Nelson Wastewater Treatment Plant

Resource Consent Application

Assessment of Alternatives

PREPARED FOR Nelson City Council | August 2023

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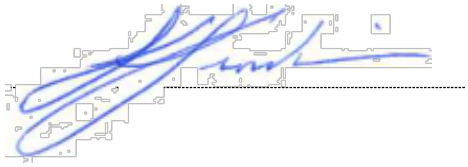
Steve Sinclair  09 August 2023

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Executive summary

Nelson City Council (NCC) is seeking consents for the ongoing discharge of treated wastewater from Nelson Wastewater Treatment Plant (NWWTP) that currently discharges to the south Tasman Bay via a marine outfall. The treatment process seeks to reduce the concentrations and loads of wastewater contaminants, which include solids, organics and microbial contaminants - bacteria, viruses and other potentially pathogenic organisms.

In preparing the future Resource Consent Applications and Assessment of Environmental Effects Report for the NWWTP, an assessment of alternatives was carried out under the requirements of the Resource Management Act (RMA) and the New Zealand Coastal Policy Statement. As part of the assessment of alternatives a Best Practicable Option approach, as defined in the RMA for determining the future option or combination of options for the NWWTP was adopted as a key objective for this project.

The definition of the Best Practicable Option (BPO) under the Resource Management Act 1991(RMA) is:

> *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*

In addition, the Nelson Resource Management Plan (NRMP) contains reference to the BPO and describes it in the same terms.

Policy direction in the coastal section of the NRMP, Policy CM6.7 treated sewage discharges, also requires that the method of wastewater treatment prior to the discharge into coastal waters adopts the best practicable option.

A sieving approach (Figure 0-1) has been used as part of this assessment of alternatives as it provides a robust methodology for determining a BPO for treated wastewater discharges from Nelson City that are currently conveyed to the NWWTP.

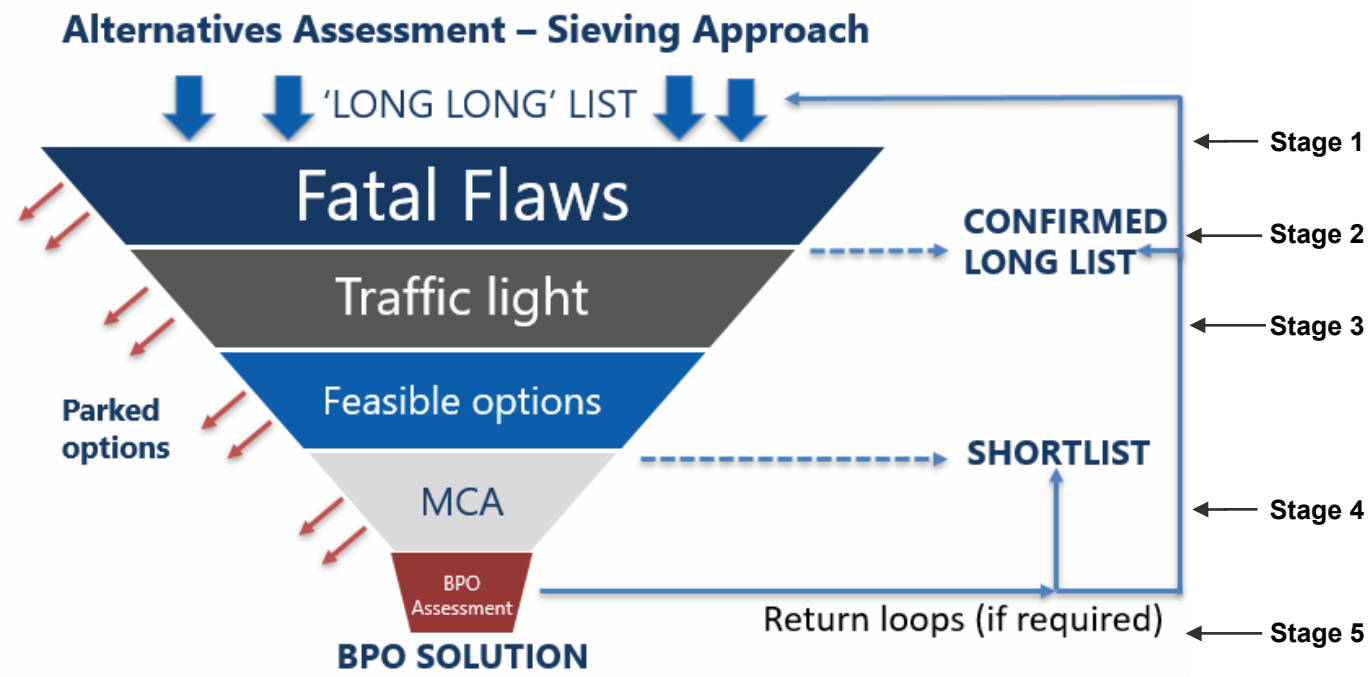

Figure 0-1: Assessment of alternatives – Iterative Approach

The alternatives assessment - sieving approach includes five key stages

Stage 1 involved the identification of all component parts of a total wastewater scheme to be considered and is known as the 'Long Long' list.

Stage 2 was a 'fatal flaw' assessment which was used to limit the number of options in the 'Long Long' list. The fatal flaw assessment removed options from the list that had a clear and significant defect which prevented the option from being considered as part of the BPO review. This took the 'Long Long List' to a confirmed "Long List'.

Stage 3 comprised a traffic light assessment which comparatively 'scored' each Long List option against multiple criteria using the three traffic light colours. It provided a simple and easily understood method for assessing and scoring a large number of options. Options which had more red scores, and fewer green scores, were less likely to progress to the BPO 'Short List' phase. Stage 3 resulted in a preliminary "Short List'.

Stage 4 of the assessment involved a Multi Criteria Assessment (MCA) of the preliminary Short List of options that had been identified from Stage 3. The MCA is a decision tool which assisted to further refine the preliminary Short List. The criteria used to compare the short listed options were able to be weighted in terms of their significance in meeting the project objectives. The MCA output then fed into Stage 5 that identified the BPO.

Stage 5 identified the BPO for the consent application(s) and duration sought.

It is noted from the sieving approach that if a very significant issue arises in the progressive evaluation of options, it can trigger the return loop back to fatal flaw assessment.

A primary focus of the RMA is managing the effects of activities on the environment. The Nelson region has a wide range of receiving environments that are potentially available. These include surface water (rivers and streams), the sea, land, groundwater, the district's water supply network (both potable and non-potable), a range of combinations of these, and other beneficial reuse options. As a result of Stages 1 and 2 a Long List of total wastewater scheme options (Figure 0-2) where identified and grouped into the following categories:

Figure 0-2: Summary of Long List of Schemes

A traffic light assessment (Stage 3) which comparatively 'scores' each Long List option against multiple criteria using the three traffic light colours was undertaken and the following short list of the nine representative schemes (Table 0-1) were identified from the confirmed Long List as part of stage 3 and brought forward to the Multi Criteria Assessment (MCA) process.

Table 0-1: Short List Options

Scheme ID	Summary of scheme
CURRENT SCHEME OPTIONS	
1	Current Scheme (Do Nothing Option)
1 OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of existing wetland areas
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS	
3	Current scheme with longer offshore outfall
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application
UPGRADED TREATMENT OPTIONS	
11OWD	Upgraded Treatment Mode One (further removal of solids/BOD/COD) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas
12 OWD	Upgraded Treatment Mode Two (further removal of pathogens) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas
13 OWD	Upgraded Treatment Mode Three (further removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland areas, additional odour management and modern offshore diffuser
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland areas and removal of the main oxidation pond.

Key:

O =	Odour management
W =	Wetland upgrade
D =	modern diffuser
-Ox =	Removal of oxidation pond
TSS	Total Suspended Solids
BOD	Biochemical Oxygen Demand ($cBOD_5$)
COD	Chemical Oxygen Demand

As part of the MCA, a variety of non-price criterion were identified to consider the environmental, social and cultural impact (both positive or negative) present by each of the options. These non-price criteria were based on the traffic light criterion and confirmed by the Working Group. Scoring and assessment in each criterion was undertaken by technical specialists using a proforma template.

Each of the nine schemes were then ranked in order of score where:

- 1 equals the highest scoring or lowest cost of the nine schemes in that category, and
- 9 equals the lowest scoring or the highest cost of the nine schemes in that category.

The non-price and price ranking for each scheme is shown in Table 0-2. As part of determining the BPO for NWWTP there needed to be a balance between price and non – price drivers. This became a key consideration in selecting the BPO. When combining the overall scores for non-price and price attribute scores each scheme's overall ranking is also shown in Table 0-2.

Table 0-2: Ranking of schemes in terms of non-price attributes and cost

Scheme ID	Description Summary	Non – price criterion rankings	Price Rankings	Overall ranking (including cost) of schemes
1	Current Scheme (Do Nothing Option)	8	1	8
1 OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of existing wetland areas	6	2	5
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS				
3	Current scheme with longer outfall	7	3	7
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	9	7	9
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	1	9	6
UPGRADED TREATMENT OPTIONS				
11OWD	Upgraded Treatment Mode One (further removal of solids/BOD/COD) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas	5	5	4
12 OWD	Upgraded Treatment Mode Two (further removal of pathogens) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas	4	4	**1**
13 OWD	Upgraded Treatment Mode Three (further removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland areas, additional odour management and modern offshore diffuser	3	6	2
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland areas and removal of the main oxidation pond.	2	8	3

The MCA assessment concludes that the best scheme in terms of the non-price criterion scores is considered to be Scheme 9a non-potable direct reuse with balance to land application. This is mainly driven by the higher level of treatment and the different discharge route (i.e. treated wastewater reused or applied to land rather than discharged to Tasman Bay). The second highest scoring scheme is 14 WD-Ox Upgraded Treatment Mode Four (removal of TSS/BOD/COD, pathogens and nutrients via a new treatment plant at the same site, with removal of the oxidation ponds), with the other three upgraded treatment options (retention of oxidation ponds with additional treatment process units) close behind.

The best scheme in terms of price scores was considered to be scheme 1, do nothing, as it is the lowest cost of all the options followed by the current scheme with a new modern outfall diffuser improve dispersion, upgrading/ planting of wetlands and improved odour management.

As part of determining the BPO for NWWTP there needs to be a balance between social, cultural, environmental, and financial drivers. When all criteria were weighted evenly, scheme 12 OWD - Upgraded Treatment Mode Two (removal of pathogens) with new modern outfall diffuser, upgrading/ planting of existing wetlands and improved odour management received the highest MCA score.

In determining the BPO, the following was considered:

- The output of the MCA, keeping in mind it is a decision tool,
- An assessment against project objectives and the practical elements arising from these objectives, and
- The RMA definition of BPO.

This assessment needs to balance the wide range of factors against costs and the case for investment. It also needs to acknowledge that nothing but a 100% of the time discharge to land of treated wastewater option or reuse will likely achieve cultural values, and therefore, ongoing engagement with iwi, tangata whenua and hapu to assess and manage the cultural health of the surrounding area is important.

In undertaking this robust and comprehensive process, the following BPO was identified for NWWTP and is based on option 12 OWD.

BPO for NWWTP

- Wastewater treatment to remain at its current location.
- Existing pre-treatment and pond / wetland system
- Existing marine pipeline and outfall diffuser with continuous discharge into the Tasman Bay
- New modern diffuser to replace existing outlet discharge structure at the end of the current marine outfall to be constructed as part of the renewals programme of the outfall.
- Upgrade and maintenance of planting around existing wetlands and swale, and surrounding NCC owned land throughout the life of the consent (in discussions with iwi and an agreed planting plan). Reviewed as part of ongoing Cultural heath indicator (CHI) monitoring or similar.
- Upgrade of odour control system to improve the air extraction capacity to draw more air from the wet well through the biofilter treatment and any other measures necessary to ensure compliance at the odour boundary identified.
- Ongoing pond health management by active pond management team and deploy appropriate mitigation measures when needed, to minimise risk of pond crashes and malodour.
- Improve treatment to reduce human norovirus concentrations and other pathogens within a 5- 10 year period if this is confirmed, through further testing and assessments, required to reduce the risk related to shellfish consumption.
- Monitor and, if needed, improve treatment to reduce TSS – this involves environmental monitoring to ensure compliance with consent conditions and periodic receiving environment surveys to assess any effects on the benthic community.
- Ongoing environment and cultural health monitoring programme (the frequency and scope to be confirmed with iwi)

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1 Introduction

The Nelson Wastewater Treatment Plant (NWWTP) has a number of resource consents associated with its operation, including a coastal permit that authorises the discharge of treated wastewater to the Tasman Bay which is due to expire 1 December 2024.

The NWWTP is located at Boulder Bank Drive, Nelson, is owned by Nelson City Council (NCC) and has been operated by Nelmac since 2011. The NWWTP receives wastewater from the northern catchment of Nelson City, which is primarily residential with a small percentage of commercial/industrial discharges. The NWWTP is an oxidation pond-based treatment system, comprising preliminary treatment (grit removal and screening), pre-treatment (clarification and trickling filter used as required), facultative pond, maturation pond and wetland system.

Treated wastewater is discharged via an ocean outfall into Tasman Bay. The treatment process seeks to reduce the concentrations and loads of wastewater contaminants, which include solids, organics and microbial contaminants - bacteria, viruses and other potentially pathogenic organisms.

NCC requires new consents to continue to operate the NWWTP. In preparing the Resource Consent Applications and Assessment of Environmental Effects (AEE) Report for the renewal consent, an assessment of alternatives must be carried out under the requirements of the Resource Management Act 1991 (RMA), and also if the discharge is to the Coastal Marine Area (CMA), the New Zealand Coastal Policy Statement 2010 (NZCPS).

Clause 6(1)(a) of Schedule 4 of the RMA requires that where it is likely that an activity will result in any significant adverse effect on the environment, a description of any possible alternative locations or methods for the undertaking of the activity should be included. Section 105(1)(c) of the RMA requires that the consent authority must have regard to, in addition to matters in section 104(1), any possible alternative methods of discharge, including discharge into any other receiving environments e.g. land, freshwater, etc (regardless of whether the effects of the discharge are significant or not).

While the RMA states “any possible alternative” there is case law that confirms not all possible alternatives need to be considered, but that a robust alternatives process has been used and is defensible. In this respect, the approach Stantec follows is to identify like groups of alternatives and work through each group by evaluating in appropriate detail a representative alternative within that group. This approach has been successfully applied in many similar projects and accepted by consent applicant clients, consent authorities, their independent decision-making commissioners and the Environment Court.

Policy 23(2)(b) (Discharge of Contaminants) of the NZCPS also requires that, in terms of managing discharge of human sewage, in order to not allow the discharge of treated human sewage to water in the coastal environment unless there has been an adequate consideration of alternative methods, sites and routes for undertaking the discharge and these have been informed by an understanding of tāngata whenua values and the effects on them.

Figure 1-1 shows the assessment of alternatives process within the project’s overall consenting timeline of events.

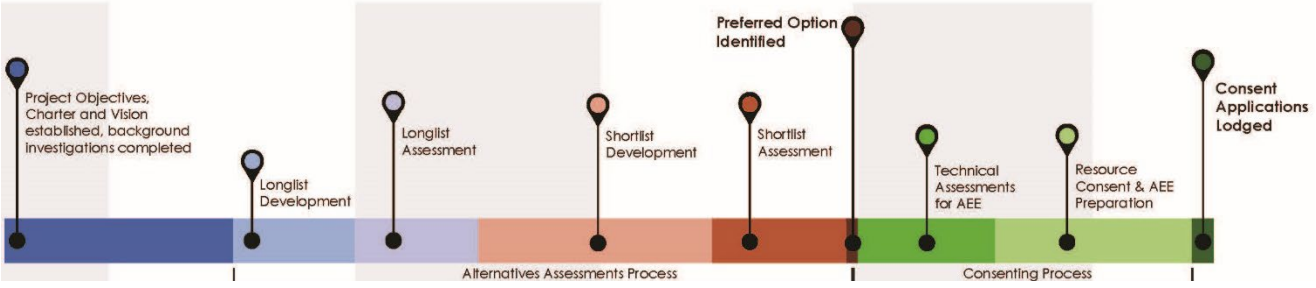

Figure 1-1: Overall alternatives assessment process

The renewal consents required for the NWWTP is a very important and strategic project for NCC. The Nelson City Council Long Term Plan 2018 – 2028 states: ‘The preferred approach is to keep this infrastructure in place and to gain a 35-year resource consent for its future operation.’[1]

[1] http://www.nelson.govt.nz/assets/Our-council/Downloads/Plans-strategies-policies/strategies-plans-policies/long-term-plan-2018-28/Long-Term-Plan-2018-28-July19-single-pages.pdf

1.1 Council's Vision and Community Outcomes

In undertaking the assessment of alternatives, it is important to start with a Councils vision then work through outcomes, drivers, goals and objectives.

The Nelson City Council Long Term Plan (**LTP**) 2018 – 2028 sets out NCC's vison as:

"Nelson is the Smart Little City: Whakatū Tōrire".

This is further defined as "Nelson is a vibrant place where we are deeply connected with, and committed to, our natural, social and cultural environment. Clever business and innovation help us thrive. We enjoy living fulfilled lives in smart, sustainable communities". Its mission is that "we leverage our resources to shape an exceptional place to live, work and play."

This is supported by the following eight community outcomes:

- Our unique natural environment is healthy and protected
- Our urban and rural environments are people-friendly, well planned and sustainably managed
- Our infrastructure is efficient, cost effective and meets current and future needs
- Our communities are healthy, safe, inclusive and resilient
- Our communities have opportunities to celebrate and explore their heritage, identity and creativity
- Our communities have access to a range of social, educational and recreational facilities and activities
- Our council provides leadership and fosters partnerships, a regional perspective, and community engagement
- Our region is supported by an innovative and sustainable economy

In terms of infrastructure development NCC notes that "Nelson City relies on its good quality, sustainable, affordable and resilient infrastructure network which supports a growing population and strong regional economy. NCC have committed to investing in wastewater, storm water, solid waste and flood protection networks to keep our people safe and healthy, the environment protected and the economy flourishing. Key city assets need ongoing maintenance and replacement so the community can depend on these essential utilities. Council is putting essential infrastructure at the forefront to future-proof our city."

As also set out in the LTP, "Nelson is recognised as a place of stunning natural beauty and we treasure, protect and restore our special places, landscapes, native species and natural ecosystems. Council through the LTP recognises investing in the environment is essential for our future. NCC also recognise the kaitiakitanga (guardianship) role of tangata whenua iwi.

A healthy environment underpins the health of our community and the way people enjoy Nelson, supports the economy and means we have functioning ecosystems to support our treasured species. Responding to climate change and growing our community's resilience to the more extreme weather events it will bring is a top priority".

There is no statutory requirement under the Resource Management Act 1991 for project objectives to be taken into consideration in any decision-making process for resource consent applications[2]. Given the importance of the project, however, key project drivers were identified and project goal and objectives developed to assist in guiding the project through to completion.

1.2 Key Project Drivers

An important early step in this consenting project is developing a Project Vision, Goal and Objectives that encompass Councils' overarching vision and community outcomes, identifying project drivers and themes, incorporating a best practicable option approach and ensuring consistency with the statutory Resource Management Act 1991 (RMA) requirements.

Underpinning the project vision, emerging goal and project objectives, is a series of key strategic project drivers being:

- Obtaining consents in a timely fashion to ensure the NWWTP can remain operational, after the existing consents expire providing it is found appropriate to continue with the NWWTP;

[2] Note section 171(1)(c) of the RMA in respect of designations requires the consideration of *"whether the work and designation are reasonably necessary for achieving the objectives of the requiring authority (NCC) for which the designation is sought".*

- Obtaining long term regional consents to provide long term security of operation, and that it considers the high level of financial investment of the NWWTP;
- Workable conditions of consent which allow operation of the NWWTP generally in accordance with current and best practices, while minimising ongoing compliance costs;
- Consideration of climate change and sea level rise;
- Consideration of the wider wastewater network and the potential for upgrades and/or replacement of assets such as pipes and/or pump stations.
- Managing cost expenditure and resources for the consenting programme;
- Partnering with Te Tau Ihu iwi, working collaboratively throughout the project; and
- Maintaining good relationships with the local community and other stakeholders.

