large land area the assessments for Option 3 are equally relevant but as the land requirement is less a lower score has been adopted.	2
4ae: Hauraki Gulf Tāmaki Mid	2 It is assumed the wastewater pipe and ocean outfall would be buried and not visible from the reserve or beach therefore any amenity effects are likely to be temporary in nature associated with construction.	3 (provisional) This part of the Hauraki Gulf is particularly valued for marine recreation such as swimming, shellfish gathering, fishing, boating and sailing. The various beaches are a very popular weekend destination during the summer months. For this reason, a wastewater discharge to the Tamaki Strait could impact the perception of this coastline as a marine destination. This is corroborated by feedback from an online survey conducted by Watercare. The expected dilution at the outfall is high and shellfish are unlikely to experience actual effects provided that the discharge is compliant. Public access to the beach will be unlikely to be affected during construction, but there may be access restrictions to parts of the beach and reserve during construction.	3 Two midden (R11-2368, R112138) and a Midden/Oven (R11-2654) may be affected by construction work. The urupa on the eastern side of Te Puru Park was discovered accidentally and it is possible that there are other burials in the vicinity. An archaeological assessment and guidance from Mana Whenua would assist with better understanding the risk of this occurring.	3 The treated wastewater discharge will be released 2.9km into the Tamaki Strait. Commercial fishing and marine farming occur in the Strait. The risk of effects on fish and shellfish is likely to be minor due to the very high dilution rates, but further assessment is required. A Quantitative Microbial Risk Assessment will support assessing this risk further. While the expected dilution rates are very high, the perception associated with wastewater discharges and the effects on shellfish may negatively impact the marketing of products produced via marine farming in this area.	3

10. Conclusion

All options have an overall score of 2 - medium to low (minor) potential adverse effects except Option 4ae: Hauraki Gulf Tāmaki Mid. This option had a score of 3 medium (more than minor) potential adverse effects, primarily because it had higher scores for the recreation and food gathering, heritage and archaeology and rural and commercial activities sub-criteria.

None of the option sub-criteria were scored as having High (significant and unlikely to be mitigated) potential adverse effects (5). The highest scoring sub-criteria was rural and commercial activities for Option 3: 100% to land which was assessed as having medium to high (significant) potential adverse effects (4)

Financial Implications Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Approach to scoring
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Alan Pattle	Land Application Engineer / 40+ years	Land application
Gary Teear	Marine Engineer / 40+ years	Ocean Outfall
Andrew Slaney	Process Engineer / 25 years	All
ALTA	Cost estimators (yet to be undertaken)	All

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Typical NZ wastewater scheme costs from experience.
- Typical NZ outfall costs from experience.
- Typical land costs in the application area
- Preliminary outfall location options report (DHI) (dated 12/9/23)
- WWTP cost curves from 2018 Boffa Miskell / GHD report for DIA
- Snells Beach WWTP cost (currently under construction)

4. Assumptions and limitations

- BNR / MBR treatment option completely replaces existing WWTP
- BNR treatment option assumes some reuse of existing assets (eg clarifier) to be considered during concept design.
- Outfall cost based on float and sink installation (marine outfall on top of seabed). Alternative is buried / tunnelled which would be significantly more expensive.
- Outfall foreshore transition assumed not rocky coastline.
- Net present value (NPV) based on 35 years at 4.3% p.a. discount rate

- Annual maintenance cost of 2.0% of capital cost
- Additional pumping energy and chemical costs included where applicable
- Other WWTP operating costs (labour, sludge, electrical energy costs) excluded from this comparison as these costs would be similar across all schemes (other than those mentioned above).

5. Financial implications criterion – description and sub-criteria

Description	Sub-criteria			
	Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk
Comparative capital, operating and maintenance, whole of life costs of the options. Where relevant to the option, land acquisition costs, capital gains and product net revenue. Affordability – community, business, and trade waste dischargers	• Capital cost of the total scheme including any land acquisition costs, capital gains and product net revenue.	• Cost effectiveness of operations and maintenance	• Combination of capital and operation and maintenance costs over the life of the assets	• Is the option affordable even if growth does not occur as predicted. • Cost to the community, business and trade waste dischargers.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low financial implications	1
Medium to low financial implications	2
Medium financial implications	3
Medium to high financial implications	4
High financial implications	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - enables people and communities to provide for their economic well being.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher financial implications rather than lower implications. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Financial Implications Criterion

Option	Capital cost	Operating and maintenance cost	Whole of life cost (NPV)	Financial risk	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Te Puru Stream – diffuse discharge	1 Lowest capex	1 Lowest opex	1 Lowest NPV	1 Lowest risk	1
2b: Te Puru Stream – direct discharge	1 Lowest capex	1 Lowest opex	1 Lowest NPV	1 Lowest risk	1
3: 100% to land	5 Highest capex	5 Highest opex	5 Highest NPV	5 Land price risk	5
3a: Land and Te Puru Stream	4 Second highest capex	4 Second highest opex	4 Second highest NPV	4 Land price risk	4
4ae: Hauraki Gulf Tāmaki Mid	2 Second lowest capex	2 Second lowest opex	2 Second lowest NPV	3 Outfall sized for ultimate population Risk of higher outfall cost if float and sink unacceptable and marine outfall has to be buried / bored (could be a 4 in this case).	2*

* Could go up to 3 if marine outfall needs to be buried / bored.

10. Conclusions

- Options 2a and 2b are essentially the same in terms of the accuracy of the estimates (the only difference being the Te Puru Stream arrangements).
- The financial risks associated with Options 2a and 2b are lowest providing the assessed treatment quality meets environmental requirements in the stream.
- The high costs for Options 3 and 3a reflect the high land costs in the area and the tight soils and resulting large areas required for land application (750 ha for Option 3 and 300 ha for option 3a).
- Marine outfall cost has a reasonably high risk due to the sensitivity of the Hauraki Gulf environment which could result in the outfall to be buried or bored for part or all of its length in the Gulf.

Resilience Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions and limitations

- Fresh water discharge options: BNR / MBR treatment process (highest level of treatment)
- Land application options: Conventional BNR process with tertiary filtration & UV
- Land application options: Pasture cut and carry system (not forestry)
- Marine outfall options: Conventional BNR process with tertiary filtration & UV

5. Resilience Criterion – description and sub-criteria

Description	Sub-criteria			
	Natural hazards	Climate Change	Operational resilience	Flexibility
Degree to which the option is resilient to natural hazards and climate change, offers operational resilience, addresses the carbon component of 40/20/20. Flexibility to accommodate changes in flows and loads, ability to respond to changes in regulatory standards, changes in technology.	• Land stability and erosion affecting infrastructure. • Flooding affecting infrastructure. • Wildfires affecting infrastructure (land application in forests).	• High intensity rainfall peaks affecting the infrastructure. • Prolonged wet weather periods affecting the infrastructure. • Prolonged dry periods affecting the infrastructure. • Prolonged dry periods resulting in an increase of low flows in streams and rivers. • Sea level rise and coastal storm inundation affecting infrastructure (ocean outfall).	• Power supply reliability – effect of outages and rapid changes to electricity pricing. • Scheme complexity leading to operational problems. • Third party damage to infrastructure, e.g., digger hitting cables, pipes etc. • Crop failure/contamination. • Loss of market for land application products e.g., cut and carry products, forestry production.	• Ability to accommodate changes in flows and loads. • Ability to respond to changes in regulatory standards e.g., emerging contaminants, endocrine disrupting compounds. • Ability to respond to changes in technology.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High degree of resilience	1
Medium to high degree of resilience	2
Medium degree of resilience	3
Medium to low degree of resilience	4
Low degree of resilience	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.

8. Section 7(i) – the effects of climate change.

9. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with lower degree of resilience rather than the higher degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

10. Assessment table

See below:

Resilience Criterion

Option	Natural Hazards	Climate Change	Operational Resilience	Flexibility	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Te Puru Stream – diffuse discharge	1. Low risk from natural hazards. Can use storage lagoon to control discharge volume and rate.	1. Resilient to climate change impacts. The highly treated wastewater could be a benefit to stream flow and ecology.etc.	1. Modern and proven BNR / MBR / UV WWTP and freshwater discharge system.	1. MBR lends itself to future reuse opportunities and/or even more treatment standards for stream discharge. eg reverse osmosis.	1
2b: Te Puru Stream – direct discharge	1. See above	1. See above	1. See above	1. See above	1
3: 100% to land	3. Flooding / land slips risk.	3. Increased frequency of high intensity rainfall events is a risk to land application.	4. Land application management adds complexity to operation. Crop market risks.	3. Land management / crop type could be difficult to change if necessary due to market or other factors.	3
3a: Land and Te Puru Stream	3. Similar to option 3.	3.. Similar to option 3	3. Somewhere between options 2 and 3.	2. Somewhere between options 2 and 3.	3
4ae: Hauraki Gulf Tāmaki Mid	1. Low risk from natural hazards	1. Resilient to climate change impacts	1. Standard WWTP and marine discharge system.	1. Similar to stream option. Conveyance pipe provides reuse opportunities to tap into treated wastewater (refer opportunities category).	1

[Colour the Reasons and Score cells and the Overall Scorer cells in accordance with the score colours in the score table above.]

11. Conclusions

- Water based discharges have a generally higher resilience than land application systems which are highly dependent on weather and soil conditions.
- MBR technology provides greater flexibility and opportunities for future reuse (eg Hunua recharge or purple pipe non potable reuse).
- Conventional BNR technology can also be upgraded to provide reuse opportunities but would require more upgrading compared with the MBR option.

- Ocean outfall option is somewhat less flexible due to high infrastructure investment.
- Experience with offshore marine outfalls in New Zealand (20 or so) shows by and large a sustainable and resilient long term solution providing appropriately sized and located and treated wastewater quality is appropriate for the receiving environment.

Technology and Infrastructure Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions and limitations

- Fresh water discharge options: BNR / MBR treatment process (highest level of treatment)
- Land application options: Conventional BNR process with tertiary filtration & UV
- Land application options: Pasture cut and carry system (not forestry)
- Marine outfall options: Conventional BNR process with tertiary filtration & UV
- Carbon footprint includes total lifetime emissions (embodied plus operational)
- Carbon footprint includes nitrous oxide emissions

5. Technology and Infrastructure Criterion – description and sub-criteria

Description	Sub-criteria				
	Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon
Degree to which the option - Degree to which the option – uses proven technology, existing infrastructure; can be constructed, staged, constructed in the required timeframes; has sufficient capacity, secure land, available infrastructure.	• Uses reliable, robust and proven technology.	• Can the option be staged. • Is the option able to be constructed within the required timeframe.	• Is the option able to be constructed e.g., geotechnical conditions, presence of groundwater, contaminated land. • Is there sufficient land available to accommodate the option and can the land be secured. • Potential to maximise the use existing infrastructure that has a valuable remaining life. • Presence of existing other infrastructure.	• Does the option have capacity to accept projected flows and loads.	• Comparative carbon footprint for operation and construction.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High degree of alignment	1
Medium to high degree of alignment	2
Medium degree of alignment	3
Medium to low degree of alignment	4
Low degree of alignment	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option’s recommended 1 to 5 score is developed by first scoring each of the criterion’s sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with a lower degree of alignment rather than a higher degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Option	Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon Footprint / Greenhouse Gas Emissions	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Te Puru Stream – diffuse discharge	1. MBR technology is now a mature technology in NZ.	1. Some elements of the WWTP can be staged for population growth.	1. New MBR treatment plant constructed on the existing WWTP site with minimal disruption to existing operation	3. The stream receiving environment has a limited capacity to accept discharges (compared with a marine outfall).	1. Embodied carbon in new WWTP; low operational emissions.	2
2b: Te Puru Stream – direct discharge	1. MBR technology is now a mature technology in NZ.	1. Some elements of the WWTP can be staged for population growth	1. New MBR treatment plant constructed on the existing WWTP site with minimal disruption to existing operation.	3. The stream receiving environment has a limited capacity to accept discharges (compared with a marine outfall).	1. Embodied carbon in new WWTP; low operational emissions	2
3: 100% to land	3. Conventional treatment plant is reliable but a 100% land scheme carries a weather related risk as no backup. Also a large area (750 ha) to manage.	3. Land acquisition / purchase is a risk to program for both obtaining consents and constructing the scheme on time.	3. Land application scheme is large and complex; spread over varying topography and multiple land parcels.	5. Highly unlikely to secure sufficient land area for 100% application. Weather and crop / land management risks to land capacity also.	5. High embodied carbon in irrigation network. Higher nitrous oxide (N2O) emission factor from land application compared with water discharges.	4
3a: Land and Te Puru Stream	2. Somewhere between options 2 & 3. 300 ha land area. Having the stream as a backup reduces the risk.	2. Somewhere between options 2 & 3.	2. Somewhere between options 2 & 3.	3. Similar to option 2.	4. Somewhere between options 2 & 3.	3
4ae: Hauraki Gulf Tāmaki Mid	1. Highly reliable system. Approximately 20 offshore outfalls currently in New Zealand.	2. Outfall must be constructed for ultimate population (no staging ability)	2. Long overland / road route conveyance pipe more disruptive than local stream options. If marine outfall is not buried (float and sink installation) then should not be too difficult.	1. The best option in terms of future growth capacity, providing outfall and conveyance pipes are sized adequately.	2. Embodied carbon in WWTP and outfall pipe. Low operational emissions.	2

