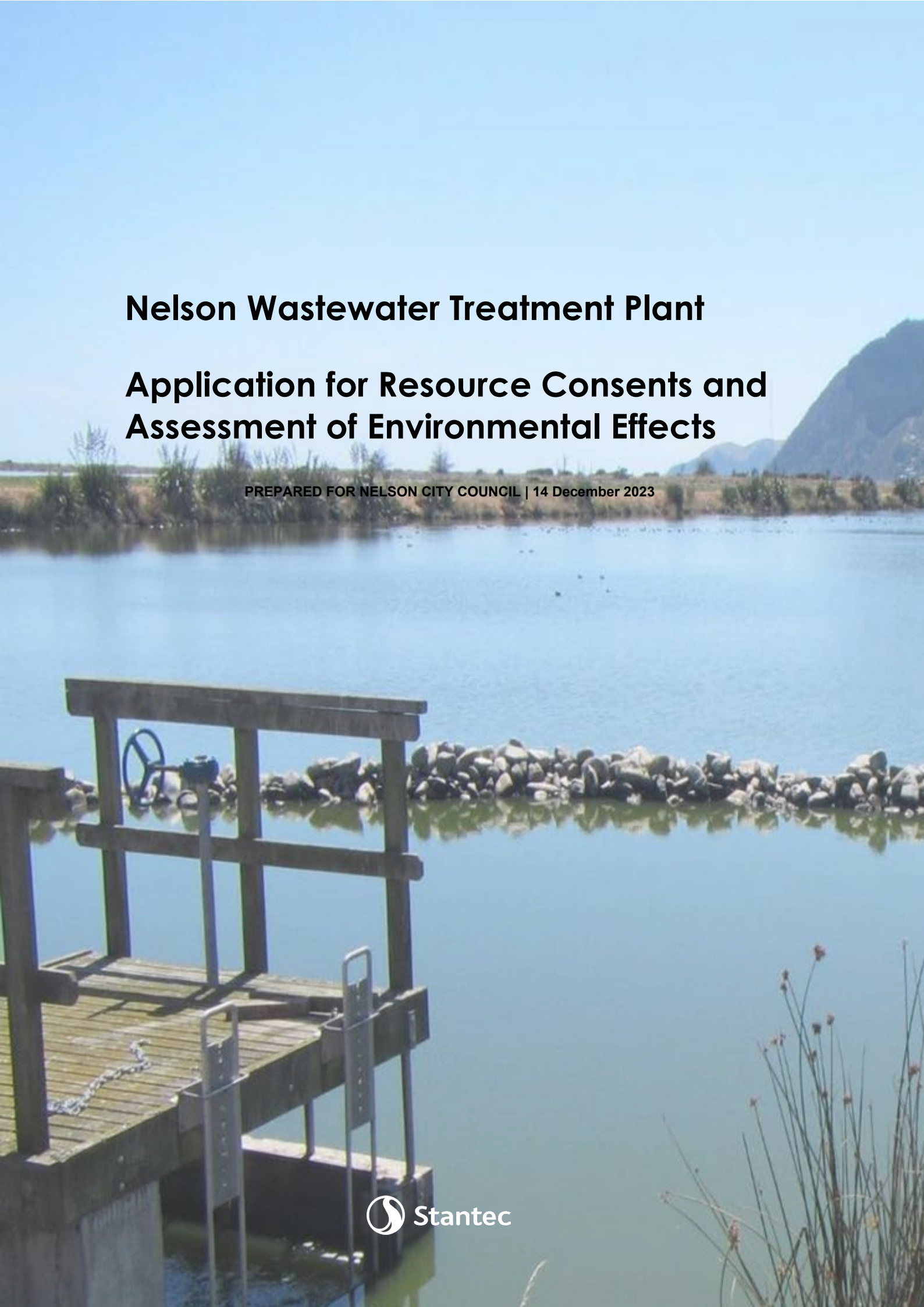

Nelson Wastewater Treatment Plant

Application for Resource Consents and Assessment of Environmental Effects

PREPARED FOR NELSON CITY COUNCIL | 14 December 2023

Stantec

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14 / 12 / 2023

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STATUS FINAL | Project No 310003031

Summary of Resource Consents Sought

Consent Number	Resource Consent Type and Activity to be Authorised	Term of Consent being sought
1	Coastal permit: To discharge treated wastewater to Tasman Bay.	35 years
2	Coastal permit: To place, use, and maintain a pipeline and outfall diffuser structure, including a replacement outfall diffuser structure, on and under the bed of Tasman Bay.	35 years
3	Coastal permit: To disturb the foreshore and seabed to replace an existing outfall diffuser structure located on and under the bed of Tasman Bay.	35 years
4	Discharge permit: To discharge treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities.	35 years
5	Land use consent: To remove vegetation and undertake earthworks to prepare the buffer pond for storage of sludge and to gain access.	35 years
6	Discharge permit: To discharge contaminants to air from the operation of a wastewater treatment plant, including during desludging activities.	35 years
7	Discharge permit: To discharge contaminants to air from the operation of a diesel-powered electricity generator.	35 years

Application Form

Resource Management Act – Form 9

Application for resource consents

To Nelson City Council

The Nelson City Council applies for the following type(s) of resource consents (all location coordinates New Zealand Transvers Mercator (NZTM)):

Coastal permit: To discharge treated wastewater to Tasman Bay (location coordinates 1626859E 5438971N).

Coastal permit: To place, use, and maintain a pipeline and outfall diffuser structure, including a replacement outfall diffuser structure, on and under the bed of Tasman Bay (location coordinates between 1627074E 5438709N and 1626859E 5438971N).

Coastal permit: To disturb the foreshore and seabed to replace an existing outfall diffuser structure located on and under the bed of Tasman Bay (location coordinates between 1627074E 5438709N and 1626859E 5438971N).

Discharge permit: To discharge treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities (centred on location coordinates 1627604E 5438527N).

Land use consent: To remove vegetation and undertake earthworks to prepare the buffer pond for storage of sludge and to gain access (location coordinates 1627209E 5438457N).

Discharge permit: To discharge contaminants to air from the operation of a wastewater treatment plant, including during desludging activities (centred on location coordinates 1627604E 5438527N).

Discharge permit: To discharge contaminants to air from the operation of a diesel-powered electricity generator (location coordinates 1627143E 5438619N).

These activities are associated with the ongoing operation of the Nelson Wastewater Treatment Plant. The sites at which the proposed activity are to occur, and the respective owners, are as follows:

Land Owner	Address	Legal Description (Certificate of Title)
Nelson City Council	162 Boulder Bank Drive, Nelson	Lot 1 DP 13614 and Lot 3 DP 7530 (CT 3B/953, 8B/1146)
Crown	Foreshore and seabed of Tasman Bay	N/A

The full name and address of each owner or occupier (other than the applicant) of the site to which the application relates are as follows: Refer to table above.

The other activities that are part of the proposal to which the application relates are as follows:

- Operation of the Nelson Wastewater Treatment Plant.
- Exclusive occupation of the coastal marine area by the outfall structure.
- Ongoing maintenance of the outfall structure.
- Off-site disposal of sludge following desludging activities.

The Nelson Wastewater Treatment Plant and its operation is authorised by Designation DN7 of the Nelson Resource Management Plan.

Exclusive occupation of the coastal marine area by the outfall structure, including any replacement structure, is a permitted activity under rule CMr.20.1 of the Nelson Resource Management Plan if the occupation "…is solely by a

structure permitted under the NRMP or a resource consent". In this case the outfall structure, including any replacement, will (assuming this application is granted) be authorised by a resource consent, so the exclusive occupation of the coastal marine area is a permitted activity.

Any ongoing maintenance of the outfall structure, and any replacement structure, is permitted by rule CMr.24.1 of the Nelson Resource Management Plan as all the permitted activity criteria would be met for any such maintenance.

Sludge is proposed to be removed from the ponds when needed and it will be dewatered in geotextile bags that will be placed in the buffer pond. Once the sludge dries to a prescribed moisture content (20%) it will be transported to York Valley landfill where its use/disposal is authorised by the consents held by the operator of that landfill.

The following additional resource consents are needed for the proposal to which this application relates and have been applied for: None

Attached is an assessment of the proposed activity's effect on the environment that:

a) includes the information required by clause 6 of Schedule 4 of the Resource Management Act 1991; and
b) addresses the matters specified in clause 7 of Schedule 4 of the Resource Management Act 1991; and
c) includes such detail as corresponds with the scale and significance of the effects that the activity may have on the environment.

Attached is an assessment of the proposed activity against:

a) the matters set out in Part 2 of the Resource Management Act 1991; and
b) any relevant provisions of the relevant documents referred to in section 104(1)(b) of the Resource Management Act 1991, including the information required by clause 2(2) of Schedule 4 of that Act; and
c) the resource management matters set out in the Nelson Resource Management Plan.

No further information is required to be included in this application by the district plan, the regional plan, the Resource Management Act 1991, or any regulations made under that Act.

.....
Signature of applicant or person authorised to sign on behalf of applicant.

DATE: 14 December 2023

Address for service of applicant:

Stantec New Zealand Limited
PO Box 13052,
Christchurch 8141
Attention: Kathryn Halder

Email: kathryn.halder@stantec.com

Glossary and Abbreviations

Glossary / Abbreviation	Full Name / Description
AAQG	Ambient Air Quality Guidelines
AEE	Assessment of environmental effects. The document to support new resource consents application
AEP	Annual exceedance probability
AMP	Activity Management Plan
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG 2018	2018 Australian & New Zealand Guidelines for Fresh & Marine Water Quality
Benthic	Living at the soil-water interface on the sea-bed and river-bed
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
BOD_5	Five-day biochemical oxygen demand
BPO	Best practicable option. In terms of the Resource Management Act 1991 and 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; b) The financial implications, and the effects on the environment, of that option when compared with other options; and The current state of technical knowledge and the likelihood that the option can be successfully applied
Cawthron	The Cawthron Institute
$cBOD_5$	Carbonaceous biochemical oxygen demand (measured as 5-day standard test) this is a measure of the organic strength or load of wastewater, $cBOD_5$ = BOD = BOD_5 = cBOD
CIA	Cultural impact assessment
cfu/100 mL	Colony forming units (of micro-organisms) per 100 millilitres (mL) of liquid sample
CHI	Cultural health indicator
CMA	Coastal marine area
COD	Chemical oxygen demand
Contaminant	In terms of the Resource Management Act 1991, includes any substance (including gases, liquids, solids, and micro-organisms) or energy (excluding noise) or heat, that either by itself or in combination with the same, similar or other substances, energy, or heat – a) When discharged into water, changes or is likely to change the physical, chemical, or biological condition of water; or b) b) When discharged onto or into land or into air, changes or is likely to change
CR	Water quality standard in the Nelson Resource Management Plan for contact recreation purposes
DGV	Default guideline value(s) from the 2018 Australian & New Zealand Guidelines for Fresh & Marine Water Quality

Glossary / Abbreviation	Full Name / Description
Discharge	In terms of the Resource Management Act 1991 Includes emit, deposit, and allow to escape
DO	Dissolved oxygen
D-OxW	Scheme with new outfall diffuser and oxidation and wetland ponds removed
Draft Nelson Plan	Draft Whakamahere Whakatū Nelson Plan
DRP	Dissolved reactive phosphorus (about 80% to 90% of total phosphorus in domestic wastewater)
E.coli	Escherichia coli, a species of bacterium normally present in the intestinal tract of humans and other animals used as an indicator of faecal contamination
Effect	Effect, in terms of the Resource Management Act, includes – (a) Any positive or adverse effect; and (b) Any temporary or permanent effect; and (c) Any past, present, or future effect; and (d) Any cumulative effect which arises over time or in combination with other effects – regardless of the scale, intensity, duration, or frequency of the effect, and also includes – (e) Any potential effect of high probability; and (f) Any potential effect of low probability which has a high potential impact
Environment	Environment, in terms of the Resource Management Act, includes - (a) Ecosystems and their constituent parts, including people and communities; and (b) All natural and physical resources; and (c) Amenity values; and (d) The social, economic, aesthetic, and cultural conditions which affect the matters stated in paragraphs (a) to (c) of this definition or which are affected by those matters
FC	Faecal coliform(s) bacteria, being an indicator of micro-organism for pathogenic micro-organisms
FTCA	COVID-19 Recovery (Fast-track Consenting) Act 2020
FEA	Water quality standard in the Nelson Resource Management Plan for fishing, fish spawning, aquatic ecosystem, and aesthetic purposes
FIB	Faecal indicator bacteria. Includes faecal coliforms and enterococci bacteria which are indicators of faecal contamination
FIDOL	Frequency, intensity, duration, offensiveness/character, and location of an odour event
GHG	Greenhouse gases
ha	Hectare – land area unit (equivalent to 10,000 m^2)
I&I	Infiltration and inflow
IIR	Individual illness risk
Indigenous	In relation to species means plants and animals found naturally in New Zealand
Iwi	Māori tribe
Kaitiakitanga	In terms of the Resource Management Act 1991 the exercise of guardianship by the tangata whenua of an area in accordance with tikanga Māori in relation to natural and physical resources; and includes the ethic of stewardship
kg/day	Kilograms per day
LA	Land application

Glossary / Abbreviation	Full Name / Description
LAWA	Land, Air, Water Aotearoa. A partnership between the Te Uru Kahika - Regional and Unitary Councils Aotearoa, Cawthron Institute, the Ministry for the Environment, the Department of Conservation, Stats NZ and has been supported by the Tindall Foundation and Massey University
L/s	Litres per second
LGA	Local Government Act 2002
LRV	Log reduction value
LTP	Long Term Plan
m	Metre(s)
m/s	Metres per second
m^3	Cubic metre(s)
m^3/s	Cubic metres per second
MAC	Microbiological assessment category
MACA Act	Marine and Coastal Area (Takutai Moana) Act 2011
MAR	Managed aquifer recharge
Mauri	The essential life force or principle. A metaphysical quality inherent in all things both animate and inanimate
MetOcean	MetOcean Solutions Limited
MfE	Ministry for the Environment
MHWS	Mean high water springs
mg/kg	Milligrams per kilogram, same as parts per million (ppm)
mg/L	Milligrams per litre, same as g/m^3, and ppm
MoH	Ministry of Health
N	Nitrogen
NA or N/A	Not applicable
NAQP	Nelson Air Quality Plan
NES	National environmental standard(s)
NES-CS	Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011
NIWA	National Institute of Water and Atmospheric Research
NPS	National policy statement(s)
NPS-FM	National Policy Statement for Freshwater Management 2020, amended February 2023
NRMP	Nelson Resource Management Plan
NWWTP	Nelson Wastewater Treatment Plant
NZCPS	New Zealand Coastal Policy Statement 2010

Glossary / Abbreviation	Full Name / Description
O	Scheme with additional odour management
O&M	Operations and maintenance
OCEL	OCEL Consultants Limited
OD	Scheme with additional odour management, and new outfall diffuser
OMP	Odour Management Plan
OWD	Scheme with additional odour management, wetland enhancement and new outfall diffuser
P	Phosphorus
Pathogens	Disease causing microorganisms
PDP	Pattle Delamore Partners Limited
pH	Measure of acid or base nature of liquid
PMP	Pond Management Plan
QMRA	Quantitative microbiological risk assessment
RMA	Resource Management Act 1991
RPS	Nelson Regional Policy Statement 1997
SG	Water quality standard in the Nelson Resource Management Plan for shellfish gathering purposes
SLR	SLR Consulting New Zealand Limited
Stantec	Stantec New Zealand Limited
T&T	Tonkin & Taylor Limited
TAN	Total ammoniacal nitrogen, being the sum of unionised ammonia and ammonium, expressed as nitrogen ($[NH_3+NH_4^+]$-N)
Tangata whenua	In terms of the Resource Management Act 1991 in relation to a particular area, means the iwi, or hapū, that holds mana whenua [moana] over the area
Te Tauihu iwi	An abbreviation of Te Tau Ihu o te waka o Māui (the prow of the waka of Maui who fished up the north island). Te Tauihu iwi is a reference to the eight iwi with mana whenua of the upper South Island as defined by Te Puni Kokiri (The Ministry of Māori Affairs). These are listed as: • Ngāti Apa ki te Rā Tō • Ngāti Kōata • Ngāti Kuia • Ngāti Rārua • Ngāti Tama ki Te Tau Ihu • Ngāti Toa Rangatira • Rangitāne o Wairau • Te Atiawa o Te Waka-a-Māui
the Council	Nelson City Council
Tikanga Māori	In terms of the Resource Management Act 1991 means Māori customary values and practices
TKN	Total Kjeldahl nitrogen, the sum of organic nitrogen, unionised ammonia (NH_3), and ammonium (NH_4^+)
TN	Total nitrogen

Glossary / Abbreviation	Full Name / Description
Total ammoniacal nitrogen	Sum of ammonia and ammonium expressed as nitrogen [NH_3+NH_4^+]-N
Total suspended solids	Fine solids in wastewater as determined by a standard test (also referred to as 'suspended solids')
TP	Total phosphorus
Trade waste	Those liquid wastes discharged by trade premises that produce wastewater as a result of their processes. These industries are commonly called 'wet' industries. Trade waste is the terminology used in the Local Government Act 2002
Treated wastewater	Wastewater treated by the NWWTP
TSS	Total suspended solids
UV	Ultraviolet light irradiation, often used as a wastewater disinfection technique
µg/L	Micrograms per litre. One µg/L being equal to 0.001 mg/L and one part per billion (ppb)
W	Scheme with additional wetland improvements
Wastewater	The mix of domestic wastewater (or sewage), commercial, trade waste (industrial wastewater), and water entering the network via infiltration and inflow
Wastewater system	The system of pipes, pump stations, treatment and disposal facilities which convey, treat and discharge wastewater
Wāhi tapu	Sacred sites, can be urupa (burial grounds), or sites of significant historic events or former pa (village) sites
WD	Scheme with additional wetland improvements and new outfall diffuser
WD-Ox	Scheme with additional wetland improvements, new outfall diffuser and oxidation ponds removed
WW	Wastewater
WWF	Wet weather flows

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1 Introduction

1.1 Overview and Existing Consents

The Nelson City Council (**the Council**) operates the Nelson Wastewater Treatment Plant (**the NWWTP**) located at 162 Boulder Bank Drive, Nelson, around 14 km north of the central business district of the city as shown in Figure 1-1.

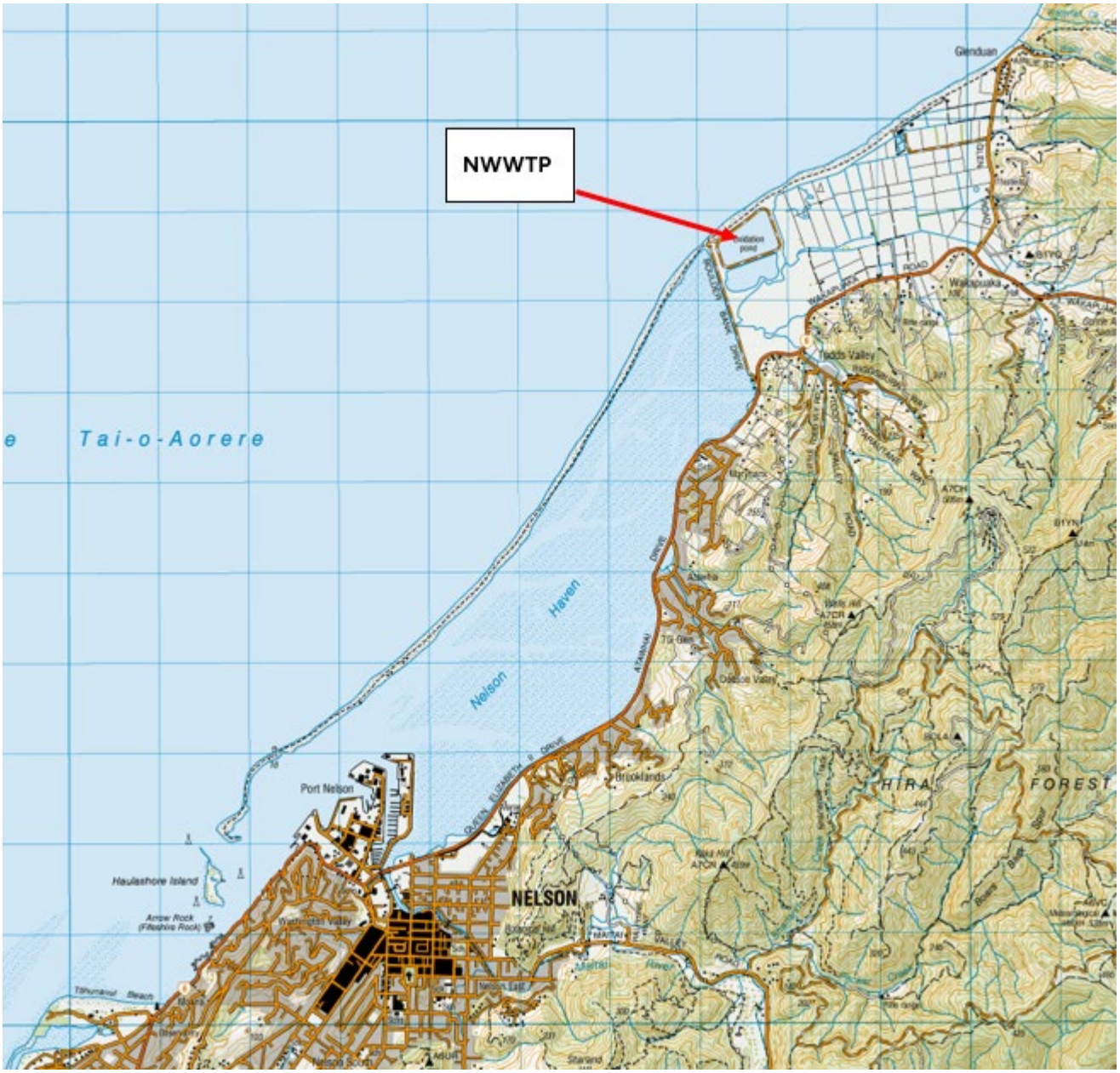

Figure 1-1: Location Map

The NWWTP is a key strategic asset for the Council and receives domestic, commercial, and industrial/trade wastewater from Nelson (excluding Tahunanui and Stoke).

The NWWTP is on land that is designated as Designation DN7 under the Nelson Resource Management Plan (**NRMP**) which authorises the operation of the treatment plant. However, Designation DN7 does not authorise various 'regional' activities associated with the NWWTP, and these are authorised by several existing resource consents (all referenced as RM02169) granted under the Resource Management Act 1991 (**RMA**), namely:

- Coastal permit: To discharge treated wastewater to Tasman Bay.
- Coastal permit: To use, maintain, and renew a pipeline and outfall structure and to occupy the seabed.
- Coastal permit: To deposit in or on the seabed substances from the outfall pipe.
- Discharge permit: To discharge wastewater on to or into land, namely the existing oxidation pond and proposed wetlands and buffer pond.
- Discharge permit: To discharge contaminants, namely wastewater treatment plant gases, to air from a wastewater treatment plant.
- Land use consent: To carry out vegetation clearance, soil disturbance, and earthworks for the construction of the treatment plant upgrade works.

The first two coastal permits listed above were, at the time the application, considered 'restricted coastal activities' under the (then operative) New Zealand Coastal Policy Statement (**NZCPS**) 1994 and were therefore issued by the Minister of Conservation[1] (on 24 November 2004). The remaining resource consents were issued by independent commissioners appointed by the Council (as **consent authority**[2]) on 21 October 2004.

In 2006, the Council applied to change Condition 1 of the first coastal permit and that application, and subsequent decision, was given a new application number of RM065473[3]. The change related to the timeframe by which proposed upgrades at the NWWTP were required to be commissioned by the Council. The change was approved by an independent commissioner on 4 September 2007. For the purposes of this document, the number RM02169 is used for all the consents (namely because the change authorised by RM065473 is very minor and involves the deletion of the last 14 words of the original Condition 1).

A copy of the existing resource consents is included in Appendix A. The resource consents under RM02169 are due to expire on 1 December 2024. The current application is for new resource consents to replace a number of the existing consents[4] covered by RM02169.

The Council also obtained three consents in December 2013 (RM135229, RM135229A, and RM135229B) to enable the desludging of the facultative pond of the NWWTP. These consents covered discharges of contaminants (gases) to air, leachate to land, and vegetation/soil disturbance to prepare the buffer pond (within which the sludge was temporarily stored). These consents expired on 1 January 2022[5]. The current application includes activities which would enable the Council to undertake similar desludging activities in the future as and when needed.

Further, the Council has, since the granting of the existing consents, installed a diesel-powered back-up electricity generator on the NWWTP site and the regular testing of this generator also requires a discharge permit for discharges from its exhaust.