The project site is within the boundaries of the Wakapuaka Block which was the subject of a number of Treaty of Waitangi grievances based on the inappropriate sale of land and granting of titles by the Crown in the latter half of the nineteenth century and the redress applied subsequent to that period because of fragmented land titles.

The wastewater plant discharges treated wastewater into a coastal marine area (CMA) where mahinga kai has traditionally occurred. The area also encompasses a popular recreation area and internationally significant geological and ecological features including a valuable wetland and former salt marsh that would once allowed for the transport of tuna and other fish species as well as attracting birds and other biota.

Iwi management plans are available on individual iwi and NCC websites and the project seeks to give due consideration to the direction provide by all the iwi management plans for the region. Each plan demonstrates extensive mātauranga Māori, from fisheries management to mineral extraction. The direction provided by these plans, and Cultural Health Indicator (CHI) monitoring, are key project drivers in providing some context for setting project goals and objectives.

Based on these plans there is a preference within the project to:

- improve the site's ability to support customary practices, such as mahinga kai, mahinga toi and mahinga rongoā (gathering supplies for food, arts and medicine);
- protect flora and fauna during any proposed works, including working with partners to transfer plants from one part of the site to another; and
- identify any historic values associated with cultural practices and collaborate with Te Tau Ihu iwi to reflect those values into any proposed works, naming approaches, cultural story telling or cultural monitoring initiatives.

1.3 Project Vision, Goal and Objectives

The following vision statement has been developed for the project:

Vision

Management of the city's wastewater incorporating a Best Practicable Option (BPO)[5] approach to enable growth, protect and enhance the environment and contribute to improving the health and mauri of Tasman Bay and Nelson Haven.

The project themes and project drivers provide the basis for the following emerging 'goal' for this reconsent project, while incorporating the overall status of the existing NWWTP, balancing the four well-beings[3], as stipulated with the Local Government Act 2002, and the Resource Management Act 1991 provisions, including views expressed during consultation and the final BPO solution:

Emerging Goal

"To cost-effectively prepare a high quality and robust resource consent application that transparently articulates the case persuasively for obtaining consents for any budgeted upgrade and continued operation and maintenance of the Nelson Waste WWTP for a long term period of 35 years within the current funding framework of the Council's LTP subject to the outcomes of consultation and analysis of alternatives."

[3] Section 10(1) (b) 'to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future.'
[5] BPO as defined in the Resource Management Act 1991

To achieve the project vision and emerging goal the following objectives have been developed for this project:

Objective 1	To recognise the importance of cultural values by working in partnership with the community, key stakeholders, and tāngata whenua to ensure a wastewater treatment and discharge solution that: ○ Provides for current and future community well-being, health and safety. ○ Ensures acceptable environmental and cultural effects.
Objective 2	To obtain long term consents that provide certainty for planned future population and industrial/commercial growth and security for ongoing investment in the infrastructure.
Objective 3	To provide a solution that is the Best Practicable Option (BPO) for the treatment and discharge of the wastewater.
Objective 4	To ensure that the option selected is serviceable, easily operational, and economically affordable for the Nelson Community and achieves efficient use of existing infrastructure.
Objective 5	To obtain reasonable and practical consent conditions in terms of treated wastewater quality that can be achieved in the short, medium, and longer terms.
Objective 6	To ensure that the treated wastewater discharge has no more than minor adverse effects on the receiving environments.

These project goal and objectives reflect NCC's regulatory requirements, strategic goals and corporate responsibilities while recognising the wider economic, social, environmental, and cultural context of the project.

The purpose of this report is to summarise the work that has been carried out as part of the alternatives assessment approach in identifying the BPO for treated wastewater discharges from Nelson City that are currently conveyed to the NWWTP.

2 Assessment of Alternatives Process

As part of the assessment of alternatives the adoption of a Best Practicable Option (BPO) approach for determining the future option or combination of options for the NWWTP was undertaken.

A BPO approach has in recent years been used by a number of local authorities in their wastewater consenting projects in assessing options and working with tāngata whenua, key stakeholders and other communities of interests in determining the most appropriate solution. Furthermore, the Nelson Resource Management Plan – Policy CM6.7 requires a BPO to be undertaken in respect to of the method of treatment prior to discharge. This requirement further strengthens the adoption of a BPO approach for the entire scheme for which new consents are being sought. The Consent Strategy further elaborates on this requirement.

The definition of the Best Practicable Option (BPO) under the Resource Management Act 1991 (RMA) is:

> *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*
>
> *d) the nature of the discharge or emission and the sensitivity of the receiving environment to adverse effects; and*
>
> *e) the financial implications, and the effects on the environment, of that option when compared with other options; and*
>
> *f) the current state of technical knowledge and the likelihood that the option can be successfully applied*

In addition, the Nelson Resource Management Plan (NRMP) contains reference to the BPO and describes it in the same terms. the Nelson Resource Management Plan – Policy CM6.7 requires *a BPO to be undertaken in respect to of the method of treatment prior to discharge*.

Such an approach is particularly relevant to this wastewater project as it brings in the sensitivity of the receiving environment, be it coastal waters, land, freshwater, groundwater or air, the financial implications of the project as compared to other options, and it also brings in assessment of the state of technical knowledge. These key components are all well embodied in the RMA's interpretation of the BPO as set out above.

Figure 2-1 shows the iterative stages that was used in this project to "sieve" or narrow down a 'Long Long' list of possible options available in order to identify the BPO.

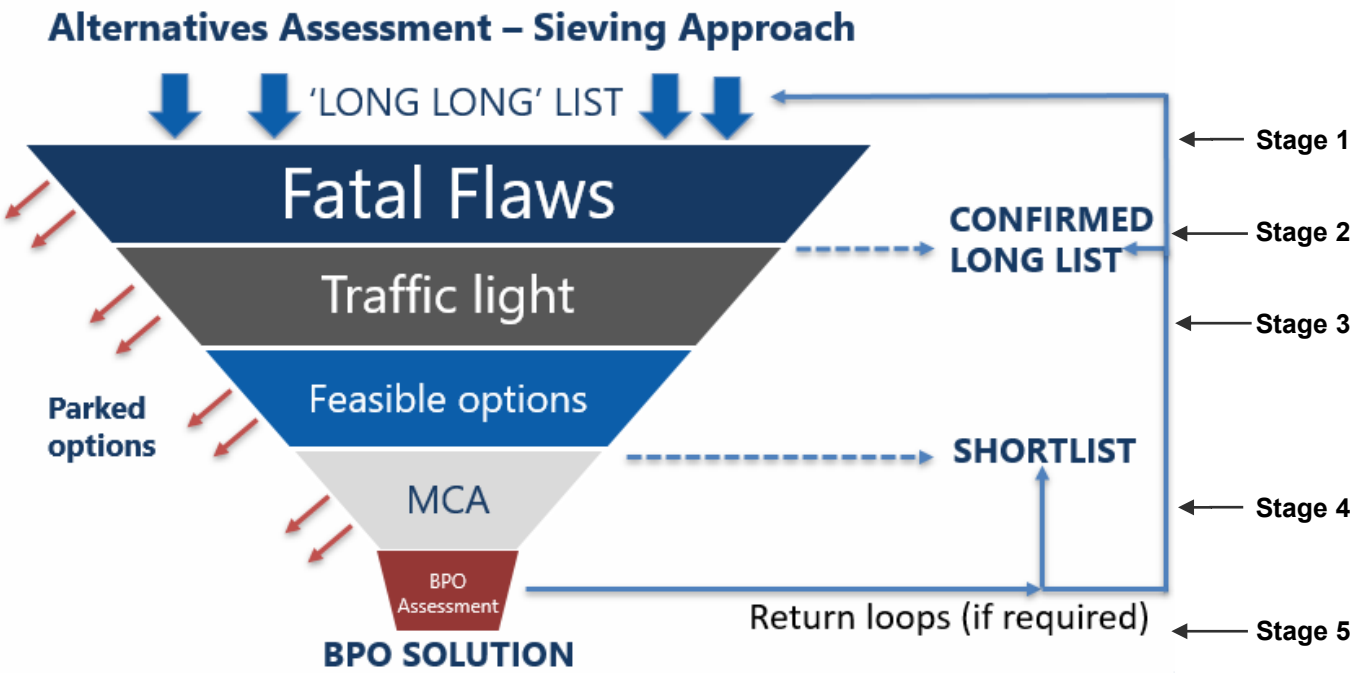

Figure 2-1: Assessment of alternatives – Iterative Approach

The alternatives assessment - sieving approach includes five key stages.

Stage 1 is the identification of all component parts of a total wastewater scheme to be considered and is known as the 'Long Long' list.

Stage 2 is the 'fatal flaw' assessment which is used to limit the number of options in the 'Long Long' list. The fatal flaw assessment will remove options from the list that have a clear and significant defect which prevents the option from being considered as part of the BPO review. This takes the 'Long Long' list to a confirmed "Long List'

Stage 3 comprises a traffic light assessment which comparatively 'scores' each longlist option against multiple criteria using the three traffic light colours. It provides a simple and easily understood method for assessing and scoring a large number of options, i.e. a longlist. Options which have more red scores, and fewer green scores are less likely to progress to the BPO Review shortlist phase. This takes the 'Long List' to a "Short List' by identifying most sustainable options.

Stage 4 of the assessment is a Multi Criteria Assessment (MCA) of the preliminary shortlist of options that has been identified from the traffic light assessment. The MCA is a decision tool which will assist to further refine the preliminary shortlist, should many options achieve similar scores in the traffic light assessment by providing scores for multiple criteria. These criteria may also be weighted in terms of their significance in meeting the project objectives. The MCA output then feeds into stage 5 that identifies the BPO.

Stage 5 identifies the best option or combination of options to be the BPO for the consent application(s) and duration(s) sought.

It is noted from the sieving approach, that if a very significant issue arises in the progressive evaluation of options, it can trigger the return loop back to fatal flaw assessment.

3 Stage 1- The 'Long Long' List

3.1 Developing Options (Alternatives)

A primary focus of the RMA is managing the effects of activities on the environment. The Nelson region has a wide range of receiving environments that are potentially available. These include surface water (rivers and streams), the sea, land, groundwater, the District's water supply network (both potable and non-potable) and other beneficial reuse options.

Figure 3-1 provides an overview of the stages of the wastewater management process for which alternatives are available. This figure also highlights that a total wastewater scheme is made up of a number of component parts. These parts all need to be considered in a consenting project like this one.

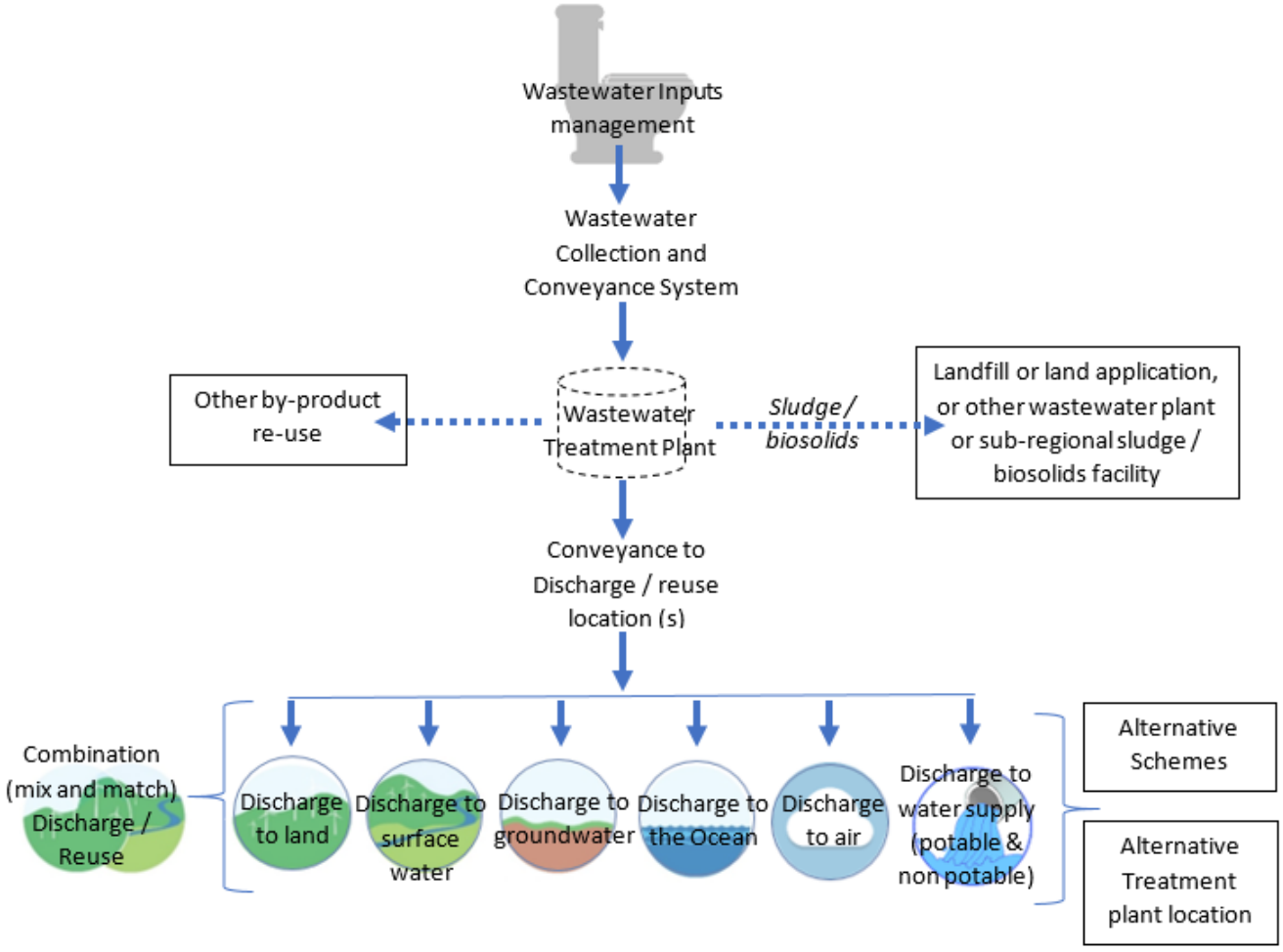

Figure 3-1: Stages of the wastewater management process

To provide a starting point to which alternatives can be identified and then grouped a draft 'long long' list of options relating to each of these potential receiving environments was identified as stage 1 of the sieving process. It is also of note that there are elements that can be incorporated into all options. These include alternative treatment plant locations, wastewater inputs management, inflow and infiltration programmes, resource recovery and beneficial re-use of treated wastewater.

3.2 Previous Alternatives considered.

In developing the 'long long' list previous alternatives considered where also reviewed. The NWWTP Resource Consent Applications and Assessment of Environmental Effects prepared in 2003 assessed several alternatives for both treatment and disposal of wastewater and evaluated the options by considering a range of factors including:

- The location of the treated wastewater disposal site and the nature and sensitivity of the receiving environment
- The standard of treatment required
- The economic impact of the options including both capital and ongoing costs
- The cultural acceptability of the options

Three supporting Issue and Options reports (1999, 2001 and supplementary reporting 2003) were prepared by consultants Duffill Watts & Tse Ltd as part of the original application. These reports are referenced in the 2003 AEE and provide further detail on each of the alternative options considered and the associated costs. The options focused mainly on new treatment technologies. Various options were also considered for the disposal of treated wastewater to land, but discarded at the time due to high cost and limited available land.

The alternative options assessed as part of the 2003 consent application are provided in full in Appendix B to this report and summarized below in Figure 3-2:

Figure 3-2: Summary of alternative options considered for NWWTP in 2003

Discharge of treated wastewater options

- To land, with onward disposal by runoff to inland waterways, seepage to groundwater or evapotranspiration
- To sea via estuaries, coastal lagoons, coastal discharges or submarine discharges.
- Inland waterways (streams, rivers or lakes)
- Wastewater re-use

Modification of the existing oxidation pond and additional of treatment options

- Decommissioning of ponds and construction of a new stand-alone treatment plant at Wakapuaka (only a limited number of stand-alone treatment plant options were compared as it was considered there were a number of "black-box" variations that would all fall in the same range of costs)
- Decommissioning of ponds and the diversion of all wastewater to the Bell Island WWTP

Pond Based options

- Primary treatment options (to achieve reliable facultative pond performance)
- Secondary treatment options following the facultative pond (to improve effluent quality paraments for discharge into the sea)

New Plant options

- New wastewater treatment plant to be built to replace in part the oxidation pond system

The BPO for the NWWTP in 2003 was decided to be the division of the existing oxidation pond into separate facultative and maturation compartments, and to construct a pretreatment facility to manipulate loading on the facultative compartment according to conditions. Pre-screening, flow buffering (to mitigate the effect of high rainfall flows and loading) and a combination of a clarifier followed by a trickling filter was identified as the most cost-effective means of achieving the desired pre-treatment (NWWTP resource consent application, 2003) and was also installed.

As part of the engagement with iwi the construction of wetlands in 2010 was also developed following the upgrade to the NWWTP.

3.3 The new draft 'Long Long' List of components

While some of the alternative technologies and disposal / discharge options considered as part of the 2003 resource consent application were added when the NWWTP was upgraded in 2007 – 2009 others were discounted at the time.

With changes in technology over time and an increase in the level of treatment needed to meet current and future legislation a technology deemed too expensive in 2003 may now be feasible. Therefore, it was considered important that any of the alternative schemes identified in 2003, and not implemented, be reconsidered as part of this assessment of alternatives. This is along with new options incorporating technology to achieve higher levels of treatment, modern

approaches to environmental management and operations, sustainability and meeting community and tāngata whenua requirements as far as possible.

The approach to developing a 'long long' list of components has been to base the level of treatment provided by an individual scheme to achieve an acceptable treated wastewater quality for the receiving environments to which the treated wastewater is discharged and / or beneficially reused. This effects driven approach follows the fundamental basis of the RMA in terms of an effects driven solution. Once a treated wastewater quality is established for a given receiving environment and/or beneficial reuse, the appropriate treatment process or processes are then determined in terms of developing a sustainable solution.

In addition, various categories or groupings were developed which involve one, or a combination of receiving environments (100% to ocean discharge options with various treatments upfront, 100% to land discharge options with various treatments upfront, a combination of ocean and land discharge options etc.) and various options involving degrees of beneficial reuse of treated wastewater.

The full 'Long Long' list of alternative components (options) considered as part of this consent application are provided in Appendix B to this report and summarized below in Figure 3-3. In total 90 individual component parts were identified as part of the 'long long' list. These encompase the various stages of the total wastewater scheme as shown in Figure 3-1.

Figure 3-3: Summary of alternative options considered as part of this report.

1. Untreated wastewater collection and management (These apply to all wastewater treatment and discharge / reuse schemes)

2. Wastewater inputs management (These apply to all wastewater treatment and discharge / reuse schemes)

3. Producing less wastewater (Apply to all wastewater treatment and discharge / reuse schemes)

4. Alternative Wastewater Treatment Plant location(s)

5. Alternative levels of treated wastewater and related types of Treatment Processes (Note each treatment option requires specific odour management consideration.)
    - Existing level of treatment
    - Improved treatment through changes to the ponds and or wetlands
    - Improved suspended solids removal
    - Improved BOD/ COD removal
    - Improved Ammonia removal (Nitrification)
    - Improved total nitrogen removal (Nitrification / Denitrification)
    - Improved phosphorus removal
    - Microbiological / pathogen removal
    - Emerging Contaminants and other contaminants of concern (e.g. heavy metals, organic compounds)
    - Reclaimed water standards - non-potable direct reuse
    - Reclaimed water standard – potable direct reuse (NZDW supply quality)
    - Managed Aquifer Recharge (MAR)for supplementing groundwater supply

6. Discharge of treated wastewater (Note – some combinations are included in the alternative discharge options above)
    - Discharge to a river / stream (surface water)
    - Discharge to Groundwater
    - Discharge to the Coastal Marine Area (CMA)
    - Discharge to air
    - Discharge to land (land application)
    - Wetland / land passage singly or jointly
    - Combination options of above discharge options.