10. Conclusions

- Water receiving environments for treated wastewater (either fresh or marine) have generally higher reliability and are generally less complex than land application systems.
- MBR treatment plants are becoming increasingly common in New Zealand as the technology matures and the capital costs reduce compared with conventional BNR plants.
- Operationally MBR plants are more complex however Watercare have experience now operating Pukekohe WWTP so this is not considered a significant differentiator.
- Modular development of treatment capacity and land application areas are easily staged however conveyance pipes and marine outfalls are not.
- The MBR option would most likely be a complete new facility.
- Conventional BNR treatment would allow some existing assets to be retained and incorporated into the new / upgraded WWTP.
- Options 3 (100% land) (and possible 3a) are unlikely to be compatible with Watercare's target 40% reduction in infrastructure carbon due to the large irrigation network (assuming not forestry sequestration).

Statutory Risks and Conflicts Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Paula Hunter

Author	Role / Experience	Category / sub-criteria
Paula Hunter	Planner	All
Simpson Grierson	Legal	Legislative barriers to options proceeding.

3. Information sources

Marine and Coastal Area (Takutai Moana) Act 2011 (MACAA)

MACAA applications

Hauraki Gulf Marine Park Act 2000

New Zealand Coastal Policy Statement

National Policy Statement for Freshwater Management

National Policy Statement for Highly Productive Land

Auckland Unitary Plan

4. Assumptions and limitations

Assessments have not been informed by information of effects on Māori cultural values, mauri, mahinga kai, wāhi tapū and sites of significance.

5. Statutory Risks and Conflicts – description and sub-criteria

Description	Sub-criteria		
	Legislative barriers to options proceeding	Consenting complexity and compliance	Conflicts with statutory direction
Legislative processes that could restrict the ability of an option to proceed, scale of consenting complexity and consent compliance. Conflicts with the direction of key planning instruments.	• Risk of an option not proceeding due to legislative changes and outcomes of legislative processes e.g., potentially successful applications for customary title under the Takutai Moana Act.	• Scale of complexity of consenting processes including s91 deferrals. Scale of complexity of compliance requirements and costs.	• Conflict with the direction of key planning instruments e.g., non-complying activity classification with a supporting "avoid" policy.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low risks and conflicts	1
Medium to low risks and conflicts	2
Medium risks and conflicts	3
Medium to high risks and conflicts	4
High risks and conflicts	5

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Sections 5, 6, 7, 8.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher risks and conflicts rather than those lower risks and conflicts. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Statutory Risks and Conflicts Assessment

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	3 Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed by the Water Services Act	1 One receiving environment, expanded overland flow area, compliance / monitoring requirements assumed to be slightly more complex than current requirements, compared to options involving new receiving environments consenting not as complex.	5 Challenging to argue that the discharge of treated wastewater to a tributary of the Te Puru Stream prioritises the health and well-being of the stream first, over secondly the health needs of people (such as drinking water) and thirdly the ability of people and communities to provide for their social, economic and cultural well-being. Challenging to argue this option will not result in the loss of stream values so potentially need to prove functional need to discharge to the stream i.e. the activity can only occur in that environment.	3
2b: Tributary of Te Puru Stream – direct discharge	3 Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed by the Water Services Act	1 One receiving environment, new discharge structure, compliance / monitoring requirements assumed to be slightly more complex than current requirements, compared to options involving new receiving environments consenting not as complex.	5 Challenging to argue that the discharge of treated wastewater to a tributary of the Te Puru Stream prioritises the health and well-being of the stream first, over secondly the health needs of people (such as drinking water) and thirdly the ability of people and communities to provide for their social, economic and cultural well-being. Challenging to argue this option will not result in the loss of stream values so potentially requirement to prove functional need to discharge to the stream i.e. the activity can only occur in that environment.	3
3: 100% Land	1 No legislative barriers identified	4 750ha land required, assumed one contiguous area not achievable which could lead to consenting and compliance complexities, potential complexities if need to rely on the Public Works Act for investigations and land purchase, conveyance infrastructure to land applications areas, storage requirements, potential need for consents under the NESFM – natural wetlands.	2 Gives effect to Te Mana o te Wai as the discharge is 100% to land, if natural wetlands significant ecological areas etc. identified in land application areas potential to avoid them, no significant policy conflict identified.	2
3a: Land / tributary of Te Puru Stream	2 Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed by the Water Services Act	5 300 ha land required, two receiving environments resulting in complex consenting and compliance / monitoring requirements, potential complexities if need to rely on the Public Works Act for investigations and land purchase, conveyance infrastructure to land applications areas, storage requirements, potential need for consents under the NESFM – natural wetlands.	3 Better gives effect to Te Mana o te Wai when compared to options 2a and 2b, but still need to get through the hierarchy and functional need tests, if natural wetlands significant ecological areas etc. identified in land application areas potential to avoid them.	3
4ae: Hauraki Gulf Tāmaki Mid	3 Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act.	3 One receiving environment, conveyance infrastructure (5.6km) to outfall, new 2.9km ocean outfall, consenting complexities with conveyance, new outfall and discharge	3 Need to avoided where practicable, or remedied or mitigated adverse effects in areas of high recreational use, fishing or shellfish gathering; commercial development; significant ecological value, potential outfall location traverses an SEA Marine 2 area, gives effect to Te Mana o te Wai as the discharge is to the CMA.	3

10. Conclusion

Option 3a: 100% to land has scored best as it has a low risk of not proceeding due to legislative changes and outcomes of legislative processes, it gives effect to Te Mana o te Wai as the option does not involve a discharge to freshwater and no conflicts of any significance with other statutory directions. All the other options score a “3” – medium risks and conflicts.

Options 2a and 2b did not score well against the sub-criteria “conflicts with statutory direction” due to the challenges of giving effect to Te Mana o te Wai. Option 3a did not score well against sub-criterion complexity and compliance primarily because it comprises two receiving environments.

Opportunities and Benefits Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table

2. Authors and experience

Criterion lead: Jim Bradley

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Andrew Slaney	Process Engineer / 25 years	All

3. Information sources

- The information sources used for the Opportunities and Benefits Criterion include:
- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Watercare and Stantec personnel's wastewater treatment and management knowledge of the New Zealand sector and overseas
- Assumed (at this stage) technology and infrastructure criteria information
- Authors and experience of those involved in this section of the Report.

4. Assumptions and limitations

a. Overall Assumptions

The Wastewater Treatment Plan is based on the "Product Factory" concept as depicted below. Concepts and developments within Watercare in recent times have adopted this approach. The approach is consistent with the principles of the Circular Economy.

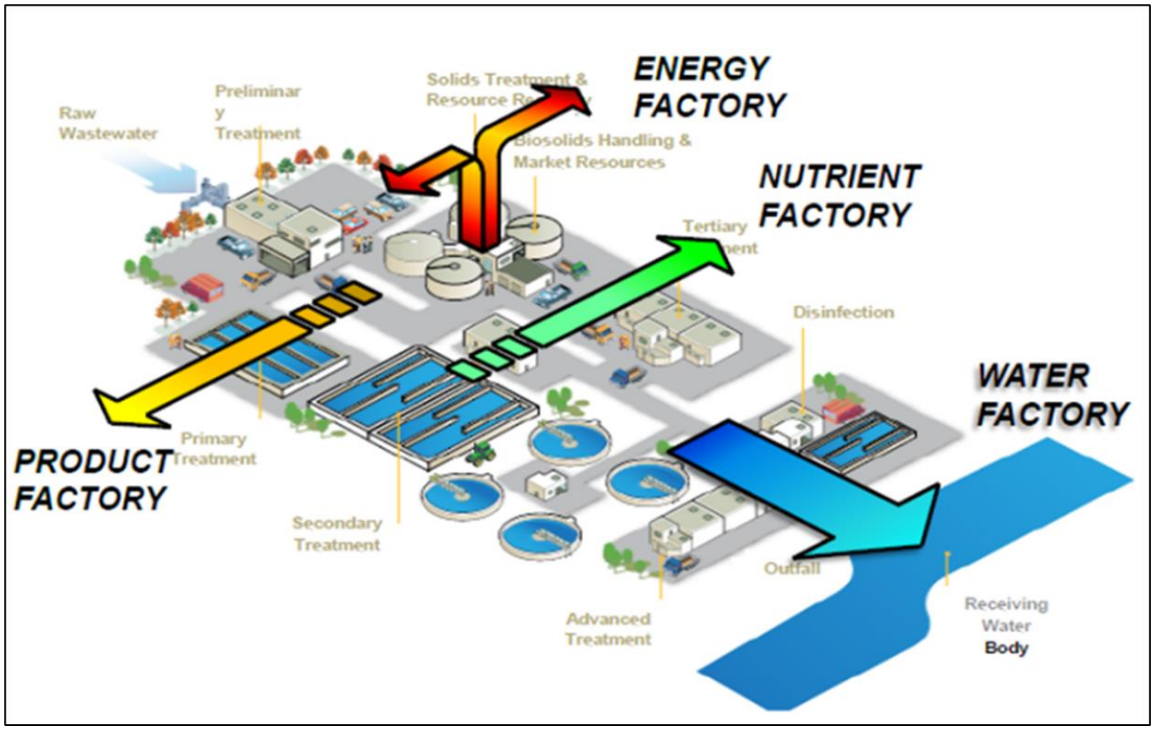


Figure 1 – The Product Factory Approach

b. Treated Wastewater Beneficial Reuse Assumption

e) Assessment based on the quality/degree of treatment of the treated wastewater and the extent/amount of treated wastewater to be beneficially reused
f) Assessment does not take into account "possible people's perceptions" of the beneficial reuse e.g. potable reuse, aquifer recharge of water supply source
g) Consents/other approvals etc can be sought for each of the beneficial reuse means included in the options.
h) The assessment includes nutrient recovery when treated wastewater is applied to land.
i) Conveyance lines of Option 4ae Tamaki mid Hauraki Gulf outfall can be tapped in for beneficial reuse of treated wastewater (consents and other approvals permitting).

c. Sludge and Biosolids Beneficial Reuse Assumptions

e) This assessment is based on degree of treatment of liquid phase needed i.e.for a high degree of treatment, there is more sludge/biosolids produced which could be beneficially reused. In this respect the MBR WWTP will produce more sludge/biosolids than the conventional BNR Plant, but this would only be a relatively small percent increase.
f) Includes vermiculture, biochar, other reusable biosolids material.
g) Assume no chemicals or other products used in the WWTP processes that render biosolids not beneficially reusable.
h) Assumes possible future/pending regulations on Emerging Organic Contaminants (EOC's) and/or microplastics does not limit beneficial reuse on land or any other reuse technique.

d. Energy Generation

Energy generation is not included in the table as it is assumed that based on the design population of the scheme (around 30,000 PE), based on the authors' experience, primary clarifiers and anaerobic digestion are unlikely to be economic and therefore none of the scheme options will provide energy generation possibilities. In addition it is noted that the carbon in primary solids will be needed for biological nitrogen / phosphorus removal as with the current plant and a number of others in New Zealand and internationally.