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[1] These coastal permits were referenced as SAR-05-61-01-06, however the consent authority retained the original consent number of RM02169 for its administrative purposes.
[2] The Council is both the consent holder/applicant and consent authority. To avoid any confusion, this document uses 'consent authority' to refer to the Council in its consenting authority capacity under the RMA and 'the Council' is used in its capacity as the consent holder/applicant.
[3] It is not clear why the change was allocated an entirely new and different number to the original consent, normally the consent authority would issue the change using the original number with a 'V1' suffix.
[4] The existing consents include authorisation for activities associated with the then proposed upgrade of the NWWTP and these have been completed so no replacement consents are needed for them. In addition, some of the components covered by RM02169 are now permitted activities and do not require resource consent (e.g. exclusive occupation of the coastal marine area).
[5] Both RM1355229 and RM1355229A have conditions which specify an expiry date, however RM135229B does not have an expiry condition. RM135229B is a land use consent that allows vegetation removal and earthworks to prepare the buffer storage pond and embankment, and to gain access to the area for desludging. Section 123(b) of the RMA states that the period for land use consents is unlimited unless otherwise specified in the consent. It would appear that RM135229B still has legal status, however the conditions are very specific to the desludging that was proposed back in 2013. Despite this, the current application seeks authorisation for the activities covered by RM135229B.

The Council requires consents to continue to operate the NWWTP and this document constitutes the Assessment of Environmental Effects (**AEE**) as required by Schedule 4 of the RMA. This document also presents the relevant statutory considerations which the consent authority must have regard to under the RMA when considering this application.

1.2 Exercise of Resource Consents While Applying for New Consents

This application is for replacement[6] resource consents for the same activities authorised by existing resource consents which are due to expire on 1 December 2024. This application has been lodged at least six months before the expiry of the existing consents, meaning the Council (being the consent holder) may, in accordance with section 124 of the RMA, continue to operate under the existing consents until a new consent is granted or declined and/or all appeals are determined.

1.3 Project Structure and Processes Followed

The NWWTP is a vital regional infrastructure asset servicing Nelson City. Accordingly, a well-developed and resourced approach and programme has been put in place to ensure all the requirements of the RMA and other key planning instruments are met by the Council.

The project structure, and its development, has included the following activities:

- Determination of a consenting approach;
- Alternatives (options) assessment;
- Determination of the best practicable option (**BPO**) for wastewater treatment and discharge;
- Consultation and engagement with tangata whenua and key stakeholders;
- Assessments of the actual and potential effects of the activities for which resource consents are being sought;
- Development of proffered resource consent conditions; and
- Preparation of this resource consent application, AEE document, and other supporting documentation.

The Project has been led by Stantec New Zealand (**Stantec**) in terms of technical, environmental science/effects and resource management. Stantec have been assisted in the project by:

- MetOcean Solutions Limited (**MetOcean**) for hydrodynamic modelling;
- The Cawthron Institute (**Cawthron**) for technical assessments on the effects within the receiving waters of Tasman Bay;
- The National Institute of Water and Atmospheric Research (**NIWA**) for quantitative microbiological risk assessment (**QMRA**);
- SLR Consulting New Zealand Limited (**SLR**) for kaimoana bivalve shellfish surveys;
- Pattle Delamore Partners Limited (**PDP**) for technical assessments of the discharges to air at the NWWTP and land application (**LA**) and managed aquifer recharge (**MAR**) alternatives assessment;
- Tonkin & Taylor Limited (**T&T**) for hazards assessments, climate change, and greenhouse gas (GHG) emissions;
- OCEL Consultants Limited (**OCEL**) for concept design for a replacement outfall diffuser; and
- The Council's external legal advisors for the Project, Tasman Law, and John Maassen, Barrister.

[6] The term 'replacement consents' or 'renewal consents' is not used in the RMA. Such applications are legally new consents for the same activity (refer section 124 RMA), however most practitioners use the term 'replacement consent' or 'renewal consent'. For the purposes of this application the term 'replacement consents' is used.

1.4 Purpose of the Document

This AEE has been prepared to support the Council's application for the resource consents required for the continued operation of the NWWTP.

This AEE has been prepared in accordance with section 88 and the Schedule 4 of the RMA. It includes:

- A description of the existing NWWTP;
- An assessment of alternatives and the BPO;
- A description of the operational and management procedures of the existing NWWTP and proposed changes to this scheme;
- A description of the existing environment;
- An assessment of the effects on the environment from the activities proposed to occur over the next 35 years (being the duration of consent being sought);
- Measures to avoid, remedy or mitigate adverse effects;
- Information on the statutory framework against which the application needs to be assessed;
- Consultation undertaken, outputs, and responses;
- The Council's rationale for seeking 35-year consent durations; and
- Proffered resource consent conditions.

2 Vision, Project Drivers, Goal, Objectives, and Consents Sought

The following project Vision, Drivers and Goal, and Objectives have been developed that encompass the Council's overarching vision and community outcomes, incorporating a BPO approach and ensuring consistency with Council's statutory requirements.

2.1 Project Vision

The following vision statement has been developed for the project:

Vision

Management of the city's wastewater incorporating a 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.

2.2 Nelson City Council's Project Drivers and Goal

The Council aspires to meet the following project drivers:

- Wastewater reticulation, treatment, and disposal services meet customers' long term needs;
- The costs of wastewater reticulation, treatment, and disposal services are minimised;
- Future wastewater treatment options consider the high level of financial investment of the NWWTP;
- The Council operates sustainably, and consideration is given to climate change and sea level rise;
- The Council endeavours to avoid, remedy, or mitigate any identified adverse environmental, social, and cultural impact;
- Good relationships are maintained with all persons affected by the activities the local community and other stakeholders;
- Partnering with Te Tauihu iwi, working collaboratively throughout the project; and
- All statutory obligations are met.

These project drivers provide the basis for the following emerging 'goal' for this application, while incorporating the overall status of the existing NWWTP, balancing the four well-beings[7], as stipulated with the Local Government Act 2002, and the RMA provisions.

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 NWWTP for a long-term period of 35 years within the current funding framework of the Council's Long Term Plan (**LTP**) subject to the outcomes of consultation and analysis of alternatives."

2.3 Project Objectives

In addition to the Council's statement of intent, goals, statutory obligations, and the relevant RMA planning framework, there are a number of other project objectives that have influenced this application, in particular:

- **Objective 1** To recognise the importance of cultural values, by working in partnership with the community, key stakeholders, and tangata whenua to ensure a wastewater treatment and discharge solution that:
  - Provides for current and future community well-being, health and safety; and
  - Ensures acceptable environmental and cultural effects.
- **Objective 2** Obtain long term consents that provide certainty for future growth and security for ongoing investment in the NWWTP and wastewater network infrastructure;

[7] 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 RMA.

- **Objective 3** To provide a solution that is the 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; and
- **Objective 6** To ensure that the treated wastewater discharge has no more than minor adverse effects on the receiving environments.

2.4 Resource Consents Sought and Duration

The Council seeks all the authorisations required for all direct and ancillary 'regional' activities described in this application that are not covered within the ambit of Designation DN7. The following resource consents, numbered 1-7 in Table 2-1, have been identified as being needed and are sought from the consent authority. Details of why these activities require resource consent are discussed in detail in Section 5.

Table 2-1: Resource Consents Sought

Consent Number	Resource Consent Type and Activity to be Authorised	Term of Consent being sought
1	Coastal permit: To discharge treated wastewater to Tasman Bay.	35 years
2	Coastal permit: To place, use, and maintain a pipeline and outfall diffuser structure, including a replacement outfall diffuser structure, on and under the bed of Tasman Bay.	35 years
3	Coastal permit: To disturb the foreshore and seabed to replace an existing outfall diffuser structure located on and under the bed of Tasman Bay.	35 years
4	Discharge permit: To discharge treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities.	35 years
5	Land use consent: To remove vegetation and undertake earthworks to prepare the buffer pond for storage of sludge and to gain access	35 years
6	Discharge permit: To discharge contaminants to air from the operation of a wastewater treatment plant, including during desludging activities.	35 years
7	Discharge permit: To discharge contaminants to air from the operation of a diesel-powered electricity generator.	35 years

3 Description of the Existing Nelson Wastewater Treatment Plant

3.1 History of the Nelson Wastewater Treatment Plant

3.1.1 Wastewater treatment plant background

The discharge of wastewater to Tasman Bay began in 1968 and involved untreated wastewater being pumped from Nelson city through a rising main with the wastewater being discharged directly to the coastal marine area (**CMA**[8]) by way of the existing pipeline structure which extends ~380 m into Tasman Bay[9]. The discharge was authorised by way of a Water Right granted under the Water and Soil Conservation Act 1967.

The Council constructed an oxidation pond in 1979 to treat the wastewater before it being discharged to Tasman Bay. In 1996 the Council upgraded the NWWTP by constructing a partition across the oxidation pond, creating a secondary maturation pond which improved the level of treatment the wastewater received before discharge. This upgrade was made because the Council had resolved, in the 1996/97 Annual Plan to "…*improve the quality of effluent discharged from the Wakapuaka Oxidation Pond to achieve a median concentration of faecal coliforms not greater than 20,000 per 100ml.*"

In 1999, flow measuring facilities at the pond inlet and outlet were installed. The ponds 'crashed' between May and August 1999 and the dividing bund was removed in February 2000 as investigations found the crash had likely been caused by the primary pond being overloaded.

Despite the fact that the Water Right did not expire until 1 October 2026 (35 years after the date the RMA came into effect), the Council decided to apply early for new resource consents under the RMA in December 2003. The application included various proposed upgrades of the NWWTP and the consents were granted in 2004 (discussed earlier in Section 1.1). The NWWTP underwent its most recent upgrade in 2007-2009 to comply with the resource consents and increased the NWWTP capacity to accommodate the anticipated population increase expected by 2024. The upgrade included a new pre-treatment facility (i.e., primary clarifier, trickling filter, and buffer pond), partitioning of the existing oxidation pond into a 16 ha facultative pond and a 10 ha maturation pond, and new downstream wetlands through which the wastewater flows before being discharged to Tasman Bay.

Minor modifications at the NWWTP have occurred since the 2007-2009 upgrades, including addition of aerators and monitoring probes (for dissolved oxygen and oxidation-reduction potential) in the facultative pond and covering the trickling filter. The facultative pond was desludged in 2014, with sludge initially stored on-site in geotextile bags that were placed in the buffer pond, with the dewatered sludge (minimum 20% solids content) progressively transported off-site to the York Valley landfill. The buffer pond was taken offline while it was used to store sludge and then returned to its original purpose of providing flow buffering when all the stored sludge had been removed. There have also been upgrades to the wastewater network, including pipe relining to reduce inflow and infiltration and addition of screening at one of the main pump stations located at Neale Park.

3.2 Overview of the Nelson Wastewater Treatment Plant

3.2.1 Wastewater collection

The NWWTP services the central and northern catchments of Nelson city, comprising mainly the central business district commercial area, domestic residences, and a small percentage of industrial/trade properties. The area serviced by the NWWTP is shown in Figure 3-1, with the purple dashed line at the left-hand side of the figure indicating the approximate southern service boundary - Tahunanui and Stoke are serviced by the Bell Island WWTP. Fish processing water from Sealord's plant at Port Nelson is screened and discharged into Tasman Bay via an outfall which the Council owns, operates, and maintains. This outfall is shown in Figure 3-1 the outfall and discharge are authorised by separate resource consents (RM045202/1-3).

[8] The CMA is the area seaward of the line of mean high water springs (**MHWS**).
[9] The total length of the pipeline and outfall diffuser structure is 425 m as measured from the manhole located within the WWTP site, however its length within the CMA is ~380 m.

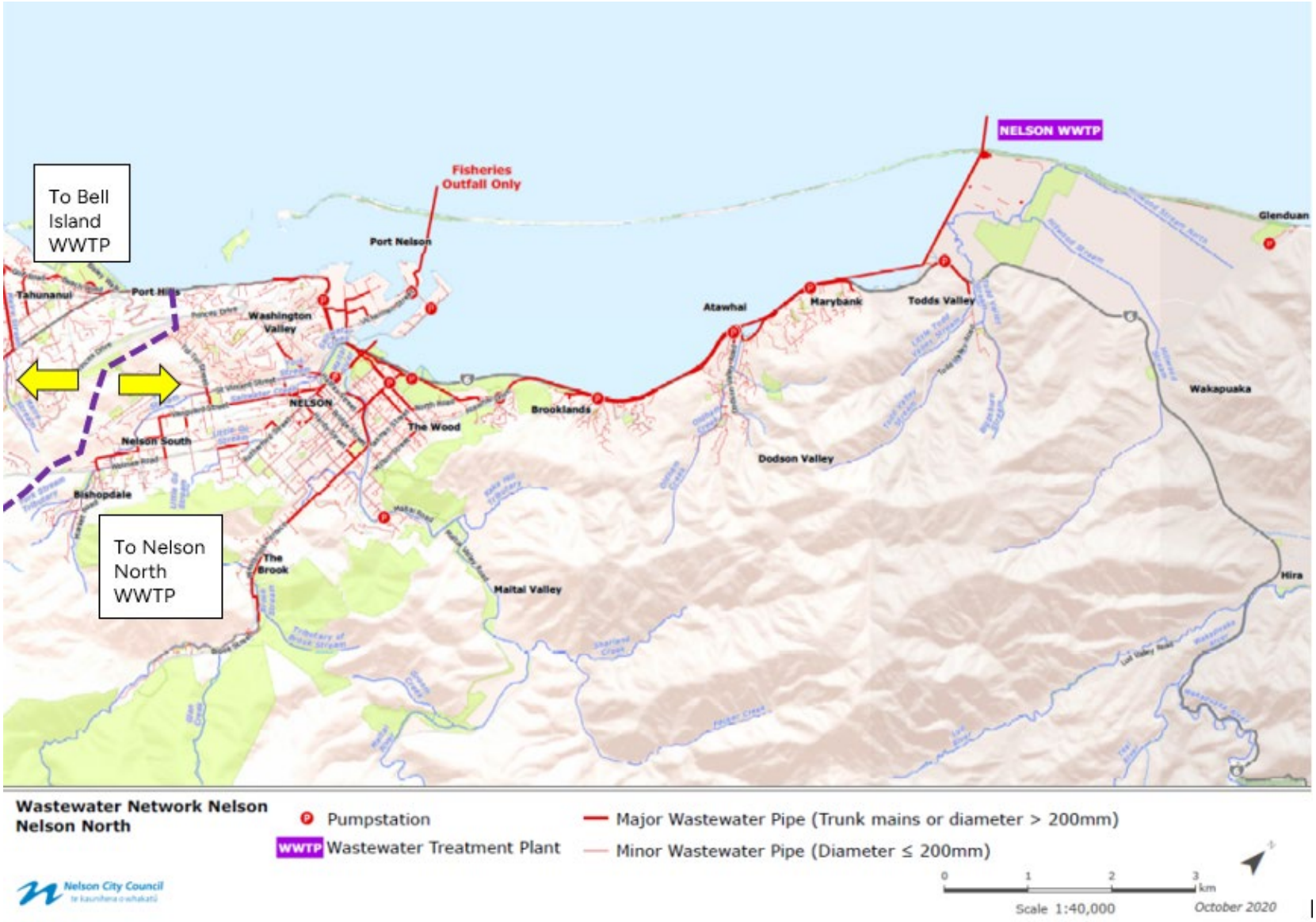


Figure 3-1: Area serviced by the Nelson Wastewater Treatment Plant (purple dashed line indicative boundary of service area)

3.2.2 Wastewater treatment

Detailed information on the wastewater treatment that occurs at the NWWTP is provided in the Stantec Report entitled 'Nelson Wastewater Treatment Plant – Process Capability Assessment', (**Stantec Process Capability Assessment**) contained in Appendix B. The reader is referred to that report, however, the following provides a summary of the treatment process.

An oblique aerial photograph of NWWTP is presented in Figure 3-2. A schematic of the process/treatment is presented in Figure 3-3 and an aerial image of the NWWTP, including indicative wastewater flow pathways, is shown in Figure 3-4.

Wastewater is pumped to the NWWTP via the ~9 km long Atawhai rising main where it receives preliminary treatment at the inlet works via a horizontal grit trap and a 3 mm step screen. All flows are passed through the inlet works and a magnetic flow meter measures the inflow rates. The inlet pump station downstream of the inlet works can divert flow into three different streams: 1) to the buffer pond; 2) to the pre-treatment facilities; or 3) to the facultative pond. Malodorous air extracted from the covered process units (inlet works, trickling filter, Interstage Pump Station No.2, and sludge handling) is treated via a biofilter located to the north of the trickling filter.

The buffer pond, which has a capacity of ~16,000 m^3, is used during periods of high inflows to the NWWTP, which typically occur during and following large or prolonged rainfall events. Once the high inflows end, the buffer pond is drained to the Interstage Pump Station No. 2. The buffer pond has sufficient capacity to avoid any full bypass of the treatment process. The downstream ponds and wetland system also provide flow buffering.

The pre-treatment plant consists of a clarifier and trickling filter and can be used or bypassed depending on the needs of the facultative pond with respect to pond health. The clarifier removes readily settleable solids and a portion of the influent biochemical oxygen demand (**BOD**) load, whilst the trickling filter is a fixed film treatment process designed to further reduce the BOD of the wastewater. The trickling filter also reduces sulphide loads to the ponds. Primary sludge from the clarifier can be thickened for disposal off-site to the Bell Island WWTP, however, it is typically directed to the facultative pond via Interstage Pump Station No. 2. Sloughed biomass from the trickling filter is also directed to the facultative pond via Interstage Pump Station No. 2.

The facultative pond (also known as 'P1') has an area of ~16 ha with an average depth of 1.5 m and contains four surface aerators and 1 submersible aerator. Treatment occurs through natural processes (sunlight, wind, algae, and bacteria). Hydraulic retention times within the facultative pond vary depending on inflows to the NWWTP and are in the order of 20 to 30 days (based on 2022 inflow data). Wastewater from the facultative pond gravitates to the maturation pond (or 'P2') via a pond transfer structure which is designed to minimise carry over of sludge and algae.

The maturation pond has an area of ~10 ha, an average depth of 1.5 m, and is partitioned into three zones to promote plug flow. The primary function of the maturation pond is to reduce pathogens. Treatment occurs naturally through various mechanisms including sunlight exposure and grazing by protozoa and invertebrates. Like the facultative pond, hydraulic retention times depend on inflows to the NWWTP and are in the order of 13 to 29 days (based on 2022 inflow data).

Wastewater from the maturation pond flows by gravity to a flow splitter box which contains three weirs, two of which lead to the two wetlands (flow is typically evenly split between the two wetlands) which have a combined area of ~13 ha. The third weir can be used to bypass the wetlands with the wastewater from the maturation pond discharging directly to the 'discharge channel' and out to Tasman Bay.

Each of the two wetlands is made up of three deep 'cells' and two shallower cells. Like the facultative and maturation ponds, hydraulic retention times depend on inflows to the NWWTP and are in the order of 10 to 12 days (based on 2022 inflow data).

Wastewater from the wetlands flows via gravity to the discharge channel[10] which is a V-shaped ~9 m wide and ~3 m deep channel which discharges to a short length of buried pipe that enters a final discharge manhole, which is connected to the pipeline into Tasman Bay. A pumped discharge may be required in the future.

[10] Sometimes also referred to as the 'final effluent channel'.

Figure 3-2: Inlet works and preliminary treatment components of the Nelson Wastewater Treatment Plant

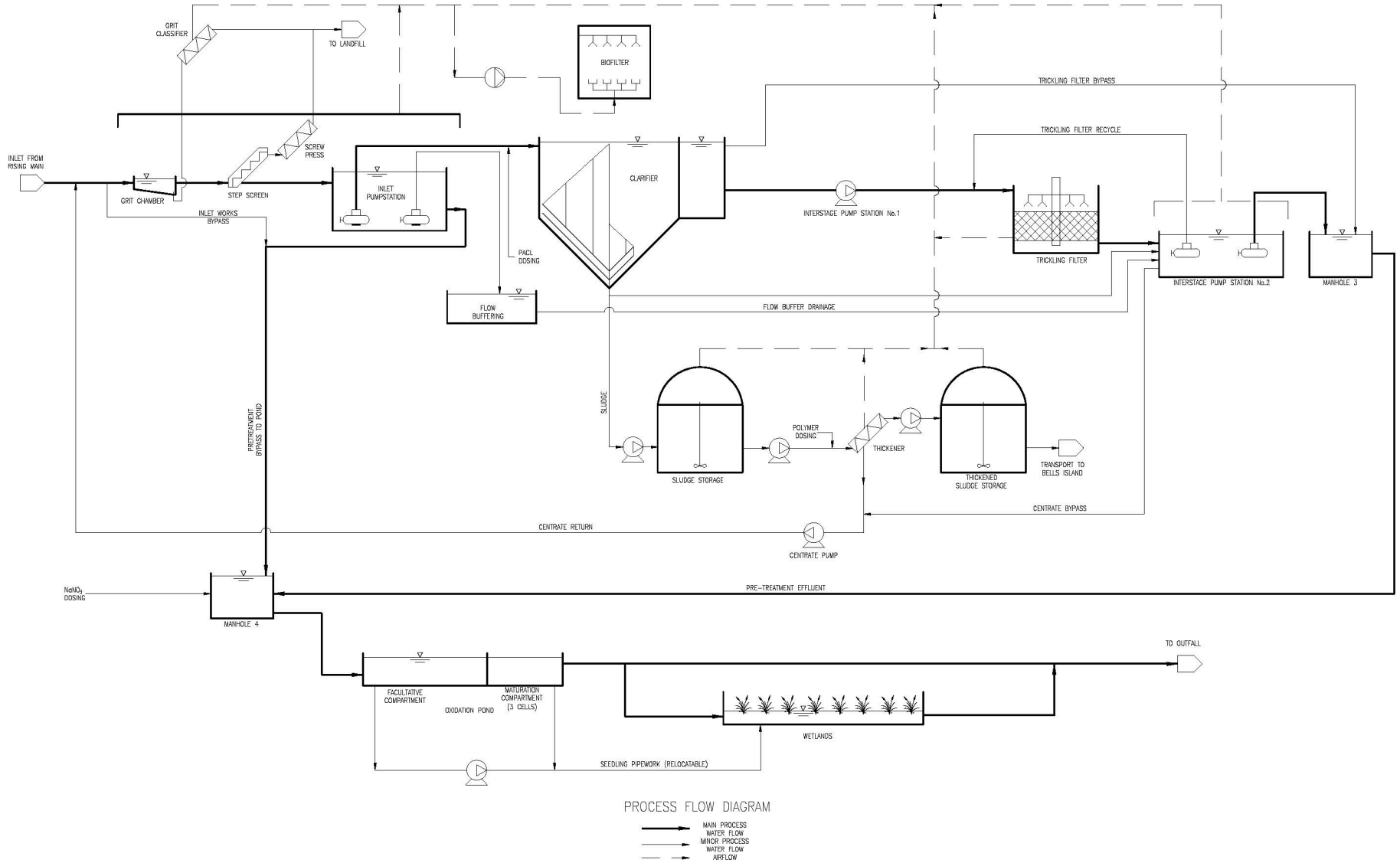


Figure 3-3 Process flow diagram at the Nelson Wastewater Treatment Plant

An aerial photo showing the overall layout and wastewater flow pathways is shown in Figure 3-4.

Figure 3-4: Aerial photograph of the Nelson Wastewater Treatment Plant and indicative wastewater flow pathways

3.2.3 Treated wastewater discharge to Tasman Bay

After a typical hydraulic retention time of around 50-55 days[11] through the facultative pond, maturation pond, and wetlands, the treated wastewater is discharged via gravity to Tasman Bay through a pipeline and outfall diffuser structure which extends ~380 m from mean high water springs (**MHWS**). Under high-tide conditions saltwater can back up the pipeline and the discharge channel. Duckbill valves have been installed at the outlets to the wetlands to prevent saltwater from entering the wetlands.

The pipeline is a 1,200 mm diameter concrete pipe which is buried beneath the seabed and progressively becomes partially, then fully, exposed along its length (refer Figure 3-5). The final ~20 m of the pipeline is the outfall diffuser structure which is made up of nine outlet holes (300 x 300 mm) spaced ~2 m along the pipe with alternating opening angles along the top of the pipe (refer Figure 3-6). There is an additional outlet hole located at the end of the outfall structure which is fitted with a 0.3 m diameter conical reducer (refer Figure 3-6), however from video footage it does not appear that wastewater discharges from this end port.

[11] 55 days is the retention time under average dry weather flows.