7. Resource recovery / Beneficial reuse

4 Stage 2 – The Long List

4.1 Fatal Flaw Assessment

The process for assessing the various components and the alternative total schemes through the first stage of the sieving process is illustrated in Figure 4-1.

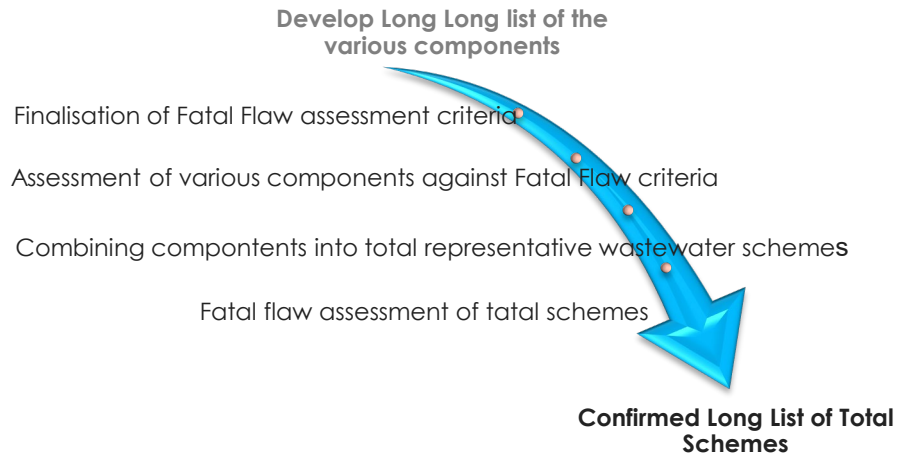

Figure 4-1: Fatal flaw assessment stages

This is an iterative process in which a list of fatal flaw criteria is determined, and the various wastewater components assessed against these criteria. The remaining components are then combined into total schemes and these schemes are also assessed against the same fatal flaw criteria. As shown in Figure 2-1 the iterative assessment of alternatives process (sieving diagram) provides opportunities for the “return loops” if in developing total representative schemes and component part needs revisiting.

Criteria considered as part of this assessment included:

- Significant increase in public health risk
- Significant increase in adverse environmental and/or cultural and/or social effects on the Tasman Bay or Nelson Haven
- Unproven technology
- Prevents growth and economic development
- Absolutely un-consentable under the RMA
- Does not meet statutory compliance limits
- Significant difficulty with constructability
- Whole-of-life costs are unaffordable.

In addition to the above list, NCC has committed to “adopting the five-year emissions reductions budgets as confirmed by government in 2021 as a way of ensuring NCC takes early and substantive action towards achieving carbon neutral status with measurable positive changes by 2025. NCC has adopted the Government targets for Council’s own greenhouse gas emissions reductions (i.e., net zero emissions of all GHGs other than biogenic methane by 2050, and a 24 to 47 per cent reduction below 2017 biogenic methane emissions by 2050, including 10 per cent reduction below 2017 biogenic methane emissions by 2030)”.

These criteria have been rationalised down to a limited number as set out in Table 4.1, taking into account the project vision, emerging goal and objectives developed as set out in section 1. These also, appropriately, embrace all of the four well-beings that reflect good local government as expressed in the Local Government Act 2002, s 10(1)(b).

4.1.1 Rationalised Fatal Flaw Criteria

Options should only be identified as being fatally flawed where it is clear they cannot meet the refined fatal flaw criteria set out in Table 4-1 below, taking into account the project vision, emerging goal and objectives, the consenting strategy and the four well-beings expressed in the Local Government Act 2002.

Table 4-1: Assessment to determine if fatal flaw.

Item	Criteria to be considered		Assessment to determine if Fatal Flaw
1	Significant increase in public health risk		Degree of public exposure to health risks relating to the treated wastewater discharge (including through land application or re-use options). Addressed at this stage by item 2 – statutory compliance
2	Un-consentable under the RMA		Fatal flaw if option does not meet statutory compliance limits (e.g. RMA, LGA, Health Act, NRMP, NPS's, NES's, NZCPS, NPSFW 2017 (2020) existing consents or other new statutory requirements)
3	Significant increase in adverse environmental and/or cultural and/or social effects on the Tasman Bay / Nelson Haven or in alternative receiving environment(s).	Natural Environment	Potential and actual adverse environmental effects on the receiving environment, particularly in relation to water quality, soils, aquatic ecology and terrestrial ecology. Environmental effects (Natural environment) to form part of the criteria in the traffic light process and MCA.
		Māori Cultural Values	Fatal flaw if waahi tapu located on areas identified as potentially feasible as new discharge locations.
			Other cultural principals, values and cultural health indicators and potential adverse effects on the mauri of natural resources, on kai moana, and on the relationship of Māori, their cultures and traditions, with ancestral lands, water, sites, waahi tapu and other taonga to form part of the traffic light and MCA assessment process.
		Social and Community Considerations	Social and community values to form part of the criteria in the traffic light process and MCA.
4	Affordable and efficient.		Whole-of-life costs are unaffordable as assessed against LGA 2002, section 101 Financial management and NCC's financing limitations. The financial implications in terms of item b of the definition of BPO of the RMA are unacceptable. Both these items will form part of the criteria in the traffic light process and MCA.
5	Technology and Infrastructure		Fatal flaw if the use of significant amount of existing infrastructure that has a remaining useful life is not maximised.
			Other areas relating to technology efficiencies to form part of the criteria in the traffic light process and MCA.
6	Receiving Environment		Fatal flaw if receiving environment option is not feasible.
7	Resilience		The emerging goal looks to consent the existing plant and there are ways to engineer against flooding and Sea Level Rise (SLR) until a decision is made on a longer-term location.
8	Prevents growth and economic development		Fatal flaw if unable to accommodate the anticipated growth of population and commercial / industrial development for the consent(s) duration(s) sought.
9	Carbon / GHG Emissions		Fatal flaw if results in significant increase in carbon / GHG emissions that cannot be off set within the option or as part of Council's wider emissions reduction programme.
			Extent of carbon / GHG emission or reduction provided by an option to form part of the criteria in the traffic light process and MCA.

4.2 Fatal Flaw assessment

It is recognised that there is overlap between some of the fatal flaw criteria. However, this is not considered to be problematic as the fatal flaw analysis is not a scoring exercise. Instead, each component and total schemes / options was considered separately against each criterion. If a component or total schemes / options are fatally flawed in relation to a single criterion it is, then removed from the longlist.

Based on the fatal flaw criteria marked in red in Table 4-1, Figure 4-2 provides a summary of the components considered to be fatally flawed as an alternative for NWWTP at this stage, developments in technology and changes in legislation and statutory requirements may allow this to be reconsidered in the future. The full fatal flaw assessment is provided in Appendix C to this report.

Figure 4-2: Summary of component parts considered to have a fatal flaw as an alternative for NWWTP

Options were only identified as being fatally flawed (highlighted in red in Table C-1 in Appendix C to this report) where it is clear they cannot meet the fatal flaw criteria. If there is doubt or uncertainty these have been carried through to the long list of schemes. These are then assessed against further criteria in a Stage 3 - traffic light exercise in order to refine the list to a short list of options. This is discussed further in section 5. To allow for a diverse range in options to be considered financial implications were not deemed a fatal flaw at this stage but agreed to be assessed later in the process.

4.3 Combining Components into a Long List of Total Schemes

A primary focus of the RMA is managing the effects of activities on the receiving environments. The Nelson region has a wide range of receiving environments that are potentially available. These include surface water (rivers and streams), the sea, land, groundwater, the district's water supply network (both potable and non-potable), a range of combinations of these, and other beneficial reuse options.

To ensure a logical approach to building up feasible total wastewater schemes, the following key scheme components or building blocks were incorporated into each individual scheme option:

Collection System or Local Wastewater Network: for the collection of wastewater from properties and conveyance to a wastewater treatment plant or to a common point for connection to a conveyance system.

Conveyance System: for the conveyance of raw wastewater from a collection system to a wastewater treatment plant and from the treatment plant to discharge/reuse location(s).

Treatment Process: for the reduction of contaminant levels to meet standards required for reuse and/or discharge to the environment. The disposal/reuse of sludge/biosolids arising from the treatment process is also required.

Discharge/reuse of treated wastewater. This normally also requires a conveyance system from the WWTP to the discharge location. The main treated wastewater discharge options are identified as:

- To land
- To surface water
- To groundwater
- To coastal water
- Beneficial reuse other than to land
- Combinations of the above.

At this stage of the assessment of alternatives process total wastewater schemes have been developed, to the extent the effects assessments has been able to be undertaken, on an acceptable treated wastewater quality for the receiving environments to which the treated wastewater is to be discharged and / or beneficially reused.

The Long List of total wastewater scheme options can be grouped into the following categories (Figure 4-3):

Figure 4-3: Summary of Long List of Schemes

A full copy of the Long List scheme options, including the discharge location, treatment regime required, and any new infrastructure needed is provided in Appendix D to this report and summarized in sections 4.3.1 to 4.3.5 below. A coded numbering system for the wide range of options considered was used for ease of identification and cross referenced as part of the summary of each alternative in brackets below. Where 'O' refers to improved odour management, 'W' refers to wetland planting, 'D' refers to a new modern diffuser, and Ox refers to the oxidation ponds.

4.3.1 Current Scheme Options

In line with project Objective 2 that recognizes the ongoing investment in the NWWTP and wastewater network infrastructure. The current scheme options look to maximise use of the existing NWWTP infrastructure at its current location and includes:

Current Scheme (Option 1)

The current scheme or 'Do Nothing' option maintains the existing NWWTP through an ongoing operational and maintenance programme but does not allow for the construction of any new infrastructure. The current scheme is an oxidation pond-based treatment system, comprising preliminary treatment (grit removal and screening), pre-treatment (clarification and trickling filter used as required), facultative pond, maturation pond and wetland system. Treated wastewater is continuously discharged through a pipeline and outfall diffuser structure which extends ~380 m from Mean High Water Spring (MHWS) into Tasman Bay at a depth of 13.5m.

Current Scheme with upgrading/ planting of Wetlands (Option 1W)

This alternative option combines the current NWWTP scheme (Option 1) with enhancement of the wetlands and surrounding area to enhance the habitat around the wetlands for birdlife and improve the biodiversity and cultural health of the Hillwood Strems and surrounding area. This includes the ongoing CHI monitoring, provided to the project by iwi and incorporation of recommendations, where possible, into the NWWTP operation and capital works programme. This option assumes the implementation of an ongoing planting programme, to replicate existing mosiac of wetland/saltmarsh vegetation, provide for the restoration of te taiao and cultural knowledge and practices, and provide habitat for local native species including fernbirds.

Current Scheme with new modern diffuser section on existing outfall (Option 1D)

This option combines the current NWWTP scheme (Option 1) with the replacement of the existing diffuser structure with new modern diffuser to ensure that the treated wastewater discharge will be better mixed on discharge and therefore within the receiving waters of Tasman Bay.

Current Scheme with new modern diffuser and upgrading/ planting of Wetlands (Option 1WD)

This option combines the current NWWTP scheme (Option 1) with enhancement of wetland planting and surrounding areas (Option 1W) and the upgrade of the current discharge outfall to include a new modern diffuser (Option 1D).

Current Scheme with improved odour management (Option 1OD)

This option combines the current NWWTP scheme (Option 1) and the upgrade of the current discharge outfall to include a new modern diffuser (Option 1D) with improvements to the NWWTP odour management technologies and procedures to ensure compliance at the site's odour management boundary. Enhanced of odour management techniques include but are not limited to:

- Additional foul air collection and treatment in biofilters
- Chemical scrubbing of foul air
- Activated carbon
- Further or additional pond aeration and or management
- Further pond crash mitigation techniques

Current Scheme with improved odour management, new modern diffuser and enhanced wetland planting (Option 1OWD)

This option combines the current NWWTP scheme (Option 1) with enhancement of wetland planting and surrounding areas (Option 1W), the upgrade of the current discharge outfall to include a new modern diffuser (Option 1D) and improved odour management techniques (Option 1O) if required to ensure compliance.

4.3.2 Current Scheme with Alternative Discharge Regime / Location Options

Current Scheme with outgoing tidal discharge (Option 2)

This option combines the current NWWTP scheme (Option 1) with a tidal discharge control facility after wetlands with the aim of providing greater dilution/dispersion of the treated wastewater discharge and directing the wastewater further away from shore on an outgoing tide.

Current scheme with longer outfall (Option 3)

This option combines the current NWWTP scheme (Option 1) with a longer outfall out into Tasman Bay discharging at greater depth with the aim of providing Improved dilution/dispersion of the treated wastewater discharge and greater protection of marine waters and shoreline.

Options 4 - 8

Land Application (**LA**) is the irrigation/discharge of treated wastewater to land. The treated wastewater is typically moved by gravity or pump via a pipe network to a land-application area. Discharge via land application occurs, typically onto a selected commercial cropping system (can also include forestry), where the treated wastewater and nutrients aid in crop growth via evapotranspiration processes. Within the soil, bacterial and geochemical processes can also add another element of 'treatment'. There are a variety of methods that LA schemes can adopt including spray irrigation, surface drip irrigation, gravity soakage beds, or subsurface systems such as dripline of low-pressure wastewater distribution beds.

For LA landowner agreements are needed if land is not owned by Council and there are other complexities such as groundwater protection, planning requirements, consents and designation, seepage and soil porosity decreasing over time, and spray drift if surface irrigation is used, Limitations on land use e.g., dairy, loss of good productive soils and land for housing and climate change that all need to be considered.

Consultants PDP was engaged to assist with identifying potential options for Land Application (LA) and Managed Aquifer Recharge (MAR). This was a technical feasibility study only, no specific input regarding the suitability of the five areas, from a cultural or heritage perspective, was sought at the time. It was calculated that a year-round land application scheme for NWWTP would require an active irrigation area of the order of 1,750 ha. The total area would be larger to account for buffer areas and practical coverage inefficiencies. Incorporating a typical 30% buffer allowance, this would equate to ~2,500 ha of land in total.

The preliminary assessment identified five generalised areas which were considered potentially feasible for LA discharge schemes as shown in Figure 7-4. An additional area(s) such as golf courses and/or open recreational areas - were also identified as potential existing freshwater irrigators and/or land uses that could benefit from re-use of a treated wastewater stream.

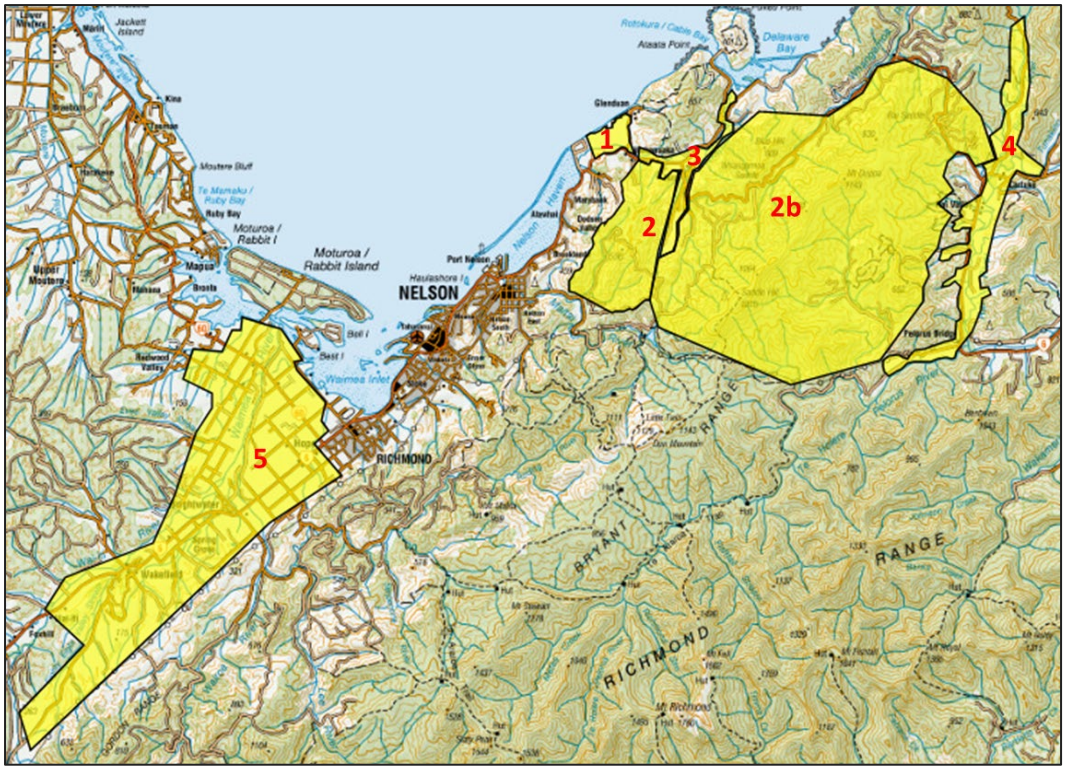

Figure 7-4: Locations of Potentially Feasible LA Areas 1 – 5

Key:

- LA Area 1 – Wakapuaka Flats:
- LA Area 2 and 2b – Hira Forest and Rai Forest (respectively):
- LA Area 3 – Eastern Valleys:
- LA Area 4 – Rai Valley:
- LA Area 5 – Waimea Plains:

Four land application options were considered for feasible for LA of wastewater from NWWTP. These are as follows:

Current scheme with All to Land Application (LA) *Year-Round Forestry Scheme – Hira and Rai Forests* (Option 4)

This option combines the current NWWTP scheme with a new discharge regime located within LA Area 2 in Figure 7-4 on steeply inclined slopes where irrigation of average daily flow to a forestry scheme, year-round has been assumed. Days with peak flows (> 97th percentile wastewater flow) will still need to discharge to the existing marine outfall or other location.

LA Area 2 Rai Valley area is located approximately 25 km from the NWWTP and has a reasonable amount of flat land (>2,000 ha), which could be considered for a land application scheme. This area is located in a different surface water catchment and also a different district and unitary authority (Marlborough District Council). The Rai River discharges to Pelorus Sound. Pelorus Sound is likely to require strict nutrient management for any potential land application scheme within this catchment due to other existing industries / values within these waters.

The well-drained nature of the soils and the flat topography suggests the area could host a year-round scheme. There may not be sufficient land area available to cover 100% of the Average Dry Weather Flow. Consequently, a dual-discharge scheme such as a combined land discharge and marine outfall, is likely to be required.

In addition, pumping wastewater to this location would likely be costly (CAPEX and OPEX) and is likely to be disruptive to SH6 during construction.

Current scheme with All to LA at Eastern Valleys or Rai Valley (Option 5)

This option combines the current NWWTP scheme with a new discharge regime located within LA Area 3 in Figure 7-4 on largely flat land within valleys where irrigation of average daily flow to a pastoral scheme, year-round has been assumed. The area is predominantly flat and located to the east of the NWWTP. This area generally forms a strip of land along SH6, with some additional area to the north along Cable Bay Road. When accounting for buffer zone requirements, there may not be sufficient land area to irrigate the full NWWTP flow.

Published soil maps indicate that the soils are generally moderately-well to well-drained throughout the area. There are some streams within or downgradient of the area that are understood to be used for recreational swimming and would therefore require careful management of potential nutrient runoff and leaching.

It is likely that 'cut and carry' system would be utilized. Days with peak flows (> 97th percentile wastewater flow) will discharge to the existing marine outfall or elsewhere.