In terms of combustion or gasification of sludge to produce energy, this possibility is included in the sludge / biosolids beneficial use category.

5. Opportunities and Benefits Criterion – description and sub-criteria

Description	Sub-criteria		
	Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery and reuse
Provides opportunities for resource recovery including beneficial reuse, energy generation, nutrient recovery / reuse.	The degree and amount of beneficial reuse of treated wastewater for each of the short listed options will depend on many factors. These include: • The overall nature of the option and its infrastructure components and their locations e.g. conveyance lines, discharge points etc • The quality of the treated wastewater • The quantity of treated wastewater available that maybe beneficially reused and above the basic option formulation • The base reuse option e.g. land application compared to a direct discharge (steam or Hauraki Gulf discharge option) • The "add-ons" that maybe feasible, acceptable and where necessary consentable in terms of use of treated wastewater as compared to the options fundamental function(s)	This includes for the range and extent of beneficial reuses of sludges and biosolids, biosolids being sludges treated to specified levels. The extent of such practices will depend on many factors including: • Amount and quality of the sludge/biosolids • Demand for particular beneficial reuse practices • Approvals and when necessary resource consents granted for particular reuse practices such as application of biosolids to land, sale of biosolids to be the home gardener etc • Overall economics of a particular practice/beneficial reuse option • Meeting statutory planning provisions • Māori cultural, other cultural and social/neighbour considerations (neighbour to a beneficial reuse site and others) Beneficial reuse techniques can for example include: • Application to agricultural, forestry, other crops • Turf culture, parks/gardens, nurseries • Compost made mixed green waste • Landfill and quarry restoration and capping • Energy production through furnacing e.g. cement kiln supplementary energy feed • Gasification/pyrolysis	• This covers the beneficial reuse of nutrient in the treated wastewater • This do not include beneficial reuse of nutrients included in sludges and biosolids • This would also include the possibilities of extracting phosphorus by way of the struvite process extraction from the centrate return water, however such processes are not likely to be used in the WWTP types being considered

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High opportunities and benefits	1
Medium to high opportunities and benefits	2
Medium opportunities and benefits	3
Medium to low opportunities and benefits	4
Low / minimal opportunities and benefits	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – sustainable management of resources.
- Section 7(b) - the efficient use and development of natural and physical resources.
- Section 7 (ba) - the efficiency of the end use of energy.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with low / minimal opportunities and benefits rather than higher opportunities and benefits. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Opportunities and Benefits Criterion

Option	Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery / reuse	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	4 Option based on overland flow to the Te Puru Stream discharge – no conveyance line from the WWTP site to facilitate reuse. Some minimal use and soakage area. High level of treatment provides opportunity for future reuse.	1 All options produce similar quantity of sludge and biosolids and have similar opportunities for beneficial use but with MBR slightly more sludge/biosolids.	5 No to minimal reuse of nutrients.	3
2b: Tributary of Te Puru Stream – direct discharge	4 Option based on Te Puru Stream direct discharge – no conveyance line from the WWTP site to facilitate reuse. High level of treatment provides opportunity for future reuse.	1 All options produce similar quantity of biosolids and have similar opportunities for beneficial use but with MBR slightly more sludge/biosolids.	5 No reuse of nutrients.	3
3: 100% Land	1 100% to land application so maximise beneficial reuse with appropriate crop(s) and management regime(s) selected (750 ha area)	1 WWTP has tertiary filtration so more sludge than BNR alone. Still slightly less than MBR options 2a and 2b	1 Uptake of nutrients by crops can be maximised.	1
3a: Land / tributary of Te Puru Stream	2 Some treated wastewater to land so maximises the beneficial reuse of that proportion providing appropriate techniques used like Option 3 (300ha area)	1 Same as Options 2a and 2b.	2 Uptake of nutrients by crops, but less than option 3a as less area	2
4ae: Hauraki Gulf Tāmaki Mid	4 Marine outfall Tamaki mid, assumes not as highly treated so not the same reuse potential but option to reuse 5.6km conveyance	3 Less, but not much less than MBR and BNR and tertiary filtration options.	5 No reuse of nutrients unless off take off conveyance line to land application for beneficial reuse	4

10. Conclusions

- Options 2a and 2b have no to little beneficial reuse of treated wastewater or nutrients but a high potential for beneficial use of sludge / biosolids.
- The 100% land application Option 3 and to a lesser extent Option 3a have a high potential for beneficial use of treated wastewater and associated nutrient uptake through crops.
- The outfall option 4ae has the lowest potential for beneficial reuse opportunities although the conveyance line to the coast could be tapped into.
- All options but particularly 2a and 2b provide opportunities for additional treatment and beneficial reuse (eg Hunua dam recharge or purple pipe non potable reuse)

Appendix F Initial Short List Workshop Participants

Attendee	Organisation
Chris Allen	Watercare
Dean Lawrence	Watercare
Helen Jansen	Watercare
Iris Tscharntke	Watercare
Jonathan Piggot	Watercare
Michael Webster	Watercare
Nathaniel Wilson	Watercare
Priyan Perera	Watercare
Rory Buchanan	Watercare
Tanvir Bhamji	Watercare
Ashlee Adams	Watercare
Annmarie Halst	Watercare
Revell Butler	Ngāi Tai ki Tāmaki
Luke Faithfull	Mitchell Daysh
Andrew Slaney	Stantec
Jim Bradley	Stantec
Katja Huls	Stantec
Paula Hunter	Stantec
Sharu Delilkan	Stantec
Allan Pattle	PDP (via teams)
Mark James	Aquatic Sciences
Padraig McNamara	Simpson Grierson
Warren Bangma	Simpson Grierson
Shane Kelly	Coast and Catchment

Appendix G Updated Short List Technical Expert Assessments

Public Health Protection Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead:

Author	Role / Experience	Category
Mark James	Strategic and technical advisor, Aquatic ecology	Microbiology Quality
Jim Bradley	Public Health Engineer	Reuse Options
Alan Pattle	Environmental Engineer	Land Application
Rebecca Stott	Microbiology expert, involved in a number of wastewater (**WW**) discharge projects, and Qualitative Microbial Risk Assessment (**QMRA**)	Microbiological quality of treated wastewater

3. Information sources

Extensive experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

Previous QMRA for Beachlands WWTP (2004)[17] estimated that human health risks are likely to be below tolerable risks for which freshwater and marine recreational water guidelines are based.

However, health risks associated with pathogenic bacteria and protozoa were substantially increased if faecal contamination from wildlife to the farm pond is considered. QMRA methodology has evolved since 2004 with the availability of new dose response models particularly for viruses (e.g. norovirus) which are typically the main aetiological agent associated with waterborne outbreaks.

Assessment uses the data available, including latest monitoring data for influent, effluent, upstream, after pond, Site 15 with limited data to date for Site E (reference), Site F and Te Puru Park (more data to come for sites in between).

[17] Stott, H.R. and McBride, G.B. 2004 Quantitative health risk assessment for a proposed upgrade to the Beachlands/Maraetai Sewage Treatment Plant, NIWA report prepared for Earth consult Ltd and Manukau Water, NIWA Client Report HAM2004-117, 45p

4. Assumptions and limitations

At least the current level of treatment and discharge quality.

QMRA to be completed on final Best Practicable Option (**BPO**) to confirm level of risk for recreation and food gathering at key sites.

Assume land/stream option will use land for most of year and maybe stream in winter when ground saturated.

5. Public Health Protection Criterion – description and sub-criteria

Description	Sub-criteria		
	Microbiological quality of treated wastewater	Spray irrigation / aerosols	Treated wastewater reuse
Degree of public health exposure to health risks from treated wastewater discharge (including through land application or re-use options).	Risk of public exposure to waterborne pathogens and other contaminants through: • Direct contact with the conveyance or treatment process. • Direct contact with the receiving environment, for example through contact recreation. • Indirect exposure – commercial operations, food gathering (shellfish, fish, watercress etc.) and groundwater use.	• Risk of public exposure to pathogens and other contaminant from spray irrigations.	• Risk of contamination of reclaimed water for potable and non-potable reuse.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low degree of public exposure to risk	1
Medium to low degree of public exposure to risk	2
Medium degree of public exposure to risk	3
Medium to high degree of public exposure to risk	4
High degree of public exposure to risk	5

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher degree of public exposure to risk effects rather than a lower degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Public Health Protection Criterion (Updated 4 December 2023)

Option	Microbiological quality of treated wastewater	Spray irrigation / aerosols	Treated wastewater reuse	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	1 Relatively good quality water discharged at present, relatively low in microbes, and similar or reduced level to upstream and reference site. Low level of use – recreation at outlet from Te Puru Stream and in Kellys Bay, shellfish gathering low level Kellys Bay. Should meet standards at least for National Bottom Lines (**NBL**) under the NPSFM noting higher microbial levels upstream and at bottom Te Puru Stream to discharge form Pond. Low risk to downstream shellfish beds due to discharge. (Need to get microbial assessment/QMRA of stream for cattle water supply, shellfish gathering, shellfish sample's from Kellys Bay to confirm) Providing concentration in the proposed discharge is the same or similar in future, increase in volume should not have much effect but it is the dilution in the stream that will affect the effective concentration of pathogens downstream where exposure could occur. We will be considering this impact of volume in the QMRA. It potentially (for a 3x increase in volume) may not make much of a difference but that is why we are doing the modelling.	NA	NA	1
2b: Tributary of Te Puru Stream – direct discharge	~~1~~ 2 Could reduce any effects of birds in pond (may not be an issue). Levels in outlet very low (more data needed though). Proposed limit of <10 cfu/100 ml in discharge should not create any risk downstream. Attenuation not as great as Option 2a thus potential for minor effects.	NA	NA	~~1~~ 2
3: 100% to land	1 Lower level of treatment proposed (limit in discharge <14 cfu/100 ml) so higher risk than Options 2 and 2a. Low risk still after irrigation and groundwater attenuation. Further assessment of the hydrology is required. Saturated flow could be an issue if land application rates cause soils to be over-saturated? Land application provides another potential barrier to people being exposed by increasing the distance of pathogens to human receptors. Levels of pathogens in groundwater are generally very low due to attenuation providing that no bypass flows or other connected hydrological pathways present. If there was a bypass flow, transport of pathogens could be quite rapid. Viruses like rotavirus may last up to several days in soils. If this was the case this would be a minor potential adverse effect, i.e score of 2.	2 Low potential for aerosols drift with pathogens/other contaminants. Can be managed.	NA	2
3a: Land and Te Puru Stream	1 Low risk, when using stream discharge, to downstream surface waters as similar to Option 2 or 2a. No risk to stream system when	2 Low potential for aerosols drift with pathogens/other contaminants Can be managed	NA	2

Option	Microbiological quality of treated wastewater	Spray irrigation / aerosols	Treated wastewater reuse	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
	applied to land (see above) in summer if onto land due to added attenuation.			
4ae: Hauraki Gulf Tāmaki Mid	1 Will be rapidly diluted close to discharge (use of appropriate diffuser) Low risk to shellfish gathering or contact recreation as some distance away.	NA		1

10. Conclusion

All five options present a low risk to public health for the following reasons:

- Under all options, the discharges will have high quality with low levels of microbial contamination. Application levels are slightly higher for land application and mid Tamaki but there will be further attenuation on land and rapid dilution offshore.
- There is a low level of recreation use in the stream and low levels of recreation and shellfish gathering in Kellys Bay. There will be rapid dilution from discharges into the CMA under the mid-Tamaki option, with microbes undetectable by the time water reaches shellfish beds.