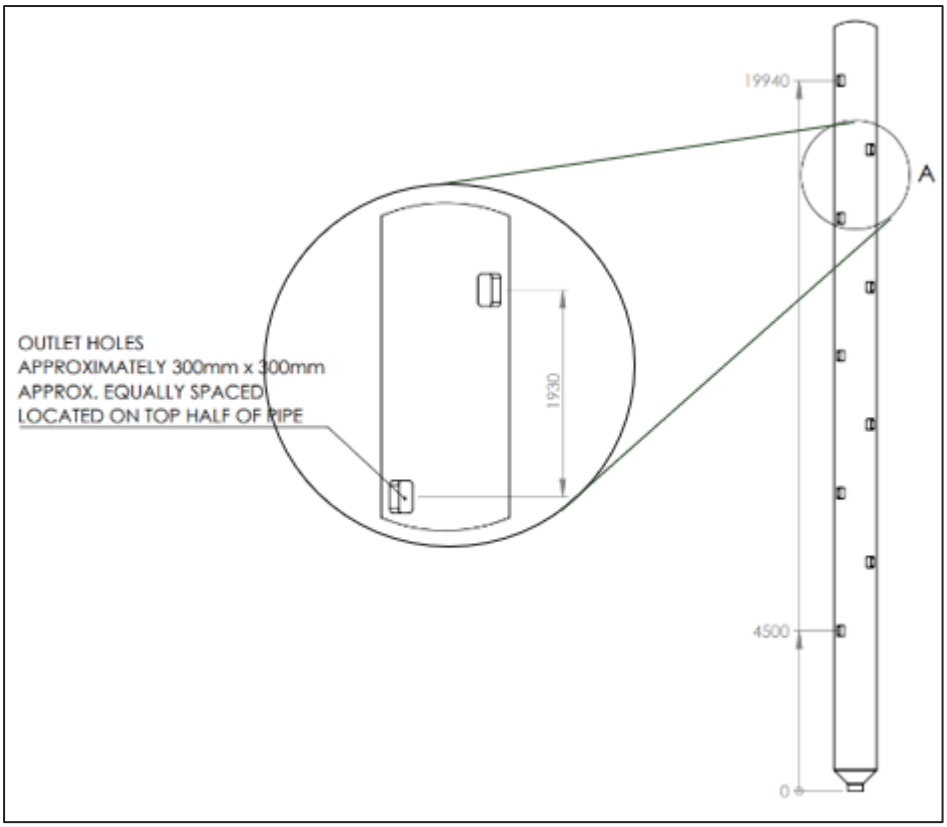
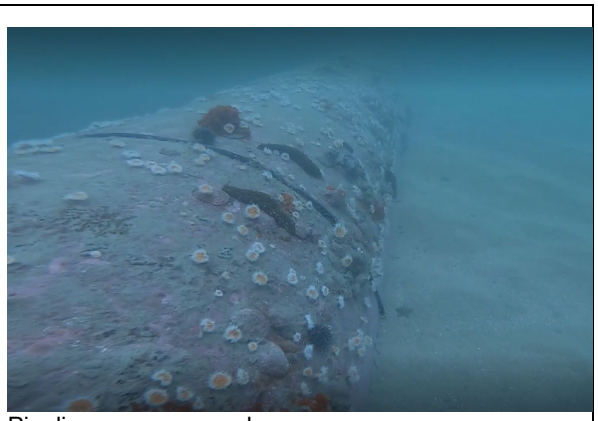
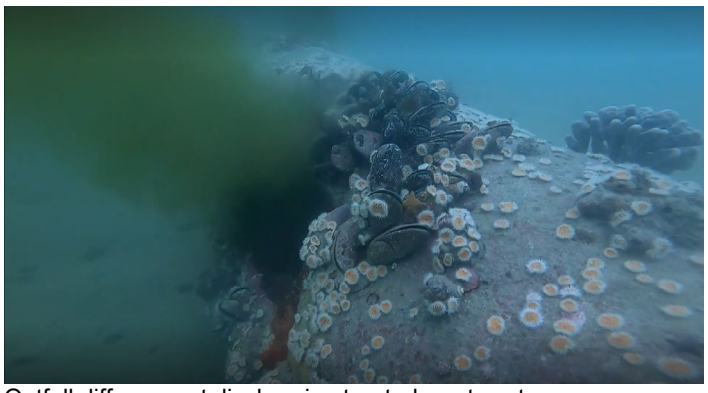


Figure 3-5: Details of the existing outfall diffuser structure.

Pipeline as it emerges from the seabed



Pipeline more exposed



Outfall diffuser port discharging treated wastewater

End port (not discharging)

Figure 3-6: Photographs of the pipeline and outfall diffuser structure.

3.2.4 Sludge handling

The sludge handling system includes raw sludge storage, a rotary drum thickener, and thickened sludge storage. Thickened sludge is then tankered off-site to the Bell Island WWTP. The sludge handling system is not frequently used[12]. Typically, when the pre-treatment system is required to be operated, the primary sludge from the clarifier is directed back to the facultative pond via Interstage Pump Station No. 2 (first operation mode). However, the solids treatment system is operated if the loading to the facultative pond is required to be further reduced, with thickened sludge tankered off-site (second operation mode).

3.2.5 Odour control

The NWWTP is equipped with an odour control system with extraction points at the following process areas:

- Inlet works;
- Grit classifier;
- Inlet pump station;
- Trickling filter;
- Interstage Pump Station No. 2;
- Rotary drum thickener;
- Unthickened sludge storage tank;
- Thickened sludge storage tank; and
- Plant room.

The extracted air/gas is directed to a biofilter which has a surface area of 210 m^2. The gas delivery system consists of slotted pipework connected to a distribution pipe embedded in 100 mm of pea gravel to distribute the foul air. The biofilter media is a uniform mixture of 75% screened bark mulch, 20% loam topsoil, and 5% crushed shell to a 1 m depth.

The moisture content of the media is maintained at 60% using a water spray in the influent duct and an irrigation spray system at the top of the media. The leachate collected at the bottom of the biofilter is collected and pumped to the Inlet Pump Station for treatment.

The PDP report entitled 'Nelson North Wastewater Treatment Plant Consent Renewal – Assessment of Discharges to Air' (**PDP Air Quality Report**) contained in Appendix D includes an assessment of the current odour controls and makes a number of recommendations regarding improvements that could be made to minimise the potential for off-site odours. These are discussed later in this AEE in Section 13.7.4.

3.2.6 Emergency electricity generation

An on-site diesel-powered electricity generator is located at the NWWTP. It has an output of 285 kVA (equivalent to a power output of 228 kW) and is housed in a dedicated building, with a large opening on one side, located within the preliminary treatment area as shown in Figure 3-7. The generator's primary purpose is to provide electricity to the NWWTP during periods when there are power outages during unforeseen circumstances. However, the Council starts up the generator on a regular basis to ensure it is working properly – this testing occurs for around 30 minutes every month. In addition, the generator is load tested annually and this involves running it for up to four hours.

[12] 2020 - used ~1.5 months; 2021 - not used; 2022 - used for ~0.5 month; and 2023 - used for a few days on two occasions.

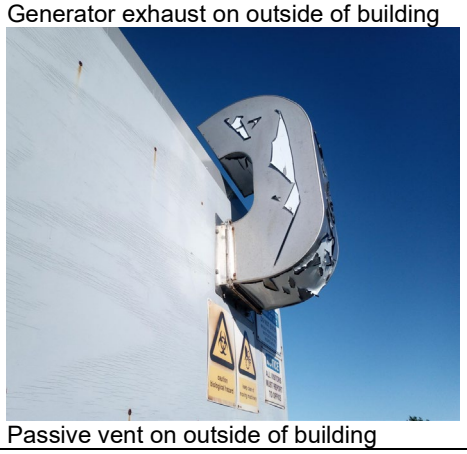
Figure 3-7: Location of the emergency electricity generator.

The exhaust from the generator consists of a horizontal pipe that vents to the southwestern side of the building as shown in Figure 3-8. In addition, the building is passively vented by way of gooseneck vent as shown in Figure 3-8.

Generator exhaust pipe inside of building

Generator exhaust on outside of building

Passive vent opening within building



Passive vent on outside of building

Figure 3-8: Generator exhaust pipe and passive building vent.

3.3 Performance of the Nelson Wastewater Treatment Plant

Consent RM02169 authorises the discharge of treated wastewater to Tasman Bay. The consent conditions include limits on the rate(s) of discharge and the quality of the discharge. These are discussed in the following sections.

3.3.1 Compliance with consented discharge rate limits

Condition 8 of consent RM02169 states that the maximum daily peak discharge rate from the NWWTP to Tasman Bay shall not exceed 38,000 m^3/day "*in a 2 year rainfall return period*". The condition does not provide a definition of the two-year rainfall return period and the Council does not determine the return period rainfall for each day but, instead, checks compliance by comparing the daily discharge rate against the maximum rate specified in Condition 8 irrespective of the rainfall return period.

The peak discharge rate specified in Condition 8 appears to be based on the design 'inflows' to the NWWTP calculated and presented in 2003 consent application (which resulted in the current consents being issued). At that time there was no flow meter in place to monitor discharge rates *from* the NWWTP[13] to Tasman Bay and it appears that inflow rates to the plant were assumed to equate to discharge rates. However, the NWWTP is able to buffer peak inflows such that the discharge rates are usually less than inflow rates provided there is not prolonged or heavy rain. Consent RM02169 required a flow meter to be installed and which measures discharge rates from the NWWTP to Tasman Bay.

Condition 8 of consent RM02169 also states that the peak 28-day average discharge rate shall not exceed 28,000 m^3/day. Again, this rate appears to be based on the predicted *inflows* to the NWWTP presented in the 2003 consent application. Condition 8 does not specify whether compliance is to be based on a rolling 28-day average or an average figure calculated every 28 days[14].

Figure 3-9 presents the daily discharge rates (red dots) and the 28-day rolling average (blue line) from the NWWTP to Tasman Bay between 2012 and mid-May 2023 – the area shaded yellow identifies the period influenced by the Covid-19 response. The results show that the peak daily discharge (for all observed rainfall return periods) has been 36,900 m^3/day (cf. the consent limit of 38,000 m^3/day for a 1 in 2 year rainfall return event) and the highest rolling 28-day average rate has been 18,400 m^3/day (cf. the consent limit of 28,000 m^3/day). The NWWTP has therefore complied with the discharge rate limits on the current resource consents.

[13] Condition 5 of consent RM02169 required a measuring device to be installed to measure discharge rates.
[14] For compliance purposes the Council has been reporting the 30-day rolling average.

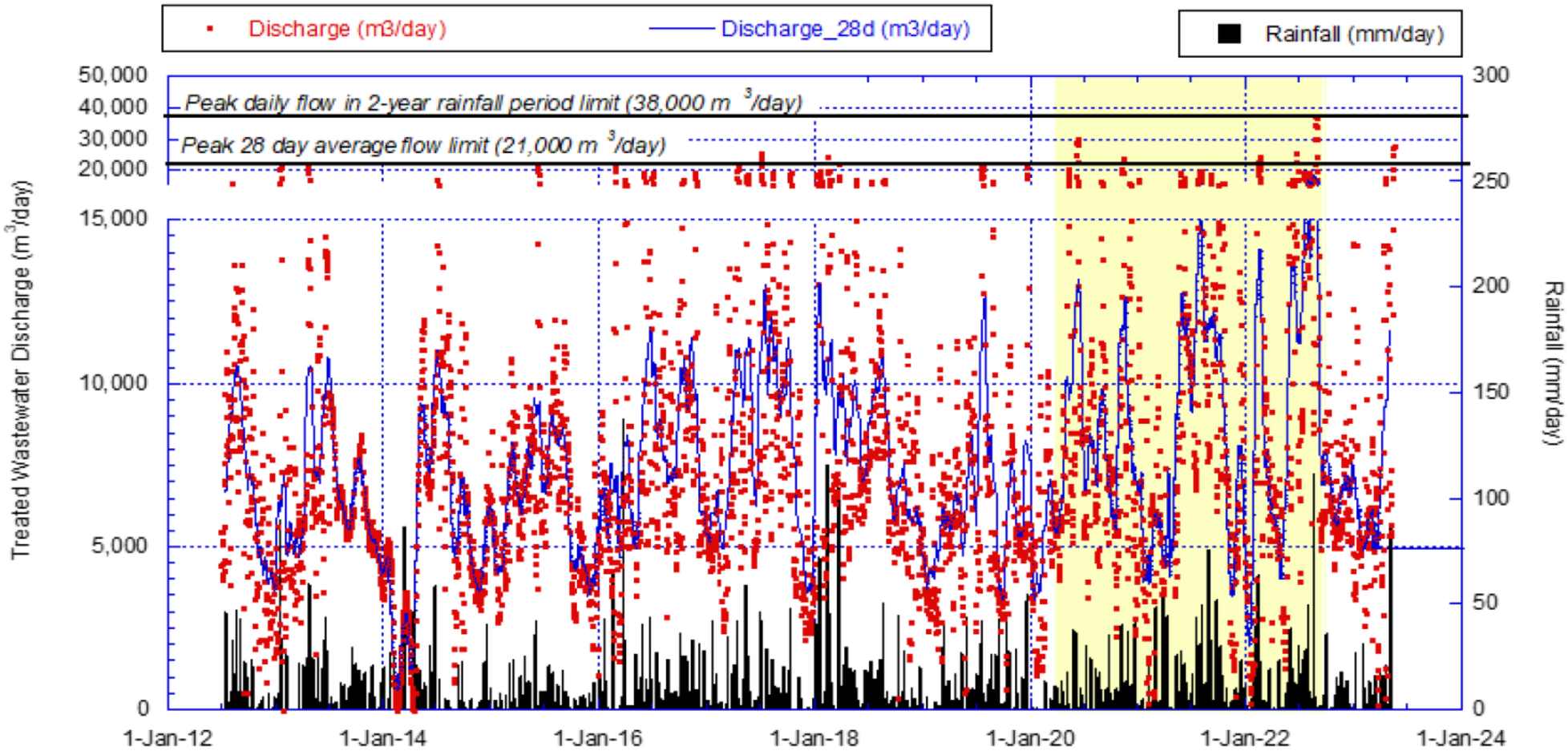


Figure 3-9: Nelson Wastewater Treatment Plant Discharge Rates (2012-2023)

3.3.2 Compliance with consented discharge standards

Consent RM02169 includes standards that the treated wastewater must meet before discharge. The standards apply "*at the outlet of the wetland*", however, samples are collected from near the end of the discharge channel prior to it entering the buried pipe that lead to the outfall pipeline. The discharge standards are presented in Table 3-1.

Table 3-1: Discharge Standards on Existing Resource Consent

Determinand	Standard/Limit
Faecal coliforms (**FC**)[15]	Median over one year: 10,000 colony forming units (**cfu**)/100 mL Not more than 1 of 12 monthly samples shall exceed 80,000 cfu/100 mL
5-day biochemical oxygen demand (**$cBOD_5$**)[16]	Median over one year: 40 g/m^3 Not more than 1 of 12 monthly samples shall exceed 50 g/m^3
Total suspended solids[17] (**TSS**)	Median over one year shall not exceed 100 g/m^3 Not more than 1 of 12 monthly samples shall exceed 150 g/m^3
Cadmium	No single sample shall exceed 0.275 g/m^3
Copper	No single sample shall exceed 0.065 g/m^3
Nickel	No single sample shall exceed 3.5 g/m^3
Zinc	No single sample shall exceed 0.75 g/m^3
Chromium	No single sample shall exceed 1.37 g/m^3
Lead	No single sample shall exceed 0.22 g/m^3
Cyanide	No single sample shall exceed 0.2 g/m^3
Phenols*	No single sample shall exceed 20 g/m^3
Mercury	No single sample shall exceed 0.02 g/m^3

* The current consent refers to 'phenols' (plural). Phenols, sometimes called phenolics, are a class of chemical compounds consisting of one or more hydroxyl groups (−OH) bonded directly to an aromatic hydrocarbon group. The simplest of these compounds is phenol. The discharge limit on the current consent is based on the ANZECC 2000 water quality guideline for 'phenol' (not phenols).

Samples are collected monthly and analysed for total FC count, $cBOD_5$, and TSS. In addition, once per year a sample is analysed for the other determinands listed in Table 3-1.

Figure 3-10 to Figure 3-12 present the results of discharge quality monitoring over the period between 1 July 2012 and 30 June 2023 (note that the concentrations are presented as mg/L, which is equivalent to g/m^3) – the yellow shaded areas show the Covid-19 response period. For compliance purposes the 'year' is based on the period 1 July to 30 June. Each individual monthly result is plotted as a symbol and the median for each year is shown as a horizontal line. The consent limits are also shown on each graph.

The treated wastewater has consistently met the median FC, TSS, and $cBOD_5$ limits. However, during 2014 the $cBOD_5$ concentrations exceeded the maximum of 50 g/m^3 in four of the 12 monthly samples (three more than allowed). Whilst the exact reason for this exceedance is not known, it is thought that it may have been a result of the desludging of the facultative pond.

Elevated treated wastewater TSS concentrations were observed in 2020/21 (annual maximum of 143 g/m^3 and median of 85 g/m^3). This was attributed to the algae in the pond-wetland system at that time, rather than a reduction in pond treatment as there was no material increase in concentration of $cBOD_5$ or FC. Since then, the Council has trialed wetland cycling; the trial is ongoing but has been successful to date in keeping TSS concentrations below the consent limits since early 2021.

[15] The consent refers to 'faecal coliforms' however the correct, and generally accepted, term is total faecal coliforms and that is used in this document.
[16] The consent refers to '5 day Biological (Biochemical) Oxygen demand (BOD)" however it does not specify the form of BOD. The accepted form for wastewater discharges is carbonaceous BOD (cBOD) and 5-day carbonaceous biochemical oxygen demand, abbreviated to $cBOD_5$, and that is used in this document. Carbonaceous BOD ($cBOD_5$) more closely represents oxygen demand associated with biodegradation of organic constituents of wastewater than does total BOD_5.
[17] The consent refers to 'suspended solids' however the correct, and generally accepted, term is total suspended solids and that is used in this document.

Table 3-2 presents the maximum concentrations of metals and other determinands measured in the annual samples collected in the past ten years. None of the annual samples have exceeded the limits specified, and in most cases none of the determinands have been measured above detection limits. The Council also undertook additional monthly testing over the period August 2020 to December 2021 and maximum concentrations measured over this period are also shown in Table 3-2. It should be noted that detection limits were different during this testing to those used for the annual compliance monitoring.

Table 3-2: Maximum Concentration of metals, cyanide, and phenol(s) measured in the NWWTP discharge

Determinand	Maximum Concentration From Annual Compliance Testing (2013-2023) (All units g/m^3)	Maximum Concentration From Monthly Testing (Aug 2020-Dec 2021) (All units g/m^3)	Discharge Limit (All units g/m^3)
Cadmium	<0.0021	<0.00011	0.275 g/m^3
Copper	<0.011	0.005	0.065 g/m^3
Nickel	0.011	0.0076	3.5 g/m^3
Zinc	0.023	0.02	0.75 g/m^3
Chromium	<0.011	0.0038	1.37 g/m^3
Lead	<0.0021	0.00119	0.22 g/m^3
Cyanide	0.04	Not measured	0.2 g/m^3
Phenol(s)*	0.009	<0.01 phenol (<0.02 total phenols)	20 g/m^3
Mercury	<0.0021	<0.00008	0.02 g/m^3

* In many cases the results are for 'total phenols', however for the August 2020-December 2021 data both 'phenol' and 'total phenol' results are presented.