Current scheme with a LA component in summer/dry periods to Hira Forest and Eastern Valleys. (Option 6)

This option combines the current NWWTP scheme with a new discharge regime located within LA Area 2 and LA Area 3 in Figure 7-4 on sloped forestry land or flat pastoral land where irrigation of average daily flow during summer period (November – April (inclusive)) has been assumed. The Hira Forest (Area 2) comprises large swaths (>2,500 ha) of both native forest and exotic forestry, between 5 to 15+ km of the NWWTP. Further afield, land may be suitable within the Rai Forest (Area 2b), but this is at a greater distance from the NWWTP. Published soil maps indicate that the soils are generally well-drained throughout the area. The steep slopes would make any irrigation scheme highly susceptible to runoff, so irrigation rates would likely be required to be lower than typical for a well-drained soil type. Other potential management measures may also be required.

It is understood there are some streams within or downgradient of the area that are used for recreational swimming. These would require careful management of potential nutrient runoff and leaching.

Days with peak flows (> 97th percentile wastewater flow) will still need to be discharge to the existing marine outfall.

Current scheme with a LA component in summer/dry periods on Wakapuaka Flats (Option 7)

This option combines the current NWWTP scheme with a new discharge regime located within LA Area 1 in Figure 7-4 on largely flat land adjacent to NWWTP where deficit irrigation of allowable volume during summer period (November – April (inclusive)) has been assumed.

The Wakapuaka Flats are located immediately to the east of the existing NWWTP which is a key advantage of this area. However, the total potentially useable area is however only approximately 330 ha, and hence would not be feasible for a year-round LA scheme.

Published soil maps indicate this land has poor drainage properties, as it is low-lying, and is predominantly underlain by marine and swamp deposits. In addition, this area is known to be at risk from flooding. There is a risk of nutrient leaching to Nelson Haven.

Current scheme with Managed Aquifer Recharge scheme (Option 8)

Managed Aquifer Recharge (MAR) is the purposeful application of water to the ground surface or subsurface with the intention that the applied water ultimately enters the groundwater system. A MAR scheme could include high-rate infiltration basins, trenches, galleries, borehole injection, or other style of water-to-ground application.

The practice is typically designed to harness an aquifer's storage, transmission and filtration properties, and can also provide opportunity for beneficial reuse. This could include groundwater replenishment (to offset abstraction stress), water quality improvement, or other associated benefits. It is noted that not all MAR options have reuse benefits.

The potential locations for managed aquifer recharge scheme(s) within the region are considered limited to the fluvial gravel deposits within valleys and floodplain areas. The preliminary assessment identified four general areas which were considered potentially feasible for MAR discharge schemes seen in Figure 7-5. A full description of each of the four areas is included in Appendix E.

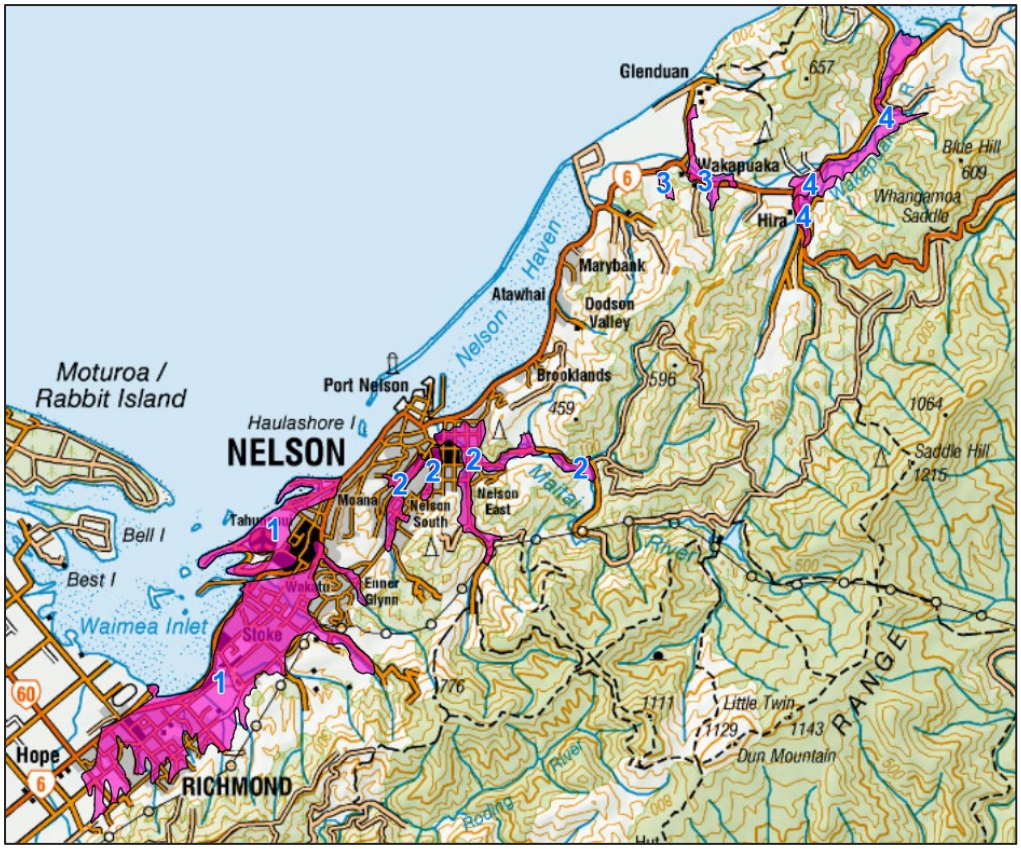

Figure 7-5: Locations of Potentially Feasible MAR Areas

MAR Area 1 – Appleby Gravel Unconfined Aquifer and Adjacent Coastal Areas:
MAR Area 2 – Maitai River and Tributaries:
MAR Area 3 – Wakapuaka Vicinity:
MAR Area 4 – Wakapuaka River / Eastern Valleys:

One option was considered a feasible option for MAR of wastewater from NWWTP which included a Year-Round Managed Aquifer Recharge Scheme. Located within in MAR Area 1 in Figure 7-5 the Waimea Plains – Appleby Gravel Unconfined Aquifer – proximal to the Waimea River, south-west of Richmond. Injection of Average Dry Weather Flow to suitable aquifer, year-round, with all other flows to be discharged via the existing marine outfall or elsewhere.

This method could provide beneficial reuse of the wastewater such as replenishing aquifer head/pressure levels, salt-water intrusion mitigation, and/or nitrogen groundwater quality improvement. Assessment of managed aquifer recharge potential near the NWWTP, and within the Nelson and Stoke areas, indicates that there is limited potential for beneficial reuse. While there will be areas where managed aquifer recharge could occur, realistic recharge targets that would enable reuse benefits have not been identified. This is due to the limited extent of highly productive aquifers and a general lack of water abstraction stress (by which a recharge scheme could provide an alleviation benefit too).

However, there are hundreds of existing boreholes within the Waimea Plains, including municipal and domestic supply takes. Placement of injection boreholes would need to take account of these, to ensure appropriate separation distances are maintained (likely on the order of 300 m+). This is to avoid potential effects on these bores e.g., maintain reasonable travel time distances and residence times.

Such an option has been considered for a number of other schemes in New Zealand, none have proceeded other than at Russell, Bay of Islands. Issues highlighted with other considerations have been aquifer contamination, māori cultural concerns and social “fecal aversion” (yuck factor). These particularly apply when aquifers in the area are used for potable water supply.

Options 9 - 10

The ‘circular economy’ approach i.e. like it is in Option 10 below, of reusing treated wastewater can provide a reliable water source for industrial, agricultural and occasionally potable uses. Treatment of wastewater coupled with reuse also has important direct climate benefits. In many cases, treating wastewater helps reduce greenhouse gas emissions, particularly methane. A well-designed wastewater project allows for better sludge management solutions, such as methane capture and energy generation, which help mitigate the greenhouse gas emissions coming from plants’ operations.

Moreover, appropriately (highly) treated wastewater reuse can contribute to helping cities adapt to climate change by providing an additional and sustainable source of fresh water.

Current treatment location with greater treatment for non-potable direct reuse with balance to existing Tasman Bay outfall (Option 9)

This option allows for the reuse of highly treated wastewater for non-potable uses to significantly reduce need for potable water supply requirements. It includes the development of an advance water treatment plant (AWT) at the existing site location with treated wastewater from the current NWWTP further treated through the AWT to meet agreed recycle standards.

It also requires the construction of a new conveyance and reticulation system for non-potable direct reuse and upgrade of domestic and commercial infrastructure with reticulation to residential and business/industrial areas as a third (purple) pipe system. There is also the potential for cross connections (household plumbing) to potable water supply that would need to be managed.

Given the reuse of the highly treated wastewater for non-potable direct reuse there is a reduction in the amount of residual wastewater that needs to be discharged to the environment. This alternative option assumes that the balance will continue to be discharged (at reduced volumes) through existing marine outfall or elsewhere.

Current treatment location with greater treatment for non-potable direct reuse with balance to LA (Option 9a)

This option combines Option 9 with Option 7 and assumes that any residual highly treated wastewater can be use within a LA application scheme on the Wakapuaka Flats, located immediately to the east of the existing NWWTP. This removes the requirement for the ocean outfall discharge to remain.

Current scheme with indirect potable reuse with balance to existing Tasman Bay outfall (Option 10)

As part of a more sustainable and “Circular Economy” approach to wastewater management at NWWTP this option includes the development of an advance water treatment plant (AWT) at the existing site location with treated wastewater from the current NWWTP further treated through the AWT to meet agreed recycle standards. This highly treated wastewater would then be directed to the Nelson water treatment plant via the Maitai reservoir and further treated through the Nelson water treatment plant for potable uses. This would significantly reduce the need for potable water supply requirements.

NZ Health / potable Water Standards are currently not yet in place to allow for the direct discharge of highly treated wastewater into Council's water supply network. Considerations elsewhere in NZ are that this is unlikely to be accepted by society and māori in the near or foreseeable future in NZ.

4.3.3 Upgraded Treatment Options

The upgraded treatment alternatives are based on the NWWTP remaining at its current location with the existing ocean outfall discharge. These options all involve upgraded / additional treatment targeted at the contaminants listed, the full list being:- Total Suspended Solids (TSS), Biochemical Oxygen Demand ($cBOD_5$), Chemical Oxygen Demand (COD) and nutrient, predominantly Total Nitrogen (TN) and Total Phosphorus (TP). Each treatment mode also considers within it, odour improvements, wetland enhancement and upgraded diffuser as alternative options.

Treatment Mode 1 – Additional Removal of TSS / $cBOD_5$ / COD (Options 11, 11OW, 11D and 11O WD)

At certain time of the year, mainly summer periods, NWWTP currently cycles treated wastewater flows between the two wetlands allowing additional settling time within one wetland before bringing it back online. Wetland cycling has been successful to control TSS levels and this trial is ongoing.

These alternative options assume sufficient treatment through NWWTP to ensure TSS discharges continue to not have a long term adverse effect of the receiving environment and that additional technologies are added if needed in the future.

There is a relatively wide range of proven treatment technologies that can be added to, some in an integrated way with the current treatment processes to achieve greater removal of the contaminants identified. Treatment Mode 1 options provide for additional removal of suspended solids / TSS. Procedures and technologies currently available for the removal of TSS in WW include, but are not limited to:

- the use of fine filters e.g., cloth drum filters
- microfilters
- chemical addition
- ballasted flocculation with chemical (aluminum or iron salt dose e.g. ACTIFLO unit or similar)
- Dissolved Air Flotation (DAF)
- densely planted wetland
- side stream treatment of part of the flow by taking a proportion of the flow and treating to a higher level with respect to TSS using one of the above processes.

For $cBOD_5$ and COD all the above processes for TSS removal will remove increased amounts of cBOD5 and COD. The extent of the removal required would determine the treatment technology which is most appropriate. For high levels of removal, a full scale activated sludge process, with or without filtration after it, would work well. Trickling filter technology would also give good, but not as high level of removals. A trickling filter is available within the current scheme but as part of the overall pond health management is not required all the time.

Treatment Mode 2 – Additional Removal of Pathogens (Options 12, 12OW, 12D and 12 OWD)

An assessment of the estimated pathogen treatment through the current scheme included in Appendix P. This shows that for current (2022) flows the expected virus log reduction (LRV) range for the NWWTP pond system is between 2.3 and 2.4 in winter and between 3.0 and 3.2 in summer, with the lower values being with 20% sludge accumulation.

Treatment mode 2 options provide for additional removal of pathogens to ensure that pathogen discharges from NWWTP are kept below a level that ensures any risks to human health because of consumption of raw shellfish or recreational contact are maintain at an acceptable level. Additional pathogen removal technologies are added as needed.

Several of the TSS processes identified in treatment mode 1 would reduce the indicator microorganism level to some extent and accordingly it would be expected the pathogens although this would depend on the actual pathogen and its size and nature.

Notwithstanding this, proven treated wastewater disinfection has been assumed to be the appropriate technique for these alternative options. Wastewater disinfection techniques include but are not limited to:

- UV light irradiation which nowadays is the extensively used technique.
- Chlorination followed dichlorination and was previously used extensively and to some extent in New Zealand, but is currently used only at the New Plymouth Plant
- Ozone disinfection, not currently used in New Zealand
- Greater detention in the oxidation ponds / wetlands can also reduce indicator and pathogen levels by using plug flow and larger facilities. Contamination by birds is however an issue for ponds and wetlands (e.g. bird droppings)
- There are also chemical treatment processes that can be installed for pathogen removal.

Treatment Mode 3 – Additional Removal of TSS / cBOD / COD and Pathogens (Options 13, 13OW, 13D and 13 OWD)

This treatment mode combines treatment modes1 and 2 by coupling TSS removal through techniques such as micro filtration before pathogen removal techniques such as UV treatment. This is an extremely effective “double barrier” approach and is assumed for these alternative options.

Treatment Mode 4 – Additional Removal of TSS / cBOD / COD, Pathogens and Nutrients (Options 14, 14OW, 14D, 14 OWD 14 WD-Ox and 14D-OxW)

This treatment mode combines treatment modes1 and 2 by coupling TSS removal before pathogen removal and then providing additional treatment to remove nutrients. Typically, this focuses on the removal of total nitrogen (TN) or total phosphorus (TP) or a combination of these.

The level of nutrient reduction is dependent on the level of treatment installed .Nutrient removal treatment techniques include a number of those stated above for TSS removal. Selection of what process or combination of processes is determined to a large extent on what nutrient is the most critical and what level needs to be achieved. If the target is to reduce TP, chemical dosing with aluminum or iron salts can reliably produce low levels. Alternatively Biological Nutrient Removal (BNR), an activated sludge type secondary treatment, is used to achieve reasonable low levels of TP as well as TN removal. Where both TN and very low TP treated wastewater levels are required BNR treatment followed by chemical dosing for further phosphorus removal is normally used. Membrane filtration, after biological treatment, or even fine (cloth etc.) filtration will also achieve reasonably low levels especially for TP as the phosphorus and to some degree the nitrogen encapsulates in the particulate (TSS) material.

These alternative treatment mode options assume the introduction of a BNR plant at the current NWWTP location which also reduces the reliance on the oxidation ponds and wetlands for further treatment. Higher nutrient reduction, in the order of 75% TN and TP, can be achieved if an BNR is installed. If the ponds are removed, flow buffering will be required to mitigate wet weather flows. Discharge quality and the associated consent compliance point is assumed before the upgraded wetlands. Retention of upgraded wetlands may result in deterioration of discharge quality due to wildlife and other natural processes in the wetlands.

4.3.4 Alternative Treatment and / or Discharge Location Options

Joint NRSBU System at Bell Island (Option 15)

This option assumes in a single WWTP at Bell Island with all of the wastewater generated within the NWWTP catchment diverted to the Bells Island WWTP. This would require laying of a new rising main (around16 km long) and the upgrading of pump stations and would result in the need to further upgrade the Bells Island treatment plant to handle the additional flows. This upgrade would result in increased costs and consenting requirements which are not guaranteed to be granted. With this option the NWWTP could be decommissioned or maintained on a smaller scale for contingency purposes. It would result in one marine outfall from the Councils WWTP's, but discharge would be within the Waimea Inlet and limited to outgoing tide only, as currently consented at Bell Island

Treated Wastewater conveyed to NRSBU – Bell Island Outfall (Option 16)

This option assumes the wastewater would continue to be treated at NWWTP but that all the treated WW would be conveyed to Bell Island prior to discharge through the Bell Island outfall to Waimea Inlet resulting in one marine outfall in Area. Any future tertiary treatment could then be provided at the single Bell Island location.

Split NWWTP site with existing site and Bell Island WWTP (Option 17)

This option assumes a proportion to untreated WW form NWWTP would be conveyed to Bell Island, hence Waimea Inlet outfall, and the remaining treated through the current scheme at NWWTP and discharged to the Tasman Bay through the existing outfall. This would reduce the overall volumes treated at NWWTP and provide more retention time for treatment. There is also potential with this option to utilize any upgrade to the conveyance networks to provide more resilience across both WWTPs and allow for WW to be directed from one WWTP to the other as needed.

4.3.5 Other wider network Options

There are also a range of other features or interventions with respect to wastewater schemes which have the potential to reduce cost, improve performance and reduce environmental effects. These interventions can be selected and applied to any option regardless of the nature and location of the discharge or the type of treatment and include:

- Reduce water use and hence the associated domestic wastewater generation at source and also with trade waste discharges.
- Optimise the collection and conveyance of wastewater.
- Better manage or recover resources from residuals and by-products of the treatment process.
- Better limit and control rain and stormwater entering the wastewater network through for example Infiltration and Inflow programmes (I&I).

The feasibility of these other interventions will continue to be assessed as part of NCC's wider wastewater asset management programme.

5 Stage 3 – The Short List

5.1 Traffic Light Assessment Criteria

Stage 3 of the assessment of alternatives approach is the traffic light assessment to filter down the long list of total schemes to a short list. This is a tool to help understand the overall findings of the comparative assessments that have been completed for each of the assessment criteria. The traffic light assessment provides a graphical summary of the comparative assessments of the confirmed long list to arrive at a shortlist.

Table 5-1 sets outs the criteria that was used for the Traffic Light Assessment

Table 5-1: Traffic Light Criteria

Item	Criteria to be considered	Assessment Description
1	Public Health Risk	Degree of public exposure to health risks relating to the treated wastewater discharge (including through land application and/or re-use options). Includes direct contact within the scheme and / or the receiving environment(s) through. • recreation (Swimming, fishing, paddle boarding etc) • exposure to pathogens from spray irrigation, • indirect exposure from food gathering / consumption and • groundwater use.
2	Natural Environment	Potential and actual adverse environmental effects on the receiving environment, particularly in relation to water quality (including the matters listed in RMA s107 (1) (c) to (g)), soils, aquatic ecology and terrestrial ecology.
3	Māori Cultural Values	Potential adverse effects on the mauri of natural resources, on kai moana, and on the relationship of Māori, their cultures and traditions, with ancestral lands, water, sites, waahi tapu and other taonga. Cultural policies as set out within Te Tau Ihu iwi management plans and culture heath indicator paper provided by the iwi working group include but are not limited to: • Value Sustainable management of Whenua, Te Wai Māori, Moana and resource use opportunities for iwi, Hapū, and Whānau • Oppose the discharge of human wastewater, even when treated, to aquatic receiving environments on the basis that this practice is culturally offensive and is harmful to: o the mauri of wai and aquatic ecosystems, o human health, and o mahinga kai. • Oppose the location of wastewater infrastructure or land application in flood or inundation-prone areas or adjacent to waterways and coastal areas or near nga wahi taonga tuku iho or mahinga kai • Need to be well designed and managed schemes • Discharges located away from wai environments or land which is unsuitable as a receiving environment for contaminants. Robust monitoring programmes, resilience to natural disasters and breakdowns and regular reviews of technology
4	Social and Community Considerations	Very significant and lasting potential adverse effects on social and community values. Including in particular • Nuisance (Odour) • amenity, • urban / rural development, and • recreational use
5	Affordable / Financial Implications	Comparative capital, operational, whole of life costs of the options. Where relevant to the option such as for land application, assessment of this criterion includes. • consideration of land acquisition costs, • capital gains and

Item	Criteria to be considered	Assessment Description
		• product net revenue.
6	Technology and Infrastructure	Degree to which the option: • Uses reliable, proven and practical technology. • Has ability and flexibility to accommodate future changes in environmental standards etc. by upgrading. • Implementation can be staged
7	Resilience	Degree to which the option is resilient to: • natural hazards • climate change and • offers operational resilience for unforeseen events.
8	Prevents growth and economic development	How well will the option support the population and economic growth of the Nelson Region for at least the consent(s) duration(s) sought and ideally much longer.
9	Carbon / GHG Emissions	The ability for Council to: • meet its emissions targets • relative / comparative carbon footprints of each option. • allows for resource recovery and beneficial reuse of treated wastewater and by-products

It is recognised that the outcome of this assessment has a connection and knock on impact to the wider wastewater network and in particular NCCs plan through the LTP to invest significant money on the Atawhai Rising Main renewal and any future upgrade, treatment and capacity that would be needed at Bell Island WWTP to manage additional flows.