Natural Environment Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Mark James

Author	Role / Experience	Category
Mark James	Strategic and technical advisor	Coastal and freshwater
Shane Kelly	Technical advisor-marine science	Coastal
Mike Stewart	Technical advisor - freshwater	Freshwater
Alan Pattle	Environmental Engineer	Land

3. Information sources

Extensive experience with a number of WW discharge projects including Omaha, Snells/Algies, Clarkes Beach, Army Bay and Wellsford.

Assessments use the data available, including latest monitoring data for influent, effluent, upstream, after pond, Site 15 with limited data to date for Site E (reference), Site F and Te Puru Park(more data to come for site sin between).

Bio-researches annual compliance reports.

4. Assumptions and limitations

Population	people	30,000
Per capita ADF	l/p/d	200
ADF	m3/day	6,000

	2a & 2b Stream & 3a Stream / Land		4 ae Hauraki Gulf		3 100% Land	
Parameter	Median conc. mg/L	Average load kg/day	Median conc. mg/L	Average load kg/day	Median conc. mg/L	Average load kg/day
BOD	5.0	n/a	5.0	30.0	20.0	120.0
TSS	5.0	n/a	5.0	30.0	20.0	120.0
NH4-N	0.50	3.0	1.00	6.0	1.00	6.0
NOx-N	2.0	12.0	5.0	30.0	5.0	30.0
SIN	2.5	15.0	6.0	36.0	6.0	36.0
TN	5.0	30	10.0	60	7.0	42
DRP	1.0	6.0	Monitoring only		4.0	24.0
TP	1.0	6.0	Monitoring only		5.0	30.0
Faecal coliforms	<10	n/a	<10	n/a	<100	n/a

- Assumes loads as per Stantec (sent 20nd Nov)
- Assume land/stream option will use land for most of year and maybe stream in winter when ground saturated.
- Appropriate extension of land treatment as buffer before stream for Option 2a. Likely to be a diffuse discharge between the current outlet and the bridge.
- Waiting for more stream water quality monitoring data especially for sites between Site 15 and the Te Puru mouth – we need data for sites G and C.
- Assumes the TN increase is due to non-biodegradable organic N at least in the short term, not available for biological uptake
- Assumes currents are as modelled at Mid-Tamaki site but needs to be confirmed by putting in ADCP (3-4 weeks), full benthic survey at site if that is taken forward.
- Assumes nothing special at mid-Tamaki site.

5. Natural Environment – description and sub-criteria

Description	Sub-criteria			
	Coastal environment	Freshwater Surface	Freshwater Groundwater	Land
Potential adverse environmental effects on the receiving environments associated with the options. Ability to meet s107 of the RMA and align with the values and bottom lines of the NPS-FM.	• Effects on life supporting capacity - water quality, marine ecology, indigenous biodiversity. • Effects on foreshore and seabed. • Effects on natural character, features and landscapes. • Ability to meet the requirements of s107 of the RMA.	• Effects on Te Mana o te Wai. • Alignment with NPS-FM compulsory values, other values, national bottom lines. • Ability to meet the requirements of s107 of the RMA.	• Effects on Te Mana o te Wai. • Alignment with NPS-FM compulsory values, other values, national bottom lines.	• Effects on terrestrial ecology • Effects on highly productive land. • Effects on natural inland wetlands.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low (less than minor) potential adverse effects	1
Medium to low (minor) potential adverse effects	2
Medium (more than minor) potential adverse effects	3
Medium to high (significant) potential adverse effects	4
High (significant and unlikely to be mitigated) potential adverse effects	5

7. RMA Part 2

- The RMA Part 2 matters addressed under this criterion are:
- Section 5 – safeguarding the life-supporting capacity of air, water, soil, and ecosystems.
- Section 6(a) - the preservation of the natural character of the coastal environment (including the coastal marine area), wetlands, and lakes and rivers and their margins, and the protection of them from inappropriate subdivision, use, and development.
- Section 6(b) - the protection of outstanding natural features and landscapes from inappropriate subdivision, use, and development.
- Section 6(c) - the protection of areas of significant indigenous vegetation and significant habitats of indigenous fauna.
- Section 7(d) - intrinsic values of ecosystems.

- Section 7(f) - maintenance and enhancement of the quality of the environment.
- Section 7 (h) - the protection of the habitat of trout and salmon.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher potential adverse effects rather than the lower effects. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Natural Environment Criterion (Updated 6 December 2023)

Option	Coastal Environment	Freshwater	Groundwater	Land	Overall Score
	Reasons and Score	**Reasons and Score**	**Reasons and Score**	**Reasons and Score**	
2a: Te Puru Stream – diffuse discharge	The proposed higher level of treatment (BNR+ MBR+UV) along with some attenuation through an increased land buffer zone would generally improve the quality of the input to the bay, though loads will be higher with the larger population. DIN loads will be similar but TN and DRP and TP loads will be higher. While the change is likely to be undetectable for the coast in general, flushing of the Bay is relatively slow. The increase in loads, may offset any improvement to the bay from a higher level of treatment. Medium to low (minor) adverse effects. If this proceeds, then will need a limited survey of shellfish along the coast close to the Te Puru Stream outlet.	The proposed level of treatment (BNR+MBR+UV) will improve the quality of the discharge and should improve the quality of the stream. There will be some increase in loads especially TN and for phosphorus (not for DIN) but this will be more of an issue for the coast as the final receiving environment. There are indications that the existing discharge increases the nutrient levels downstream even to Te Puru Park compared with upstream and reference sites and does not meet guidelines. The proposed level of treatment should mean standards/guidelines are now met downstream for dissolved inorganic nitrogen (DIN) eg at Site 15 below the first confluence. The assumption is that there will be an expansion of the buffer planted zone and potentially pond/wetland area to ensure the same level of attenuation from the WWTP before entering the stream as the volume increases. Fish and invertebrate diversity/numbers are very low below the discharge (conductivity is high) with inverts showing improvement downstream. Communities at present are “poor” downstream and would not meet the NPSFM NBL. It is a farmed catchment and habitat could play a part as even one of the reference site had low invertebrate scores. Conductivity was a concern expressed by Bioresearches and at times will be close if not exceeding the level that can impact on stream biota. The current levels in the discharge will need to be reduced significantly, this can be managed. Similarly, phosphorus levels will exceed the NBL downstream and should be reduced significantly through use of alum. Overall, with the new treatment including overland flow treatment, effects are potentially low for water quality in terms of nitrate and ammonia and may meet guidelines below Site 15. Whether this results in an improvement in biota is yet to be established.	NA?	NA	2 Note many parameters will obviously increase in the stream below the pond, even towards the bottom of the stream – so some questions over whether an increase allowed under NPSFM even if it meets standards.
2b: Te Puru Stream – direct discharge	Lower quality than above as no attenuation before entering the stream and eventually the estuary. Water quality at the nearest Council monitoring sites (Outer Tamaki and Wairoa Bay) has fluctuated between good and marginal rankings in the past 10 years, but median values for the water quality indicators used for determining these rankings have been below	Will be lower quality than diffuse discharge as there is no land buffer/attenuation. The overland flow treatment/pond presently can halve the concentrations and potentially loads of some nutrients. Will not meet NPSFM NBLs	NA	NA	3

Option	Coastal Environment Reasons and Score	Freshwater Reasons and Score	Groundwater Reasons and Score	Land Reasons and Score	Overall Score
	regional water quality guidelines over the past 10 years (note that the WQ rankings are not based on median values). Higher loads would go into the coastal environment for DRP, TP and TN although any effects of this may be hard to detect Potentially medium adverse effects due to increase in loads and potentially slow flushing.	Medium (minor) adverse effects (depends on how much the land and pond take out and where standards should apply).			
3: 100% to land	85-90% reduction in contaminants, even with higher loads and reduced treatment means very low levels reaching the coast and would take some time. Low potential for adverse effects	Assuming the groundwater doesn't reach surface waters until the estuary/coast the potential adverse effects low. Even if there were some contaminants reaching waterways the levels would be significantly reduced going through soils and groundwater.	With low areal loading rates for contaminants and relatively short pathways under irrigation areas (500m average) changes to groundwater concentrations unlikely to be detectable. Do need to check nitrate levels in bores if this proceeds.	Effects on land likely to be increased saturation in winter (neutral for grass/fodder) but more productive in summer for grass/fodder.	1
3a: Land and Te Puru Stream	If most of the contaminants are removed then low risk of effects on coastal waters. Score depends on which stream option chosen and reductions before water reaches coast.	Land treatment/irrigation before discharge in summer, to Te Puru Stream when soils saturated and natural flows in stream likely to be higher. Low potential for adverse effects with high level of treatment and land buffer before stream.	With low areal loading rates for contaminants and relatively short pathways under irrigation areas (500m average) changes to groundwater concentrations unlikely to be detectable.	Effects on land likely to more productive for grass/fodder	1
4ae: Hauraki Gulf Tāmaki Mid	Water quality at the nearest Council monitoring sites (Outer Tamaki and Wairoa Bay) has fluctuated between good and marginal rankings in the past 10 years, but median values for the water quality indicators used for determining these rankings have been below regional water quality guidelines over the past 10 years (note that the WQ rankings are not based on median values). Good dilution with rapid dispersal and limited plume field, away from the coast. Little information on habitat quality and biota in the area. Video footage indicates that the existing seabed environment in the vicinity of the potential Mid Tāmaki outfall does not contain features of significant ecological value. Habitats at the site consisted of soft sediment interspersed with exposed patches of a remnant bed of dense shell. No rocky reefs, living biogenic habitats or regionally significant benthic species were observed within the survey area. However, the Gulf is degraded and needs to be improved. The option would increase the input from treated WW to the Gulf by an estimated 3-5% and would be 0.4 % of what is estimated to come from rivers into the HG(TBC) Emerging issues including reduced denitrification and low oxygen in bottom waters at times. Recent arrival of exotic Caulerpa (which is reportedly sensitive to nutrient inputs) would need	No impact on freshwater ecosystems and would actually improve quality of stream.	NA	NA	2

Option	Coastal Environment	Freshwater	Groundwater	Land	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
	to be considered. Potentially medium to low effects.				
	We consider that a reduction in the level of treatment for offshore cf with stream discharge lowers the score. The Hauraki Gulf is showing signs of degradation that must be addressed and any increase in nutrients especially loads is likely to be unacceptable. The increase in loads would be a concern for nitrogen processes and oxygen levels in bottom waters even if the changes may not be detectable.				

10. Conclusion

- Option 2a Te Puru Stream – diffuse discharge
- Overall minor (medium to low) potential for adverse effects. The main reason for this option not being low is the increase in loads to the coast as the final receiving environment. Whether this will be detectable or have an obvious adverse effect is yet to be determined. The stream on the other hand transfers water relatively quickly to the coast but potential for changes to stream habitat, at least short-term with 3x the volume, lower the score. Noting that at time sin summer the only flow in the immediate tributary is from the WWTP.
- There could be some effect of load on the stream but not as much as at bottom of catchment. It is possible that the improved treatment will result in the stream meeting standards/guidelines at the bridge.
- Option 2b Te Puru Stream – direct discharge.
- Loads will be higher than diffuse discharge to the stream and may results in standards/guidelines not being met in the stream or receiving coastal environment. Increased risk of potential adverse effects compared with diffuse discharge. Risk to coastal and fresh waters may be medium (more than minor?) and may not meet standards int eh stream.
- Option 3 - 100% land
- Positive and negative effects due increased ground saturation in winter but more productive land in summer. Some contaminants (maybe up to 10% discharge load from treatment plant) would still reach waterways over long term (decades for full effect). Generally low level of effects due to attenuation before reaching coast.
- Option 3a – Land and Te Puru Stream
- Generally, a better option as provides better quality water in discharge and potential for attenuation in soils and groundwater. If soils saturated then assume could be put through a small land buffer and into stream as for Option 2a – maybe up to 50% of year. Lower residual load from groundwater to streams – may 1/3 of Option 3.
- Option 4ae – Hauraki Gulf Mid
- Good dilution of contaminants offshore but some question around increased loads to a degraded environment. The lower level of treatment results in potential for minor adverse effects on coastal waters but no effect on stream. Stream quality would improve at least in the upper reaches of the Te Puru Stream.