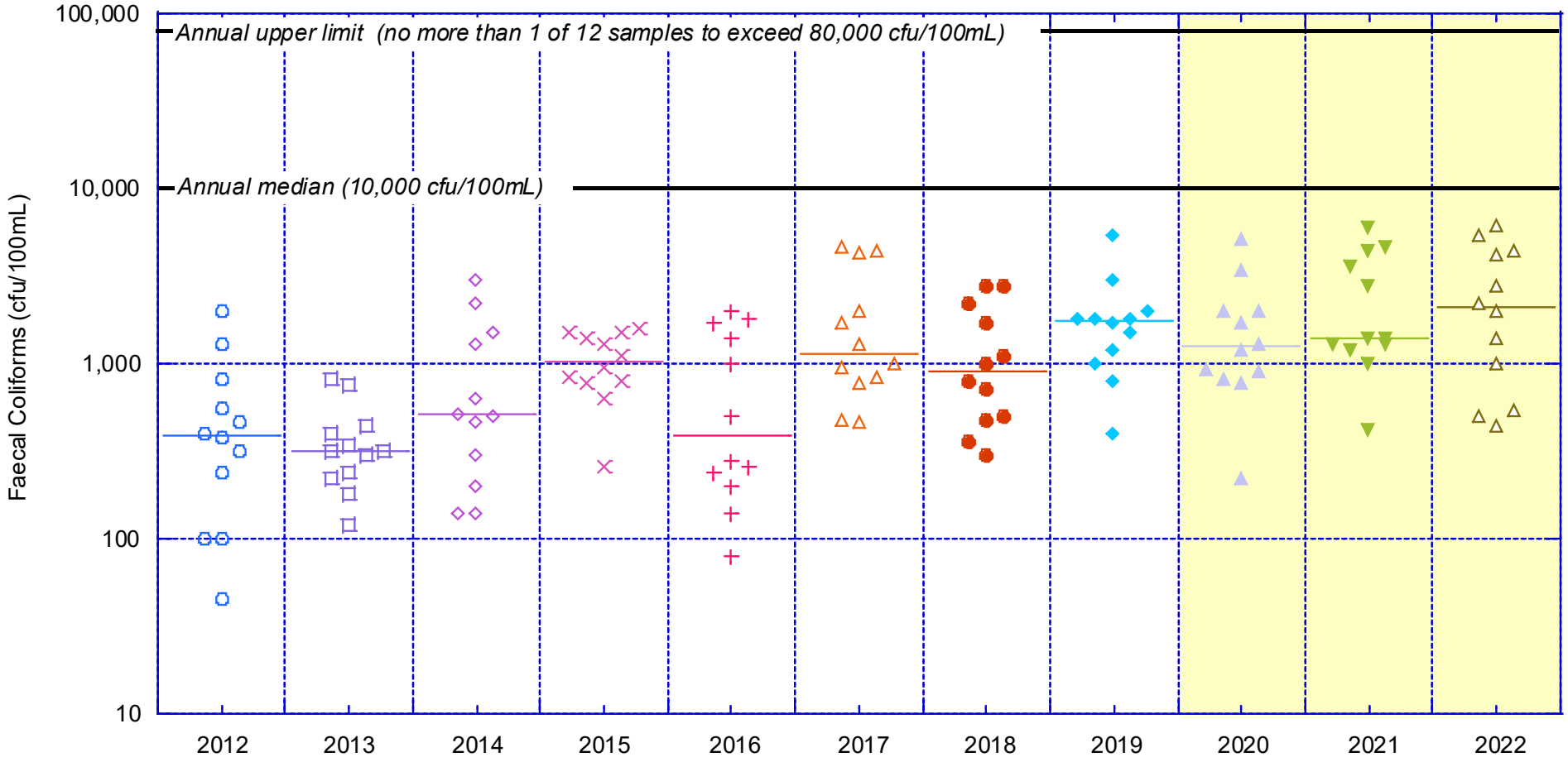


Figure 3-10: Faecal Coliform Concentrations in the Treated Wastewater Discharge

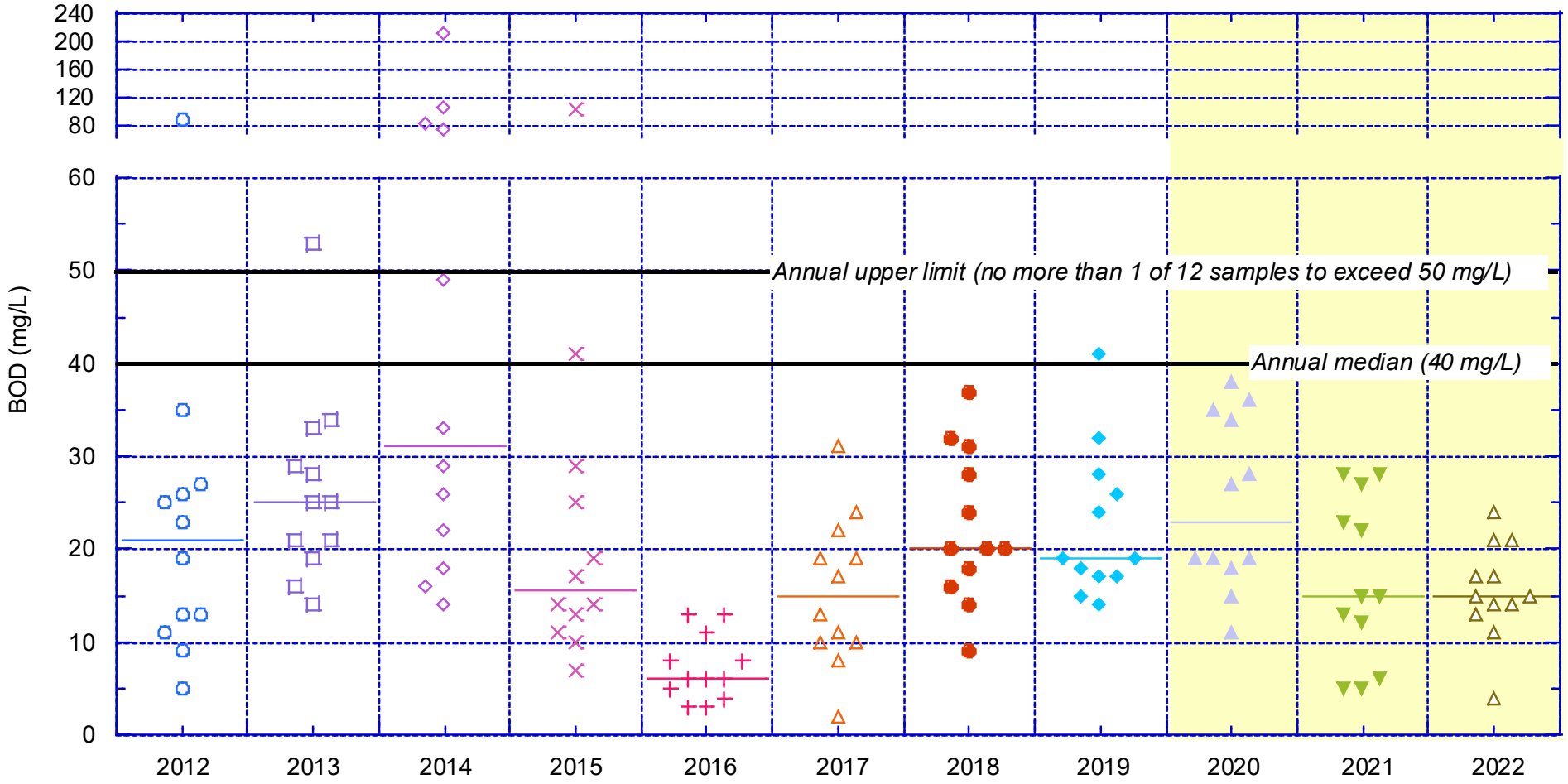


Figure 3-11: cBOD$_5$ Concentrations in the Treated Wastewater Discharge

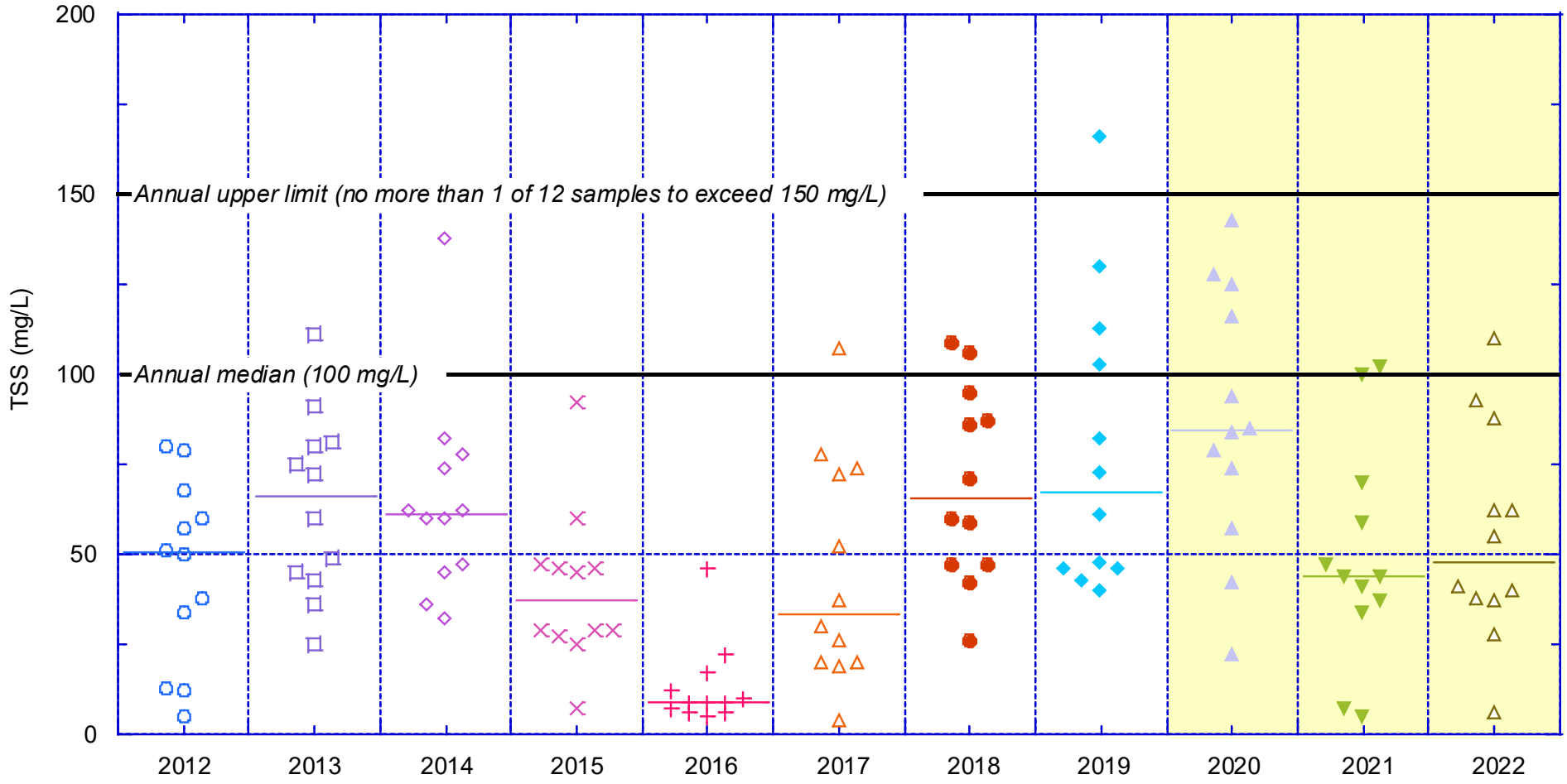


Figure 3-12: Total Suspended Solids Concentration in the Treated Wastewater Discharge

4 Future/Proposed Discharge

4.1 Growth Projections

As described in Section 1.1, the NWWTP receives wastewater from parts of Nelson city. This section details the growth projections for these contributing areas for the 35-year duration sought for the resource consents.

The Council has undertaken population forecasting as part of preparing its LTP 2021-2031 and its Wastewater Activity Management Plan (**AMP**) 2021-2031. The report entitled "Long Term Plan and Activity Management Plans 2021 – Population Growth and Demographics" was used to determine the projected population served by the NWWTP in 2059.

The Stantec Process Capability Assessment presented in Appendix B includes an assessment of the predicted population growth expected over the next 35 years. The population equivalent connected to the NWWTP in 2022 was estimated to be 27,540 and this is predicted to increase to 37,230 in 2059.

4.2 Predicted Future Wastewater Flows and Loads

The Council engaged Stantec to review historic flows to the NWWTP and to predict future discharge rates to Tasman Bay over the next 35 years based on the growth projections described in Section 4.1. A copy of the Stantec Technical Memorandum entitled 'Considerations for Discharge Quantity Consent limits' (**Stantec Flow Limits Assessment**) is included in Appendix C .

The Stantec Memorandum states that inflows to the NWWTP can be attenuated through the facultative pond, maturation pond, and wetland system. However, during periods of prolonged high inflows (due to extreme, prolonged wet-weather, and/or consecutive significant wet-weather events), the NWWTP can reach flow buffering capacity, with average discharge flows essentially matching average inflows. Rainfall on the surface of the ponds and wetlands (together being about 40 ha) can also contribute a significant volume of water to the discharge. The existing discharge is via gravity; however, a pumped discharge may be required to accommodate future flows. Hence historical inflows have been used as a surrogate for "worst-case" discharge rates.

Two different calculations have been used to estimate future discharge rates and both use 2022 as the base year as this was a 'wet year' and considered appropriate to use to develop a discharge rate limit for the new consent. Both an average daily discharge rate and a peak daily discharge rate have been calculated using the two methods and the lowest rate (rounded to the nearest 5,000 m^3) is proposed as the new discharge rate limits in the proffered conditions contained in Appendix W .

As discussed in Section 3.3.1, the current consent has two discharge rate limits; one being a peak limit of 38,000 m^3/day "in a 2 year rainfall return period" and the other being that the peak 28-day average discharge rate shall not exceed 28,000 m^3/day.

The Council considers it appropriate to include a similar peak limit on the new consent with a revised figure of 65,000 m^3/day[18]. In terms of an average daily discharge rate limit, the Council considers it appropriate for this to be based on a rolling 365-day period rather than the 28-day period as specified in the current consent. Using a larger averaging period provides a better measure of the typical rate of discharge compared to using a shorter averaging period. This can be seen in Figure 4-1, which plots both the 30-day rolling average (blue dots – noting these are very similar to the blue dots/line shown in Figure 3-9 for the 28-day rolling average flows) and the 365-day rolling average (green dots) of the discharge from the NWWTP. The Council notes that a 365-day rolling average is commonly used as a discharge limit on consents granted throughout New Zealand for wastewater discharges from WWTPs[19]. The Council considers a 365-day rolling average limit of 15,000 m^3/day[20] is appropriate as this caters for forecasted flows to the NWWTP in 2059.

[18] Based on the 'alternative' predicted peak daily flow calculation presented in the Stantec Memorandum of 62,800 m^3/day in 2059, rounded up to the nearest 5,000 m^3/day.
[19] For example, Bell Island WWTP, Mangere WWTP, Helensville WWTP
[20] Based on the predicted average daily flow presented in the Stantec Memorandum of 13,000 m^3/day in 2059 rounded up to the nearest 5,000 m^3/day.

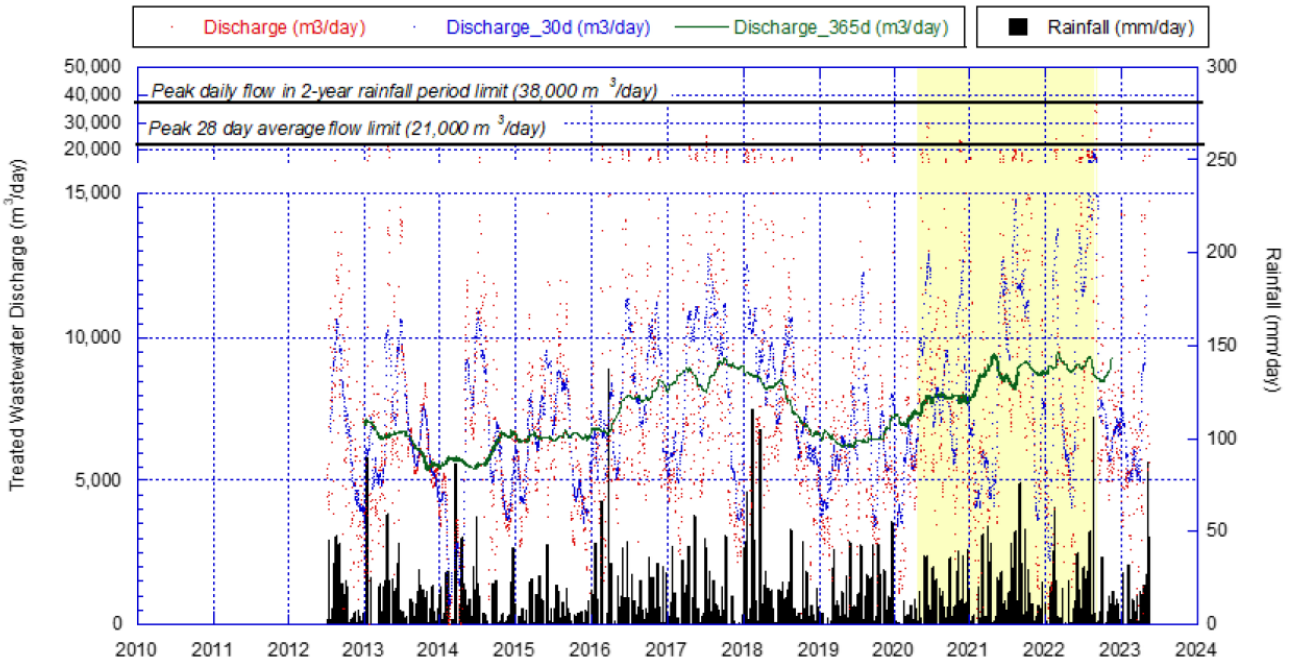


Figure 4-1: Treated Wastewater Discharge Volumes

4.3 Best Practicable Option

In accordance with the provisions of the RMA, the Council considers that an appropriate approach for determining the consents for the NWWTP, given that they include consents for the discharge of contaminants, is a BPO approach. Accordingly, this is included in the Project Objectives (refer to Section 2.2).

Section 2 of the RMA defines BPO as follows:

> *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.*

A BPO approach has, in recent years, been used by a number of local authorities in assessing options and working with their communities, tangata whenua, and other key stakeholders in determining the most appropriate solution for community infrastructure, including the management and discharge of municipal wastewater. In addition, Policy CM6.7 of the NRMP requires that the method of wastewater treatment prior to the discharge into coastal waters adopts the BPO.

Such an approach is particularly relevant to this project as it brings in the sensitivity of the receiving environment, the financial implications of the NWWTP (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 definition of the BPO as set out above.

Clause 6(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*…" (emphasis added), a description of any possible alternative locations or methods for the undertaking of the activity should be included. In this case (as will be discussed in Section 10 of this AEE) no significant adverse effects are predicted to occur, so consideration of alternatives is not strictly required under Schedule 4 of the RMA. Despite this, section 105(1)(c) of the RMA requires that the consent authority must, when considering a discharge permit or coastal permit that would contravene section 15 of the RMA (which is applicable here) have regard to, in addition to matters in section 104(1), any possible alternative methods of discharge, including discharge into any other receiving environment regardless of whether the effects of the discharge are significant or not.

Further, Policy 23(2)(b)(i) (Discharge of contaminants) of the current (2010) NZCPS also states that, in terms of managing discharge of human sewage, the discharge of treated human sewage to water in the coastal environment should not be allowed unless there has been an adequate consideration of alternative methods, sites and routes for undertaking the discharge. Lastly, section 108(2)(e) of the RMA enables a consent authority to impose, as a condition of a discharge or

coastal permit relating to the discharge of contaminants, a requirement that the consent holder adopt the BPO to prevent or minimise any actual of likely adverse effect on the environment of the discharge.

The Council, with direction provided by Te Tauihu iwi as part of a Working Group, key stakeholders, and technical specialists has undertaken extensive work to determine what the BPO is for the NWWTP. This work has included consideration of a range of alternatives and combinations of alternatives which are set out in Section 7 and covered in detail in the Stantec report entitled 'Nelson Wastewater Treatment Plant Resource Consent Application Assessment of Alternatives ' (**Stantec Alternatives Assessment**), included in Appendix E This alternatives assessment also incorporates the findings of the PDP report entitled 'Nelson North Wastewater Treatment Plant – Land Application and Managed Aquifer Recharged Review' (**PDP LA and MAR Report**) included in Appendix F .

To determine the BPO, the iterative sieving approach shown in Figure 4.2 was used.

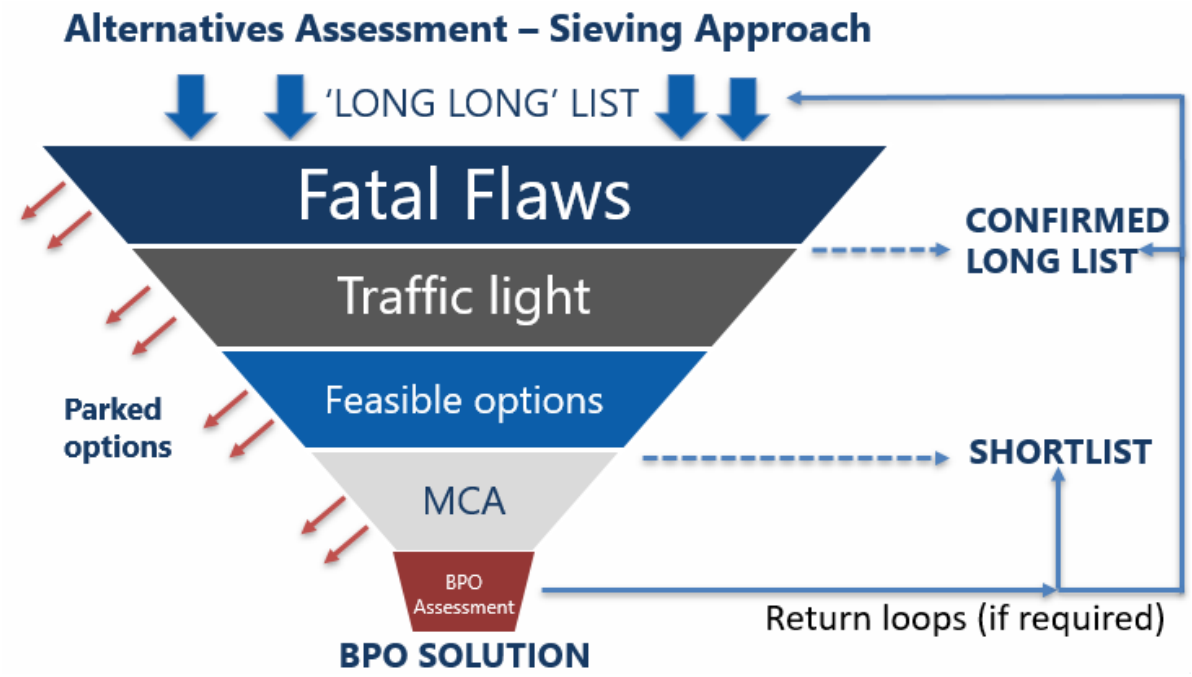


Figure 4-2: Best Practicable Option – Iterative Sieving Approach

The sieving approach included 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 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 'Shortlist' phase. Stage 3 resulted in a preliminary 'Shortlist'.

Stage 4 of the assessment involved a multi criteria assessment (**MCA**) of the preliminary Shortlist of options that had been identified by Stage 3. The MCA is a decision tool which assisted to further refine the preliminary Shortlist. The criteria used to compare the shortlisted 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.

In determining the BPO from the shortlisted options, the following were considered:

4.3.1 The output of the multi criteria assessment

After following the steps in the sieving process, the resultant Shortlist went through the MCA assessment. The MCA assessment (as set out in section 6 of the Stantec Alternatives Assessment included in Appendix E) concluded that the best option in terms of the non-price criteria scores was non-potable direct reuse with the balance to LA (Option 9a). This was mainly driven by the higher level of treatment and the different discharge route (i.e. treated wastewater beneficial reuse or applied to land rather than discharged to Tasman Bay). The second highest scoring (non-price) option was 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) (Option 14 WD-Ox), with the other three upgraded treatment options (retention of oxidation ponds with additional treatment process units) close behind.

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

As part of determining the BPO for the NWWTP there needs to be appropriate consideration given to a variety of social, cultural, environmental, and financial drivers. Using an evenly weighted approach (i.e. all non-price and price attributes given the same weighting), Option 12 OWD received the highest score – Option 12 OWD involves additional removal of pathogens, a new modern outfall diffuser, upgrading/ planting of existing wetlands, and improved odour management.

4.3.2 The project objectives and the associated practical considerations

Six project objectives were developed as set out in Section 2.3 and the ranking of options through the MCA (included in the Stantec Alternatives Assessment in Appendix E) were assessed against these project objectives before identifying the BPO for this application. The following sections demonstrate how the BPO achieves each of the objectives.

4.3.2.1 Recognising the importance of cultural values (Objective 1)

While the assessment included within the MCA builds upon the mahi and direction provided by Te Tauihu iwi[21] as part of the Working Group and the guiding principles drawn from the available iwi management plans, it does not speak on their behalf.

The assessment of options 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 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 the BPO. The level of additional treatment will be determined by the findings of further site-specific virus testing. 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. The implementation of the recommendations of cultural health indicator (**CHI**) monitoring, where possible, forms part of the BPO. This is 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.

[21] 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

4.3.2.2 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 by the current NWWTP provides flexibility for managing future growth.

4.3.2.3 Review against treatment and discharge standards (Objective 3)

The current scheme discharge has met the consented discharge quality limits. The BPO allows for additional operational or mechanical treatments to be implemented if concentrations of pathogens or TSS increase beyond acceptable limits, or standards become more conservative.

4.3.2.4 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, is considered part of the BPO.

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 Council's LTP. The BPO is 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.

4.3.2.5 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 reuse. Seeking additional or new area consents outside the current NWWTP site designation also requires further land use considerations. To obtain reasonable and practicable 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.

4.3.2.6 No more than minor adverse effects on the receiving environment (Objective 6)

Based on the Cawthron assessment and benthic surveys (discussed in detail in Section 10), the current discharge is not having an impact on the marine receiving environment beyond what it is naturally able to attenuate for. The QMRA (discussed in detail in Section 10.3) assesses the potential effect of the discharge on human health through contact recreation and shellfish gathering. The QMRA shows that the only unacceptable risk to human health is potentially the consumption of uncooked bivalve shellfish at some sites. This requires further testing of the assumptions used within the QMRA, the viral reduction rates through the WWTP, and confirmation from iwi where kaimoana shellfish beds are located. The BPO allows for the introduction of additional pathogen treatment to further target viruses related to uncooked bivalve shellfish consumption, if this is deemed to be needed following further testing. If pathogen reduction is shown to be needed, then TSS concentrations may also need to be reduced to ensure effective disinfection.

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 are also waste and emissions associated with the manufacture and operation of additional mechanical plant.

4.3.3 The case for investment

The BPO needs to appropriately weigh up a wide range of factors against costs as set out in section 7.1 of the Stantec Alternative Assessment included in Appendix E. The following case for investment was considered for the BPO in terms of the benefit of additional treatment to the receiving environment and/or cultural and social benefits and relative investment required.

Improved dispersion at the point of discharge is achieved within the level of investment associated with replacement of the diffuser as part of the BPO. 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. Ongoing proactive pond management is achieved by the investment to minimise risk of objectionable odours from the ponds. The present scheme complies with FC consent limits but is reliant on natural treatment processes. The potential public health risks associated with the discharge have been assessed to relate to contact recreation and consumption of uncooked bivalve shellfish, with the latter potentially posing an unacceptable risk but this needs to be verified through additional testing. Case for investment provides a mechanical backup that can be implemented if concentrations increase, or standards become more stringent. A lead-in time would be required to procure and construct new infrastructure; and to collect sufficient data to design the upgrades needed to reduce pathogen concentrations.

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, if determined to be necessary through further testing, allows NWWTP to limit at source its contribution to any additive risks of this discharge.

4.3.4 Best practicable option and the Local Government Act 2002

In weighing factors and attributing values through the MCA process and evaluating alternatives, the Council has also considered the statutory planning documents made by the Council under the Local Government Act 2002 (**LGA**) through special consultative processes.

4.3.4.1 Statutory Overview

In summary of the statutory setting in which NCC operates. Section 10 of the LGA states:

> *"**10 Purpose of local government***
> *The purpose of local government is—*
> *(a) to enable democratic local decision-making and action by, and on behalf of, communities; and*
> *(b) to promote the social, economic, environmental, and cultural well-being of communities in the present and for the future".*

Section 11 and the powers in section 12 of the LGA all inform decision-making by the Council when performing a function under another enactment, including providing core services governed by the RMA.

Section 13 of the LGA states:

> *"**13 Performance of functions under other enactments***
> *Sections 10 and 12(2) apply to a local authority performing a function under another enactment to the extent that the application of those provisions is not inconsistent with the other enactment".*

The principles governing the Council are set out in section 14 of the LGA which states:

> "***14 Principles relating to local authorities***
> *(1) In performing its role, a local authority must act in accordance with the following principles:*
> *(a) a local authority should—*
> *(i) conduct its business in an open, transparent, and democratically accountable manner; and*
> *(ii) give effect to its identified priorities and desired outcomes in an efficient and effective manner:*
> *(b) a local authority should make itself aware of, and should have regard to, the views of all of its communities; and*
> *(c) when making a decision, a local authority should take account of—*
> *(i) the diversity of the community, and the community's interests, within its district or region; and*
> *(ii) the interests of future as well as current communities; and*
> *(iii) the likely impact of any decision on each aspect of well-being referred to in section 10:*
> *(d) a local authority should provide opportunities for Māori to contribute to its decision-making processes:*
> *(e) a local authority should actively seek to collaborate and co-operate with other local authorities and bodies to improve the effectiveness and efficiency with which it achieves its identified priorities and desired outcomes; and*
> *(f) a local authority should undertake any commercial transactions in accordance with sound business practices; and*
> *(fa) a local authority should periodically—*
> *(i) assess the expected returns to the authority from investing in, or undertaking, a commercial activity; and*
> *(ii) satisfy itself that the expected returns are likely to outweigh the risks inherent in the investment or activity; and*
> *(g) a local authority should ensure prudent stewardship and the efficient and effective use of its resources in the interests of its district or region, including by planning effectively for the future management of its assets; and*
> *(h) in taking a sustainable development approach, a local authority should take into account—*
> *(i) the social, economic, and cultural well-being of people and communities; and*
> *(ii) the need to maintain and enhance the quality of the environment; and*
> *(iii) the reasonably foreseeable needs of future generations.*
> *(2) If any of these principles, or any aspects of well-being referred to in section 10, are in conflict in any particular case, the local authority should resolve the conflict in accordance with the principle in subsection (1)(a)(i)."*

In relation to the delivery of services such as wastewater treatment, section 17A of the LGA states:

"***17A Delivery of services***

(1) A local authority must review the cost-effectiveness of current arrangements for meeting the needs of communities within its district or region for good-quality local infrastructure, local public services, and performance of regulatory functions.