The criteria for each option were ranked using the following (Table 5-2) green, orange or red criteria, signalling how well the option met the relevant criteria:

Table 5-2: Traffic light assessment criteria

Meets criteria well

Marginally meets the criteria

Fails to meet the criteria

Criteria to be considered	Meets Criteria Well	Marginally meets the criteria	Fails to meet the criteria
Public Health Risk	Well meets all public health standards and guidelines plus adds multiple barriers (separation, treatment)	Meets all public health standards and guidelines (recreational, shellfish etc.)	Medium to High risk to public health e.g. shellfish, contact recreation and drinking water supplies
Natural Environment	Exceeds all environmental standards / requirements and guidelines (nutrients, colour, clarity, adverse aquatic and terrestrial ecology effects)	Meets all environmental standards / requirements.	Medium to High risk of adverse effects (failing to meet standards)
Māori Cultural Values	Enhanced / positive long-term effects in terms of mauri and provision of customary practices. Cultural health monitoring to measure mauri enhancement is critical.	No net effect change. Cultural Health (CHI) monitoring is paramount.	Significant adverse effects from ongoing operational activities (long term effects), i.e. discharges of treated wastewater - mana diminishing.
Social and Community Considerations	Enhanced / positive long-term effects in terms of recreation, visual, odour	No net effect change	Significant adverse effects from - Construction effects (short term effects), Land acquisition, Recreation Users,

Criteria to be considered	Meets Criteria Well	Marginally meets the criteria	Fails to meet the criteria
			Noise, visual, odour, sensitivity neighbouring land use (number and severity).
Affordable / Financial Implications	$0 – $50m Range of NPV	$50m - $100m Range of NPV	$100m + Range of NPV
Technology and Infrastructure	Well proven, reliable process with flexibility for future, easy to manage	Proven technology but difficult to control subject to natural processes	New relatively unproven technology or limited flexibility for future changes and staging. Difficult to operate / control
Resilience	Appropriate degree of resilience	Vulnerable to sea level rise / storm surge / flooding / earthquake / forest fires	Extremely Vulnerable to sea level rise / storm surge / flooding / earthquake / forest fires
Growth and economic development	Accommodates for planned growth and can implement flexible to accommodate some additional growth if required	Accommodates for planned growth but limited flexibility for additional growth	Accommodates for planned growth but no flexibility for additional growth
Carbon / GHG Emissions	Resource recovery (water and biosolids); OR lowest GHG emissions.	Resource recovery (water and biosolids); OR moderate GHG emissions	Some resource recovery (biosolids only); moderate GHG emissions

5.2 Traffic Light Assessment Summary

The traffic assessment used this ranking system to refine the confirmed Long List of schemes into a Short List of options. Appendix E to this report, provides a copy of the full traffic light assessment and commentary for each criterion. Options which have more red scores, and fewer green scores are less likely to progress to shortlist phase of the BPO assessment.

Table 5-3 highlights the key driver (s) of each criteria assessment.

Table 5-3: Traffic Light assessment summary

Item	Criteria to be considered	Assessment summary of overall schemes
1	Public Health Risk	• The majority of schemes have been assessed as meeting the criteria well through the installation of a modern marine outfall diffuser achieving additional dilution and dispersion and / or UV pathogen treatment or creating multiple (pathogen) barriers through advanced treatment. • Bell Island considered less favorable due to short outfall and less outfall dispersion. • Water supply, streams and groundwater potentially more vulnerable with land application replacing one public health risk with another.
2	Natural Environment	• The majority of schemes have been assessed as meeting the criteria well through the installation of modern diffuser and the additional dilution and dispersion achieved in the receiving environment. • Land considered a more resilient however streams and freshwater bodies considered more sensitive receiving environment if runoff occurs. • Bell Island considered less favorable due to more sensitive receiving environment
3	Māori Cultural Values	• The majority of schemes have been assessed as marginally meets the criteria as the discharge of wastewater into CMA and potential kia moana impact is abhorrent to iwi • In receipt of CHI from Te Atiawa (April 2022). Mauri restoration / enhancement with CHI measures is key with any option. • Land application favoured over sea outfall as long as it avoids areas at risk of flooding or inundation that may otherwise result in the discharge of partially treated wastewater to aquatic environments. Alternatives will require net benefits to be realized and soil risk assessments.

Item	Criteria to be considered	Assessment summary of overall schemes
		• Wetlands important to improve discharges to land, allowing Papatūānuku the opportunity to filter and clean any impurities.
4	Social and Community Considerations	• Assessment influenced by the fact that odour nuisance is one of the main complaints currently received as a result of 'pond crashes'. • The majority of schemes have been assessed to marginally meet the criteria as there no change to the ponds. • Moving all to Bell Island considered more favorable for residents within the vicinity of the NWWTP and salt marsh regeneration potential but odour can be a source of nuisance to those residents near Bell Island and Bell Island relies on ponds for treatment also.
5	Affordable / Financial Implications	• Developed on an indicative comparative NPV life cycle assessment. • 35-year O&M duration applied • 6% Discount rate applied to future O&M costs and income. • Schemes with limited upgrade have been assessed as meeting the criteria well, LA and alternative treatments that move away from the current pond system and outfall have high infrastructure costs.
6	Technology and Infrastructure	The majority of schemes have been assessed to marginally meet the criteria as the current technology is proven but the ponds are difficult to control subject to natural processes.
7	Resilience	• The majority of scheme have been assessed as fails to meet the criteria due to the vulnerability of the pond system. • Tonkin & Taylor Nelson – Wakapuaka Wastewater Networks Natural Hazards Risk Assessment stage 1 report April 2018 notes the ponds to be "Criticality = Extreme noting Moderate-large EQ could liquefy embankments and foundations, causing lateral spreading, slumping or cracking of embankments. • Moderate-large tsunami could scour or destroy pond embankments". • Network including pump stations are identified as "Criticality = Medium to High"
8	Growth and economic development	Most schemes are limited by the size of the current primary clarifier, trickling filter and associated sludge handling system and therefore only marginally meets the criteria. This is being considered in more detail as part of a process review.
9	Carbon / GHG Emissions	• The majority of scheme have been assessed as fails to meet the criteria due to the ponds. Methane emissions from oxidation pond have been assessed to cause high GHG emissions. • Remote irrigation schemes have high embodied carbon due to conveyance infrastructure. • Exotic forest plantation already established so no opportunity for sequestration credits due to new forest.

5.3 Short List of Schemes

The following short list of the nine representative schemes were identified from the confirmed Long List as part of stage 3 and brought forward to the MCA process. This was based on their scores received as part of the traffic light assessment. No weightings have been applied to the scores at this point in the process. These short-listed schemes are described in more detail in Appendix F to this report.

Table 5-4: Short List Options

Scheme ID	Summary of scheme
CURRENT SCHEME OPTIONS	
1	Current Scheme (Do Nothing Option)
1 OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of existing wetland areas
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS	
3	Current scheme with longer offshore outfall
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application
UPGRADED TREATMENT OPTIONS	
11OWD	Upgraded Treatment Mode One (further removal of solids/BOD/COD) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas
12 OWD	Upgraded Treatment Mode Two (further removal of pathogens) with improved odour management, new modern offshore diffuser and upgrading/ planting of existing wetland areas
13 OWD	Upgraded Treatment Mode Three (further removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland areas, additional odour management and modern offshore diffuser
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland areas and removal of the main oxidation pond.

Key:

O = Odour management
W = Wetland upgrade
D = modern diffuser -
Ox = Removal of oxidation pond
TSS Total Suspended Solids
BOD Biochemical Oxygen Demand ($cBOD_5$)
COD Chemical Oxygen Demand

6 Stage 4 – Multi Criteria Assessment (MCA)

6.1 Criterion Scoring and Assessment Approach

As part of the MCA a variety of non-price criterion were identified, as set out in Table 6-1, to consider the environmental, social and cultural impact (both positive and negative) presented by each of the options. These non-price criteria were based on the traffic light criterion and confirmed by the working party. They include:

- Public Health Risk
- Water Quality Improvement / Natural Environment
- Māori Cultural Values
- Social and Community Considerations
- Technology and Infrastructure and future growth
- Resilience
- Carbon / GHG Emissions and Overall Sustainable Approach

The net present value (NPV) cost of each scheme was also calculated to assist in an assessment of affordability against environmental, social and cultural outcomes.

Scoring and assessment in each criterion was undertaken by a technical specialist using a proforma template. Scores within the comparative range 1-5 were applied with 1 being the worst and 5 the best. Each specialist completed their assessment and provided supporting information as needed. A description of the criterion used, and the scoring and assessments of options are provided in the sections below. Table 6-1 elaborates on what each criteria includes and does not include.

6.1.1 MCA Non price criterion used.

Table 6-1: Criterion Description

Criteria to be considered	Assessment Description	What it includes	What it does not include
Public Health Risk	Degree of public exposure to health risks relating to waterborne pathogens in the treated wastewater discharge (including through land application and/or re- use of treated wastewater and / or biosolids options).	Risks associated with • Direct contact within the scheme and / or the receiving environment(s) through recreation activities • exposure to pathogens from spray irrigation, • indirect exposure from food gathering / consumption (both wild food and cultivated food) • water supply protection (nitrogen) • groundwater use.	Risks associated with • Work safety • Emerging contaminants • beneficial re-use • treatment plant failures or malfunction
Water Quality Improvement/Natural Environment	Potential and actual environmental effects on the receiving environment from treated wastewater discharge, particularly in relation to water quality, soils, aquatic ecology and terrestrial ecology.	Potential effects on • nutrient loads, • algae growth, • macroinvertebrates and fish in the coastal environment, • small streams near the WWTP, and waterways near irrigation areas. • Aquatic and terrestrial ecology • soil health and structure. Any comparative improvement of water quality and ecology in the Tasman Bay, Haven and associated small streams in the catchment.	Effects on • recreational bathing water quality, • drinking water, • cultural values, or • economic costs.

Criteria to be considered	Assessment Description	What it includes	What it does not include
Māori Cultural Values	Potential effects on the mauri of natural resources, on mahinga kai, and on the relationship of Māori, their cultures and traditions, with ancestral lands, water, sites, waahi tapu and other taonga.	• Cultural policies as set out within the various Te Tau Ihu iwi management plans • Cultural heath indicator assessments prepared for Te Kaunihera o Whakatū in 2014 & 2022 by Te Ātiawa Manawhenua Ki Te Tau Ihu Trust - Kaitiaki o Te Taiao • Direction provided by the iwi Working Group	While the assessment builds upon the mahi and direction provided by Ngāti Tama ki Te Tau Ihu, Te Ātiawa o Te Waka-a-Māui, Ngāti Rārua, Ngāti Kōata, Ngāti Toa Rangatira, Ngāti Kuia, Ngāti Apa ki te Rā Tō, Rangitāne o Wairau it does not speak on their behalf Other iwi speak for themselves and may choose to provide separate views on options
Social and Community Considerations	Lasting potential effects on social and community values, particularly in relation to odour management, amenity value, urban / rural development, long term land use, and recreational activities	Effect of an option on • people's quality of life and access to basic necessities of life including in particular odour management / odour nuisance, amenity, urban / rural development, long term land use, and recreational activities • amenity value bringing in natural and physical qualities that contribute to people's appreciation of pleasantness and aesthetic coherence • The ecosystems that contribute to peoples well being • Community support or dislike	It is not • The effect of a solution on individuals' property values
Technology and Infrastructure and future growth	The need for reliable, proven, and practical technology. That has the ability and flexibility to accommodate future changes in environmental standards and meet future growth demands. Additionally, to be able to accommodate future changes in technology should it be appropriate to do so.	The complexity and flexibility of the infrastructural elements of each option takes account of: • the need to acquire land in some options • the ability to be constructed and operational within 5 years of the commencement of the new consent(s). • opportunity to be staged • available capacity to support the population and economic growth for at least the consent(s) duration(s) sought and ideally much longer. • Potential improvement on emerging contaminant / microplastic removal through the process	Receiving environment discharge limits not considered under this criterion
Resilience	Degree to which the option is resilient to natural hazards and climate change and offers operational resilience for unforeseen events.	Natural hazard risks from: • earthquakes • land movement & erosion • flooding • storm surge/tsunami • Climate Change / Adaption • High intensity rainfall • Prolonged wet weather • Prolonged dry periods	• Operation resilience • Wildfire risk • Climate change risk to crops on land application areas

Criteria to be considered	Assessment Description	What it includes	What it does not include
		• Increased period of low flows • Sea and groundwater level rise	
Carbon / GHG Emissions and Overall Sustainable Approach	The ability for Council to meets its emissions targets bringing in the relative / comparative carbon footprints, Green House Gas (GHG) / Carbon emissions associated with the operation of the WWTP and resource recovery opportunities	• GHG emissions associated with the operation of the WWTP • GHG increases or decreases achieved by each option • resource recovery • beneficial reuse of treated wastewater and by-products • trees, other crops, carbon sequestration. • High level assessment of emission associated with the manufacturing, transport or installation of any new plant or equipment. (Scope 3 Emissions)	

6.1.2 Assumptions of Schemes

To ensure that the approach followed in developing individual MCAs are consistent, and to allow for an assessment of effects, several assumptions were provided regarding the level of treatment achieved through the NWWTP as part of each alternative scheme.

These assumptions are listed below:

1. Residual solids (sludge/biosolids) handling has not been considered. Current scheme options with/without alternative discharge regime (Options 1, 1 OWD, 3, 7) are reliant on periodic oxidation pond desludging with removed sludge disposed of to landfill; when pre-treatment is operated, the captured sludge is either discharged into the facultative pond or thickened and transported off-site to Bell Island WWTP, where it is treated to Grade A biosolids and then sprayed to Rabbit Island pine plantation. Other options result in a marginal to significant increase in sludge production that will need to be managed.

2. At this stage of the assessment of alternatives, a preferred treatment technology and hence level of treatment has not been selected for the treatment upgrade options. Hence, for the purpose of scoring, the following treated wastewater discharge quality has been assumed:

    a. **Option 1, 1 0WD, 3, 7**: existing TSS, BOD and E.coli concentrations.
        i. *Existing TSS in discharge is largely algal solids, rather than untreated suspended solids.*
        ii. *Extending outfall (Option 10WD and 3)) will not change discharge quality at point of discharge but rather improve dispersion in receiving waters. Existing wetlands have produced treated wastewater with low TSS and BOD (<10 mg/L) at times, however this is not consistent; an upgraded or replanted wetland (Option 10WD) is likely to be similar.*
        iii. *Any improved odour management will not change the typical treated wastewater discharge quality. It is assumed that the BPO will incorporate any mitigation required to address matters raised by historical complaints received. Any natural pond-based system or uncovered mechanical treatment systems have 'normal' wastewater-related odour.*
        iv. *For Option 7, the wastewater will continue to be treated as it percolates through the soil before reaching groundwater, resulting in reduction in TSS, BOD, pathogens, TN and TP; further treatment to reduce algal solids or other contaminants may be required prior to land application.*
        v. *All wastewater flows received at the NWWTP are able to be treated via the oxidation pond-based system, i.e. there are no plant bypasses of untreated wastewater*

    b. **Option 9a**: non-potable direct reuse requires a high level of treatment: TSS and BOD largely removed (≤1mg/L), E.coli (<<126 cfu/100mL). *Level of treatment depends on end use.*
        i. *Discharge route, location and required level of treatment of concentrated liquid waste stream from new reuse WWTP needs to be considered.*
        ii. *The ponds, or part of the ponds, retained to buffer peak wet weather flows so there are no plant bypasses of untreated wastewater.*

c. **Option 11OWD**: Treatment upgrade mode one – further removal of solids/BOD to the existing situation: TSS of 15 mg/L and BOD of 10 mg/L. E.coli as existing.
   i. *From an environmental effects perspective, the required TSS and BOD reduction should be determined by an environmental effects assessment of the preferred discharge route (or routes if mix and match option proposed).*
   ii. *Retention of the ponds also buffers peak wet weather flows so there are no plant bypasses of untreated wastewater*

d. **Option 12OWD**: Treatment upgrade mode two – further removal of pathogens: – E.coli of 126 MPN/100mL. TSS and BOD as existing.
   i. *From a public health perspective, the required level of pathogen reduction should be determined by a Quantitative Microbiological Risk Assessment (QMRA).*

e. **Option 13OWD**: Treatment upgrade mode three – further removal of solids/BOD/pathogens: TSS and BOD as for mode one; E.coli as for mode two.
   i. *See notes for Options 11OWD and 12 OWD*

f. **Option 14OWD**: Treatment upgrade mode four – improved removal of solids/BOD/pathogens/nutrients: TSS and BOD as for mode one; E.coli as for mode two; 50% reduction in TN and TP.
   i. *See notes for Options 11OWD and 12 OWD*
   ii. *Removal of the oxidation ponds will require replacement with a new WWTP; the level of nutrient reduction is dependent on the level of treatment proposed. Higher nutrient reduction, in the order of 75% TN and TP, can be achieved if an MBR is installed.*
   iii. *If the ponds are removed, flow buffering will be required to mitigate wet weather flows.*
   iv. *Discharge quality is assumed before the upgraded wetlands. Retention of upgraded wetlands may result in deterioration of discharge quality.*

6.2 MCA Scoring Summary

At the meeting of the Working Group on 29 July 2022 it was presented and then agreed in a memo to the Working Group that non-price attributes and price should be considered separately and therefore options were ranked applying non-price attributes and price separately. Direction from NCC on 15 September 2022 requested that the weightings for each criterion should also be treated evenly.

Based on this each criterion was assessed and scored and a preference list or ranking of the 'best' options determined, this is provided in sections 6.2.1, 6.2.2 and 6.2.3.

6.2.1 Non-Price Criterion Overall Scores

Table 6-2 provides a summary of the scores given to each of the criterion by the technical experts in their field. Criterion were scored between 1 and 5, where 1 was considered the worst and 5 the best scenario. Where multiple scores were given within a single criterion, the average score was calculated (hence some scores have decimal points). Copies of the full assessments can be provided upon request.

Table 6-2: Non-Price Criterion overall scoring[2]

Scheme ID	Description	Public Health Risk	Natural Environment	Māori Cultural Values[4]	Social and Community	Technology and Growth	Resilience	Carbon Emissions	Total Score
1	Current Scheme (Do Nothing Option)	3	3.4	1	2	3	2	2.67	17.0
1 OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of Wetlands	4	4	1	3.5	3	2	2.67	20.2
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS									
3	Current scheme with longer outfall	4	3.4	1	2	3	2	2.33	17.7
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	4	3.1	1	1.5	3	1	2.33	15.9
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	4	3.8	3	3.5	3	3	3.67	24.0
UPGRADED TREATMENT OPTIONS									
11OWD	Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	4	3.9	1	4	4	2	2.33	21.3
12 OWD	Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	4	4.0	1	4	4	2	2.33	21.3
13 OWD	Upgraded Treatment Mode Three (removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland area, additional odour management and modern diffuser	4	4.1	1	4	4	2	2.33	21.4
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland area and removal of the main oxidation pond.	4	4.3	1	4.5	3	3	3.33	23.1

[4] Subject to iwi review

6.2.2 Cost and Affordability

Table 6-3 provides a description of what was considered in terms comparative scheme costs and Table 6-4 shows the total cost of investment required over the lifetime of the consent as calculated as indicative net present value (NPV) based on a 35 year period and 6% discount rate.