Social and Community Considerations Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Katja Huls

Author	Role / Experience	Category
Katja Huls	Planner	All
Shane Kelly	Environmental Scientist	Recreation and Food Gathering
Workshop Participants	Confirmation of provisional score	Recreation and Food Gathering

3. Information sources

- 5086-SCTTTP-Marine-Spatial-Plan-WR.pdf, April 2017 (gulfjournal.org.nz)
- "Beachlands: Options for Sustainable Development", 'A Sustainable Development Plan for Beachlands' July 2008 (PDF).
- 2018 Census place summary: Te Puru
- Whitford Estuaries Conservation Society (whitford estuaries (whitfordestuary.org))
- The Auckland Unitary Plan Operative in part (Updated November 2023)
- Auckland Council Cultural Heritage Index (geospatial database)
- Understanding the Social Impacts of Freshwater Reform: A Review of Six Limit-Setting SIAs, Mike Mackay and Nick Taylor for the Ministry of Environment 2020
- State of our Gulf Report 2017 (State of our Gulf 2017 - Knowledge Auckland (link))
- Use of treated sewage or wastewater as an irrigation water for agricultural purposes – Environmental, health, and economic impacts, Ofori et. al. 2020 (link) Science Direct.
- Auckland Region Mountain Biking Trails (link)
- Proposed Plan Change 88 to the Auckland Unitary Plan, notified 26 January 2023.
- Community Survey and Community Information session report and summary from Watercare Services Ltd 1 November 2023

4. Assumptions and limitations

- The discharges will not increase erosive flows in the ~~streams and~~ inlets.
- Erosive flows in the stream will be managed with stream bank strengthening using best practice methods.
- Land application sites will be chosen to avoid sensitive sites.

- Engineered Overflow Points in the wastewater network have not been assessed in terms of their location, nor the need for additional overflow points or their effects.
- While cultural effects are within the ambit of ~~this~~ a typical social and community assessment; ~~however~~ Mana Whenua feedback ~~has not been received yet. Their feedback may impact the scoring~~ addressing Maori cultural effects is separate to this assessment because it is appropriate that this assessment is conducted by Mana Whenua .
- A Quantitative Microbial Risk Assessment has not been conducted which may impact the scoring.
- An economic assessment has not been conducted on the impacts of wastewater re-use on rural land.
- A targeted survey of commercial stakeholders has not been conducted.
- Community feedback was received from 61 participants in an online survey and 30 - 40 participants in a community information session. Some may have participated in both sessions.
- An archaeological assessment has not been completed, but known archaeological sites and heritage sites identified in the Auckland Council Cultural Heritage Inventory[18] have been included in the assessment.
- To date recreation surveys have not been undertaken.
- The assessments for the recreation and food gathering sub-criteria are preliminary and will require input from workshop participants.

5. Social and Community Considerations Criterion – description and sub-criteria

Description	**Sub-criteria**			
	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities
Potential adverse effects on social and community values relating to amenity, recreation and food gathering, archaeology and heritage. Public access to and along the coastal marine area, and rivers and streams. Impact on rural activities and commercial operations.	• Nuisance effects (e.g., odour, noise, visual). • Effects on sensitive activities	• Effects on recreation activities and values, and food gathering. • Effects on public access to the CMA, rivers, and streams.	• Effects on archaeology and recorded sites of significance. • Effects on heritage buildings and sites.	• Effects on rural activities • Effects on commercial operations in the marine environment

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	**Score**
Low (less than minor) potential adverse effects	1
Medium to low (minor) potential adverse effects	2
Medium (more than minor) potential adverse effects	3
Medium to high (significant) potential adverse effects	4
High (significant and unlikely to be mitigated) potential adverse effects	5

[18] The Cultural Heritage Inventory (CHI) is a computer database containing information on over 20,000 heritage places including archaeological and maritime sites, built and botanical heritage areas and places and sites of significance to mana whenua.

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their social and economic well being.
- Section 6(d) - the maintenance and enhancement of public access to and along the coastal marine area, lakes, and rivers.
- Section 6(f) - the protection of historic heritage from inappropriate subdivision, use, and development.
- Section 7(c) - the maintenance and enhancement of amenity values.
- Section 7(f) - maintenance and enhancement of the quality of the environment.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher potential adverse effects rather than the lower effects. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Social and Community Considerations Criterion (Updated 1 December 2023)

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary to Te Puru Stream – diffuse discharge	1 The stream flows approximately 4.5km to Kelly's Beach. The stream channel is tidal here and approximately 12m wide between the mangrove tree lines. Amenity values are unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. The discharge is unlikely to generate any odours associated with the stream environment.	3 (provisional) The Te Puru (Te Ruangaingai) Stream traverses the eastern side of Te Puru Park, which is a sports ground and community facility. It enters the CMA at Kelly's Bay on the eastern side of the Park. Kelly's Bay is tidal with a sandy beach and walkways to Omana Beach to the east and Shelly Bay to the west. The amount of shellfish gathering in Kelly's Beach is not known. MoH and Fisheries NZ and Councils generally advise against gathering shellfish from urban areas. Risks will be assessed further with a Quantitative Microbial Risk Assessment. Land based recreation is unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. Swimming recreation may be affected due to negative perceptions associated with wastewater discharges (feedback from community engagement).	3 The urupa in Te Puru Park could be affected by flood waters that have mixed with the treated wastewater discharge. This matter should be considered and assessed by mana whenua. There are two known midden on the banks of the tidal portion of the Te Puru Stream near the coast (referenced as S11-559 and S11-560 in the Auckland Council Cultural Heritage Index). These are not expected to be affected by treated wastewater discharges.	1 Commercial activities other than rural activities are not evident in the vicinity of the Te Puru Stream. It is not expected that treated wastewater discharges in the stream will impact the surrounding rural activities. There is limited commercial fishing in the vicinity of Kelly's Bay.	2
2b: Tributary to the Te Puru Stream – direct discharge	1 The stream flows approximately 4.5km to Kelly's Beach. The stream channel is tidal here and approximately 12m wide between the mangrove tree lines. Amenity values are unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. The discharge is unlikely to generate any odours associated with the stream environment.	3 (provisional) The Te Puru (Te Ruangaingai) Stream traverses the eastern side of Te Puru Park, which is a sports ground and community facility. It enters the CMA at Kelly's Bay on the eastern side of the Park. Kelly's Bay is tidal with a sandy beach and walkways to Omana Beach to the east and Shelly Bay to the west. The amount of shellfish gathering in Kelly's Beach is not known. MoH and Fisheries NZ and Councils generally advise against gathering shellfish from urban areas. Risks will be assessed further with a Quantitative Microbial Risk Assessment. Land based recreation is unlikely to be affected by the discharge to the stream because the discharge will not be discernible from natural flows in the stream. Swimming recreation may be affected due to negative perceptions associated with wastewater discharges (feedback from community engagement).	3 The urupa in Te Puru Park could be affected by flood waters that have mixed with the treated wastewater discharge. This matter should be considered and assessed by mana whenua. There are two known midden on the banks of the tidal portion of the Te Puru (Te Ruangaingai) Stream near the coast (S11-559 and S11-560). These are not expected to be affected by treated wastewater discharges.	1 Commercial activities other than rural activities are not evident in the vicinity of the Te Puru Stream. It is not expected that treated wastewater discharges in the stream will impact the surrounding rural activities. There is limited commercial fishing in the vicinity of Kelly's Bay.	2
3: 100% to land	2 The indicative land application area (750ha) is extensive and includes land zoned Countryside	2 (provisional) Equestrian activities occur on the rural land and there are a number of mountain bike trails in the	12	4	2

Option	Amenity values	Recreation and food gathering	Heritage and archaeology	Rural and commercial activities	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
	Living which enables rural-residential living activities including lifestyle blocks, “hobby farming”, fruit and vegetable growing and equestrian activities. While the Public Health Protection assessment concludes that there is low potential for aerosols drift from the discharge, residents could consider this as a risk. Sensitive land uses are located in the urban areas and are remote from the identified land application area.	Maraetai and Whitford forests. These could lead to direct contact with the treated wastewater and any pathogens within it. These risks will be assessed further with a Quantitative Microbial Risk Assessment.	Known cultural and archaeological sites have been identified and will be excluded from any land application area with a buffer. There is the potential, within the proposed land application area, for other cultural and archaeological sites to be discovered during construction. A buffer will also be applied around these areas to exclude them. No formal feedback has yet been received from mana whenua on the effectiveness of a buffer, or its appropriate size. An archaeological assessment and guidance from Mana Whenua would assist with better understanding the risk of undiscovered sites occurring. Heritage buildings and sites are not affected by this option.	The indicative land application area is extensive and includes land zoned for rural production activities and Countryside Living. Irrigation with treated wastewater may affect land values for land marketed as rural lifestyle living. Irrigation may improve yield from rural land in dry seasons. There is potential risk associated with effects of the discharge on rural production activities (dairy, fruit, vegetables) and market perceptions. Risks of pathogens will be assessed further with a Quantitative Microbial Risk Assessment.	
3a: Land and Tributary to the Te Puru Stream	2 The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the land option.	3 (provisional) The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the stream options.	2 The assessment for this option is the same as the matters set out for the land and for the stream options. A precautionary approach has been adopted for the score, based on the score for the stream options.	2 Because this option also involves a large land area (300ha) the assessments for Option 3 are equally relevant but as the land requirement is less a lower score has been adopted.	2
4ae: Hauraki Gulf Tāmaki Mid	2 It is assumed the near shore section of the wastewater pipe and ocean outfall ~~while on land~~ would be buried and not visible from the reserve or beach therefore any amenity effects are likely to be temporary in nature associated with construction. Note that the outfall will lay on the seabed further into the strait, however assessment the seabed does is not included in the scope of this assessment.	3 (provisional) This part of the Hauraki Gulf is particularly valued for marine recreation such as swimming, shellfish gathering, fishing, boating and sailing. The various beaches are a very popular weekend destination during the summer months. For this reason, a wastewater discharge to the Tamaki Strait could impact the perception of this coastline as a marine destination. This is corroborated by feedback from an online survey conducted by Watercare. The expected dilution at the outfall is high and shellfish are unlikely to experience actual effects provided that the discharge is compliant. Public access to the beach will be unlikely to be affected during construction, but there may be access restrictions to parts of the beach and reserve during construction.	3 Two midden (R11-2368, R112138) and a Midden/Oven (R11-2654) may be affected by construction work. The urupa on the eastern side of Te Puru Park was discovered accidentally while developing the fields and it is possible that there are other burials in the vicinity. An archaeological assessment and guidance from Mana Whenua would assist with better understanding the risk of this occurring.	3 The treated wastewater discharge will be released 2.9km into the Tamaki Strait. Commercial fishing and marine farming occur in the Strait. The risk of effects on fish and shellfish is likely to be minor due to the very high dilution rates, but further assessment is required. A Quantitative Microbial Risk Assessment will support assessing this risk further. While the expected dilution rates are very high, the perception associated with wastewater discharges and the effects on shellfish may negatively impact the marketing of products produced via marine farming in this area.	3

10. Conclusion

All options have an overall score of 2 - medium to low (minor) potential adverse effects except Option 4ae: Hauraki Gulf Tāmaki Mid. This option had a score of 3 medium (more than minor) potential adverse effects, primarily because it had higher scores for the recreation and food gathering, heritage and archaeology and rural and commercial activities sub-criteria.