(2) Subject to subsection (3), a review under subsection (1) must be undertaken—

(a) in conjunction with consideration of any significant change to relevant service levels; and

(b) within 2 years before the expiry of any contract or other binding agreement relating to the delivery of that infrastructure, service, or regulatory function; and

(c) at such other times as the local authority considers desirable, but not later than 6 years following the last review under subsection (1).

(3) Despite subsection (2)(c), a local authority is not required to undertake a review under subsection (1) in relation to the governance, funding, and delivery of any infrastructure, service, or regulatory function—

(a) to the extent that the delivery of that infrastructure, service, or regulatory function is governed by legislation, contract, or other binding agreement such that it cannot reasonably be altered within the following 2 years; or

(b) if the local authority is satisfied that the potential benefits of undertaking a review in relation to that infrastructure, service, or regulatory function do not justify the costs of undertaking the review.

(4) A review under subsection (1) must consider options for the governance, funding, and delivery of infrastructure, services, and regulatory functions, including, but not limited to, the following options:

(a) responsibility for governance, funding, and delivery is exercised by the local authority:

(b) responsibility for governance and funding is exercised by the local authority, and responsibility for delivery is exercised by—

(i) a council-controlled organisation of the local authority; or

(ii) a council-controlled organisation in which the local authority is one of several shareholders; or

(iii) another local authority; or

(iv) another person or agency:

(c) responsibility for governance and funding is delegated to a joint committee or other shared governance arrangement, and responsibility for delivery is exercised by an entity or a person listed in paragraph (b)(i) to (iv).

(5) If responsibility for delivery of infrastructure, services, or regulatory functions is to be undertaken by a different entity from that responsible for governance, the entity that is responsible for governance must ensure that there is a contract or other binding agreement that clearly specifies—

(a) the required service levels; and

(b) the performance measures and targets to be used to assess compliance with the required service levels; and

(c) how performance is to be assessed and reported; and

(d) how the costs of delivery are to be met; and

(e) how any risks are to be managed; and

(f) what penalties for non-performance may be applied; and

(g) how accountability is to be enforced.

(6) Subsection (5) does not apply to an arrangement to the extent that any of the matters specified in paragraphs (a) to (g) are—

(a) governed by any provision in an enactment; or

(b) specified in the constitution or statement of intent of a council-controlled organisation.

(7) Subsection (5) does not apply to an arrangement if the entity that is responsible for governance is satisfied that—

(a) the entity responsible for delivery is a community group or a not-for-profit organisation; and

(b) the arrangement does not involve significant cost or risk to any local authority.

(8) The entity that is responsible for governance must ensure that any agreement under subsection (5) is made publicly available.

(9) Nothing in this section requires the entity that is responsible for governance to make publicly accessible any information that may be properly withheld if a request for that information were made under the Local Government Official Information and Meetings Act 1987".

4.3.4.2 Financial disciplines in managing Local Authority services

Financial planning is a core component of local government under Part 6 of the LGA and includes the requirement for long-term planning under a LTP (section 93 of the LGA) and a requirement for financial management under Part 6 Subpart 3 that includes the requirement for an infrastructure strategy (see section 101B of the LGA).

This application reflects the financial and community planning documented in the LTP. Budgets reflect choices and inevitably address trade-offs based on community-led democratic processes illuminated by statutory principles. In this case, trade-offs of social, economic, and cultural well-being with environmental and cultural factors.

The Council's LTP 2021-31 provides for placeholder budget between 2036 and 2051 for a long-term alternative to the NWWTP to recognise possible climate change, cultural and social demands, and tighter discharge standards. The value as cited for this project is $82 million. An element of strategic scoping budgeted at $350,000 for investigative work in the 2021-31 LTP/AMP; this figure has been increased and is expanded in the Council's Draft LTP 2024-34. The Council's Draft LTP 2024-34 has the following features:

> "*Draft LTP 24 -34 Is currently under review and is subject to scrutiny related to the current cost of living challenges for the community - so the numbers below may change.*
>
> *Future NWWTP upgrade/relocate -there is more granularity in this LTP as we have a better idea of some of the things that may come up in the 30 years of the AMPs (all numbers are uninflated):*
> - *2025/26 & 27: $1.35m linked to the potential need for odour management improvements (expected to be tied to the conditions of consent) or similar - there is some uncertainty concerning this at this stage.*
> - *2031/32 to 33/34: $12.5m tied to the possible need for upgraded pathogen treatment.*
> - *2048/49 to 52/53: $82m - potential significant upgrade or relocation*
>
> *NWWTP Upgrade Strategic Scoping:*
> - *A budget of $480k (uninflated) over the first six years of the LTP has been allowed for scoping a major upgrade.*
> - *This work is intended to as fully as possible understand the status quo in terms of risk (particularly to climate change), the current level of investment, availability and feasibility of alternate options (both at the same and different sites), and to determine a strategic approach to securing Nelsons WW treatment over the long term (50 years +). At the end of this work, a long-term programme with associated funding milestones would be a key output as would some level of consensus between Council, iwi partners and key stakeholders*".

The current budget allocations for wastewater services reflect several drivers, including those expressly covered in the statutory provisions above. Needless to say, Nelson residents are also (like other residents in New Zealand) facing a cost-of-living pressure. It is important to budget appropriately for services provided by the Council.

4.3.5 How well the preferred option meets the best practicable definition

It is important that the preferred option meets all parts of the BPO definition qualify to be the BPO. The components that make of the BPO are discussed below.

a) Preventing or minimising adverse effects on the receiving environment, taking into account its sensitivity.

These are considered in terms of:

- Effects of discharge of treated wastewater to Tasman Bay (Section 10)
- Effects of the existing pipeline and outfall diffuser structure, including any replacement outfall diffuser (Section 11)
- Effects of seepage to groundwater (Section 12)
- Effects of discharges to air (Section 13)
- Effects on cultural values and associations (Section 14 still to be prepared)
- Natural hazards and climate change (Section 15)

It is considered that, overall, the adverse effects are suitably avoided or minimised by the preferred option 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 preferred option enables the sensitivities of the receiving environment to be considered further as part of refining the type of pathogen treatment technology adopted (if shown to be needed) or the implementation of any other measures necessary to ensure ongoing compliance with consent conditions. The preferred option also allows for ongoing cultural health monitoring to give effect to kaitiakitanga.

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 preferred option (Section 4.3.4), when appropriately weighed in both the policy assessment and the alternatives assessment with the environmental outcomes as part the MCA (Section 4.3.1), show the preferred option 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 option is well understood. The preferred option is considered to include industry proven technologies and operational methodologies to minimise any adverse effects on the receiving environment.

4.3.6 Best practicable option - preferred option identified

In summary, the BPO assessment for the NWWTP resulted in Option 12 OWD being identified as the most appropriate solution and the BPO for the NWWTP at this time. This includes the following:

- The NWWTP to remain at its current location.
- Existing pre-treatment and pond / wetland system to be retained.
- Existing pipeline and outfall diffuser with continuous discharge into the Tasman Bay to continue.
- New modern outfall diffuser to replace existing diffuser at the end of the pipeline to be constructed as part of the renewals programme of the outfall.
- Upgrade and maintenance of planting around existing wetlands and swale, and surrounding Council owned land throughout the life of the consent (in discussions with iwi and an agreed planting plan). Reviewed as part of ongoing 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 to 10 year period if this is shown to be neededfollowing further testing and assessments, to reduce the risk related to uncooked bivalve shellfish consumption.
- Monitor and, if needed, improve treatment to reduce TSS concentrations – 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 CHI monitoring programme (the frequency and scope of any CHI monitoring to be confirmed with iwi).

One of the significant factors for 12 OWD being considered the BPO is that it provides appropriate environmental upgrades while still achieving affordable services for the community particularly in a cost-of-living crisis.

4.4 Key Elements of the BPO

4.4.1 Outfall diffuser replacement

The existing outfall diffuser structure has been in place for over 50 years and it has an expected further 20 (±10) years life, meaning it is likely to need replacing during the term of consent being sought by the Council. When the time comes to replace the diffuser structure the Council will take the opportunity to upgrade it so that the treated wastewater is better mixed within the receiving waters of Tasman Bay. When this occurs, the existing diffuser will be left on the seabed (the reasons for this are discussed in Section 11.3).

A final diffuser design has not yet been decided and the Council has proffered a condition which would require a detailed design report and construction methodology to be submitted to the Consent Authority for certification prior to any replacement diffuser being installed. However, to provide an indication of the potential scale of works associated with constructing a new diffuser, a concept design has been prepared by OCEL and a preliminary concept design report entitled 'Nelson North WWTP Outfall – Concept Design for an Improved More Efficient Diffuser' (**OCEL concept design**) is included in Appendix G . The concept design is shown in Figure 4-3 and consists of two 100 m long polyethylene pipes (630 mm diameter) that extend from the start of the existing diffuser at an angle of 30 degrees. Each pipe would have 40 'duck-bill' outlet ports positioned at 2.5 m intervals with the ports alternating on each side of the pipe.

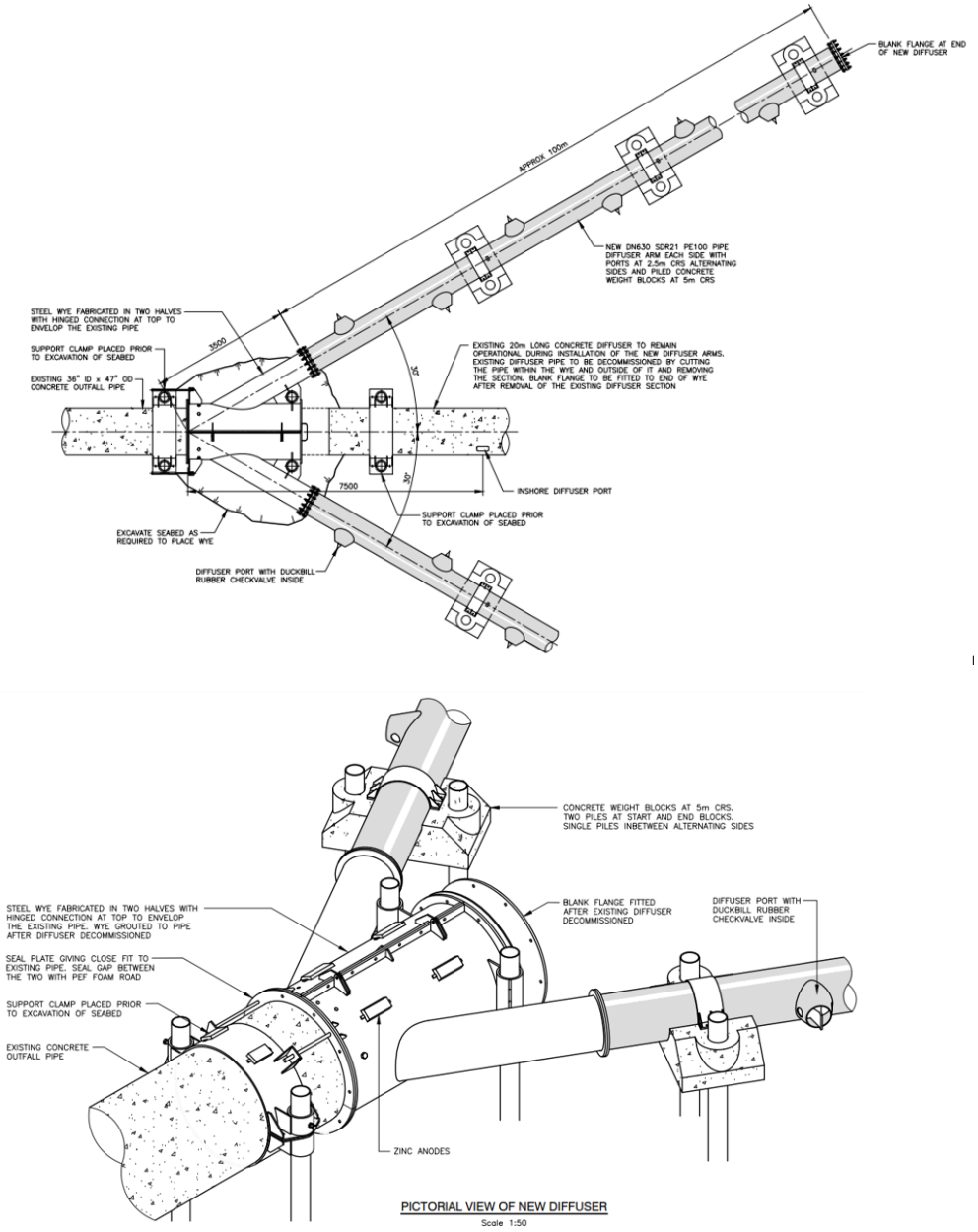


Figure 4-3: Concept design of the proposed replacement outfall diffuser structure.

The new pipes would be placed on ballast weights located at 5 m spacings along the pipe, each with footings to prevent movement of the weights. The two pipes would be connected to the existing pipe by way of a wye (a short pipe with two branches joining at an angle).

The new diffuser arms would need to be installed while the outfall continues in operation. This can be achieved by installing a purpose-built wye chamber around the outfall pipe at the start of the existing diffuser and attaching the two new diffuser arms to the wye chamber either side of the existing diffuser. The cylindrical wye structure fabricated from steel and built in two identical half sections hinged together along the spine of the wye barrel cylinder, closes around, and is clamped to, the existing outfall pipe, allowing the outfall to continue discharging through the wye. The diffuser arms, which are made of HDPE pipe, bolt to the wye arm flanges either side of the existing pipe. The new diffuser can be installed, connected to the wye, and secured in position against the maximum wave induced hydrodynamic loads by installing piles through the precast concrete ballast weights clamped to the HDPE pipe arms while the existing diffuser continues in operation.

To install the wye in position of the existing outfall pipe a hole has to be dredged under the pipe at the wye location to allow the wye halves to close around the pipe and the wye to be clamped together. The weight of the wye will need to be taken both by piles installed through pile guides in the wye structure and by a separate clamp clamped around the outfall pipe upstream of the wye and supported by piles to take bending stress off the existing outfall pipe.

To enable the changeover between the new and the old diffuser, the outfall discharge is stopped and a 4 m length of the existing diffuser pipe is cut out of the diffuser outside the wye using a diamond wire rope saw - one cut just outside the wye barrel and the second cut 4 m distant offshore. The 4 m length is then recovered to surface leaving the end of the wye clear. The diffuser pipe length inside the wye is then cut using the diamond rope saw run through a slot provided in the top of the wye barrel. Once the pipe section is cut it is pulled out of the wye using a hydraulic winch line secured back to the remaining length of the original diffuser as a reaction point. The existing cutoff outfall diffuser length may be left on the seabed after the construction of the replacement diffuser to provide potential localised habitat and minimise the extent of seabed disturbance.

A steel blind flange is then bolted to the end of the wye sealing it off following which the outfall flow can be turned back on to discharge through the new diffuser arms. The changeover can be completed inside a working day with all the tools set up ready to start the moment the outfall flow is shut down. The timing of the works will coincide with a forecasted dry weather period when flows to the NWWTP are not influenced by wet weather.

To install each pipestring the pipestring is towed to the location and lined up on surface with its final position on the seabed. Once directly above the alignment and held in position by workboats at either end. Figure 4-4 shows a pipestring floating at the stern of the supporting workboat ready to be pulled down, diver attaching rigging - the inshore end of the pipestring is pulled down to the seabed to mate with the corresponding flange on the subsea wye pipe stub. The end of the pipe is pulled straight down to give a J shaped transition as illustrated in Figure 4-5. Halfway down the flooding valve on the pulldown head is opened, the offshore end of the pipe is kept closed. As the pipe is pulled down flooding as it goes the J shape transition changes to an S shape and stabilises.

It is difficult to estimate the level of seabed disturbance that may occur by the installation of a new diffuser because the actual design is not known. However, based on the OCEL concept design an area of disturbance of ~350-400 m^2 may occur (based on 2 × 100 m long pipestrings each disturbing a 1.8 m width of seabed, plus the works to install the wye etc.).

Figure 4-4: Example of diffuser pipestring being installed.

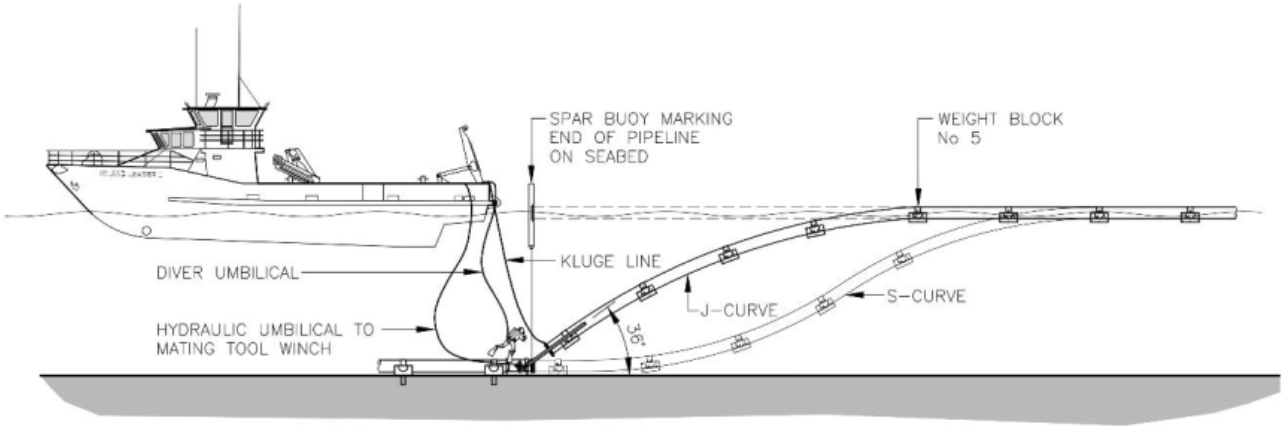


Figure 4-5: Indicative installation method for new diffuser pipestring.

4.4.2 Upgrade of the NWWTP to provide additional pathogen reduction

Additional pathogen reduction may be needed during the term of the new consents. A QMRA has been undertaken (discussed in detail in Section 10.3) which identifies that human norovirus in the treated wastewater has the potential to results in unacceptable risks to people who consume uncooked bivalve shellfish at some of the sites which have been assessed.

The level of risk is dependent on rates at which human norovirus enter the NWWTP and the reduction/removal rates of human norovirus through the treatment process. The rate at which the NWWTP reduces human norovirus can be estimated, however, actual rates may be different to the predicted rates. The required rates of reduction to reduce bivalve shellfish consumption risks to acceptable levels (according to the QRMA) are close to the predicted rates – that is, the NWWTP *may* be treating human norovirus in the wastewater to a level such that risks are acceptable, however, this cannot be verified until actual human norovirus reduction testing at the NWWTP is undertaken. Should the testing show that reduction rates of human norovirus are less than current predictions (including consideration of future flows to the NWWTP), then the Council will upgrade the NWWTP to ensure human norovirus reduction rates through the treatment process are such that uncooked bivalve shellfish consumption risks are reduced to acceptable levels at sites where bivalve shellfish beds have been shown to exist.

The Council is currently undertaking testing at the NWWTP to determine the actual reduction rates for human norovirus. The results of that testing will be used to determine whether an upgrade of the NWWTP is necessary to reduce human norovirus concentrations prior to discharge to Tasman Bay. Not only will the monitoring determine if an upgrade is necessary to address risks, but the results will also inform what level of additional treatment is needed to address the risks. The details of the testing and review of the QMRA following the testing are presented in Section 10.3.5. The Council will be in a position to determine whether an upgrade is necessary prior to a decision being made on this application.

If the monitoring and review of the QMRA following the human norovirus monitoring determines that an upgrade at the NWWTP is needed, then the Council will upgrade the plant with the upgrades being completed within a five to seven year period after the date of commencement of the consents (i.e. 2029-2031). To provide for unforeseen delays, the latest date the upgrades would be completed and commissioned is 31 December 2034 (being 10 years from the date of commencement of the new consents).

The Council considers the above approach is a prudent and responsible one given that it is not certain that the risks of the current (and future) discharge from the NWWTP pose unacceptable risk or not. Any upgrade will involve a significant investment and the Council needs to ensure such expenditure is shown to be necessary to achieve the desired outcomes before committing it for an upgrade.

4.4.3 Wastewater management and operation procedures and active pond health management

4.4.3.1 Operation and maintenance manual

The operation and maintenance of the NWWTP is undertaken by Nelmac who are contracted to the Council. The NWWTP Operation and Maintenance Manual (**O&M Manual**) covers the ongoing operation and maintenance of the NWWTP.

The O&M Manual is made up of 13 volumes as follows:

- Volume 1 – NWWTP overview;
- Volume 2 – Pumps;
- Volume 3 – Inlet works equipment;
- Volume 4 – Clarifier and trickling filter;
- Volume 5 – Sludge system;
- Volume 6 – Ancillary process equipment;
- Volume 7 – Valves and plant services;
- Volume 8 – SCADA and PLC operations manual;
- Volume 9 – Instrumentation;
- Volume 10 – Electrical systems;
- Volume 11 – Treatment plant drawings;
- Volume 12 – Asset Management Plan; and
- Volume 13 – Odour Management Plan (subsequently updated as discussed below).

4.4.3.2 Pond management plan

The Pond Management Plan (**PMP**) covers management of the facultative pond, the maturation pond, and the wetlands. Its purpose is to define how the ponds and wetlands should be best managed and operated to ensure treatment complies with the conditions of the existing consent.

The PMP covers the following areas:

- Pond operating philosophy, including pond health monitoring, key process elements and levers, and desludging;
- Decision making, performance review, and reporting;
- Contingency management;
- Personnel; and
- Management Plan control and revision requirements.

4.4.3.3 Odour management plan

The purpose of the Odour Management Plan (**OMP**) is to define how the NWWTP is managed and operated to minimise odours so that discharges to air comply with the current resource consent. The OMP covers the following areas:

- Odour sources;
- Odour management;
- Response procedures;
- Contingencies; and
- OMP updating procedures.

4.4.4 Upgrade and maintenance of wetland planting and cultural health indicator monitoring

A CHI assessment is a tool kindly provided 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.

As a result of the CHI report (1 April 2022) the Council has established an ongoing planting project with tangata whenua in and around the NWWTP. Through a series of meetings with iwi, each of the CHI recommendations have been discussed and actions agreed, where possible, that move towards delivering the recommendations.

The focus has been agreed to:

- diversify the species of plants directly around the wetland areas;
- plant the banks of the freshwater channels, from mid-way up to the top of the bank to be planted in blocks leaving some open areas for future access for maintenance; and

- plant the higher ground areas to enhance the natural habitat. Initially planting will be focused on intensifying existing planted areas.

A range of plants has been identified by tangata whenua and have been reviewed by the Council's ecologists and a Rongoa Māori specialist. Based on the agreed range of plants, plans have been prepared for the first stage of planting. The frequency and scope of future cultural health monitoring and ongoing enhancement planting is still to be confirmed with iwi.

4.4.5 Solids management and desludging

Sludge is generated as part of the treatment process within the facultative pond and this sludge accumulates on the base of the pond over time. A similar process occurs, but to a lesser extent, within the maturation pond and the wetlands. If the loading to the facultative pond is required to be reduced, the solids treatment system and sludge management regime is operated, with thickened sludge tankered off-site. The periods to which this will occur in the future may change and will be determined through the active pond health management procedures.

The Council undertakes desludging when sludge levels within the ponds reach a depth whereby the treatment ability of the ponds and/or wetland are being affected. The facultative pond was last desludged in 2014 and involved dredging of the sludge into geotextile dewatering bags that were temporarily placed in the buffer pond.

The Council is likely to need to undertake further desludging at the NWWTP over the term of consent being sought (i.e. over the next 35 years) and this application seeks authorisation for the various discharges associated with such desludging.