Table 6-3: Description of price criterion

Criteria to be considered	Assessment Description	What it includes	What it does not include
Affordable / Financial Implications	Comparative capital, operational, whole of life costs (represented by NPV) including land acquisition (for some options) and conveyance requirements.	• Treatment plant upgrades • Conveyance pipes & pump stations • Purchase of land application areas and irrigation infrastructure • Scheme operational & maintenance costs • Land use & ETS income if forestry / land application is included within scheme • Applicability within Council commercial and targeted rates models	It is not • a subjective assessment of 'affordability' • an assessment of the financing opportunities for the different options • an assessment of the benefits and costs to the city or regional economy

Table 6-4: Indicative NPV cost of each scheme

Scheme ID	Description	Indicative cost of total scheme NPV
1[5]	Current Scheme (Do Nothing Option)	< $10 M
1 OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of Wetlands	$ 10M– $ 15 M
3	Current scheme with longer offshore outfall	$ 15M – $ 20M
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	$ 40M – $ 50M
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	$ 200M +
11OWD	Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	$ 20M – $ 30M
12 OWD	Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	$ 15M – $ 20M
13 OWD	Upgraded Treatment Mode Three (removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland area, additional odour management and modern diffuser	$ 30M – $ 40M
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland area and removal of the main oxidation pond.	$ 100M +

[5] Do Nothing Option – NPV includes operational and asset maintenance and replacement costs.

6.2.3 Overall Rankings

Each of the nine schemes were then ranked in order of score where:

- 1 equals the highest scoring or lowest cost of the nine schemes in that category, and
- 9 equals the lowest scoring or the highest cost of the nine schemes in that category.

The non price and price ranking for each scheme is shown in Table 6-5.

Table 6-5: Ranking of schemes in terms of non-price attributes and cost

Scheme ID	Description Summary[6]	Non – price criterion rankings	Price Rankings
1	Current Scheme (Do Nothing Option)	8	1
1 OWD	Current Scheme with improved odour management with new modern outfall diffuser and upgrading/ planting of Wetlands	6	2
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS			
3	Current scheme with longer outfall	7	3
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	9	7
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	1	9
UPGRADED TREATMENT OPTIONS			
11OWD	Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	5	5
12 OWD	Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	4	4
13 OWD	Upgraded Treatment Mode Three (removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland area, additional odour management and modern diffuser	3	6
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland area and removal of the main oxidation pond.	2	8

As part of determining the BPO for NWWTP there needs to be a balance between price and non – price drivers. This becomes a key consideration in selecting the BPO. When combining the overall scores for non-price and price attribute scores each schemes overall ranking is shown in Table 6-6. Price scoring has been calculated on a sliding scale of investment within the full range of NPV costs as a portion of a maximum score of 5.

[6] refer to Appendix D to this report for fuller description of schemes

Table 6-6: Overall Ranking of schemes

Option	Description	Total Non-price Attribute Score	Price Score	Total Score	Overall ranking[7] (including cost) of schemes 1 – 9
CURRENT SCHEME OPTIONS					
1	Current Scheme (Do Nothing Option)	17.0	4.87	21.9	8
1OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of Wetlands	20.2	4.71	24.9	5
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS					
3	Current scheme with longer outfall	17.7	4.67	22.4	7
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	15.9	4.10	20.0	9
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	24.0	0.12	24.1	6
UPGRADED TREATMENT OPTIONS					
11OWD	Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	21.3	4.46	25.7	4
12 OWD	Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	21.3	4.64	26.0	**1**
13 OWD	Upgraded Treatment Mode Three (removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland area, additional odour management and modern diffuser	21.4	4.39	25.8	2
14 WD-O	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland area and removal of the main oxidation pond.	23.1	2.63	25.7	3

[7] Overall ranking based on equal weighting of all 9 criteria

The MCA assessment concludes that the best scheme in terms of the non-price criterion scores is considered to be Scheme 9a non-potable direct reuse with balance to land application. This is mainly driven by the higher level of treatment and the different discharge route (i.e. treated wastewater reused or applied to land rather than discharged to Tasman Bay). The second highest scoring scheme is 14 WD-Ox Upgraded Treatment Mode Four (removal of TSS/BOD/COD, pathogens and nutrients via a new treatment plant at the same site, with removal of the oxidation ponds), with the other three upgraded treatment options (retention of oxidation ponds with additional treatment process units) close behind.

Whereas the best scheme in terms of price scores was considered to be scheme 1 – do nothing as it is the lowest cost of all the options, followed by the current scheme with a new modern outfall diffuser improve dispersion, upgrading/ planting of wetlands and improved odour management.

As part of determining the BPO for NWWTP there needs to be a balance between social, cultural, environmental, and financial drivers. When all criteria are weighted evenly then scheme 12 OWD - Upgraded Treatment Mode Two (removal of pathogens) with new modern outfall diffuser, upgrading/ planting of existing wetlands and improved odour management receives the highest MCA score.

7 Stage 5 - Informing the BPO Assessment

To enable a final selection of a BPO a case for investment was considered with information regarding treatment benefit in terms of the treated wastewater's receiving environment and relative investment required. This is provided in section 7.1 below. Its intention was to enable an informed decision by the Working Group in terms of considering what is affordable to NCC, linkage to other NCC projects and how that option measures up from the other criterion, especially acceptance in the receiving environment and the vulnerability (over time) of the treatment plant location.

Finally, a review of options against the objectives of the project has also been provided in determining the BPO, this is provided in section 7.2.

7.1 Case for Investment for Shortlisted Options

Based on the non – price rankings, cost and non-cost were combined and a case for investment was considered in terms of treatment benefit of the treated wastewaters receiving environment or other discharges or cultural and social benefits and relative investment required. This is consistent with direction provided by NCC on 15 September 2022.

Table 7-1: Case for investment

Scheme ID	Description	Overall ranking[8] (including cost) of schemes 1 – 9	Associated NPV cost	Case for investment relative to effects of current scheme on receiving environment
1	Current Scheme (Do Nothing Option)	8	< $10M	Status quo / benchmark
1 OWD	Current Scheme with improved odour management with new modern outfall diffuser and upgrading/ planting of Wetlands	5	$ 10M – $ 15M	Improved dispersion at the point of discharge is achieved by the level of investment. Modification of planting around the wetlands or an alternative location has cultural value (CHI driven) to local iwi and provides a native eco seed source for other areas. Improved odour management is achieved by the investment to minimise risk of objectionable odours from the ponds.
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS				
3	Current scheme with longer outfall	7	$ 15M – $ 20M	The same discharge quality but increased dispersion in the marine receiving environment would be achieved. Typically the case for investment in a longer outfall would be if the discharge to the CMA at this location was a long-term option.

[8] Overall ranking based on equal weighting of all 9 criteria

Scheme ID	Description	Overall ranking[8] (including cost) of schemes 1 – 9	Associated NPV cost	Case for investment relative to effects of current scheme on receiving environment
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	9	$ 40M – $ 50M	Recent rain events demonstrate the vulnerability of the Wakapuaka Flats to heavy rain events and flooding. With an increase in extreme weather events predicted, the case for significant investment for land application only during dry – summer periods at this location are uncertain.
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application	6	$ 200M +	Level of investment is better suited to a new facility, potentially a regional facility, located at a new site not subject to climate change and natural hazards (e.g. tidal wave surge, flooding etc.) impacts. A new site would take time to implement and needs further engagement with tangata whenua. Case for investment provides a highly treated wastewater that can be beneficially reused, reducing use of potable water supply for non-potable uses (e.g. irrigation). There is a cultural desire to remove all wastewater discharges from the coastal environment. The case for investment provides for this, however significant engagement with iwi consultation would be required to identify culturally appropriate locations and reuse opportunities.
UPGRADED TREATMENT OPTIONS				
11 OWD	Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	4	$ 25M – $ 30M	Case for investment identified in option 1OWD also achieved by this option. The present scheme currently complies with solids consent limits except during the summer 2019/20 but is reliant on natural treatment processes. Trial of wetland cycling has been successful during recent summer periods, however trial is ongoing. Mechanical removal may be required in the future if trial unsuccessful. Case for investment provides a mechanical backup that can be implement if concentrations increase or standards become more conservative. A lead time would be required to procure and construct new infrastructure.
12 OWD	Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern diffuser and upgrading/ planting of existing wetland area	1	$ 15M – $ 20M	Case for investment identified in option 1OWD also achieved by this option. The present scheme currently complies with pathogens consent limits but is reliant on natural treatment processes. The greatest public health risks associated with the discharge have been assessed to relate to shellfish consumption. Case for investment provides a mechanical backup that can be implement if concentrations increase or standards become more conservative. A lead time would be required to procure and construct new infrastructure. Standards are currently set within the receiving environment and other contaminant sources (outside the control of the NWWTP) contribute to the overall water quality. The case for investment in additional pathogen treatment allows NWWTP to limit its contribution to any additive risks of this discharge and other inputs of pathogens, in particular Bell Island WWTP.

Scheme ID	Description	Overall ranking[8] (including cost) of schemes 1 – 9	Associated NPV cost	Case for investment relative to effects of current scheme on receiving environment
13 OWD	Upgraded Treatment Mode Three (removal of solids/BOD/COD and pathogens) with upgrading/ planting of existing wetland area, additional odour management and modern diffuser	2	$ 30M – $ 35M	See discussion for 11 OWD and 12 OWD
14 WD-Ox	Upgraded Treatment Mode Four (improved removal of solids/BOD/COD, pathogens and nutrients) with new modern offshore diffuser, upgrading/ planting of existing wetland area and removal of the main oxidation pond.	3	$ 100M +	Level of investment best suited at a new site not subject to climate change (e.g. tidal wave surge, flooding etc.) impacts. A new site would take time to implement. The level of investment would reduce the reliance on a pond system and contribute to councils GHG emission targets.

7.2 Review of option ranking against project objectives

As identified in section 1.3, the following objectives were developed for the project and ratified by the project Working Group in May 2020.

Objective 1	To recognise the importance of cultural values by working in partnership with the community, key stakeholders, and tāngata whenua to ensure a wastewater treatment and discharge solution that: ○ Provides for current and future community well-being, health and safety. ○ Ensures acceptable environmental and cultural effects.
Objective 2	To obtain long term consents that provide certainty for planned future population and industrial/commercial growth and security for ongoing investment in the infrastructure.
Objective 3	To provide a solution that is the Best Practicable Option (BPO) for the treatment and discharge of the wastewater.
Objective 4	To ensure that the option selected is serviceable, easily operational and economically affordable for the Nelson Community and achieves efficient use of existing infrastructure.
Objective 5	To obtain reasonable and practical consent conditions in terms of treated wastewater quality that can be achieved in the short, medium and longer terms.
Objective 6	To ensure that the treated wastewater discharge has no more than minor adverse effects on the receiving environments.

7.2.1 Recognising the importance of cultural values (Objective 1)

While the assessment included within the MCA builds upon the mahi and direction provided by Ngāti Tama ki Te Tau Ihu, Te Ātiawa o Te Waka-a-Māui, Ngāti Rārua, Ngāti Kōata, Ngāti Toa Rangatira, Ngāti Kuia, Ngāti Apa ki te Rā Tō, Rangitāne o Wairau it does not speak on their behalf. Other iwi speak for themselves and may choose to provide separate views on options.

Te Tau Ihu iwi have been invited as part of the Working Group to provide input throughout the whole project development. The assessments made within this assessment of alternatives are largely built around the guidance provided by iwi as part of the Working Group and the guiding principles drawn from the iwi management plans with regard to the effects of each option on the mauri of natural resources (particularly wai), on mahinga kai and on the relationship of tangata whenua with land and water. The assessment of schemes acknowledges that even when a mitigating factor or treatment improvement is included, if the option involves the discharge of treated wastewater to fresh water / coastal marine environment, it is offensive to tangata whenua, degrades the mauri of wai and inhibits the ability of tangata whenua to harvest kaimoana from this once prolific mahinga kai environment.

A review of the options considers that there would be a significant lead in time and investment required to move the discharge of treated wastewater at NWWTP completely away from its current location within the CMA. Such an approach is not considered to be the BPO at this time. Instead, these alternatives need to form part of the current korero with ngā iwi around long term options and the cultural desire to remove all treated wastewater discharges from the coastal environment at Atawhai and Horoirangi and the wider Whakatū Rohe.

Until a viable alternative can be agreed and implemented, the continued discharge through the existing offshore outfall with improved dispersion through a future upgrade to the existing outfall to incorporate a new diffuser during the life of the consent is considered the BPO for discharge at this site.

Additional pathogen treatment to help restore the mauri of natural resources (particularly wai), mahinga kai and the relationship of tangata whenua with land and water is considered part of options 12 OWD,13 OWD and 14WD-Ox. The level of additional treatment will be determined by the findings of further site-specific virus testing, better understanding of the potential shellfish beds and traditional kaimoana harvesting sites in the area. These future inputs will be used in the refinement of the QMRA assessment.

In recognising the importance of cultural values of the area and to help minimise cultural effects of the continued treatment of wastewater at NWWTP, it is important that monitoring is ongoing, and opportunities are provided to allow Papatūānuku to filter and clean any impurities. A Cultural Health Indicator (CHI) assessment is a tool being kindly provided at the present time to the project by Te Tauihu and currently led by Te Ātiawa. The CHI aims to make an onsite assessment of cultural health within a catchment or within specific freshwater, coastal and marine areas. CHI monitoring identifies opportunities for preservation, restoration of te taiao and cultural knowledge and practices. The implementation of the recommendations, where possible, of the CHI monitoring forms part of all alternative schemes in order to provide potential opportunities for customary use of te taiao and to give effect to kaitiakitanga to ensure that significant decisions do not negatively impact on taonga, waahi tapu, indigenous flora and fauna, rongoā and the diversity of species and habitats associated with local ecosystems. Continued CHI monitoring by tangata whenua of the NWWTP and surrounding Wakapuwaka Flats and ongoing involvement by ngā iwi on the implementation of any recommendations needs to be considered within any BPO.

7.2.2 Providing certainty for planned future population growth (Objective 2)

There is sufficient capacity within the current scheme to provide for projected population growth to 2059. Therefore, the buffer provided within the current ponds provides flexibility for managing future growth. An in-tank treatment system would need to be sized to manage both growth and an increase in wet weather flows. The vulnerability of the current location and surrounding land to natural hazards and climate change means that any high level of investment required is better suited to a new facility, potentially a regional facility, located at a new site.

7.2.3 Review against treatment and discharge standards (Objective 3)

While the current scheme discharge meets the NRMP and the draft Nelson Plan standards for an occasion during the summer 2019/20 elevated algal suspended solids were recorded bringing the TSS level close to consent limits. Compliance is reliant on natural treatment processes. Trial of wetland cycling has been successful during subsequent summer periods to control TSS levels and this trial is ongoing. The case for investment in additional TSS or pathogen removal provides a mechanical backup that can be implement if concentrations increase beyond acceptable limits or standards become more conservative.

7.2.4 Serviceable, operational and economic constraints (Objective 4)

The majority of the current scheme is biological in nature and requires active operational management to balance the system and prevent pond crashes. It relies heavily on the skills of the operators and pond management team. Ongoing pond health management by active pond management and deploying appropriate mitigation measures when needed.

There has been significant investment in terms of time, money and associated wastewater network infrastructure in the development and treatment of wastewater at NWWTP. Moving away from this site would require a level of investment that is currently not provided for within the NCC Long Term Plan (LTP). The BPO needs to be considered affordable and sufficient funds are available within the new LTP that comes into effect in 2024.

There is an important link between the costs and associated financial implications in terms of meeting the financial implications part of the definition of the BPO as set above.

NCC's long term programme also provides a commitment to working with ngā iwi, NRSBU and TDC on the long-term option for a new treatment facility, potentially a regional facility, which considers the removal of wastewater discharges from the coastal environment as alternative options for discharging treated wastewater and other by-products of the process become more feasible and economical viable.

7.2.5 Review against resource consent requirements (Objective 5)

Moving away from the current discharge regime brings additional complexity in terms of resource consent requirements with additional receiving environments to be considered and conditions applied to the discharge quality to land, water or for reuse. Seeking additional or new area consents outside the current NWWTP site designation also requires further land use considerations. To obtain reasonable and practical consent conditions in terms of treated wastewater quality that can be achieved in the short, medium and longer terms the BPO is considered to be for continued discharge to the existing outfall where the current effects have been determined to be no more than minor and water quality standards can be achieved, after reasonable mixing.

RMA complexities in applying for a new location or discharge regime, include the likelihood of:

- Gathering baseline data and information.
- Conducting receiving environment investigations be it to coastal water, land and/or air, including modelled mixing zones and marine ecology assessments or terrestrial ecology and odour assessments.
- Costing and design for new infrastructure associated with pipeline discharge point.
- Consent and environmental assessment to potentially remove or abandon any redundant marine pipeline in the coastal marine area, noting that the NZCPS promotes the removal of any abandoned or redundant structure that has no reuse value.
- Consideration of 'sunk costs' for the existing infrastructure should the current NWWTP be removed or abandoned.
- Redesign of required modifications to the wastewater network, new treatment facility, pipeline outfall / or discharge structure i.e. irrigation, and associated infrastructure, either to the coastal marine area or to a land disposal location.

7.2.6 No more than minor adverse effects on the Receiving Environment (Objective 6)

Based on the Cawthron assessment and benthic surveys, the current scheme is not having an impact on the marine receiving environment beyond what it is naturally able to attenuate for. The QMRA assess the potential effect on human health through contact recreation and shellfish gathering. The findings of the QMRA shows that the only risk to human health as a result of shellfish gathering and consumption of raw shellfish. When consideration is given to the cumulative effects of multiple treated wastewater discharges and other non-point source stormwater and wastewater discharges in the area this risk is likely to increase. The identified risk from NWWTP can be managed through the introduction of additional pathogen treatment to target viruses related to shellfish consumption, if still deemed needed with further testing.

Additional treatment will reduce the total mass and concentration of contaminants within the treated wastewater discharge but is expected to increase the volume of sludge and biosolid that need to be managed and disposed of. There is also waste, and emissions associated with the manufacture and operation of additional mechanical plant.

8 Determining the BPO

In determining the BPO, the following needs to be considered

- the output of the MCA keeping in mind it is a decision tool (refer Section 6.2.3),
- the assessment against project objectives and the practical elements arising from these objectives as set out in section 7.2 above,
- the RMA definition of BPO (refer Section 1)

This assessment needs to balance the wide range of factors against costs and the case for investment as set out in Section 7.1 above. It also needs to acknowledge that nothing but a 100% of the time discharge to land of treated wastewater option or reuse is likely to achieve cultural values, and therefore, ongoing engagement with iwi, tangata whenua and hapu to assess and manage the cultural health of the surrounding area is important.

Based on the MCA (which identified Option 12OWD as the most appropriate solution and the BPO for NWWTP at this time) and project objectives the following practical elements have been considered in determining the BPO for the continued treatment of wastewater at NWWTP:

- continued discharge through the offshore outfall with improved dispersion through a new diffuser section.
- enhancement of the planting around the WWTP, discharge swale, and surrounding Wakapuwaka Flats in consultation with DoC and ngā iwi.
- continued cultural health monitoring by tangata whenua of the NWWTP and surrounding Wakapuwaka Flats throughout the life of the plant and ongoing involvement by ngā iwi on the implementation of any recommendations.
- ongoing active odour management.
- the introduction of additional infrastructure to reduce the quantity of pathogens being discharged as determined by the findings of the QMRA assessment and further refinement of assumptions through further onsite testing.
- the flexibility to introduce additional infrastructure to reduce Total Suspended Solids (TSS) if it is shown to be required to address adverse environmental or for compliance.
- Commitment to working with ngā iwi, NRSBU and TDC on the long-term option for a regional treatment facility that will considers the staged removal of wastewater discharges from the coastal environment.