None of the option sub-criteria were scored as having High (significant and unlikely to be mitigated) potential adverse effects (5). The highest scoring sub-criteria was rural and commercial activities for Option 3: 100% to land which was assessed as having medium to high (significant) potential adverse effects (4).

Financial Implications Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Approach to scoring
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Alan Pattle	Land Application Engineer / 40+ years	Land application
Gary Teear	Marine Engineer / 40+ years	Ocean Outfall
Andrew Slaney	Process Engineer / 25 years	All
ALTA	Cost estimators (yet to be undertaken)	All

3. Information sources

- Alta P95 capital cost estimates (see Alta memo dated 22/11/23)

4. Assumptions and limitations

- MBR treatment option completely replaces existing WWTP – buffer ponds can be reused for storage of treated effluent to manage discharge.
- BNR treatment option assumes some reuse of existing assets (eg clarifier) to be considered during concept design.
- Outfall cost based on float and sink installation (marine outfall on top of seabed). Alternative is buried / tunnelled which would be significantly more expensive.
- Outfall foreshore transition assumed not rocky coastline.
- Net present value (NPV) based on 35 years at 4.3% p.a. discount rate.
- Annual maintenance cost of 2.0% of base capital cost (excluding contingencies).
- Additional pumping energy and chemical costs included where applicable.
- Other WWTP operating costs (labour, sludge, electrical energy costs) common to all schemes and included at \$350 per 1,000 m^3 volume treated.
- Range of costs shown in assessment table reflect confidence interval of -10% + 30%.

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5. Financial implications criterion – description and sub-criteria

Description	Sub-criteria			
	Capital cost	Operating and maintenance cost	Whole of life cost	Financial risk
Comparative capital, operating and maintenance, whole of life costs of the options. Where relevant to the option, land acquisition costs, capital gains and product net revenue. Affordability – community, business, and trade waste dischargers	• Capital cost of the total scheme including any land acquisition costs, capital gains and product net revenue.	• Cost effectiveness of operations and maintenance	• Combination of capital and operation and maintenance costs over the life of the assets	• Is the option affordable even if growth does not occur as predicted. • Cost to the community, business and trade waste dischargers.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low financial implications	1
Medium to low financial implications	2
Medium financial implications	3
Medium to high financial implications	4
High financial implications	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - enables people and communities to provide for their economic well-being.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher financial implications rather than lower implications. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Financial Implications Criterion (Update 29 November 2023)

Option	Capital cost	Operating and maintenance cost	Whole of life cost (NPV)	Financial risk	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	1 Lowest capex $270 – $430M	1 Lowest opex $52M PV	1 Lowest NPV $320 – $480M	1 Lowest risk	1
2b: Tributary of Te Puru Stream – direct discharge	1 Lowest capex $270 – $430M	1 Lowest opex $52M PV	1 Lowest NPV $320 – $480M	1 Lowest risk	1
3: 100% to land	5 Highest capex $320 – 510M	5 Second highest opex $54M PV	5 Highest NPV $370 – $560M	5 Land price risk	5
3a: Land and Te Puru Stream	4 Second highest capex $310 – $490M	4 Highest opex $56M PV	4 Second highest NPV $370 – $550M	4 Land price risk	4
4ae: Hauraki Gulf Tāmaki Mid	2 Third lowest capex $280 – $450M	2 Lowest opex $52 PV	2 Third lowest NPV $330 – 500M	3 Outfall sized for ultimate population Risk of higher outfall cost if float and sink unacceptable and marine outfall has to be buried / bored (could be a 4 in this case).	2*

* Could go up to 3 if marine outfall needs to be buried / bored.

10. Conclusions

- Options 2a and 2b are essentially the same in terms of the accuracy of the estimates (the only difference being the Te Puru Stream arrangements).
- The financial risks associated with Options 2a and 2b are lowest providing the assessed treatment quality meets environmental requirements in the stream.
- The high costs for Options 3 and 3a reflect the high land costs in the area and the tight soils and resulting large areas required for land application (750 ha for Option 3 and 300 ha for option 3a). The estimated costs include costs associated acquisition and any objections under the Public Works Act 1981.
- Marine outfall cost has a reasonably high risk due to the sensitivity of the Hauraki Gulf environment which could result in the outfall to be buried or bored for part or all of its length in the Gulf.

Resilience Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions and limitations
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions and limitations

- Fresh water discharge options: BNR / MBR treatment process (highest level of treatment)
- Land application options: Conventional BNR process with tertiary filtration & UV
- Land application options: Pasture cut and carry system (not forestry)
- Marine outfall options: Conventional BNR process with tertiary filtration & UV

5. Resilience Criterion – description and sub-criteria

Description	Sub-criteria			
	Natural hazards	Climate Change	Operational resilience	Flexibility
Degree to which the option is resilient to natural hazards and climate change, offers operational resilience, addresses the carbon component of 40/20/20. Flexibility to accommodate changes in flows and loads, ability to respond to changes in regulatory standards, changes in technology.	• Land stability and erosion affecting infrastructure. • Flooding affecting infrastructure. • Wildfires affecting infrastructure (land application in forests). • Earthquakes	• High intensity rainfall peaks affecting the infrastructure. • Prolonged wet weather periods affecting the infrastructure. • Prolonged dry periods affecting the infrastructure. • Prolonged dry periods resulting in an increase of low flows in streams and rivers. • Sea level rise and coastal storm inundation affecting infrastructure (ocean outfall).	• Power supply reliability – effect of outages and rapid changes to electricity pricing. • Scheme complexity leading to operational problems. • Third party damage to infrastructure, e.g., digger hitting cables, pipes etc. • Crop failure/contamination. • Loss of market for land application products e.g., cut and carry products, forestry production.	• Ability to accommodate changes in flows and loads. • Ability to respond to changes in regulatory standards e.g., emerging contaminants, endocrine disrupting compounds. • Ability to respond to changes in technology.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High degree of resilience	1
Medium to high degree of resilience	2
Medium degree of resilience	3
Medium to low degree of resilience	4
Low degree of resilience	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – enables people and communities to provide for their health and safety.
- Section 7(i) – the effects of climate change.

8. Assessment method

An option’s recommended 1 to 5 score is developed by first scoring each of the criterion’s sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with lower degree of resilience rather than the higher degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Resilience Criterion (Updated 29 November 2023)

Option	Natural Hazards	Climate Change	Operational Resilience	Flexibility	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	1. Low risk from natural hazards. Can use storage lagoon to control discharge volume and rate.	1. Resilient to climate change impacts. The increased volume of highly treated wastewater could be a benefit to stream flow and ecology etc during prolonged periods of dry weather.	1. Modern and proven BNR / MBR / UV WWTP and freshwater discharge system.	1. MBR lends itself to future reuse opportunities and/or even more treatment standards. eg reverse osmosis.	1
2b: Tributary of Te Puru Stream – direct discharge	1. Low risk from natural hazards. Can use storage lagoon to control discharge volume and rate.	1. Resilient to climate change impacts. The highly treated wastewater could be a benefit to stream flow and ecology etc.	1. Modern and proven BNR / MBR / UV WWTP and freshwater discharge system	1. MBR lends itself to future reuse opportunities and/or even more treatment standards. eg reverse osmosis.	1
3: 100% to land	3. Flooding / land slips risk with no backup option.	3. Similar to Natural Hazards criterion. Increased frequency of high intensity rainfall events is a risk to land application.	4. Land application management adds complexity to operation. Crop market risks.	3. Land management / crop type could be difficult to change if necessary due to crop market changes or other factors.	3
3a: Land and Te Puru Stream	~~3~~ 2. Flooding / land slips risk but have stream backup option. Changed from 3 to 2.	~~3~~ 2. Increased frequency of high intensity rainfall events is a risk to land application but have the stream as a backup option. Changed from 3 to 2.	3. Land application management adds complexity to operation, crop market risks but not a significant as Option 3 as smaller land area and stream discharge.	2. Land management / crop type could be difficult to change if necessary due to market or other factors but not a significant as Option 3 as smaller land area and stream discharge.	~~3~~ 2 Changed from 3 to 2.
4ae: Hauraki Gulf Tāmaki Mid	1. Low risk from natural hazards.	1. Resilient to climate change impacts and the outfall would not be affected by sea level rise or inundation given the outfall would be buried from the shoreline to the mid channel and then laid on the seabed surface to the discharge point	2. Standard WWTP and some complexity with marine discharge system.	1. Conventional BNR technology can also be upgraded to provide reuse opportunities but would require more upgrading compared with the MBR option. Conveyance pipe provides reuse opportunities to tap into treated wastewater (refer opportunities category).	1

10. Conclusions

- Water based discharges have a generally higher resilience than land application systems which are highly dependent on weather and soil conditions.
- MBR technology provides greater flexibility and opportunities for future reuse (eg Hunua recharge or purple pipe non potable reuse).
- Conventional BNR technology can also be upgraded to provide reuse opportunities but would require more upgrading compared with the MBR option.
- Ocean outfall option is somewhat less flexible due to high infrastructure investment.
- Experience with offshore marine outfalls in New Zealand (20 or so) shows by and large a sustainable and resilient long-term solution providing appropriately sized and located and treated wastewater quality is appropriate for the receiving environment.

Technology and Infrastructure Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Andrew Slaney

Author	Role / Experience	Category
Andrew Slaney	Process Engineer / 25 years	Overall / wastewater treatment
Jim Bradley	Environmental Engineer / 50+ years	Overall

3. Information sources

- Knowledge of the current Beachlands WWTP
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis"
- Experience of the authors.
- Preliminary outfall location options report (DHI) (dated 12/9/23)

4. Assumptions and limitations

- Fresh water discharge options: BNR / MBR treatment process (highest level of treatment)
- Land application options: Conventional BNR process with tertiary filtration & UV
- Land application options: Pasture or other crop cut and carry system (not forestry).
- Marine outfall options: Conventional BNR process with tertiary filtration & UV
- Carbon footprint includes total lifetime emissions (embodied plus operational)
- Carbon footprint includes nitrous oxide emissions

5. Technology and Infrastructure Criterion – description and sub-criteria

Description	Sub-criteria				
	Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon footprint / GHG emissions
Degree to which the option - Degree to which the option – uses proven technology, existing infrastructure; can be constructed, staged, constructed in the required timeframes; has sufficient capacity, secure land, available infrastructure.	• Uses reliable, robust and proven technology.	• Can the option be staged. • Is the option able to be constructed within the required timeframe.	• Is the option able to be constructed e.g., geotechnical conditions, presence of groundwater, contaminated land. • Is there sufficient land available to accommodate the option and can the land be secured. • Potential to maximise the use existing infrastructure that has a valuable remaining life. • Presence of existing other infrastructure.	• Does the option have capacity to accept projected flows and loads.	• Comparative carbon footprint / GHG emissions for operation and construction.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High degree of alignment	1
Medium to high degree of alignment	2
Medium degree of alignment	3
Medium to low degree of alignment	4
Low degree of alignment	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 - sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations.
- Section 7(b) - the efficient use and development of natural and physical resources.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with a lower degree of alignment rather than a higher degree. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Technology and Infrastructure Criterion (Updated 29 November 2023)