The exact methodology that would be used for future desludging operations is not currently known but it is likely to be similar to the 2014 operation, which involved the following:

- Site preparation: preparing the base of the buffer storage pond to ensure its ground is at a constant grade and sloping towards the sump located at the north of the pond – this work would involve clearance of any exotic vegetation that may be present and soil disturbance/earthworks;
- Dredging of the sludge: a dredger would float on the pond (or wetland) and suck sludge from the bottom and discharge this into geotextile bags via an enclosed/sealed pipeline system which will be laid above ground. A flocculant would be injected into the pipeline to effect the separation of solids from the sludge prior to entering the geotextile bags. The dredging would occur for up to 24 hours per day, seven days per week (worst case) and each desludging operation may take up to six months to complete (weather dependent);
- Sludge dewatering and on-site storage: Geotextile bags would be laid out at the base of the buffer pond. Sludge would be pumped from the dredger into the bags. 'Leachate' is produced during the dewatering process within the bags and this leachate will seep out of the bags onto the base of the pond and flow (via gravity) to the sump at its northern end where it would be pumped into the facultative pond. One to two bags would typically be filled per week; and
- Sludge disposal: The sludge within the geotextile bags would progressively become drier over time and when the required minimum dry solids content of 20% is reached the bag would be cut open and the sludge transported by truck to the York Valley landfill. A maximum of 300 t of sludge would be transported per month, any remaining sludge in any opened bag would be covered with a well anchored cover system to minimise odour release and minimise rainwater re-wetting the dewatered sludge. Representative samples of the sludge would be tested to confirm compliance with the York Valley landfill resource consent waste acceptance criteria (including the toxicity characteristic leaching procedure .

Figure 4-6 shows an aerial photograph of the geotextile bags stored in the buffer pond following the 2014 desludging operation.

Figure 4-6: Geotextile sludge dewatering bags located within the buffer pond.

4.5 Consent Duration Sought

The Council is seeking a duration of 35 years for all the consents being sought (the maximum allowed for under the RMA).

The Council and its customers have invested in a substantial and regionally significant infrastructure asset in terms of the NWWTP. The replacement value of the existing NWWTP is in the order of $21.5 million. Further, should additional pathogen reduction be shown to be needed following the additional monitoring that is proposed at the NWWTP, an additional $10-15 million may be invested. The Council has committed to substantial investment over the duration of the consent and the draft LTP/AMP allows sufficient budget for the replacement of the diffuser and any other future upgrades identified under the BPO.

It is important that the Council has financial security for this substantial infrastructural asset / investment and is able to provide future flexibility to accommodate domestic and business / commercial / industrial/ trade waste growth. Future growth projections set out in Section 4.1 demonstrate the population growth planned for the NWWTP catchment over the next 35 years.

To achieve financial security and provide certainty for future investors, community and business growth, it is important for the Council to have long term certainty in terms of the on-going operation of the NWWTP. This is a critical consideration in seeking a 35 year duration for the proposed consent. The requested consent duration will enable the Council to perform its statutory functions as described in Section 4.3.4 under the LGA according to the statutory principles and supports the sound financial management of the community's resources.

In order to address concerns relating to potential adverse effects, the Council has proffered consent conditions that provide for discharge and receiving environment monitoring and reporting, and a specific review condition has been proffered that would allow the consent authority to review the consent conditions to address any adverse effects on the environment that may arise from the exercise of consent. The conditions provide for such a review annually should the consent authority consider this necessary.

The Natural and Built Environment Act 2023 (**NBEA**) gained Royal Assent on 23 August 2023. For most intents and purposes consent applications continue to be processed under the RMA until the first NBEA Plans come into effect for each region. However, the NBEA also inserted new clauses into Schedule 12 of the RMA, which provide interim restrictions on the maximum duration that 'affected resource consents' (which are essentially water permits or discharge permits that relate to freshwater) can be granted for. For this application, this would cover the discharge of treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities – these discharges have the potential to result in contaminants entering groundwater and adjacent streams.

However, new clause 40 of Schedule 12 of the RMA provides an exception, where an applicant, as part of their application, seeks from the consent authority a determination that clause 39 does not apply because the application is primarily for an activity described in clause 40(3). The activities in that sub-clause include '*the construction, operation, upgrading, and maintenance of infrastructure that forms part of a public wastewater network*'. The NWWTP meets this definition, and the Council therefore requests that the consent authority determines that the restrictions in clause 39 do not apply to the discharge of treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities. For the avoidance of doubt, clauses 39 and 40 of Schedule 12 of the RMA do not apply to the discharge of treated wastewater to Tasman Bay as those clauses only apply to discharges to 'freshwater' (as defined in the RMA to mean all water except coastal water and geothermal water).

4.6 Lapsing

Section 125 of the RMA states that resource consents lapse on the date specified in the consent or, if no date is specified, they lapse five years after the date of commencement (the default). The current application includes activities which are ongoing, meaning they will be 'given effect to' immediately and the consents for those activities will not lapse. However, two of the proposed activities, namely the replacement of the outlet diffuser and desludging activities, are anticipated to be undertaken 'as needed' during the life of the consent (i.e. at some time over the next 35 years) but the exact timing of these is currently unknown. Accordingly, it is not possible to specify a lapsing period for these consents. In such situations it is normal to include a lapse date which is the same as the expiry date and the Council considers that to be appropriate in this case. A condition to this effect has been proffered.

5 Resource Consent Requirements

5.1 Rules Assessment

5.1.1 Introduction

The NRMP is the relevant statutory planning document in respect of the rules applicable to some of the proposed activities. The rules in Chapter 13 (Coastal Marine Area) and Appendix 28 (Freshwater) are applicable. In addition, the Nelson Air Quality Plan (**NAQP**) contains rules relating to discharges of contaminants to air. The following sections cover these matters.

It should be noted that the Council has been preparing a replacement to the NRMP called the Draft Whakamahere Whakatū Nelson Plan (**the Draft Nelson Plan**), however the rules in this document have no legal status as the plan has not been notified. Accordingly, the rules in the Draft Nelson Plan are not relevant and have not been considered or applied.

The NWWTP and its operation is subject to Designation DN7 of the NRMP, however, the NRMP includes some land use rules which are identified as being 'regional rules', meaning those activities are not covered by the designation. For the avoidance of doubt, the Council seeks all the authorisations required for all direct and ancillary 'regional' activities described in this application that are not covered within the ambit of Designation DN7. All best endeavours have been made to identify which activities require resource consent under the NRMP, the NAQP, and the Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011 (**NES-CS**), however there be some rules which have been missed.

The following also apply to the NWWTP site in terms of NRMP zonings and overlays:

- Underlying zoning is Rural
- Part of the site is within the Flood Overlay
- Part of the site is within the Inundation Overlay
- Part of the site, including a small part of the buffer pond where vegetation and earthworks may take place to prepare it for storing sludge, is within the Conservation Overlay
- The entire site is within the Coastal Environment Overlay
- Hillwood Stream has a Riparian Overlay (referred to in the NRMP as the 'Wakapuaka flats drains')
- The majority of the site is identified as being on the Hazardous Activity and Industries List (**HAIL**) – interestingly, the buffer pond is not within the HAIL area, however, the activity that occurs there qualifies as a HAIL activity
- The pipeline and outfall diffuser structure are located within the Marine Area of Significant Conservation Value (**ASCV**)
- Part of the pipeline traverses the Riparian Overlay Coastline
- The site is within Airshed C according to the NAQP

The land zonings and extents of the various overlays are shown in Figure 5-1 and Figure 5-2.

Figure 5-1: NRMP Zones and Extent of Designation

Figure 5-2: NRMP Overlays.

5.1.2 Rules

How the proposed activities comply, or otherwise, with the rules[22] of the NRMP and NAQP are presented in Table 5-1.

Table 5-1: NRMP and NAQP Rules Assessment

Activity	Relevant Plan and Permitted Activity Rule(s)	Discussion	Class of Activity and Applicable Rule
To discharge treated wastewater to Tasman Bay (within the CMA)	NRMP CMr.47.1	The discharge of treated wastewater (human sewage in the NRMP) to coastal waters is not permitted except from vessels. Discharges of treated wastewater to coastal waters is discretionary if: a) prior consultation with tangata whenua in accordance with tikanga Māori, and with the public, has been carried out, and b) after reasonable mixing the classification standards (contained in Schedule CMs) for the receiving water are complied with, and c) the discharge better meets the purpose of the Act than disposal to land. These conditions are all met so the discharge is a discretionary activity.	**Discretionary** activity – Rule CMr.47.3
To place, use and maintain a pipeline and outfall diffuser structure on and under the bed of Tasman Bay (within the CMA)	NRMP CMr.22.1	Rule CMr.22.1 permits outfall structures provided they are, amongst other things, less than 800 mm in diameter and do not extend more than 6 m into the CMA. The outfall structure is 1,200 m in diameter and extends ~400 m into the CMA so is therefore not a permitted structure.	**Discretionary** activity – Rule CMr.22.3
To disturb the foreshore and seabed to replace an existing outfall diffuser structure located on and under the bed of Tasman Bay (within the CMA)	NRMP CMr.24.1	Rule CMr.24.1 provides for the 'maintenance' of structures within the CMA and the wording of the rule anticipates that this can include 'alteration' of an existing structure. There are a number of requirements that need to be met for any such maintenance/alteration to be permitted, namely: - The activity uses material of a similar type to that used in the existing structure; - The activity does not substantially change the appearance of the structure (repainting does not constitute such change); The activity disturbs less than 10 m^3 of sand, shingle, shell or other natural foreshore or seabed material. In this case the replacement diffuser will likely result in disturbance of more than 10 m^3 of seabed material, but less than 100 m^3 specified in controlled activity rule CMr.24.2. In addition, Chapter 2 of the NRMP defines 'maintenance of a structure' to includes certain requirements, including that the activity does not result in any increase in seabed occupied by the structure.	**Controlled** activity – Rule CMr.24.2

[22] The NRMP has rules for both 'soil disturbance' and 'earthworks'. Chapter 2 of the NRMP (Meaning of Words) defines 'earthworks' as any modification to the shape of the land surface, including, inter alia, removal of soil and re-contouring and 'soil disturbance' means disturbance of soil other than by modification to the shape of the land surface (and includes activities such as cultivation, deep ripping, root raking etc.). The proposed works have therefore been assessed as being 'earthworks' and not 'soil disturbance'.

Activity	Relevant Plan and Permitted Activity Rule(s)	Discussion	Class of Activity and Applicable Rule
To discharge treated wastewater to land via seepage from the base of the ponds and wetlands, including wastewater leachate from dewatering of sludge within the buffer pond following desludging activities.	NRMP FWr.25.1	There are no specific rules that deal with discharges of treated wastewater via seepage from the base of ponds or wetlands. As such, the activity falls to be considered under rule FWr.25 which covers general discharges to land where it may enter water. The discharge is not specified in permitted rule FWr.25.1 and, as such, it is a discretionary activity under rule FWr.25.3	**Discretionary** activity – Rule FWr.25.3
To remove vegetation to prepare the buffer pond for storage of sludge and to gain access	NRMP RUr.25.1 RUr.57.1	Rule RUr.25.1 relates to vegetation clearance and allows such clearance provided it is not within 20 m of the CMA. Minor vegetation clearance may be required within 20 m of the CMA. This rule is identified as a regional rule in the NRMP. Rule RUr.57.1 relates to vegetation clearance within the Conservation Overlay. This applies to only a small portion of the buffer pond as shown in Figure 5-2. The activity will involve only clearance of exotic vegetation and is therefore permitted under rule RUr.57.1. The NRMP does not specifically identify this as being a regional rule, however given the vegetation clearance activity rules are regional rules it has been assumed this too is a regional rule.	**Controlled** activity – Rule RUr.25.2
To undertake earthworks to prepare the buffer pond for storage of sludge and to gain access	NRMP RUr.27.1 RUr.53.1 RUr.62.1	Rule RUr.27.1 relates to earthworks and allows such earthworks provided they are not within 20 m of the CMA. This same separation distance is included in controlled activity rule 27.2. Earthworks may be required within 20 m of the CMA. This rule is identified as a regional rule in the NRMP. Rule RUr.53.1 relates to earthworks within the Coastal Environment Overlay and the proposed earthworks are not listed as being permitted by this rule. The activity meets all the criteria of controlled activity rule RUr.53.2. Rule RUr.62.1 relates to earthworks within the Flood Overlay and notes that no special rules apply to this overlay.	Restricted discretionary activity – Rule RUr.27.3 And Controlled activity – RUr.53.2
To discharge contaminants to air from the operation of the NWWTP, including during desludging activities	NAQP AQr.53.1	The NWWTP is classified as an industrial premises according to the RMA and Chapter 2 of the NAQP. There are no specific rules that relate to WWTPs in the NAQP so the discharges to air are captured by the 'catch all' rule AQr.53 which applies to all other industrial or trade premises. The advice note for this rule confirms it applies to discharges to air from waste management processes including wastewater operations. The activity is deemed to be a discretionary activity under rule AQr.53.3.	**Discretionary** activity – Rule AQr.53.3
To discharge contaminants to air from a diesel-powered electrical generator	NAQP AQr.32.1	The generator is a 'stationary internal combustion engine' which is fueled by diesel and, as such, the discharges to air from its operation is covered by rule AQr.32 of the NAQP. While clause d) iii) authorises the discharge from generators that are used in an unforeseen emergency as a permitted activity, the generator is tested regularly and therefore not only operated during emergency situations. Accordingly, clause d) ii) applies and requires the generator to have a power output of less than 400 kW and have a stack that complies with the requirements in Appendix AQ6. While the generator has a power output of less than 400 kW, its stack does not comply with Appendix AQ6 and therefore its operation during regular testing is a discretionary activity under rule AQr.32.3.	**Discretionary** activity – Rule AQr.32.3

The activities for which resource consents are sought are inextricably linked to such a degree that they are appropriate to 'bundle' and the most restrictive activity class be applied to the overall bundle. In this case the most restrictive activity is **discretionary**.

5.2 Resource Management (National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health) Regulations 2011

The NWWTP is identified as a HAIL site (ID HAIL10655) and, as such, soil disturbance is subject to the NES-CS, which include regulations that allow soil to be disturbed as either a permitted, controlled, restricted discretionary, or a discretionary activity. As noted in Section 5.1.1, the buffer pond is not shown as being within the HAIL area (shown in Figure 5-2), however, this area would meet the HAIL requirements given its use. For the purposes of this assessment, it has been assumed the buffer pond is HAIL site.

Regulation 8 of the NES-CS allows certain activities to be undertaken as permitted activities. For general soil disturbance, regulation 8(3)(c) specifies certain requirements and limits, including a limit of 25 m^3 of soil disturbance per 500 m^2. The HAIL descriptor covers an area of ~510,000 m^2, meaning that up to 25,500 m^3 of soil may be disturbed as a permitted activity under the NES-CS. The volume of soil disturbance associated with the preparation of the buffer pond will be significantly less than this volume so is **permitted** by regulation 8(3)(c) of the NES-CS.

Regulation 8(3)(f) states that the duration of the soil disturbance must not exceed two months. Any soil disturbance will not exceed two months so is **permitted** by regulation 8 of the NES-CS.

5.3 Other Activities (including permitted activities)

The NWWTP and its operation is subject to a designation DN7 of the NRMP. Any works proposed by the Council in terms of new buildings or structures will be the subject of an outline plan that would be submitted to the consent authority under section 176A of the RMA. There is no 'approval' process for outline plans.

Exclusive occupation of the CMA by the outfall structure, and any replacement outfall structure, is a permitted activity under rule CMr.20.1 of the NRMP if the occupation "…*is solely by a structure permitted under the NRMP or a resource consent*". In this case the outfall structure, and any replacement outfall structure, will (assuming this application is granted) be authorised by a resource consent, so the exclusive occupation of the CMA is a permitted activity.

Any ongoing maintenance of the outfall structure, including any replacement outfall structure, is permitted by rule CMr.24.1 as all the permitted activity criteria would be met for any such maintenance.

Sludge is proposed to be removed from the ponds when needed and it will be dewatered in geotextile bags that will be placed in the buffer pond. Once the sludge dries to a prescribed moisture content (20%) it will be transported to York Valley landfill where its use/disposal is authorised by the consents held by the operator of that landfill.

The Council also operates a network of pumping stations and overflows from these to land, freshwater, and coastal water can occur due to wet weather and power failures. These discharges are authorised by a discharge permit (RM105388) and a coastal permit (RM105388A) which do not expire until 1 April 2032.

6 Guidelines

6.1 Introduction

There are a number of guidelines that are applicable to this application. Under section 104(1)(b)(vi) the water quality standards of the NRMP are a relevant consideration for decision makers. However, the NRMP standards were drafted in 2004 and a number of more recent guidelines have been adopted which essentially supersede the NRMP standards. These more recent guidelines are able to be considered under section 104(1)(c) of the RMA, which allows decision makers on resource consent applications to have regard to any other matter considered relevant and reasonably necessary to determine the applications. It is considered that these more recent guidelines should be given greater weight than the NRMP standards. The following sections cover the more recent guidelines as well as the NRMP standards.

6.2 Australian & New Zealand Guidelines for Fresh and Marine Water Quality 2018

The 2018 Australian & New Zealand Guidelines for Fresh & Marine Water Quality (**ANZG 2018**) superseded the 2000 Australian and New Zealand Guidelines for Fresh and Marine Water Quality (commonly referred to as the **ANZECC Guidelines**). The ANZG 2018 include default guideline values (**DGVs**) for a variety of determinands. These guidelines have been developed "*to provide an authoritative guide for setting water quality objectives required to sustain current or likely future environmental values for natural and semi-natural water resources in Australia and New Zealand*." The ANZG 2018 include guideline values for both fresh water and marine (coastal) waters and different levels of species protection are provided depending on the current or desired condition of the ecosystem and associated level of protection that is assigned, being:

> ***high ecological/conservation value system — apply 99% species protection DGV;***
> ***slightly to moderately disturbed system — apply 95% species protection DGV; and***
> ***highly disturbed system — apply 90 or 80% species protection DGV.***

In addition, the ANZG 2018 provide a reliability classification for each DGV as either very high, high, moderate, low, very low, or unknown. This classification is mainly based on the number and type (chronic, acute, or a mix of both) of data used to derive the guideline value, as well as the fit of the statistical (SSD) model to the data.

The ANZG 2018 have been used for this application for the coastal waters of Tasman Bay, using the 95% species protection DGVs. In terms of freshwater, priority is given to the National Policy Statement for Freshwater Management 2020, amended February 2023 (**NPS-FM**) (discussed in the next section) where a particular contaminant is covered by this policy statement, however where the NPS-FM does not cover a particular contaminant then the ANZG 2018 has been used (80% species protection level given the degraded nature of the receiving waterways).

The ANZG 2018 also includes DGVs for sediment quality. Two types of DGVs are presented, namely a DGV and a DG-high concentration. There is a low risk of unacceptable effects occurring where the concentration of a contaminant is below the DGV. Adverse ecological effects *may* occur where the concentration is between the DGV and DG-high, and toxicity related adverse effects *are expected* to be observed where concentrations are above the DG-high.

6.3 National Policy Statement for Freshwater Management 2020

The NPS-FM includes a National Objectives Framework (**NOF**) which sets out states to be achieved for a range of water quality and ecological attributes. These attribute states are assigned on the basis of various statistics calculated from representative data, including medians, 95th percentile values, minima, or maxima. A lengthy and substantial dataset is required in order to assess against the majority of attributes, and this can present a challenge when determining the status of a freshwater site if data availability is limited.

Most NPS-FM attribute states assign classes from A to D – 'A' representing the best possible state for an attribute, and 'D' the worst – and have an associated 'National Bottom Line' which indicates a minimum condition to be achieved for each attribute.

6.4 Nelson Resource Management Plan

The NRMP includes water quality standards for both marine (coastal) and freshwater. These are based on the applicable guidelines which were available when the NRMP was being drafted in 2004 and many of these guidelines have subsequently been updated or superseded. Despite this, the NRMP standards still have legal effect.

In terms of marine water quality standards, the relevant water quality classifications in the vicinity of the outfall are shown in Figure 6-1. The light blue coloured circular area around the outfall has a fishing, fish spawning, aquatic ecosystem, and aesthetic purposes (**FEA**) classification. The area to the north and south of the outfall located between 0-10 m water depth also has an FEA classification, except offshore of The Glen (Glenduan) which has a contact recreation (**CR**) classification and this is located >3.5 km from the outfall. Coastal waters between 10-40 m water depth (with the exception of the half-circle area around the outfall) are classified as FEA and shellfish gathering (**SG**). The distance between the outfall and SG waters is >1 km. Part CMs of the NRMP presents the water quality standards that apply to these classifications and these apply 'after reasonable mixing' (discussed in greater detail in Section 10.2.2), and are replicated in Table 6-1.

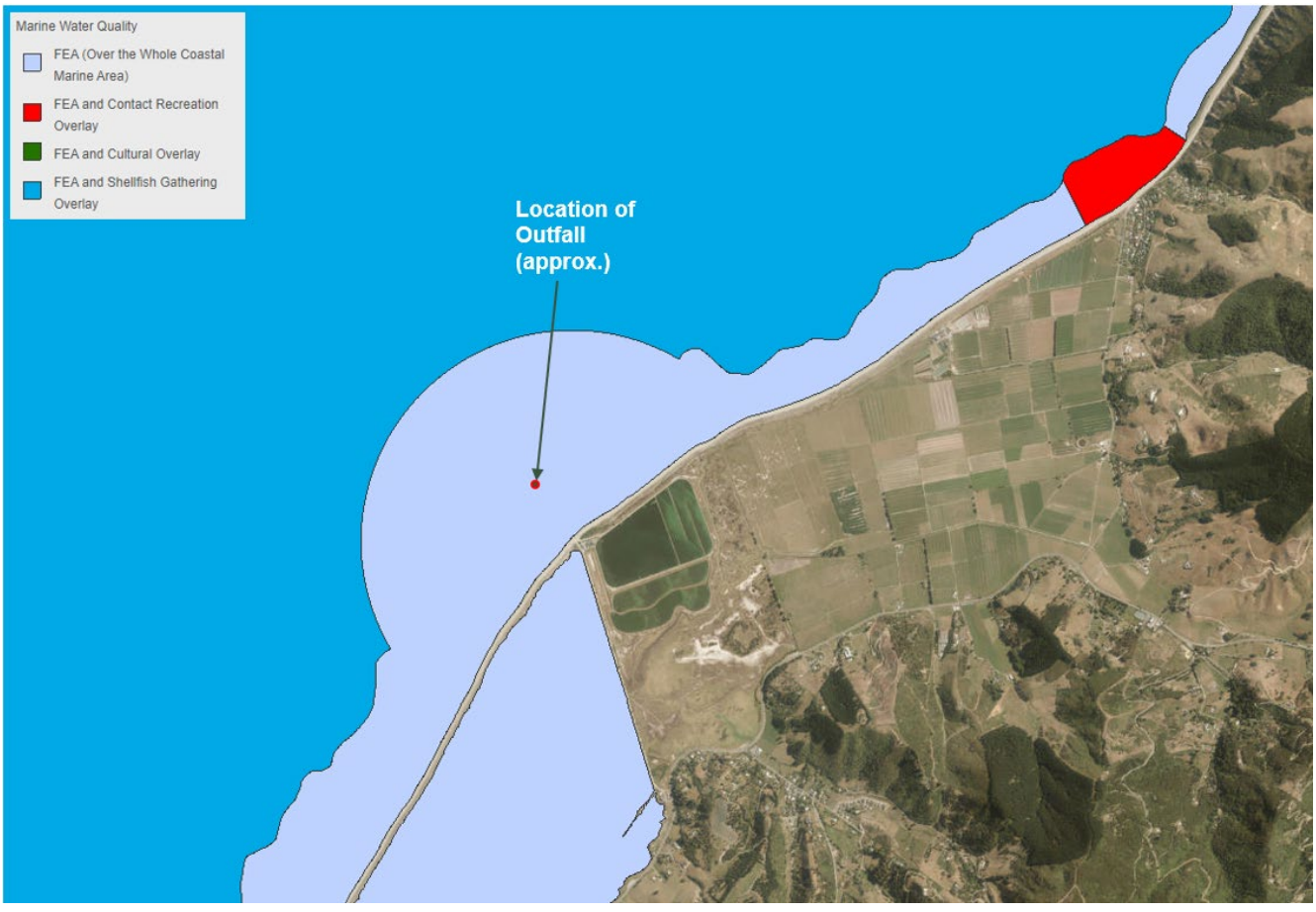


Figure 6-1: Marine water quality standards from the NRMP.