8.1 How well the preferred scheme meets the BPO definition.

In terms of the definition of BPO set out above, it is important that the preferred scheme can meet all parts of the definition, to be considered the BPO. In summary:-

a) Preventing or minimizing adverse effects on the receiving environment, taking into accounts its sensitivity.
These are considered in terms of

- Positive effects of the NWWTP
- Effects of discharge of treated wastewater to Tasman Bay
- Effects of the existing pipeline and outfall diffuser structure
- Effects of seepage to groundwater
- Effects of discharges to air
- Effects on Tangata Whenua
- Natural Hazards and climate change

In summary of these sections, it is considered overall that the adverse effects are suitably prevent or minimized by the preferred BPO to ensure any effect at worst, is minor and acceptable when compared to the wide range of effects associated with the alternatives assessed and considering the sensitivity of the receiving environments.

The additional monitoring allowed for within the BPO enables the sensitivities of the receiving environment to be considered further as part of refining the type of pathogen treatment technology adopted or the implementation of any other measures necessary to ensure ongoing compliance.

b) The comparative financial implications and the effects on the environment.
As set out in the case for investment (Section 4.3.3) and the review against objective 4 (Section 4.3.2.4), the financial implications of the BPO when balanced with the environmental outcomes as part the MCA (4.3.1) show the preferred scheme to score higher overall when compared to the wide range of alternatives assessed. Sufficient funds are allowed for within the Council's LTP 2024 – 2034.

c) Technology
This is considered in terms of whether the option can be successfully implemented, is proven, and the construction and operation of the scheme is well understood. The BPO is considered to include industry proven technologies and operational methodologies to minismise any adverse effects on the receiving environment.

8.2 BPO - preferred option identified.

Therefore, the following BPO has been identified for NWWTP.

BPO for NWWTP

- Wastewater treatment to remain at its current location.
- Existing pre-treatment and pond / wetland system
- Existing marine pipeline and outfall diffuser with continuous discharge into the Tasman Bay
- New modern diffuser to replace existing outlet discharge structure at the end of the current marine outfall to be constructed as part of the renewals programme of the outfall.
- Upgrade and maintenance of planting around existing wetlands and swale, and surrounding NCC owned land throughout the life of the consent (in discussions with iwi and an agreed planting plan). Reviewed as part of ongoing Cultural heath indicator (CHI) [Note 3] monitoring or similar.
- Upgrade of odour control system [Note 1] to improve the air extraction capacity to draw more air from the wet well through the biofilter treatment and any other measures necessary to ensure compliance at the odour boundary identified.
- Ongoing pond health management by active pond management team and deploy appropriate mitigation measures when needed, to minimise risk of pond crashes and malodour.
- Improve treatment to reduce human norovirus concentrations and other pathogens within a 5- 10 year period if this is confirmed, through further testing and assessments, required to reduce the risk related to shellfish consumption [Note 4].
- Monitor and if needed improve treatment to reduce TSS, [Note 2] this involves environmental monitoring to ensure compliance with consent conditions and periodic receiving environment surveys to assess any effects on the benthic community.
- Ongoing environment and cultural health monitoring programme (the frequency and scope to be confirmed with iwi) [Note 3]

Notes:

1. The additional foul air collection and treatment to be implemented in accordance with the odour assessment and recommendations identified as being required by PDP Odour Assessment 2023
2. Any trigger values will be allowed for within consent conditions.
3. The frequency and scope of any cultural health monitoring to be confirmed with iwi.
4. The level of pathogen treatment to be determined by further virus testing, conformation of shellfish beds and traditional iwi shellfish harvesting sites in the area and review of the QMRA.

Appendices

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Appendix A Abbreviations

Enter Abbreviation	Enter Full Name
ADWF	Average Dry Weather Flow
AEE	Assessment of Environmental Effects
ATAD	Autothermal Thermophilic Aerobic Digestion
AWT	Advanced Water Treatment
BNR	Biological Nutrient Removal
BOD5	Biochemical Oxygen Demand (Carbonaceous – 5day)
BPO	Best Practicable Option
CHI	Cultural Health Indicator / Index
CMA	Coastal Marine Area
COD	Chemical Oxygen Demand
D	Scheme with new outfall diffuser
DAF	Dissolved Air Flotation
D-OW	Scheme with new outfall diffuser and oxidation and wetland ponds removed
ETS	Emissions Trading Scheme
GHG	Green House Gas
HA	Health Act 1956
LGA	Local Government Act 2002
MAR	Managed Aquifer Recharge
MBR	Membrane bio reactors
MCA	Multi Criteria Assessment (a decision tool)
MF	Microfiltration
MHWS	Mean High Water Springs
NCC	Nelson City Council
Nelson Plan	Draft Whakamahere Whakatū Nelson Plan
NES	National Environmental Standards
NPS	National Policy Statements
NPS-FM (2020)	National Policy Statement for Freshwater Management
NPV	Net Present Value (based on a 35 year period and 6% discount rate)

Enter Abbreviation	Enter Full Name
NRMP	Nelson Resource Management Plan
NRSBU	Nelson Regional Sewerage Business Unit
NWWTP	Nelson Wastewater Treatment Plant
NZCPS	New Zealand Coastal Policy Statement
OD	Scheme with additional odour management
QMRA	Quantitative Microbiological Risk Assessment
RMA	Resource Management Act 1991
SLR	Sea Level Rise
TBA	To be agreed
TDC	Tasman District Council
TSS	Total Suspended Solids
UV	Ultra Violet (Light disinfection)
W	Scheme with additional wetland improvements
WD	Scheme with additional wetland improvements and new outfall diffuser
WD-O	Scheme with additional wetland improvements, new outfall diffuser and oxidation ponds removed
WWF	Wet Weather Flows

Appendix B 'Long Long' List of Components

Table B-1: Alternatives considered as part of the 2003 Consent application9

Wastewater Management Categories	Options	Alternatives considered for each Option
Discharge of treated wastewater	To land, with onward disposal by runoff to inland waterways, seepage to groundwater or evapotranspiration.	Flat land – Wakapuaka marine and river flats – Delaware Bay – Whangamoa River Flats Steep Land – Hira Forest – Rai forest Combination of flat land during summer and steep land during winter
	To sea via estuaries, coastal lagoons, coastal discharges or submarine discharges.	Current outfall location approximately 350m offshore from the boulder bank
	Inland waterways (streams, rivers or lakes)	Discharge to the Nelson Haven
	Wastewater re-use	Not considered a practical disposal option
Treatment Technologies	Modification of the existing oxidation pond and additional of treatment stages	A1a Screening, trickling filter pre-treatment to reduce BOD and retain existing flow regime A1b Screening, aeration basin to reduce BOD and retain existing flow regime A2a Screening, run both compartments in parallel for increased facultative area and construct new maturation pond. A2b Screening, run both compartments in parallel for increased facultative area, construct new maturation pond and trickling filter pre-treatment A3 A2b plus incorporate wetlands with maturation ponds A4 A2b plus rock bed prior to sea outfall A5 A3 plus addition of UV disinfection A6 A2b plus membrane filtration
	Decommissioning of ponds and construction of a new stand-alone treatment plant at Wakapuaka (only a limited number of stand-alone treatment plant options were compared as it was considered there were a number of "black-box" variations that would all fall in the same range of costs)	B1 Decommission facultative pond, construct constant level batch reactor in existing maturation pond, discharge through sea outfall plus UV disinfection and sludge to Bell Island ATAD'S B2 Decommission both ponds, construct new extended aeration, biological nutrient removal plant with UV disinfection, discharge through sea outfall and sludge to Bell Island ATAD'S.
	Decommissioning of ponds and the diversion of all wastewater to the Bell Island WWTP	• Flow diversion with a new 16km rising main along SH6 and pump station upgrading. Further upgrading of the Bell Island WWTP also required.

[9] Source NWWTP Resource Consent application & AEE, Duffill Watts &Tse Ltd, 2003

Wastewater Management Categories	Options	Alternatives considered for each Option
Pond Based options	Primary treatment options (to achieve reliable facultative pond performance)	• In pond aeration • Oxygen injection • Trickling Filter Options • Aerated lagoon options (fully mixed aerated lagoons – partially mixed aerated facultative lagoon systems) • Anaerobic Pre-treatment
	Secondary treatment options following the facultative pond (to improve effluent quality paraments for discharge into the sea)	• Maturation Ponds • Rock Bed Filters
New Plant options	New wastewater treatment plant to be built to replace in part the oxidation pond system	• In-pond constant level batch reactor • Extended aeration activated sludge biological nutrient removal plant (with ultra-violet disinfection)

Table B-2: Draft 'Long Long' list of Alternatives (options) for NWWTP resource consenting projects 2023

Wastewater Management Categories	General Description	Alternatives / Options

1. Untreated wastewater collection and management
(Apply to all wastewater treatment and discharge / reuse schemes)
	Note: There are a number of such options available, including a number of reticulation options. However, there is a reticulated system already in the urban areas and there are no other yet proven and approved types of schemes available that do not require a reticulation system in significantly sized urban areas. Hence the WWTP needs to be based on a modern-day, well operated, reticulated system.
	Notwithstanding this, there are means to minimise the input of wastewater relative to the community the Scheme serves
		• Conventional waterborne reticulated wastewater collection system (as in place now for the urban Nelson areas served by the WWTP)
		• Alternative wastewater collection systems (overlap with category 3)
		  ○ Low pressure
		  ○ STEP (septic tank effluent pumping)
		  ○ Vacuum Systems
		• on-site wastewater treatment type systems
		• cluster systems (community schemes)
		• waterless toilet systems
		• Greywater reuse
		• Other TBA

2. Wastewater inputs management	(Apply to all wastewater treatment and discharge / reuse schemes)	• Trade waste management through implementing cleaner technology and waste minimisation measures through the trade waste controls and education. • Wastewater and Trade Waste Bylaws • Other TBA

3. Producing less wastewater
(Apply to all wastewater treatment and discharge / reuse schemes)
	Wastewater input management techniques can reduce the wastewater flows and loads relative to those in uncontrolled and not well managed sewerage systems.	• Water supply conservation and demand management
		• Engineering and infrastructure standards used in the construction and management of the wastewater infrastructure.
		• Infiltration and inflow management, including illegal connections.
		  ○ Modelling programmes of the wastewater reticulation system.
		  ○ Stormwater upgrades.
		  ○ Renewal programmes; and
		  ○ Investigation and inspection programmes.
		• Use of low pressure grinder pump schemes or vacuum or STEP in new residential and industrial areas, these significantly reduce wet weather flows over conventional collection systems (overlap with category 1).
		• Other TBA

4. Alternative Wastewater Treatment Plant location(s)		• Existing WWTP location • Convey all of the wastewater in the NWWTP catchment to Bell Island WWTP • New WWTP location • Split WWTP site with existing site and new site

Wastewater Management Categories	General Description	Alternatives / Options	
		• Other TBA	
		Level of Treatment	**Related type of treatment process**
5. Alternative levels of treated wastewater and related types of Treatment Processes Note each treatment option requires specific odour management consideration.	Effects driven – the approach as set out in this memo (Section 1.16.1) will be to base the level of treatment on an acceptable treated wastewater quality for the receiving environments to which the treated wastewater is discharged and or beneficially reused. This approach follows the fundamental basis of the RMA in terms of an effects driven solution. Once a treated wastewater quality is established the appropriate treatment process or processes are then determined in terms of developing an overall sustainable total wastewater scheme BPO solution.	Existing level of treatment	• Grit removal, Screening, clarifier, trickling filter, facultative pond, maturation pond, flow buffering and wetlands.
		Improved treatment through changes to the ponds and or wetlands	• Additional aeration in ponds • Recirculation in ponds • Baffling • Pond management (active seeding) • Depth modification of wetland • Planting and management regimes of wetlands • Other TBA
		Improved suspended solids removal	For example • Filtration various types e.g. rock filter, sand, granular, disc /cloth filter, membrane. • Clarification / ballasted Flocculation e.g. ACTIFLO unit or similar • Dissolved Air Flotation (DAF) • Ultrasonics • Aquamats • Other TBA
		Improved BOD/ COD removal	• Increase biological treatment. • Trickling filter • Membrane bio reactors (MBR) • Improve suspended solids removal as above. • Other TBA
		Improved Ammonia removal (Nitrification)	• Trickling filter (full or side stream treatment) • Aeration / Nitrification treatment • Pond / Wetland management • pH management in pond

Wastewater Management Categories	General Description	Alternatives / Options	
			• Other TBA
		Improved total nitrogen removal (Nitrification / Denitrification)	• Range of biological nutrient removal treatment depending on the levels required. • Nitrifying filters • Nitrifying / Denitrifying filters • Membrane bio reactors (MBR) • Other TBA
		Improved phosphorus removal	• Biological processes treatment • Biological processes in pond • Chemical addition directly to the pond • Chemical addition to a clarifier • Ballasted Flocculation
		Microbiological / pathogen removal	• UV Disinfection • Chlorination / dechlorination • Other chemical additions e.g Hydrogen peroxide, ozone etc
	To be confirmed following understanding of wastewater contaminant concentrations	Emerging Contaminants and other contaminants of concern (e.g. heavy metals, organic compounds)	• Depends on overall treatment processes selected and wastewater inputs management including trade waste.
		Reclaimed water standards - non-potable direct reuse	• Advanced Water Treatment (AWT) Plant - Combination of a number of the above with or without further treatment such as ultra filtration and possibly reverse osmosis. Depends on the quality of reclaimed water required.
		Reclaimed water standard – potable direct reuse (NZDW supply quality)	• Advanced Water Treatment (AWT) Plant - Combination of a number of the above including ultra-filtration and reverse osmosis and disinfection
		Managed Aquifer Recharge (MAR)for supplementing groundwater supply	• Advanced Water Treatment (AWT) Plant - Combination of a number of the above including ultra-filtration, disinfection and possibly reverse osmosis.

Wastewater Management Categories	General Description	Alternatives / Options	
		Other TBA	Other TBA
6. Discharge of treated wastewater	Discharge to a river / stream (surface water)	• Discharge to surface water • Other TBA	
	Discharge to Groundwater	• Groundwater reinjection • Managed Aquifer Recharge (indirect reuse) • Groundwater discharge via rapid infiltration (to shallow aquifer) • Other TBA	
	Discharge to the Coastal Marine Area (CMA)	• Existing outfall with 100% discharge to the CMA • New longer offshore marine outfall into Tasman Bay • Discharge to the Haven • Convey treated wastewater to the Bell Island outfall. • Other TBA	
	Discharge to air	Evaporation of all wastewater	
	Discharge to land (land application)	• 100% of treated wastewater to land application in coastal strip e.g. • Pasture Irrigation system • Golf Course (s) and Parks in Nelson City • Airport • 100% of treated wastewater to land application in inland areas e.g. • Pasture Irrigation system • Forest Irrigation • Partial land application of treated wastewater to land with high flows discharge to sea. • Partial land application of treated wastewater amounts and timing split between inland areas and coastal strip. • Partial land application of treated wastewater to land along with discharge to groundwater for high flows • Combinations of above land application on a seasonal or receiving environments assimilation ability basis	

Wastewater Management Categories	General Description	Alternatives / Options
	Wetland / land passage singly or jointly	• Existing Wetland with no changes • Changes made to existing wetland to increase planting. • Changes made to existing wetland to increase aesthetics, wildlife, cultural component. • Alternative land contact / land passage prior to discharge to CMA or freshwater • Other TBA
	Combination options of above discharge options. Note – some combinations are included in the alternative discharge options above	• Combinations of above devised on respective eco-systems assimilation capacities, for example to land when the land is dry, to river when river flows are higher. Trigger levels to be established to determine what proportion of the treated wastewater goes where. • Ocean + Land • Land + River • Land + Groundwater • Ocean + Land + Groundwater • Any of the above with beneficial reuse options (category 7 below) • Other TBA
7. Resource recovery / Beneficial reuse	Beneficial Reuse Options for total wastewater volume, or some proportion in conjunction with a category 6 discharge option and category 5 treatment option or options.	• Re-use of treated wastewater by industry, agriculture, horticulture, sports fields, gardens, landscaping etc • Direct non-potable water • Direct potable water • Indirect (e.g. aquifer recharge) • Energy management or reuse system • Other TBA
	Sludge and Biosolids management and Beneficial reuse Different treatment processes generate different quantities and qualities of sludge and when stabilized with appropriate treatment processes biosolids	• Existing scheme currently disposes (wet) biosolids via the Bell Island Treatment Plant then onto consented areas of Rabbit Island • Resource recovery at treatment plant • Additional biosolids treatment to acceptable standards for safe application to land • Reduction in sludge generation – is there a no sludge option? • Other TBA

Appendix C Fatal Flaw Assessment

Table C-1: Fatal Flaw Assessment of scheme components (all other components were deemed to not trigger a fatal flaw criteria)

Category	Component No.[10]	Description	Fatal Flaws						Comments
			Statutory Fatal Flow	Clash with Waahi Tapu	Does not Use Existing infra-structure	Receiving Environment not sustainable	Does not Provide for Planned Growth	Significant Increase in GHG	
Untreated wastewater collection and management (Applies to all wastewater treatment and discharge / reuse schemes)	1.2	Alternative wastewater collection systems (overlap with category 3)							Does not use existing infrastructure. Could have alternatives for new areas or replacement infrastructure (e.g. pressure sewers)
	1.3	Individual on-site wastewater treatment systems							Does not use existing infrastructure. Significant reduction in level of service and potential compromise of public health.
	1.4	Cluster systems (community schemes)							Similar issues as Option 1.3.
Alternative Wastewater Treatment Plant location(s)	4.3	New WWTP location							Complete replacement of existing WWTP infrastructure. Extensive replacement of conveyance systems dependent on location.
Discharge of treated wastewater to river	6.1.1	Discharge to river							Anticipated significantly higher discharge quality required to meet NPS FW. 2001 options study did not identify any suitable options. No significant water courses within 5km.
Discharge of treated wastewater to the Coastal Marine Area (CMA)	6.3.3	Discharge to the Haven							Coastal marine water standards may be more stringent under the proposed Nelson Plan.

[10] Component No. as referenced to the full list of components identified in Appendix B of this report

Category	Component No.[10]	Description	Fatal Flaws						Comments
			Statutory Fatal Flow	Clash with Waahi Tapu	Does not Use Existing infra-structure	Receiving Environment not sustainable	Does not Provide for Planned Growth	Significant Increase in GHG	
Discharge to air	6.4.1	Evaporation of all wastewater							Excessive energy requirements. Reject brine water and environmental issues re: disposal.
Discharge of treated wastewater to land	6.5.1	100% of treated wastewater to land in coastal strip.							Insufficient land area to manage 100% of treated WW. (PDP assessment 2021)
Combination options of above discharge options.	6.7.2	Land + River							Same issues as Option 6.1.1
	6.7.4	Ocean + Land + Groundwater							Significant level of infrastructure required to discharge to three different receiving environments.