Option	Reliable and proven technology	Staging and timing	Constructability	Capacity	Carbon Footprint / Greenhouse Gas Emissions	**Overall Score**
	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	1. MBR technology is now a mature technology in NZ.	2. Some elements of the WWTP can be staged for population growth.	1. New MBR treatment plant constructed on the existing WWTP site with minimal disruption to existing operation	3. The stream receiving environment has a lower capacity to accept discharges compared with a marine outfall so scores higher to provide differentiation for this criterion. Refer to Natural Environment criterion.	1. Embodied carbon in new WWTP; low operational emissions.	2
2b: Tributary of Te Puru Stream – direct discharge	1. MBR technology is now a mature technology in NZ.	1. Some elements of the WWTP can be staged for population growth.	1. New MBR treatment plant constructed on the existing WWTP site with minimal disruption to existing operation	3. The stream receiving environment has a lower capacity to accept discharges compared with a marine outfall so scores higher to provide differentiation for this criterion. Refer to Natural Environment criterion.	1. Embodied carbon in new WWTP; low operational emissions	2
3: 100% to land	3. Conventional treatment plant is reliable but a 100% land scheme carries a weather risk (high intensity rainfall events causing flooding and potential land instability and damage to infrastructure) as there is no backup. Also a large area (750 ha) to manage.	3. Land acquisition / purchase is a risk to program for both obtaining consents and constructing the scheme on time.	3. Land application scheme is large and complex; spread over varying topography and multiple land parcels.	~~3~~ 4. Watercare has the power under the PWA 1981 to aquire land. However, this is subject to an objections process. Accordingly, it may be difficult for Watercare to secure a sufficient land area for 100% application, particularly within required timeframes. Weather and crop / land management risks to land capacity also. Changed from 3 to 4.	5. High embodied carbon in irrigation network. Higher nitrous oxide (N2O) emission factor from land application compared with water discharges. Forestry is not assumed for this option hence no carbon sequestration credit.	4
3a: Land and Te Puru Stream	2. MBR technology is now a mature technology in NZ. Land area not as large as for Option 3 (300 ha). Having the stream as a backup reduces the risk.	2. Some elements of the WWTP can be staged for population growth. Land acquisition / purchase is a risk to program not as high as for Option 3 as area required not as large.	2. New MBR treatment plant constructed on the existing WWTP site with minimal disruption to existing operation. Land application scheme is not as large and complex as Option 3.	3. The stream receiving environment has a limited capacity to accept discharges (compared with a marine outfall). This option also involves discharge to land (300 ha). While Watercare has the ability to compulsorily acquire land under the PWA, this is subject to a right of objection. Accordingly, this may be difficult, as outlined above, in relation to Option 3.	4. Embodied carbon in new WWTP; low operational emissions. High embodied carbon in irrigation network, higher nitrous oxide (N2O) emission factor from land application compared with water discharges.	3
4ae: Hauraki Gulf Tāmaki Mid	1. Highly reliable system. Approximately 20 offshore outfalls currently in New Zealand.	2. Outfall must be constructed for ultimate population (no staging ability)	2. Long overland / road route conveyance pipe more disruptive than local stream options. The foreshore and initial section of the outfall will be buried. Assuming the majority of the marine outfall is not buried (that is, float and sink) then this section should not be too difficult.	1. The best receiving environment in terms of capacity, providing outfall and conveyance pipes are sized adequately.	2. Embodied carbon in WWTP and outfall pipe. Low operational emissions.	2

10. Conclusions

- Water receiving environments for treated wastewater (either fresh or marine) have generally higher reliability and are generally less complex than land application systems.
- MBR treatment plants are becoming increasingly common in New Zealand as the technology matures and the capital costs reduce compared with conventional BNR plants.
- Operationally MBR plants are more complex however Watercare have experience now operating Pukekohe WWTP so this is not considered a significant differentiator.
- Modular development of treatment capacity and land application areas are easily staged however conveyance pipes and marine outfalls are not.
- The MBR option would most likely be a complete new facility.
- Conventional BNR treatment would allow some existing assets to be retained and incorporated into the new / upgraded WWTP. (All reusable assets like the storm buffer pond can be reused for both BNR+MBR plant and conventional BNR treatment). Watercare have advised that most of the existing assets cannot be reused.
- Option 3 (100% land) and possible Option 3a are unlikely to be compatible with Watercare's target 40% reduction in infrastructure carbon due to the large irrigation network (assuming not forestry sequestration).
- While Watercare has the ability to compulsorily acquire land under the PWA 1981, there may be difficulties and delays associated with obtaining all of the land required, due to landowner's right of objection.

Statutory Risks and Conflicts Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Approach to scoring
- Criterion categories / sub-categories
- Method of assessment
- Assessment table
- Conclusions

2. Authors and experience

Criterion lead: Paula Hunter

Author	Role / Experience	Category / sub-criteria
Paula Hunter	Planner	All
Simpson Grierson	Legal	Legislative barriers to options proceeding.

3. Information sources

Marine and Coastal Area (Takutai Moana) Act 2011 (MACAA)

MACAA applications

Hauraki Gulf Marine Park Act 2000 (HGMPA)

New Zealand Coastal Policy Statement 2010

National Policy Statement for Freshwater Management 2020

National Policy Statement for Highly Productive Land 2022

Auckland Unitary Plan Operative in Part (Updated 10 November 2023)

Water Services Act 2021

Resource Management Act 1991

4. Assumptions and limitations

Assessments have not been informed by information of effects on Māori cultural values, mauri, mahinga kai, wāhi tapū and sites of significance.

5. Statutory Risks and Conflicts – description and sub-criteria

Description	Sub-criteria		
	Legislative barriers to options proceeding	Consenting complexity and compliance	Conflicts with statutory direction
Legislative processes that could restrict the ability of an option to proceed, scale of consenting complexity and consent compliance. Conflicts with the direction of key planning instruments.	• Risk of an option not proceeding due to legislative changes and outcomes of legislative processes e.g., potentially successful applications for customary title under the Takutai Moana Act.	• Scale of complexity of consenting processes including s91 deferrals. • Scale of complexity of compliance requirements and costs.	• Conflict with the direction of key planning instruments e.g., non-complying activity classification with a supporting "avoid" policy.

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
Low risks and conflicts	1
Medium to low risks and conflicts	2
Medium risks and conflicts	3
Medium to high risks and conflicts	4
High risks and conflicts	5

7. Part 2

The RMA Part 2 matters addressed under this criterion are:

- Sections 5, 6, 7, 8.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with higher risks and conflicts rather than those lower risks and conflicts. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Statutory Risks and Conflicts Assessment (Updated 1 December 2023)

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	~~3~~ 1 Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed under the Water Services Act Changed from a 3 to a 1 as the Water Services Act 2021 relates primarily to the provision of drinking water rather than wastewater services. This wastewater consenting process does not involve Watercare performing a function or exercising a power under that Act that is caught by the s14(2) requirement to give effect to Te Mana o te Wai. Suggest 1 instead.	1 One receiving environment, expanded overland flow area, compliance / monitoring requirements assumed to be slightly more complex than current requirements, compared to options involving new receiving environments consenting not as complex.	~~5~~ 4 Some challenges to demonstrating that the discharge of treated wastewater to a tributary of the Te Puru Stream prioritises the health and well-being of the stream first, over secondly the health needs of people (such as drinking water) and thirdly the ability of people and communities to provide for their social, economic and cultural well-being. Challenging to argue this option will not result in the loss of stream values so potentially need to prove functional need to discharge to the stream i.e. the activity can only occur in that environment. Changed from a 5 to a 4 as the as the Natural Environment assessment identified that the attenuation through the over land flow area assists in the improvement of the quality of the discharge when compared to Option 2b.	~~3~~ 2 Changed from a 3 to a 2
2b: Tributary of Te Puru Stream – direct discharge	~~3~~ ! Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed under the Water Services Act Changed from a 3 to a 1 as the Water Services Act 2021 relates primarily to the provision of drinking water rather than wastewater services. This wastewater consenting process does not involve Watercare performing a function or exercising a power under that Act that is caught by the s14(2) requirement to give effect to Te Mana o te Wai. Suggest 1 instead.	1 One receiving environment, new discharge structure, compliance / monitoring requirements assumed to be slightly more complex than current requirements, compared to options involving new receiving environments consenting not as complex.	5 Some challenges to demonstrating that the discharge of treated wastewater to a tributary of the Te Puru Stream prioritises the health and well-being of the stream first, over secondly the health needs of people (such as drinking water) and thirdly the ability of people and communities to provide for their social, economic and cultural well-being. Challenging to argue this option will not result in the loss of stream values so potentially requirement to prove functional need to discharge to the stream i.e. the activity can only occur in that environment. Scored a 5 when compared to Option 2a.	~~3~~ 2 Changed from a 3 to a 2
3: 100% Land	1 No legislative barriers identified	4 750ha land required, assumed one contiguous area not achievable which could lead to consenting and compliance complexities, potential complexities if need to rely on the Public Works Act for investigations and land purchase, conveyance infrastructure to land applications areas, storage requirements, potential need for consents under the NESFM – natural wetlands.	2 Gives effect to Te Mana o te Wai as the discharge is 100% to land, if natural wetlands significant ecological areas etc. identified in land application areas potential to avoid them, no significant policy conflict identified.	2
3a: Land / tributary of Te Puru Stream	2 1 Watercare must give effect to Te Mana o te Wai as part of any functions, powers and duties imposed under the Water Services Act Changed from a 3 to a 1 as the Water Services Act 2021 relates primarily to the provision of drinking water rather than wastewater services. This wastewater consenting process does not involve Watercare performing a function or exercising a power under that Act that is caught by the s14(2) requirement to give effect to Te Mana o te Wai. Suggest 1 instead.	5 300 ha land required, two receiving environments resulting in complex consenting and compliance / monitoring requirements, potential complexities if need to rely on the Public Works Act for investigations and land purchase, conveyance infrastructure to land applications areas, storage requirements, potential need for consents under the NESFM – natural wetlands.	3 Better gives effect to Te Mana o te Wai when compared to options 2a and 2b, but still need to get through the hierarchy and functional need tests, if natural wetlands significant ecological areas etc. identified in land application areas potential to avoid them.	3

Option	Legislative barriers to options proceeding	Complexity and compliance	Conflicts with statutory direction	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
4ae: Hauraki Gulf Tāmaki Mid	~~3~~ 4 Potential risks associated with applications for customary rights and titles lodged under the Marine and Coastal Area (Takutai Moana) Act. Changed from a 3 to a 4 due to the requirements of the Hauraki Gulf Marine Part Act - s7 relating to recognising the national significance of Hauraki Gulf and s8 relating to the protection and, where appropriate, the enhancement of the Hauraki Gulf must be had regard to by the consent authority:	~~3~~ 4 One receiving environment, conveyance infrastructure (5.6km) to outfall, new 2.9km ocean outfall, consenting complexities with conveyance, new outfall and discharge. Changed from a 3 to a 4 given advice at the workshop regarding the number of iwi and hapū with interests in the Tāmaki Straight and wider Hauraki Gulf.	3 Need to avoid where practicable, or remedy or mitigate adverse effects in areas of high recreational use, fishing or shellfish gathering; commercial development; significant ecological value, protection of indigenous biological diversity, preservation of natural character (NZCPS, Unitary Plan), potential outfall location traverses an SEA Marine 2 area (Unitary Plan), gives effect to Te Mana o te Wai as the discharge is to the CMA.	~~3~~ 4 Changed from a 3 to a 4

10. Conclusion

Option 3a: 100% to land has scored best as it has a low risk of not proceeding due to legislative changes and outcomes of legislative processes, it gives effect to Te Mana o te Wai as the option does not involve a discharge to freshwater and no conflicts of any significance with other statutory directions. All the other options score a “3” – medium risks and conflicts.

Options 2a and 2b did not score well against the sub-criteria “conflicts with statutory direction” due to the challenges of giving effect to Te Mana o te Wai. Option 3a did not score well against sub-criterion “complexity and compliance” primarily because it comprises two receiving environments.

Opportunities and Benefits Criterion

1. Introduction

The following sets out the approach and assessment for this criterion and records:

- Authors and experience
- Information sources
- Assumptions
- Traffic light definition
- Criterion categories / sub-criteria
- Method of assessment
- Assessment table

2. Authors and experience

Criterion lead: Jim Bradley

Author	Role / Experience	Category
Jim Bradley	Environmental Engineer / 50+ years	All
Andrew Slaney	Process Engineer / 25 years	All

3. Information sources

The information sources used for the Opportunities and Benefits Criterion include:

- Knowledge of the current Beachlands WWTP.
- Information in the Draft "Beachlands Wastewater Treatment Plant Upgrade – Concept Design Basis".
- Watercare and Stantec personnel's wastewater treatment and management knowledge of the New Zealand sector and overseas.
- Assumed (at this stage) technology and infrastructure criteria information.
- Authors and experience of those involved in this section of the Report.