Table 6-1: Applicable NRMP water quality standards after reasonable mixing

Water Quality Standard	Standard to be met after reasonable mixing
FEA	1) The natural temperature of the water shall: a) not be changed by more than 2°C, and b) not exceed 25°C, and 2) The concentration of dissolved oxygen shall exceed the higher of 6mg/l or 80% saturation, and 3) There shall be no significant adverse effects on aquatic life arising from the discharge of a contaminant into water, a pH change, the deposition of matter on the foreshore or seabed, or any other cause, and 4) There shall be no a) production of any conspicuous oil or grease films, scums or foams or floatable or suspended material, and b) conspicuous change in the colour or visual clarity, and c) emission of objectionable odour in the receiving water.
SG	1) Aquatic organisms shall not be rendered unsuitable for human consumption by the presence of contaminants, and 2) The median faecal coliform content of samples taken over a shellfish gathering season shall not exceed 14 MPN per 100ml and not more than 10% of samples should exceed 43 MPN per 100ml.
CR	1) The visual clarity of the water shall not be so low as to be unsuitable for bathing, and 2) The water shall not be rendered unsuitable for bathing by the presence of contaminants, and 3) There shall be no undesirable biological growths as a result of any discharge of a contaminant into water, and 4) The median of samples taken over the bathing season shall not exceed 35 enterococci/100ml, and 5) No sample, in the following areas, shall exceed the following limits. *Area* — *Use Category* — *Enterococci limit/100ml* Tahunanui (main beach) — Designated bathing beach — 104 Port opposite Cut — Moderate — 153 Haven (at Atawhai) — Moderate — 153 Tahunanui (back beach) — Light — 275 Cable Bay — Light — 275 Monaco — Light — 275 The Glen Beach — Light — 275

In terms of freshwater quality, the NRMP classifies the Hillwood Stream[23] in Appendix AP28.4 as being 'Class D'[24]. However, Policy DO19.1.5 of the NRMP seeks to have no waterbodies to have a classification lower than Class C, with Appendix AP28.4 identifying those waterbodies which are top priority for improvement – Hillwood Stream is identified as a second priority waterbody for improvement. Table 6-2 presents both Class D and Class C water quality standards from Appendix AP28.5 of the NRMP.

Table 6-2: Freshwater quality standards from the NRMP

Water Quality Standard	Standard/Criteria
Class D	**Class D Degraded**
	General Characteristic — Water quality of this class meets or exceeds the requirements of selected and essential uses.
	Characteristic uses — Characteristic uses includes but are not limited to the following: Water supply (industrial). Human consumption of aquatic biota Aquaculture Aquatic ecosystem (including migration) Wildlife habitat Recreation and Aesthetics (secondary contact recreation, visual use, fishing, boating, aesthetic enjoyment) Commerce
	Water Quality Criteria
	Waterborne Pathogens — No criteria
	Toxic algae — No criteria.
	Dissolved oxygen — Rivers and streams: minimum dissolved oxygen measured under low flow conditions over 24 consecutive hours is not less than 80% saturation. Lakes and reservoirs; no measurable decrease from natural conditions.
	Turbidity — Turbidity (mean or median) in rivers and streams does not exceed 5.0 NTU.
	Clarity — Clarity: natural visual clarity is not reduced by more than 33%. Alternatively, clarity (median) of rivers and streams (black disc) is not less than 0.6m. Lakes and reservoirs (secchi disc) is not less than 3m.
	Colour — Colour: hue is not changed by more than 10 points on the Munsell scale.
	Temperature — Temperature in rivers and streams does not exceed a daily mean of 25^{0}C or a daily maximum of 30^{0}C due to human activities.
	pH — pH is within the range of 6.5 and 9.0.
	Periphyton — No criteria.
	Nutrients — Phosphorus and nitrogen. Rivers and streams; mean monthly concentrations of soluble inorganic phosphorus (SIP) and soluble inorganic nitrogen (SIN) measured under low flow conditions should be less than 30 and 350ug/l respectively. Lakes and reservoirs: mean monthly concentrations of total phosphorus (TP) and total nitrogen (TN) are less than 20 and 337ug/l respectively.
	Toxicants — Toxicants - toxic, radioactive or deleterious material concentrations are below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon these waters and bed sediments, or adversely affect public health, as determined by the 90% level of protection for toxicants in water (AP28.6.i in Appendix 28) and the ISQG-Low Trigger Value for toxicants in sediments (AP28.6.ii in Appendix 28).
	Objectionable material — Not applicable.
	Aesthetic — Aesthetic values are not interfered with by the presence of obnoxious wastes, slimes, aquatic growths, or materials which taint the flesh of edible species.
	Macroinvertebrates (rivers and streams) — No criteria.
	Aquatic habitat — No criteria.

[23] The NRMP identifies Hillwood Stream as 'Hillwood Valley Stream' as there is another stream in the district called Hillwood Stream.
[24] The NRMP has classifications ranging from Class A (excellent) to Class E (very degraded).

Water Quality Standard	Standard/Criteria
Class C	

Class C Moderate	
General Characteristic	Water quality of this class markedly and uniformly exceeds the requirement for most uses
Characteristic uses	Characteristic uses include but are not limited to the following: Water supply (industrial). Human consumption of aquatic biota. Aquaculture Aquatic ecosystem (including migration) Wildlife habitat Recreation and Aesthetics (secondary contact recreation, visual use, fishing, boating, aesthetic enjoyment)
Water Quality Criteria	
Waterborne Pathogens	E.coli. running median (estimated monthly): less than 500/100ml. Faecal coliforms (estimated monthly): no greater than 20% of samples exceed 400/100ml.
Toxic algae	No criteria.
Dissolved oxygen	Rivers and streams: minimum dissolved oxygen measured under low flow conditions over 24 consecutive hours is not less than 90% saturation. Lakes and reservoirs: dissolved oxygen is in the range of 90-110% saturation..
Turbidity	Turbidity (mean or median) in rivers and streams does not exceed 3.0 NTU.
Clarity	Clarity - Natural visual clarity not reduced by more than 33%. Or Clarity (median) - rivers and streams (black disc) shall not be less than 2.5m. Lakes and reservoirs (secchi disc) shall not be less than 4m.
Colour	Colour - hue is not changed by more than 10 points on the Munsell scale.
Temperature	Temperature in rivers and streams, does not exceed a daily mean of 22^{0}C or a daily maximum of 27^{0}C due to human activities.
pH	pH is within the range of 6.5 and 8.5.
Periphyton (rivers and streams)	Maximum cover of diatoms and cyanobacteria: more than 0.3cm thick in gravel/cobble bed streams does not exceed 60% cover and filamentous algae more 2cm long does not exceed 30% cover unless there have been no significant freshes (more than 6x baseflow) for a period longer than 20 days.
Nutrients	Phosphorus and nitrogen. Rivers and streams: mean monthly concentrations of soluble inorganic phosphorus (SIP) and soluble inorganic nitrogen (SIN) measured under low flow conditions are less than 26 and 295ug/l respectively. Lakes and reservoirs: mean monthly concentrations of total phosphorus (TP) and total nitrogen (TN) are less than 20 and 250ug/l respectively.
Toxicants	Toxicants - toxic, radioactive or deleterious material concentrations are below those which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic conditions to the most sensitive biota dependent upon these waters and bed sediments, or adversely affect public health, as determined by the 95% level of protection for toxicants in water (AP28.6.i in Appendix 28) and the ISQG-Low Trigger Value for toxicants in sediments (AP28.6.ii in Appendix 28).
Objectionable material	Waters are free from: floating debris, oil, grease and other objectionable material, excluding those of natural origin.
Aesthetic	Aesthetic values are not reduced by dissolved, suspended, floating, or submerged matter not attributed to natural causes, so as to affect water use or taint the flesh of edible species.
Macroinvertebrates (rivers and streams)	Species richness of the predominant invertebrate assemblages in gravel/cobble bed rivers and streams, as measured by the macroinvertebrate community index (MCI), are not less than 80, and/or the semi-quantitative MCI (SQMCI) is not less than 4.00.
Aquatic habitat	No criteria.

7 Assessment of Alternatives

7.1 Background

Clause 6(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*…" (emphasis added), a description of any possible alternative locations or methods for the undertaking of the activity should be included. In this case (as will be discussed in Section 10 of this AEE) no significant adverse effects are predicted to occur, so consideration of alternatives is not strictly required under Schedule 4 of the RMA. Despite this, section 105(1)(c) of the RMA requires that the consent authority must, when considering a discharge permit or coastal permit that would contravene section 15 of the RMA (which is applicable here), have regard to, in addition to matters in section 104(1), any possible alternative methods of discharge, including discharge into any other receiving environment regardless of whether the effects of the discharge are significant or not.

Further, Policy 23(2)(b)(i) (Discharge of contaminants) of the NZCPS also states that, in terms of managing discharge of human sewage, the discharge of treated human sewage to water in the coastal environment should not be allowed unless there has been an adequate consideration of alternative methods, sites and routes for undertaking the discharge.

For this Project and AEE the RMA term "alternative" is taken as to be the same as the term "option".

Within this assessment, not all alternatives that are physically possible have been identified and evaluated. Instead, as is a common procedure with RMA alternative assessments, only 'representative alternatives' have been assessed within the various categories or groupings of alternatives available.

The reader is also referred to the discussion on the BPO presented in Section 4.3, and in particular the Stantec Alternatives Assessment contained in Appendix E which outlines the work undertaken on determining the BPO for the NWWTP. This work is supported by the PDP LA and MAR Report contained in Appendix F . This work involved a detailed assessment of alternative options and is not repeated here.

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

Figure 7-1 provides an overview of the components of wastewater management options for which alternatives are available and highlights that a total wastewater scheme is made up of several component parts.

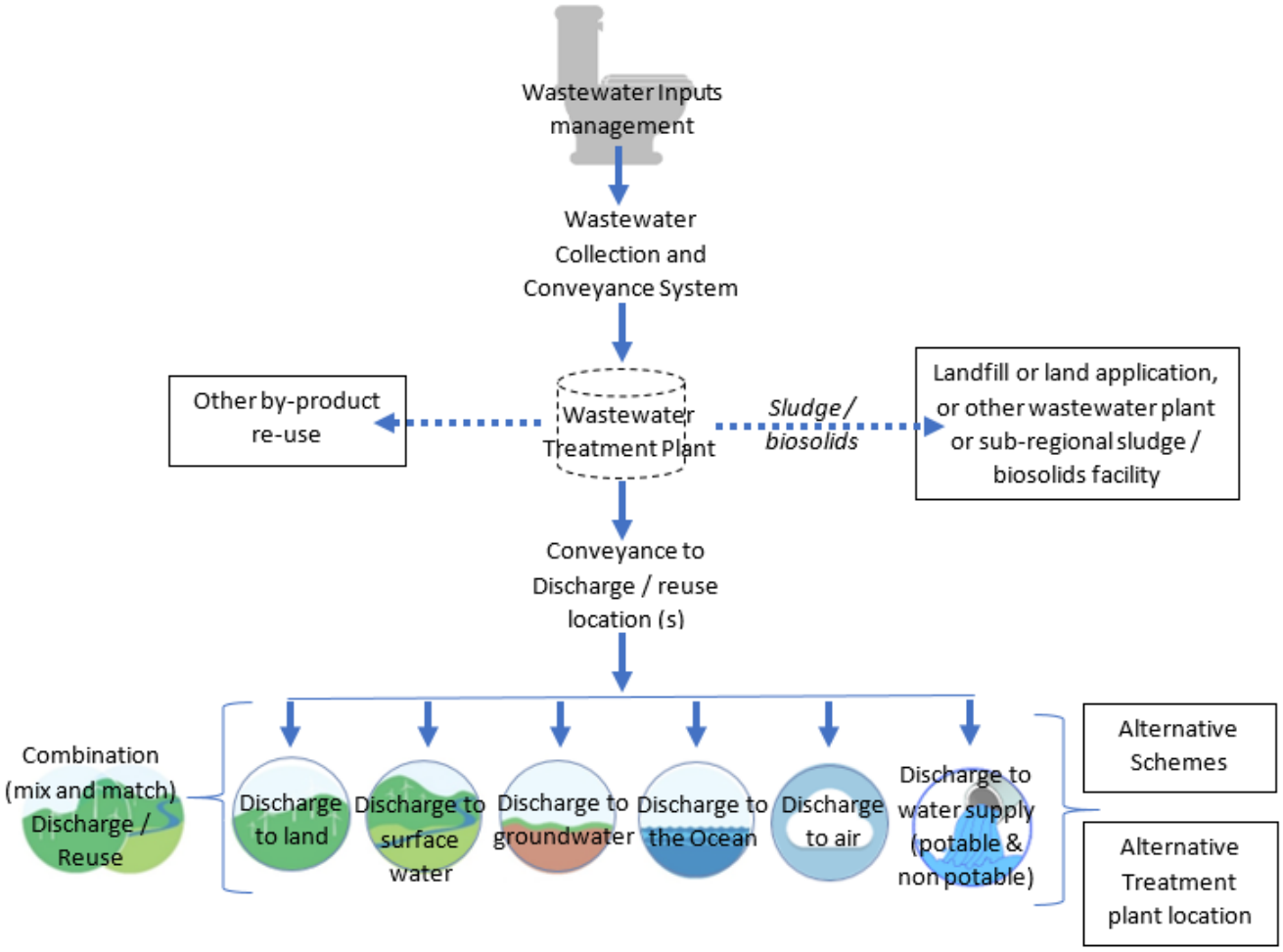


Figure 7-1 Stages of the wastewater management process

7.2 Previous Alternatives Considered

In developing the 'Long Long' list of alternatives it was appropriate to reconsider earlier alternative methods for discharge canvassed in the previous studies and applications in order that such options are not lost sight of as circumstances may have changed over time resulting in some being (potentially) more viable.

In this respect the previous consent application[25] set out various alternatives previously considered. This earlier AEE includes Section 4 the "Alternative Options". It summarises two more detailed Issues and Options Reports (1999 and 2001) which included:

Land disposal:

Possible land disposal sites within an economic radius (being 20 km) of Wakapuaka were assessed in the 1999 Issues and Options Report, based on application rates for treated wastewater of 1 mm/day for winter and 3-4 mm/day for summer. Based on a 50-year design inflow at that time, a minimum area of 1,390 ha was calculated as being required for winter, including 100 ha required for buffer zones, which reduced to 450 ha (inclusive of buffer zones) in summer.

Most of the land within the 20 km radius was considered too steep (> 20 degrees) for the application of wastewater. However, two distinct landforms existed: that being 900 ha of flat land (being the Wakapuaka marine and river flats,

[25] Duffill Watts & Tse Limited, 2003, 'Nelson Wastewater Treatment Plant Resource Consent Application and Assessment of Environmental Effects – Volume 1 Application – December 2003"

Delaware Bay and Whangamoa River Flats) and 10,000 ha of steep land (Hira and Rai Forests). A review of these areas found a variety of issues, including soil type, land ownership, pumping costs, and hillside slopes.

The costs associated with land disposal were prohibitive in 2001 when considering both capital and annual operating costs for little environmental benefit over the sea-outfall.

Sea disposal:

The 1999 Issues and Options report originally considered a range of sea disposal options; however, it was concluded that, based on a study from Cawthron in 1998, there was no environmental reason to assess an alternative sea disposal option.

Following additional consultation with iwi in 2002/03, a recommendation was made that treated wastewater should be discharged to Nelson Haven, if treated adequately through a full wetland system. It was thought that this would help enhance the estuary's mauri and its productivity, as well as its ecological values. However, Cawthron subsequently advised that the discharge of treated wastewater to Nelson Haven was not a favoured option as the lack of dilution could give rise to adverse effects. This advice was accepted, along with the advice of the sea discharge, provided wetlands were incorporated in the future upgrade of the treatment plant.

Treated Wastewater re-use:

Some limited re-use of wastewater may be appropriate, however at the time of the 2003 application no proposals for re-use were received from the public, and it was considered unlikely that uses could be found for the extra volume of wastewater discharges on a year-round basis. Accordingly, re-use of wastewater was not considered a practical disposal option, although it could be used in conjunction with all other options to reduce wastewater discharge volumes.

Modification of the existing oxidation pond and additional treatment stages:

Strategies for upgrading the existing oxidation pond were considered in two separate parts; namely primary treatment options (to achieve reliable facultative pond performance) and secondary treatment options following the facultative pond (to improve wastewater quality parameters for discharge into the sea environment).

A wide range of treatment options were considered and evaluated, including on-pond aeration, oxygen injection, tricking filter options, aerated lagoon options, and anaerobic pre-treatment. The options following the oxidation pond secondary (biological) treatment systems were considered to provide a reduction in pathogens and to provide more consistent performance in treated wastewater quality, these included maturation ponds and rock bed filters.

New treatment plant options:

Alternative treatment plant options were considered that would result in a replacement, in part, of the oxidation pond system. A wide range of treatment plant options are available and the consideration of these depends on the final wastewater targets to be achieved.

Two options were considered as representative of the types of treatment plants that can be built. The first being an in-pond constant level batch reactor which would be constructed using part of the existing oxidation pond system. The second option was extending aeration activated sludge biological nutrient removal plant with ultra-violet disinfection.

Flow diversion:

The final alternative considered during the earlier AEE was the diversion of all of the wastewater generated within the Wakapuaka catchment to the Bell Island WWTP. This option would require laying of a new 16 km long rising main and the upgrading of pump stations and would result in the need to further upgrade the Bell Island WWTP to handle the additional flows. This upgrade would have resulted in increased costs and additional consenting requirements which were then not guaranteed to be granted. This option would result in the NWWTP needing to be decommissioned, resulting in additional costs.

Following the consideration of alternatives, it was determined that the BPO in 2003 was to upgrade the NWWTP by dividing the existing pond into separate facultative and maturation compartments, to construct a pre-treatment facility, and two constructed wetlands. This was carried through to the application and the existing consents cover these upgrades.

7.3 Recent Alternatives Considered

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 but 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 tangata whenua requirements as far as practicable.

A five stage sieving approach (Figure 7-2) as identified in section 4.3 was used as part of this assessment of alternatives to "sieve" or narrow down a 'Long Long' list of possible options available in order to identify the BPO.

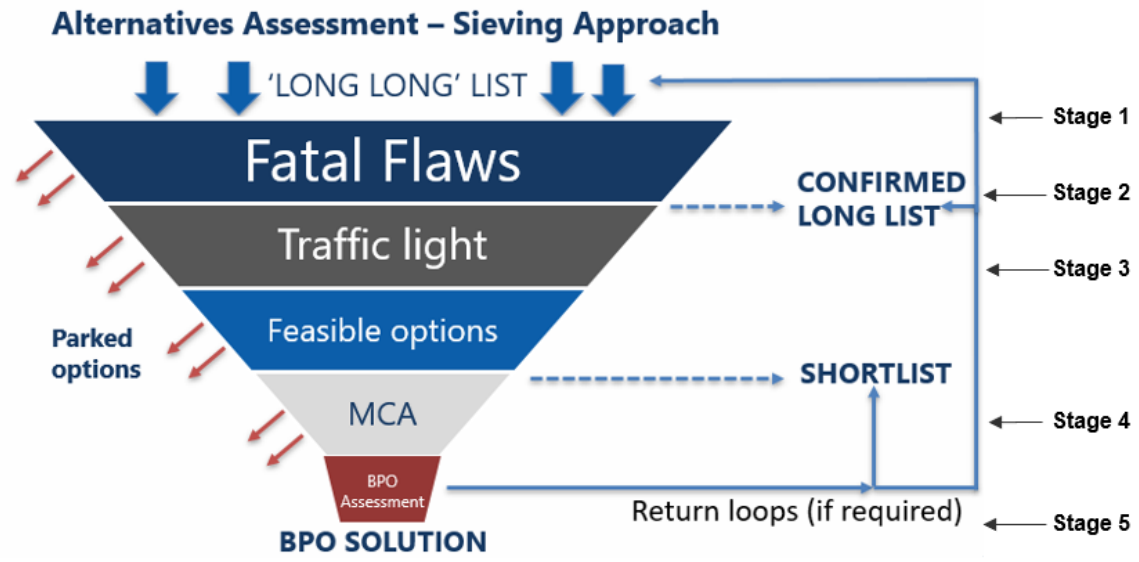


Figure 7-2: Assessment of alternatives – Iterative Approach

7.3.1 'Long Long' list of alternatives components considered

In total, 90 individual component parts were identified and considered as part of the 'Long Long' list (Stage 1) and fatal flaw (Stage 2) assessments. These components encompassed the various stages of the total wastewater scheme as shown in Figure 7-1 and are summarised in Table 7-1. A full copy of the 'Long Long' list of alternatives considered is provided in Table B-2 for the Stantec Alternatives Assessment in Appendix E

Table 7-1: Summary of 'Long Long' List of alternative options considered.

No.	Standard/Criteria
1.	Untreated wastewater collection and management (These apply to all wastewater treatment and discharge / reuse options)
2.	Wastewater inputs management (These apply to all wastewater treatment and discharge / reuse options)
3.	Producing less wastewater (Apply to all wastewater treatment and discharge / reuse options)
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 total 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 (New Zealand Drinking Water supply quality) • MAR or supplementing groundwater supply

No.	Standard/Criteria
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 CMA • Discharge to air • Discharge to land (LA) • Wetland / land passage singly or jointly • Combination options of above discharge options.
7.	Resource recovery / Beneficial reuse

7.3.2 Confirmed long list of total scheme alternatives

Components that were deemed to not be fatally flawed were incorporated into the long list of 37 total schemes as part of the Alternatives assessment. The Long List of total wastewater scheme options were grouped into the categories shown in Figure 7-3 and described in more detail in sections 7.3.2.1 to 7.3.2.5.

A full copy of the Long List scheme options, including the discharge location, treatment regime required, and any new infrastructure needed is provided in Table D-1 for the Stantec Alternatives Assessment in Appendix E

Figure 7-3: Summary of Long List of Options

A coded numbering system for the wide range of options considered is set out within the Stantec Alternatives Assessment in Appendix E 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.

7.3.2.1 Current scheme options

In line with project Objective 2 that recognises 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 MHWS into Tasman Bay at a depth of 13.5 m.

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

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 Streams 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 mosaic 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 1 D)

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 1 WD)

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

Current Scheme with improved odour management (Option 1 OD)

This option combines the current NWWTP scheme (Option 1) and the upgrade of the current discharge outfall to include a new modern diffuser (Option 1 D) 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 1 OWD)

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

7.3.2.2 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

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 LA 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 options 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 the 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.

PDP was engaged to assist with identifying potential options LA and MAR a copy of this assessment is contained within the PDP LA and MAR Report in Appendix F . 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 LA 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. A full description of each of the areas is provided in the PDP LA and MAR Report in Appendix F.

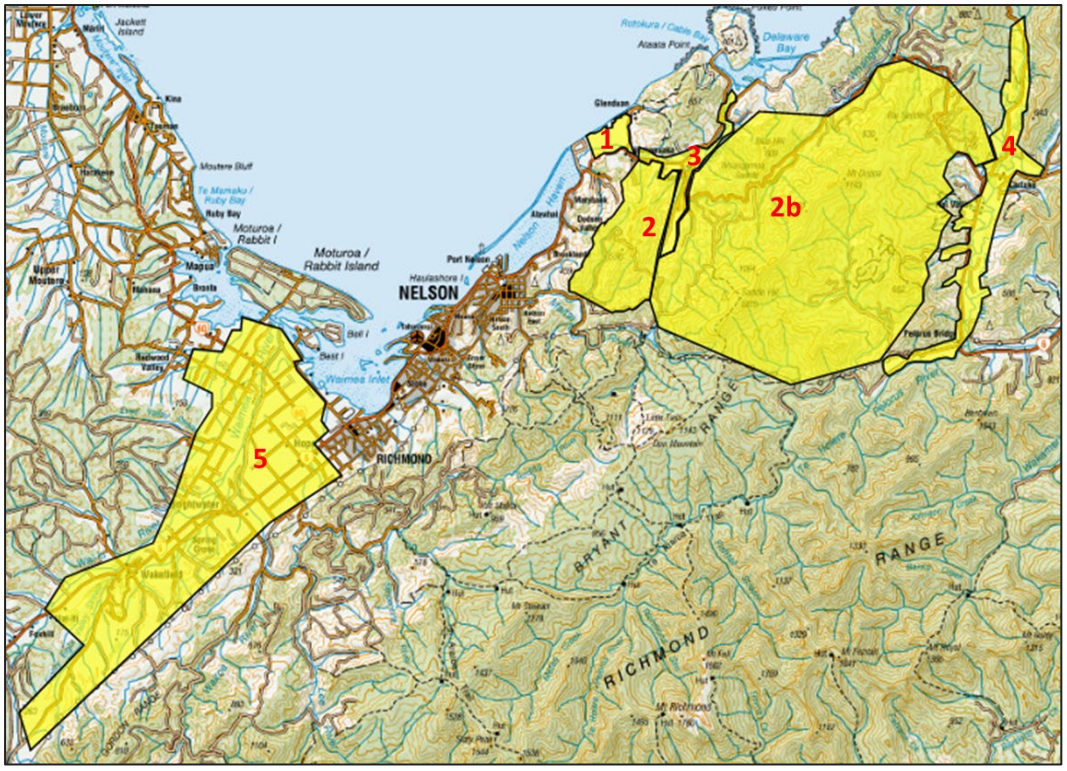


Figure 7-4: Locations of Potentially Feasible LA Areas 1 – 5

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:
LA Area 6 – Nelson Golf Club / Golf Courses / Recreational Areas:

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

Current scheme with All to 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 LA 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 LA 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 utilised. 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 MAR scheme (Option 8)

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 MAR 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 the PDP LA and MAR Report in Appendix F .