Appendix D Long List of Total Schemes

Table D-1: Long list of total schemes

Option No.	Summary of scheme	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s)
Current Scheme Options with upgrades						
1	Current Scheme	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	As existing	As existing
1W	Current Scheme with upgrading/ planting of Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded wetlands	As existing
1D	Current Scheme with new modern diffuser section on existing outfall	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	As existing	As existing
1WD	Current Scheme with new modern diffuser and upgrading/ planting of Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded wetlands	As existing
1 OWD	Current Scheme with improved odour management, new modern diffuser and upgrading/ planting of Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50- 100 m on the end of the existing outfall.	Upgraded wetlands New / enhanced odour management	As existing
Current Scheme with alternative discharge regime / location of discharge options						
2	Current Scheme with outgoing tidal discharge	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Discharge as on outgoing tide	• As existing	As existing	As existing
3	Current scheme with longer outfall	Longer outfall approx. ???? m out into Tasman Bay at ??? m depth	Existing continuous discharge	• New longer outfall with modern diffuser	As existing	As existing
4	Current scheme with All to Land Application (LA)	Hira and/or Rai Forest(s)	Forest spray irrigation (fixed sprinklers)	• Conveyance • Storage • Irrigation infrastructure	Assumed as presently (could decommission wetlands, part of oxidation ponds)	As existing

Option No.	Summary of scheme	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s)
				• Retain marine outfall for extreme/contingency events		
5	Current scheme with All to Land Eastern Valleys or Rai Valley	Eastern Valleys	Spray Land use?	• Conveyance • Storage • Irrigation infrastructure • Retain marine outfall for extreme/contingency events	Assumed as presently (could decommission wetlands, part of oxidation ponds)	As existing
6	Current scheme with a land application component in summer/dry periods	Existing marine outfall plus Hira or Rai Forest or Eastern Valley	Forest or? Land use	• Existing marine outfall with or without new diffuser plus • Land application • Conveyance • Storage • Irrigation infrastructure	Assumed as presently (could decommission wetlands, part of oxidation ponds)	As existing
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	Existing marine outfall and a proportion to Wakapuaka Flats in dry summer period (with/without new modern diffuser)	Existing marine outfall (continuous or outgoing tide discharge	• Existing marine outfall with or without new diffuser plus • Land application • Conveyance • Storage • Irrigation infrastructure	Existing	As existing
8	Current scheme with Managed Aquifer Recharge (MAR) scheme	Appleby gravels aquifer under Stoke and Richmond suburbs for ADWF Existing marine outfall for WWF's with/without modern diffuser	Managed aquifer recharge + marine discharge	• Conveyance to and bore injection for MAR	Existing with possible Filtration and UV disinfection for MAR proportion	As existing
9	Current scheme with non-potable direct reuse with balance to existing Tasman Bay outfall	Non – potable reticulated Domestic and Business reuse. Balance to existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Reuse and balance to existing discharge	• Existing marine outfall with or without new diffuser plus • New conveyance and reticulation system for non-potable direct reuse	Upgrade to existing WWTP with AWT to meet agreed recycle standards	As existing

Option No.	Summary of scheme	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s)
10	Current scheme with indirect potable reuse (Nelson Water Supply) with balance to existing Tasman Bay outfall	Supplement Matai water supply reservoir (Nelson water supply). Balance to existing marine outfall	Reuse and balance to existing discharge	• Existing marine outfall with or without new diffuser plus • New conveyance system for potable indirect reuse	Upgrade to existing WWTP with AWT to meet agreed recycle standards producing "reclaimed water"	As existing
Upgraded Treatment Options – Treatment Mode 1 – Additional Removal of Solids / BOD / COD						
11	Upgraded Treatment Mode One	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting TSS and BOD / COD	As existing
11W	Upgraded Treatment Mode One with upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting TSS and BOD / COD Upgraded wetlands	As existing
11D	Upgraded Treatment Mode One with new modern diffuser section on existing outfall	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting TSS and BOD / COD	As existing
11WD	Upgraded Treatment Mode One with new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting TSS and BOD / COD Upgraded wetlands	As existing
Upgraded Treatment Options – Treatment Mode 2 – Additional Removal of Pathogens						
12	Upgraded Treatment Mode Two	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of pathogens	As existing
12W	Upgraded Treatment Mode Two with upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of pathogens Upgraded wetlands	As existing
12D	Upgraded Treatment Mode Two with new modern diffuser section on existing outfall	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of pathogens	As existing
12WD	Upgraded Treatment Mode Two with new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of pathogens Upgraded wetlands	As existing

Option No.	Summary of scheme	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s)
Upgraded Treatment Options – Treatment Mode 3 – Additional Removal of Solids / BOD / COD and Pathogens						
13	Upgraded Treatment Mode Three	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens	As existing
13W	Upgraded Treatment Mode Three with upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens Upgraded wetlands	As existing
13D	Upgraded Treatment Mode Three with new modern diffuser section on existing outfall	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens	As existing
13WD	Upgraded Treatment Mode Three with new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens Upgraded wetlands	As existing
13 OWD	Upgraded Treatment Mode Three with improved odour management, new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50- 100 m on the end of the existing outfall.	New / enhanced odour management Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens Upgraded wetlands	As existing
Upgraded Treatment Options – Treatment Mode 3 – Additional Removal of Solids / BOD / COD, Pathogens and Nutrients						
14	Upgraded Treatment Mode Four	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of TSS / BOD / COD, pathogens and nutrients	As existing
14W	Upgraded Treatment Mode Four with upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	Upgraded/improved treatment targeting removal of TSS / BOD / COD, pathogens and nutrients Upgraded wetlands	As existing

Option No.	Summary of scheme	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s)
14D	Upgraded Treatment Mode Four with new modern diffuser section on existing outfall	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD / COD, pathogens and nutrients	As existing
14WD	Upgraded Treatment Mode Four with new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD / COD, pathogens and nutrients Upgraded wetlands	As existing
14WD-O	Upgraded Treatment Mode Four with new modern diffuser and upgrading/ planting of existing Wetlands Without main oxidation pond	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD / COD, pathogens and nutrients Removal of oxidation ponds Upgraded wetlands	As existing
14D-OW	Upgraded Treatment Mode Four with new modern diffuser Without main oxidation pond and Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD, pathogens and nutrients Removal of oxidation ponds Removal of wetland	As existing
Alternative Treatment Location Options – involving Bell Island						
15	All treated and discharged through a Single WWTP System at Bell Island	Bell Island outfall to Waimea Inlet	Outgoing tide as currently at Bell Island	• Existing Bell Island outfall • Retain existing NWWTP outfall for Contingency purposes	As per Bell Island or upgraded with new consent	Bell Island upgraded
16	Treated Wastewater conveyed to – Bell Island WWTP Outfall	Bell Island outfall to Waimea Inlet	Outgoing tide as currently at Bell Island	• Existing Bell Island outfall • Retain existing NWWTP outfall for Contingency purposes	As existing at NWWTP, existing outfall if new Bell Island consent allows for additional volumes.	As existing
17	Further Split NWWTP flows with existing site and Bell Island WWTP	A further proportion of untreated WW to Bell Island, hence Waimea Inlet outfall, and the remained at existing NWWTP and Tasman Bay outfall	Existing continuous discharge at NWWTP Outgoing tide as currently at Bell Island	• Existing Bell Island outfall • Existing NWWTP outfall with / without new modern diffusers	As required for the respective two outfall Marine Discharges	As existing

Appendix E Traffic Light Assessment

Table E-1: Traffic Light assessment

Scoring

= 0 points = 1 point = 2 points

Note: The scoring is based on equal weight for each of the traffic light criteria. Weightings could be given to individual criteria. At this stage this will be part of the MCA of the short list.

Option No.	Summary of scheme	Public Health	Natural Environment	Māori Cultural Values	Social and Community Considerations	Affordable / Financial Implications	Technology and Infrastructure	Resilience	Growth and economic development	Carbon / GHG Emissions / Resource Recovery
CURRENT SCHEME OPTIONS										
1	Current Scheme									
1OD	Current Scheme with improved odour management									
1W	Current Scheme with upgrading/ planting of Wetlands									
1D	Current Scheme with new modern diffuser section on existing outfall									
1WD	Current Scheme with new modern diffuser and upgrading/ planting of Wetlands									
1OWD	Current Scheme with improved odour management with new modern diffuser and upgrading/ planting of Wetlands									
CURRENT SCHEME WITH ALTERNATIVE DISCHARGE REGIME / LOCATION OPTIONS										
2	Current Scheme with outgoing tidal discharge									
3	Current scheme with longer outfall									
4	Current scheme with All to Land Application (LA) forest									
5	Current scheme with All to Land Eastern Valleys or Rai Valley									
6	Current scheme with a land application component in summer/dry periods									
7	Current scheme with a land application component in summer/dry periods on Wakapuaka Flats									
8	Current scheme with Managed Aquifer Recharge (MAR) scheme									
9	Current treatment location with greater treatment for non-potable direct reuse with balance to existing Tasman Bay outfall									
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to land application									
10	Current scheme with indirect potable reuse (Nelson Water Supply) with balance to existing Tasman Bay outfall									
UPGRADED TREATMENT OPTIONS – TREATMENT MODE 1 – ADDITIONAL REMOVAL OF SOLIDS / BOD / COD										
11	Upgraded Treatment Mode One									
11W	Upgraded Treatment Mode One with upgrading/ planting of existing Wetlands									
11D	Upgraded Treatment Mode One with new modern diffuser section on existing outfall									
11WD	Upgraded Treatment Mode One with new modern diffuser and upgrading/ planting of existing Wetlands									
11OWD	Upgraded Treatment Mode One with improved odour management, new modern diffuser and upgrading/ planting of existing Wetlands									
UPGRADED TREATMENT OPTIONS – TREATMENT MODE 2 – ADDITIONAL REMOVAL OF PATHOGENS										
12	Upgraded Treatment Mode Two									
12W	Upgraded Treatment Mode Two with upgrading/ planting of existing Wetlands									
12D	Upgraded Treatment Mode Two with new modern diffuser section on existing outfall									
12WD	Upgraded Treatment Mode Two with new modern diffuser and upgrading/ planting of existing Wetlands									

Option No.	Summary of scheme	Public Health	Natural Environment	Māori Cultural Values	Social and Community Considerations	Affordable / Financial Implications	Technology and Infrastructure	Resilience	Growth and economic development	Carbon / GHG Emissions / Resource Recovery
12OWD	Upgraded Treatment Mode Two with improved odour management, new modern diffuser and upgrading/ planting of existing Wetlands									
UPGRADED TREATMENT OPTIONS – TREATMENT MODE 3 – ADDITIONAL REMOVAL OF SOLIDS / BOD / COD AND PATHOGENS										
13	Upgraded Treatment Mode Three									
13W	Upgraded Treatment Mode Three with upgrading/ planting of existing Wetlands									
13D	Upgraded Treatment Mode Three with new modern diffuser section on existing outfall									
13WD	Upgraded Treatment Mode Three with new modern diffuser and upgrading/ planting of existing Wetlands									
13OWD	Upgraded Treatment Mode Three with upgrading/ planting of existing Wetlands, additional odour management and modern diffuser									
UPGRADED TREATMENT OPTIONS – TREATMENT MODE 4 – ADDITIONAL REMOVAL OF SOLIDS / BOD / COD, PATHOGENS AND NUTRIENTS										
14	Upgraded Treatment Mode Four									
14W	Upgraded Treatment Mode Four with upgrading/ planting of existing Wetlands									
14D	Upgraded Treatment Mode Four with new modern diffuser section on existing outfall									
14WD	Upgraded Treatment Mode Four with new modern diffuser and upgrading/ planting of existing Wetlands									
14WD-O	Upgraded Treatment Mode Four with new modern diffuser and upgrading/ planting of existing Wetlands Without main oxidation pond									
14D-OW	Upgraded Treatment Mode Four with new modern diffuser Without main oxidation pond and Wetlands									
ALTERNATIVE TREATMENT AND / OR DISCHARGE LOCATION OPTIONS										
15	All treated and discharged through a Single WWTP System at Bell Island									
16	Treated Wastewater conveyed to NRSBU – Bell Island Outfall									
17	Split NWWTP flows with existing site and Bell Island WWTP									

Appendix F Short List Scheme Descriptions used for MCA.

Table F-1: Traffic Light assessment

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
1 Current Scheme	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth	Existing continuous discharge	As existing	As existing	As existing	Nil
1 OWD Current Scheme with improved odour management, new modern diffuser and upgrading/ planting of Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50- 100 m on the end of the existing outfall.	Upgraded wetlands New / enhanced odour management	As existing	New / enhanced odour management by one or more of the following: • Additional foul air collection and treatment in biofilters • Chemical scrubbing of foul air • Activated carbon • Further or additional pond aeration and or management • Further pond crash mitigation techniques Wetlands upgrading by one of the following: • Replanting the existing wetland. • Enhancing the cultural planting / natural habitats around the wetland and leave the ponds as existing • Use of floating modules of wetland plants. • Modify the existing wetland cells to create a 'swamp' • Depth modification in ponds New modern duckbill diffuser discharge infrastructure
3 Current scheme with longer outfall	Longer outfall approx. ???? m out into Tasman Bay at ??? m depth	Existing continuous discharge	• New longer outfall with new modern diffuser	As existing	As existing	• Extended outfall further into the Tasman Bay

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
7 Current scheme with a land application component in summer/dry periods on Wakapuaka Flats	Existing marine outfall and a proportion to Wakapuaka Flats in dry summer period (with/without new modern diffuser)	Existing marine outfall (continuous or outgoing tide discharge	• Existing marine outfall with or without new diffuser plus • Conveyance • Storage • Irrigation infrastructure	As existing	As existing	• Control system to where treated wastewater goes • Conveyance to land application scheme • Storage at site • Irrigation system • Access/roading etc.
9a Current treatment location with non-potable direct reuse with balance to forestry land	Non – potable reticulated Domestic and Business reuse. Balance to Hira and/or Rai Forest(s)	Reuse and balance to Forest spray irrigation (fixed sprinklers)	• New conveyance and reticulation system for non-potable direct reuse • Conveyance for land application • Storage • Irrigation infrastructure	Upgrade to existing WWTP with AWT to meet required recycled water standards (could decommission wetlands, part of oxidation ponds)	As existing	• Control system to where treated wastewater goes • Conveyance to land application scheme • Storage at site • Irrigation system • • Access/roading etc. Advanced Water Treatment (AWT) Plant • Conveyance and reticulation scheme and connection to households and businesses • Upgrading of existing NWWTP to produce suitable quality of treated wastewater for the inlet to AWT

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
11 OWD Upgraded Treatment Mode One (removal of solids/BOD/COD) with improved odour management, new modern outfall diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill section 5 - 100 the end of the existing outfall.	New / enhanced odour management Upgraded/improved treatment targeting TSS and BOD / COD Upgraded wetlands	As existing	Treatment plant upgrading to remove TSS and BOD / COD by either or a combination of: • Chemical addition • Filtration various types e.g. granular media, disc /cloth, membrane • Clarification / ballasted flocculation e.g. ACTIFLO unit or similar • Dissolved Air Flotation (DAF) • In-pond enhancements (e.g. Aquamats®) New / enhanced odour management by one or more of the following: • Additional foul air collection and treatment in biofilters • Chemical scrubbing of foul air • Activated carbon • Further or additional pond aeration and or management • Further pond crash mitigation techniques Wetlands upgrading by one of the following: • Replanting the existing wetland. • Enhancing the cultural planting / natural habitats around the wetland and leave the ponds as existing • Use of floating modules of wetland plants. • Modify the existing wetland cells to create a ‘swamp’ • Depth modification in ponds New modern duckbill diffuser discharge infrastructure

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
12 OWD Upgraded Treatment Mode Two (removal of pathogens) with improved odour management, new modern outfall diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50- 100 m on the end of the existing outfall.	New / enhanced odour management Upgraded/improved treatment targeting removal of pathogens Upgraded wetlands	As existing	Treatment plant upgrading to remove pathogens by either or a combination of: • Increase retention time by reducing short circuiting in ponds (baffles) • Membrane filtration • UV Disinfection • Chlorination / dechlorination • Other chemical additions e.g. hydrogen peroxide, ozone etc. New / enhanced odour management by one or more of the following: • Additional foul air collection and treatment in biofilters • Chemical scrubbing of foul air • Activated carbon • Further or additional pond aeration and or management • Further pond crash mitigation techniques Wetlands upgrading by one of the following: • Replanting the existing wetland. • Enhancing the cultural planting / natural habitats around the wetland and leave the ponds as existing • Use of floating modules of wetland plants. • Modify the existing wetland cells to create a ‘swamp’ • Depth modification in ponds New modern duckbill diffuser discharge infrastructure

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
13 OWD Upgraded Treatment Mode Three with Improved odour management, new modern diffuser and upgrading/ planting of existing Wetlands	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50- 100 m on the end of the existing outfall.	New / enhanced odour management Upgraded/improved treatment targeting removal of TSS / BOD / COD and pathogens Upgraded wetlands	As existing	Treatment plant upgrading to remove TSS and BOD / COD by either or a combination of: • Chemical addition • Filtration various types e.g. granular media, disc /cloth, membrane • Clarification / ballasted flocculation e.g. ACTIFLO unit or similar • Dissolved Air Flotation (DAF) • In-pond enhancements (e.g. Aquamats®) Treatment plant upgrading to remove pathogens by either or a combination of: • Increase retention time by reducing short circuiting in ponds (baffles) • Membrane filtration • UV Disinfection • Chlorination / dechlorination • Other chemical additions e.g. hydrogen peroxide, ozone etc. New / enhanced odour management by one or more of the following: • Additional foul air collection and treatment in biofilters • Chemical scrubbing of foul air • Activated carbon • Further or additional pond aeration and or management • Further pond crash mitigation techniques Wetlands upgrading by one of the following: • Replanting the existing wetland. • Enhancing the cultural planting / natural habitats around the wetland and leave the ponds as existing • Use of floating modules of wetland plants. • Modify the existing wetland cells to create a ‘swamp’ • Depth modification in ponds • New modern duckbill diffuser discharge infrastructure

Code/Option No. Notes 1,2,3	Treated Wastewater Discharge Location	Discharge Regime	Discharge Infrastructure	Treatment Regime Required	Treatment Plant Site(s) Note 5	New Infrastructure Required Note 4
14 WD-Ox Upgraded Treatment Mode Four (removal of solids/BOD/COD, pathogens and nutrients) with new modern outfall diffuser and upgrading/ planting of existing Wetlands Without main oxidation pond	Existing marine outfall approx. 430m out into Tasman Bay at 13.5m depth with new modern diffuser	Existing continuous discharge	New rubber duckbill diffuser section 50-100 m on the end of the existing outfall.	Upgraded/improved treatment targeting removal of TSS / BOD, pathogens and nutrients Removal of oxidation ponds Upgraded wetlands	As existing	Treatment plant upgrading to remove nutrients by either or a combination of: • Biological nutrient removal (BNR) plant • Membrane bioreactor (MBR) plant • Nitrifying filters • Nitrifying / Denitrifying filters • Advanced wetland system • Chemical addition to a clarifier / DAF • Ballasted Flocculation • Wetlands upgrading by one of the following: • Replanting the existing wetland. • Enhancing the cultural planting / natural habitats around the wetland and leave the ponds as existing • Use of floating modules of wetland plants. • Modify the existing wetland cells to create a 'swamp' • Depth modification in ponds New modern duckbill diffuser discharge infrastructure

Notes:

1. All total schemes based on existing and planned collection network. Does not include alternative in future e.g. pressure sewers
2. All schemes could have some beneficial use of treated wastewater on an "on demand" basis providing NCC agree and consents, when necessary, and resource consents permitting, e.g. golf course, nurseries, turf culture industrial reuse
3. All treatment schemes can have some resource recovery specific to treatment type and associated infrastructure
4. New Infrastructure is that required for the Scheme. It excludes capacity upgrades for growth and replacement of aged infrastructure.
5. A new site location considered to be fatally flawed as it would take a period of 20 – 35 years to secure a new location and construct a new facility, Does not maximise use of existing infrastructure.

Appendix G MCA Assessments

Available upon request

DESIGN WITH COMMUNITY IN MIND

Communities are fundamental. Whether around the corner or across the globe, they provide a foundation, a sense of place and of belonging. That's why at Stantec, we always design with community in mind.

We care about the communities we serve—because they're our communities too. This allows us to assess what's needed and connect our expertise, to appreciate nuances and envision what's never been considered, to bring together diverse perspectives so we can collaborate toward a shared success.

We're designers, engineers, scientists, and project managers, innovating together at the intersection of community, creativity, and client relationships. Balancing these priorities results in projects that advance the quality of life in communities across the globe.

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