4. Assumptions and limitations

a. Overall Assumptions

The Wastewater Treatment Plan is based on the "Product Factory" concept as depicted below. Concepts and developments within Watercare in recent times have adopted this approach. The approach (recovery and reuse of resources) is consistent with the principles of the Circular Economy (which embraces sustainability).

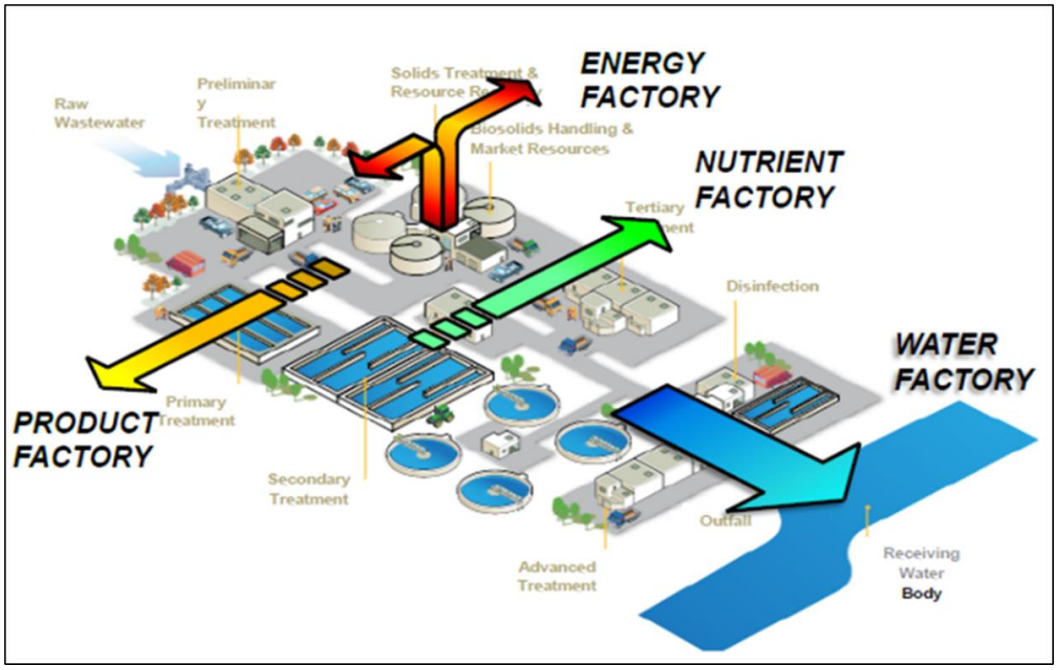

Figure 1 – The Product Factory Approach

b. Treated Wastewater Beneficial Reuse Assumptions:

j) Land application options assume that suitable relatively flat and stable land is available that enables beneficial use of the treated wastewater (eg for crops, dry stock etc)

k) Assessment based on the quality/degree of treatment of the treated wastewater and the extent/amount of treated wastewater to be beneficially reused for the option as described, but keeping in mind future opportunities.

l) Assessment does not take into account "possible people's perceptions" of the beneficial reuse e.g. potable reuse, aquifer recharge of water supply source.

m) Consents/other approvals etc can be sought for each of the beneficial reuse means included in the options.

n) The assessment includes nutrient recovery when treated wastewater is applied to land.

o) Conveyance lines of Option 4ae Tamaki mid Hauraki Gulf outfall can be tapped in for beneficial reuse of treated wastewater (consents and other approvals permitting).

c. Sludge and Biosolids Beneficial Reuse Assumptions

i) This assessment is based on degree of treatment of liquid phase needed i.e. for a high degree of treatment, there is more sludge/biosolids produced which could be beneficially reused. In this respect the MBR WWTP will produce more sludge/biosolids than the conventional BNR Plant, but this would only be a relatively small percent increase.

j) Includes vermiculture, biochar, other reusable biosolids material.

k) Assume no chemicals or other products used in the WWTP processes that render biosolids not beneficially reusable provided for land application etc appropriate loading rates are used. Alum will be used to reduce TP so it will have chemical in the sludge. Zinc is also high in the current biosolids due to rainwater collection and use within the area.

l) Assumes possible future/pending regulations on Emerging Organic Contaminants (EOC's) and/or microplastics does not limit beneficial reuse on land or any other reuse technique.

d. Energy Generation

Energy generation is not included in the table as it is assumed that based on the design population of the scheme (around 30,000 PE), and based on the authors' experience, primary clarifiers and anaerobic digestion are unlikely to be economic and therefore none of the scheme options will provide energy generation possibilities.

In addition, it is noted that the carbon in primary solids will be needed for biological nitrogen / phosphorus removal as with the current plant and a number of others in New Zealand and internationally.

In terms of combustion or gasification of sludge to produce energy, this possibility is included in the sludge / biosolids beneficial use category.

5. Opportunities and Benefits Criterion – description and sub-criteria

Description	**Sub-criteria**		
	Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery and reuse
Provides opportunities for resource recovery including beneficial reuse, energy generation, nutrient recovery / reuse.	The degree and amount of beneficial reuse of treated wastewater for each of the short listed options will depend on many factors. These include: • The overall nature of the option and its infrastructure components and their locations e.g. conveyance lines, discharge points etc • The quality of the treated wastewater • The quantity of treated wastewater available that maybe beneficially reused and above the basic option formulation • The base reuse option e.g. land application compared to a direct discharge (steam or Hauraki Gulf discharge option) • The "add-ons" that maybe feasible, acceptable and, where necessary, consentable in terms of use of treated wastewater as compared to the options fundamental function(s)	This includes for the range and extent of beneficial reuses of sludges and biosolids, biosolids being sludges treated to specified levels. The extent of such practices will depend on many factors including: • Amount and quality of the sludge/biosolids • Demand for particular beneficial reuse practices • Approvals and when necessary resource consents granted for particular reuse practices such as application of biosolids to land, sale of biosolids to be the home gardener etc • Overall economics of a particular practice/beneficial reuse option • Meeting statutory planning provisions • Māori cultural, other cultural and social/neighbour considerations (neighbour to a beneficial reuse site and others) Beneficial reuse techniques can for example include: • Application to agricultural, forestry, other crops	• This covers the beneficial reuse of nutrient in the treated wastewater • This does not include beneficial reuse of nutrients included in sludges and biosolids • This would also include the possibility of extracting phosphorus by way of the struvite process extraction from the centrate from dewatering , however such processes are not likely to be used in the WWTP types being considered

		• Turf culture, parks/gardens, nurseries • Compost made mixed green waste • Landfill and quarry restoration and capping • Energy production through furnacing e.g. cement kiln supplementary energy feed • Gasification/pyrolysis

6. Approach to scoring

When scoring each option against the criterion a score between 1 to 5 has been adopted with 1 being the best score and 5 the worst. The table below provides a description of the score and associated score colour.

Description	Score
High opportunities and benefits	1
Medium to high opportunities and benefits	2
Medium opportunities and benefits	3
Medium to low opportunities and benefits	4
Low / minimal opportunities and benefits	5

7. RMA Part 2

The RMA Part 2 matters addressed under this criterion are:

- Section 5 – sustainable management of resources.
- Section 7(b) - the efficient use and development of natural and physical resources.
- Section 7 (ba) - the efficiency of the end use of energy.

8. Assessment method

An option's recommended 1 to 5 score is developed by first scoring each of the criterion's sub-criteria separately. An overall score is then identified by comparing the range of sub-criteria scores and giving an overall score erring on the side of those with low / minimal opportunities and benefits rather than higher opportunities and benefits. A qualitative expert judgement approach is followed in determining the scores for the short list assessment rather than a quantitative approach.

9. Assessment table

See below:

Opportunities and Benefits Criterion (Updated 1 December 2023)

Option	Treated wastewater beneficial reuse	Sludge and biosolids beneficial reuse	Nutrient recovery / reuse	Overall Score
	Reasons and Score	Reasons and Score	Reasons and Score	
2a: Tributary of Te Puru Stream – diffuse discharge	4 3 Option based on overland flow to the Te Puru Stream discharge – no conveyance line from the WWTP site to facilitate reuse. Some minimal use and soakage area. High level of treatment provides opportunity for future reuse. Change reflects greater recognition of future opportunities	1 All options produce similar quantity of sludge and biosolids and have similar opportunities for beneficial use but with MBR slightly more sludge/biosolids.	5 No to minimal reuse of nutrients.	3
2b: Tributary of Te Puru Stream – direct discharge	4 3 Option based on Te Puru Stream direct discharge – no conveyance line from the WWTP site to facilitate reuse. High level of treatment provides opportunity for future reuse. Change reflects greater recognition of future opportunities	1 All options produce similar quantity of biosolids and have similar opportunities for beneficial use but with MBR slightly more sludge/biosolids.	5 No reuse of nutrients.	3
3: 100% Land	1 100% to land application so maximise beneficial reuse with appropriate crop(s) and management regime(s) selected (750 ha area)	~~1~~ 2 WWTP has tertiary filtration so more sludge than BNR alone. For a comparative assessment still slightly less than MBR options 2a and 2b	1 Uptake of nutrients by crops can be maximised.	1
3a: Land / tributary of Te Puru Stream	2 Some treated wastewater to land so maximises the beneficial reuse of that proportion providing appropriate techniques used like Option 3 (300ha area)	1 All options produce similar quantity of sludge and biosolids and have similar opportunities for beneficial use but with MBR slightly more sludge/biosolids.	2 Uptake of nutrients by crops, but less than option 3a as less area	2
4ae: Hauraki Gulf Tāmaki Mid	4 Marine outfall Tamaki mid, assumes the discharge quality if not as highly treated as the stream discharge options so not the same reuse potential but option to reuse 5.6km conveyance	3 Less biosolids produced due to no tertiary filter, but not much less than MBR and BNR and tertiary filtration options.	5 No reuse of nutrients unless off take off conveyance line to land application for beneficial reuse	4

10. Conclusions

- Options 2a and 2b have no to little beneficial reuse of treated wastewater or nutrients as it stands because there is no conveyance pipe from the site, but a high potential for beneficial use of sludge / biosolids. MBR treated wastewater at the plant has the potential for reuse if conveyed off site at a later time. The high quality also facilitates adding advanced treatment if a high quality reclaimed water was required.
- The 100% land application Option 3 and to a lesser extent Option 3a have a high potential for beneficial use of treated wastewater and associated nutrient uptake through crops.
- The outfall option 4ae has the lowest potential for beneficial reuse opportunities although the conveyance line to the coast could be tapped into.
- All options but particularly 2a and 2b provide opportunities for additional treatment and beneficial reuse (eg Hunua dam recharge or purple pipe non potable reuse)

Appendix H Short List Workshop Participants

Participant	Organisation
Chris Allen	Watercare
Dean Lawrence	Watercare
Helen Jansen	Watercare
Iris Tscharntke	Watercare
Jonathan Piggot	Watercare
Michael Webster	Watercare
Nathaniel Wilson	Watercare
Priyan Perera	Watercare
Rory Buchanan	Watercare
Tanvir Bhamji	Watercare
Annmarie Halst	Watercare
Zaelene Maxwell Butler	Ngāi Tai ki Tāmaki
Revell Butler	Ngāi Tai ki Tāmaki
Luke Faithful	Mitchell Daysh
Andrew Slaney	Stantec
Sam Hewitt	Stantec
Jim Bradley	Stantec
Katja Huls	Stantec
Paula Hunter	Stantec
Sharu Delilkan	Stantec
Alan Pattle	PDP
Mark James	Aquatic Sciences
Padraig McNamara	Simpson Grierson
Warren Bangma	Simpson Grierson
Shane Kelly	Coast and Catchment

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