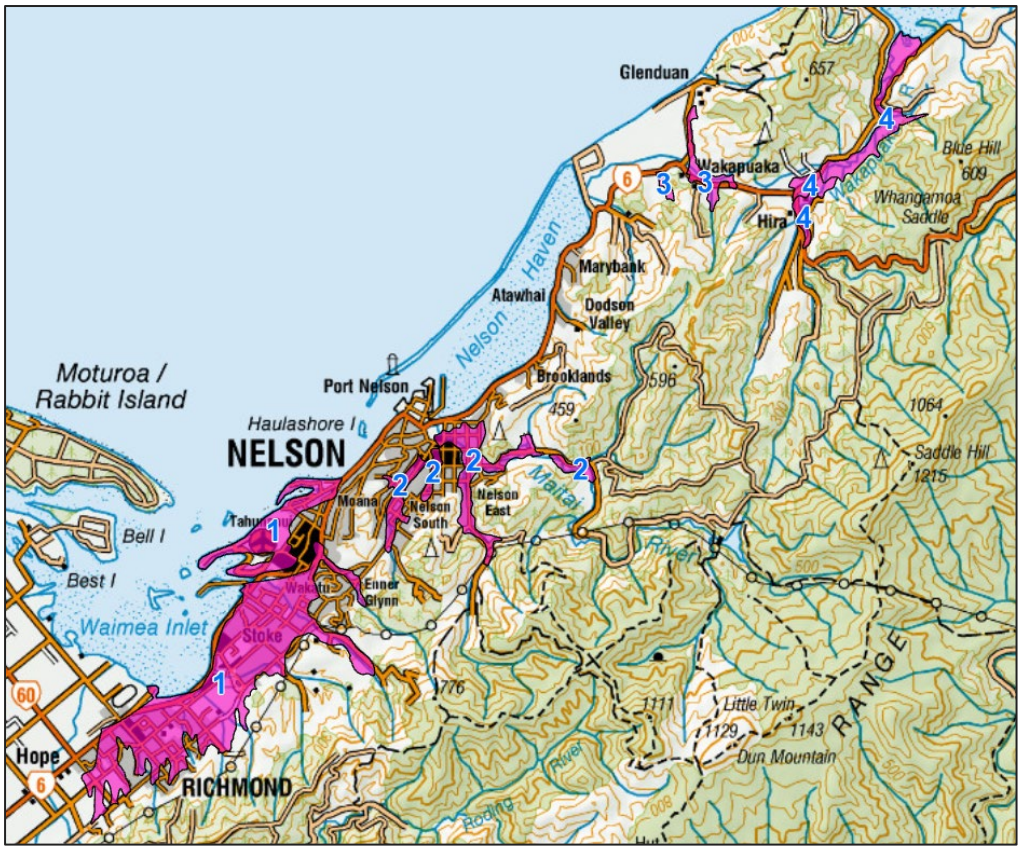


Figure 7-5: Locations of Potentially Feasible MAR Areas

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 MAR Scheme. Located within 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 MAR 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 MAR 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.

New Zealand 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 New Zealand are that this is unlikely to be accepted by society and Māori in the near or foreseeable future in New Zealand.

7.3.2.3 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:- TSS, $cBOD_5$, COD, and nutrient, predominantly TN and 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, 11 OW, 11 D, and 11 OWD)

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 concentrations 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 on 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 $cBOD_5$ 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, 12 OW, 12 D, and 12 OWD)

An assessment of the estimated pathogen treatment through the current scheme included in the Stantec Virus Log Reduction memorandum in Appendix S This shows that for current (2022) flows the expected virus log reduction value (**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 uncooked bivalve shellfish or recreational contact are maintained 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 WWTP.
- Ozone disinfection, not currently used in New Zealand.
- Greater detention in the oxidation ponds / wetlands can also reduce indicator and pathogen concentrations 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 / $cBOD_5$ / COD and pathogens (Options 13, 13 OW, 13 D, 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 / $cBOD_5$ / COD, pathogens, and nutrients (Options 14, 14 OW, 14 D, 14 OWD, 14 WD-Ox, and 14 D-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 TN or 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 concentrations. Alternatively Biological Nutrient Removal (BNR), an activated sludge type secondary treatment, is used to achieve reasonable low concentrations of TP as well as TN removal. Where both TN and very low TP treated wastewater concentrations 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 concentrations 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 (WWF). 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.

7.3.2.4 Alternative treatment and / or discharge location options

Joint Nelson Regional Sewage Business Unit (NRSBU) system at Bell Island (Option 15)

This option assumes in a single WWTP at Bell Island with all the wastewater generated within the NWWTP catchment diverted to the Bell Island WWTP. This would require laying of a new rising main (~16 km long) and the upgrading of pump stations and would result in the need to further upgrade the Bell 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 Council's WWTP but discharge would be within the Waimea Inlet and limited to outgoing tide only, as currently consented by the Bell Island WWTP's resource consents.

Treated wastewater conveyed 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 wastewater 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 wastewater to be directed from one WWTP to the other as needed.

7.3.2.5 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 the Council's wider wastewater asset management programme.

7.3.3 Shortlist of alternatives considered.

7.3.3.1 Traffic light assessment.

Stage 3 of the assessment of alternatives approach is the traffic light assessment to filter down (as per the sieving process) the long list of total schemes to a shortlist. 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 resulted in the nine Shortlist options shown in Table 7-2.

Table 7-2. Shortlist Options

Option ID	Summary of option
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 LA component in summer/dry periods on Wakapuaka Flats
9a	Current treatment location with greater treatment for non-potable direct reuse with balance to LA
UPGRADED TREATMENT OPTIONS	
11 OWD	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	TSS	Total Suspended Solids
W =	Wetland upgrade	BOD	Biochemical Oxygen Demand ($cBOD_5$)
D =	modern diffuser	COD	Chemical Oxygen Demand
-Ox =	Removal of oxidation pond		

7.3.3.2 Multi criteria assessment.

These shortlist options (Table 7-2) were then brought forward, and the MCA was undertaken on them. A variety of non-price criteria were identified and used as part of the MCA to consider the environmental, social, and cultural impact (both positive and negative) of each of the options.

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

- “1” equals the highest scoring or lowest cost of the nine options in that category; and
- “9” equals the lowest scoring or the highest cost of the nine options in that category.

The non-price and price ranking for each of the Shortlist options is shown in Table 7-3.

Table 7-3. Overall Ranking of Options in Terms of Non-price Attributes and Price Rankings

Option ID	Description Summary	Non – price Criterion Rankings	Price Rankings	Overall Ranking (including cost) of Option
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 LA 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 LA	1	9	6
UPGRADED TREATMENT OPTIONS				
11 OWD	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

As part of determining the BPO for NWWTP there needs to be appropriate consideration given to a variety of 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.

With scheme 12 OWD being the highest weighted option coming out of the MCA process, and it meeting the requirements of the BPO process well, It has been deemed the preferred option and has been brought forward for this application as the BPO, as discussed in Section 4.3.

8 Description of the Existing Environment

The following description of the existing environment has been summarised from the various technical reports contained in the Appendices to this application which should be referenced for a more detailed description. It should be noted that the 'existing environment' includes effects that have occurred as a result of the exercise of the existing NWWTP consents. The following section is based on various reports contained in the appendices and the reader is referred to those reports for more detailed information, including references and sources of information.

8.1 Land Use

The NWWTP is located at the northern end of Boulder Bank Drive on an area of reclaimed land within the Wakapuaka sandflats. Immediately to the east and south of the NWWTP is the Wakapuaka Sandflats Esplanade Reserve, to the west is the Nelson Haven/Paruparuroa and the Tasman Bay/Te Tai-o-Aorere is immediately north of the NWWTP.

The land use in the wider catchment is dominated by pastoral farming. Nearby residential settlements include Todds Valley (0.75 km), Marybank (1.7 km), Wakapuaka (2.5 km), and Glenduan (2.9 km) as shown in Figure 8-1 – the closest residential dwelling is ~0.65 km from the NWWTP (being south of State Highway 6).

Figure 8-1: Location of the NWWTP and nearby residential settlements.

8.2 Climate

The PDP Air Quality Report contained in Appendix D includes data from the weather station located at the NWWTP as well as the Nelson Automatic Weather Station. The report notes that the predominant wind direction is from the southwest with winds frequently from the northeast also. The average wind speeds in the NWWTP area are 3.3 m/s, with calms (defined as winds less than 0.5 m/s) occurring 2.3% of the time. Average hourly temperatures above 25 ^{o}C were recorded 0.35% of the time, and hourly rainfall above 1 mm was recorded 3.1% of the time.

8.3 Geology

The report prepared by Stantec entitled 'Nelson Wastewater Treatment Plant: Groundwater Assessment of Effects' (**Stantec Groundwater Report**) in Appendix H provides an outline of the geology at a regional and local scale. Regionally, the geology is inferred to be dominated by marine deposits with a veneer of fill used to raise the land surface and reclaim land. Based on geotechnical site investigations undertaken in 2002 the local geological conditions were assumed to be a clayey silt and silty clay extending to a depth of 40 m where deposits are inferred to contact greywacke basement rock.

8.4 Hydrology

8.4.1 Surface water

The report prepared by Stantec entitled 'Nelson Wastewater Treatment Plant - Surface Water Quality Assessment' (**Stantec Surface Water Quality Report**) in Appendix I provides an outline of the freshwater bodies in the vicinity of the NWWTP. Figure 8-2 shows the streams that flow near the NWWTP – the ponds and wetlands being shown within the yellow dashed line. Hillwood Stream flows immediately south of the NWWTP, flowing from the east (Wakapuaka valley) to the west (Nelson Haven estuary). A tributary of the Hillwood Stream, referred to as Hillwood Stream North flows in a southerly direction along the eastern boundary of the NWWTP where it discharges into Hillwood Stream (refer Figure 8-2). The lower Hillwood Stream is a second order stream with an estimated mean annual flow of 0.2 m^3/s. Hillwood Stream in the vicinity of the NWWTP has a near flat gradient, with mainly run habitat. Model data suggests that the dominant sediment particle size is coarse gravel, however, given the site characteristics it is likely a most reaches have a soft bottom with sand and silt as the prevalent sediment particle size.

Results from the Stantec Surface Water Quality Report indicate that the water quality of the freshwater receiving environments (lower reach of the Hillwood Stream) is degraded. Nutrient concentrations are generally elevated and patterns in nitrogen species indicate likely influence of upstream land use which includes extensive agriculture in the form of cattle and dairy farming.

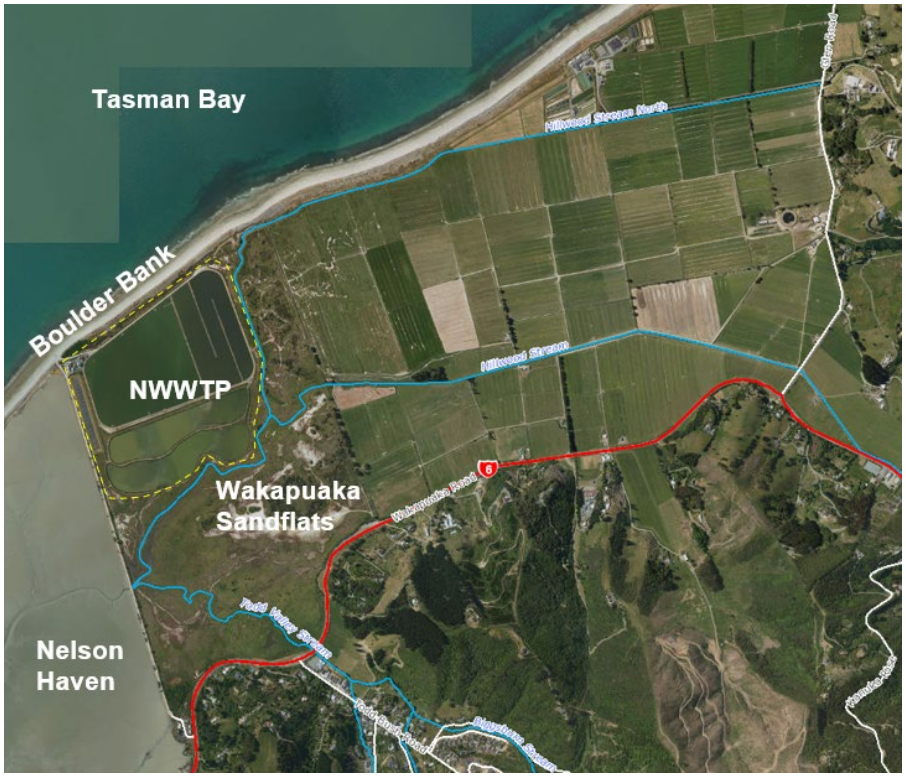


Figure 8-2: Streams located near the NWWTP.

8.4.2 Groundwater

The Stantec Groundwater Report contained in Appendix H includes a detailed description of the hydrogeology associated with the NWWTP site. The groundwater in the area of the NWWTP is high and is tidally influenced. Groundwater flows towards the Nelson Haven and Tasman Bay, however the presence of the NWWTP results in the groundwater to be mounded.

8.5 Freshwater Ecology

The report prepared by Stantec entitled 'Nelson Wastewater Treatment Plant Resource Consent Ecological Impact Assessment' (**Stantec Ecological Report**) in Appendix J provides a detailed discussion on the freshwater ecology of the streams in the surrounding area of the NWWTP. The following discussion is a summary of that report.

Both the Hillwood Stream and the Todd Valley Stream flow through the Wakapuaka flats before their discharge point at Boulder Bank Drive and into the Nelson Haven estuary (refer Figure 8-2).

The Council undertakes state of the environment monitoring within the Hillwood Stream where it flows under The Glen road and within the Todd Valley Stream where it flows under State Highway 6. The macroinvertebrate community sampling results at both locations are indicative of severe organic pollution and severe loss of ecological integrity.

Although the water quality is degraded and the physical characteristics of the waterways highly modified, eDNA sampling within Hillwood Stream near the NWWTP undertaken in 2023 by Stantec detected a total of eight species fish. These results indicate that the fish community in the lower Hillwood Stream near the NWWTP consists of yelloweye mullet (*Aldrichetta forsteri*), shortfin eel (*Anguilla australis*), longfin eel (*Anguilla dieffenbachii*), Īnanga (*Galaxias maculatus*), common bully (*Gobiomorphus cotidianus*), giant bully (*Gobiomorphus gobioides*) and redfin bully (*Gobiomorphus huttoni*). Furthermore, the stream reach provides a connection route for koaro (*Galaxias brevipinnis*) and banded kōkopu (*Galaxias fasciatus*) that primarily live further upstream.

8.6 Terrestrial Ecology

The Stantec Ecological Report (Appendix J) provides a detailed discussion on the terrestrial ecology in the surrounding area of the NWWTP. The following discussion is a summary of that report.

The NWWTP is situated adjacent to the Wakapuaka sandflats, which are composed of highly modified saltmarsh, former estuarine mudflat with low coastal vegetation and low productive grassland. The current vegetation, further encouraged by the altered state of the area, consists of saltmarsh and estuarine rushes, exotic grasses and coastal scrub species. Active planting occurred at some stage prior to 2008, with mixed results. The planted species are not typically representative of sandflat ecology, and may, to some extent contribute to the ongoing change in state.

A number of at-risk, or otherwise threatened flora species have been recorded in the area. Monro's forget-me-not (*Myosotis monroi*) is a range restricted species, endemic to ultramafic soils within the wider Nelson region. Native musk (*Thrydia repens*) is a coastal species, usually found near estuaries or salt marshes in wet, saline soils. They are intolerant of competition by taller species and faster growing mat species. *Thrydia repens* is widespread across the country, but naturally uncommon. Due to the ongoing rate of change within the Wakapuaka sandflats there is a reasonable likelihood that the local population of the species will decline as competition increases

The Wakapuaka sandflats provides habitat for a variety of fauna including insects, lizards and birds. The fauna includes common species including North Island coastal copper (*Lycaena salustius*), common garden katydid (*Caedicia simplex*), aurora bluetail (*Ischnura aurora*), monarch butterfly (*Danaus plexippus*), common lagoon fly (*Eristalinus aeneus*), *Eudonia leptalaea*, fishing spiders (*Dolomedes* spp.) and glass snails (*Oxychilus* spp.).

Five species of lizards and two species of amphibians have been observed within a 10 km radius of the NWWTP. The starred gecko (*Naultinus stellatus)* is the most numerously recorded species but all records are outside the Hillwood Stream catchment, >8.90 km away from the NWWTP. Other lizard species observed include the northern grass skink (*Oligosoma polychroma*), the glossy brown skink (*Oligosoma zelandicum*), a common gecko species (*Woodworthia* sp.) and the northern spotted skink (*Oligosoma kokowai*). The northern spotted skink has been observed the closest to the NWWTP (540m) with records within the Boulder Bank Scenic Reserve. Considering the habitat in the area it is likely that northern grass skinks and possibly common gecko will occur within the Wakapuaka sandflats area. Both these species have been observed 2.15 km from the NWWTP. The two amphibian species are brown tree frog (*Litoria ewingii*) and southern bell frogs (*Ranoidea raniformis*).

8.7 Avifauna

The Stantec Ecological Report (Appendix J) provides a discussion on the avifauna in the surrounding area of the NWWTP. The following discussion is a summary of that report.

Both the NWWTP site and adjacent areas provide habitat for a significant number of avian species. The adjacent Wakapuaka sandflats host one of two populations of fernbirds in the Nelson city area. Nelson Haven is an important habitat for avian species, including significant numbers of annual migrants, and a number of at-risk, or otherwise threatened species. The Nelson Boulder Bank adjacent to the NWWTP is considered to provide a regionally, nationally, and international important breeding site for indigenous coastal birds.

Avian species are highly mobile and may have considerable home ranges or migrate large distances. Birds observed at the NWWTP include a number of vagrant species, or species otherwise not found within the Nelson-Tasman region, including birds utilising the site for short periods of time during migration or due to weather events. The site is surrounded by a large variety of highly productive habitats, including the Wakapuaka sandflats, saltmarsh, the Nelson Haven estuary, The Horoirangi Marine reserve, and the wider Tasman Bay, as such it is difficult to determine the actual, ongoing use of the site by specific avian species. Additionally, the location provides suitable access to the Cook Strait and the North Island.

The ponds and wetlands of the NWWTP provide suitable habitat for fauna including a variety of avian species. The New Zealand scaup (*Aythya novaeseelandiae*; not threatened) has been observed utilising the NWWTP waterbodies, especially the wetlands, for foraging and breeding, with the population increasing from zero records in 2008 to over 1000 birds in 2021. New Zealand scaup have started breeding at the NWWTP waterbodies (mainly within the wetlands) from 2012 (Field, et al. 2022). The NWWTP population of New Zealand scaup from a significant portion of the known New Zealand, and therefore global, population, making the habitat of international importance for this species.

A total of 36 threatened or at-risk species have been recorded within 10 km of the NWWTP, due to the highly variable habitat within this area, and limited population or distribution of some species, not all will be present, or likely to utilize the site, or directly adjacent areas; further details of these recorded species is contained within the Stantec Ecology Report in Appendix J .

8.8 Marine Environment

8.8.1 Water quality

The Land, Air, Water Aotearoa (**LAWA**) website has been interrogated to determine the available recreational water quality data within Tasman Bay. At the nearby Glenduan monitoring site, the preceding five years of monitoring data show that the site was suitable for swimming with the results meeting the national water quality guidelines at the time of testing on all weekly occasions, except three which coincided with heavy rainfall events.

The most important limiting nutrient (i.e. the nutrient that restricts plant growth) in Tasman Bay is nitrogen, in the form of dissolved inorganic nitrogen (**DIN**). Catchment nutrient modelling suggests that all rivers and streams are estimated to contribute 71% of the total nitrogen input to Tasman Bay. These compare with a 4% contribution from the NWWTP discharge.

Land use practices involved with agriculture, forestry and residential and industrial activities introduce natural and artificial fertilisers, herbicides, pesticides and numerous other nutrients, toxic contaminants and sediments to the coastal environment. The routes of introduction include rivers and streams, land run-off from impermeable surfaces, and direct industrial and other point-source discharges.

8.8.2 Phytoplankton

Phytoplankton are the most important primary producers within the Tasman Bay ecosystem. Seasonal and inter-annual variations in biomass and specific composition of the phytoplankton affect the productivity of benthic and pelagic food webs. Phytoplankton productivity and biomass in nearshore (< 30 m depth) regions of Tasman Bay are strongly affected by river inflows, which supply essential inorganic nutrients. These inflows also affect estuarine circulation processes, density stratification and light availability, all of which have implications for phytoplankton growth. Chlorophyll-a (a proxy for phytoplankton biomass) in Tasman Bay measured between 1998 and 2003 ranged from 0.5 mg/m^3 to 2.9 mg/m^3, rating the bay as oligotrophic (low) to mesotrophic (moderate) in terms of phytoplankton productivity.

8.8.3 Benthic habitat

The seabed over most of Tasman Bay consists of muddy sediment with varying amounts of sand and shell gravel. Organic content generally constitutes 4–7.5% of the weight of fine sediments but is lower in areas with coarser sediments. The predominant organisms living in the sediments are polychaete worms, bivalve shellfish and crustaceans.

Barter and Forrest (1998) mapped seabed habitats around the outfall using aerial photographs and diver surveys. They reported that boulder habitat extended tens to hundreds of metres seaward of the Boulder Bank. South and east (inshore) of the outfall, boulder habitat was relatively patchy, with continuous boulder field inshore and individual or patches of boulders in predominantly sandy areas further offshore. The seabed around the outfall was rippled medium sand, becoming predominantly small boulders beyond 60 m north of the outfall.

The sand around the NWWTP outfall showed no sign of organic enrichment (such as black discolouration and smell of hydrogen sulphide), appearing well oxygenated. Concentrations (0.5–1.0% for organic matter and 50–70 mg/kg for TN) were within the range found at other sites along the Boulder Bank and elsewhere in Tasman Bay. Patches of microalgae were present on the surface of the sand but there was no indication that their growth was more prolific near the outfall than elsewhere (as might be expected if nutrients from the outfall were having a stimulating effect). The condition of the sediments around the outfall is consistent with the results of the ongoing five-yearly consent monitoring.

8.8.4 Fish

Trawl survey catch rates for depths between 20 and 42 m in Tasman Bay indicated that the key species within this depth range include gurnard, snapper, barracouta (*Thyrsites atun*), sand flounder, John dory (Zeus faber), leatherjacket (*Meuschenia scaber*), jack mackerel (*Trachurus novaezelandiae*), tarakihi (*Nemadactylus macropterus*), rig and spiny dogfish (*Squalus acanthias*). In depths less than 30 m, flatfish, gurnard and snapper are likely to be the key commercial species, with rig an important bycatch.

Recreational fishing is widely practiced in the inshore areas of Tasman Bay, with vessels launching from the boat ramp in Nelson marina to access areas in the southern and eastern parts of the bay. Target species include snapper, kahawai (*Arripis trutta*) and, in summer and autumn, kingfish (*Seriola lalandi lalandi*). Other species frequently landed include gurnard, rig and red cod (*Pseudophycis bachus).*

8.8.5 Shellfish

Historically, large, shallow beds of oysters (*Ostrea chilensis*) and green-lipped mussels (*Perna canaliculus*) occurred in the bays, but these have been removed through overexploitation, and commercial fishing for these species had virtually ceased by 2012. Scallops (*Pecten novaezelandiae*) have been fished more recently within Tasman Bay (within southern scallop fishery SCA 7), both commercially and recreationally, but have also declined and the fishery closed in 2017 until further notice.

Since the fishery was fully closed in 2017, Fisheries New Zealand has commissioned regular surveys, using towed dredges and video transects, to assess scallop density across core scallop beds in the area. The latest reported survey in Tasman Bay was conducted in May-June 2020. Specific objectives of the survey included: providing estimates of the current population distribution, size structure, abundance, and biomass, and comparing the estimates with other relevant data from previous surveys.

In Tasman Bay, recruited scallop catch densities were very low in most areas (0–12 per tow) except for a single tow northwest of the Glenduan which had an unexpectedly high catch density of 300 scallops (plus a mix of live and dead horse mussels of a similar size, all around 215 mm shell length), as shown in Figure 8-3. Two other dredge tows in this area had scallop catch densities of 206 and 4 per tow (also with a mix of live and dead horse mussels). A more targeted video survey was undertaken around this area and this provided evidence of a bed of scallops and horse mussels in 25–35 m water depth offshore of Glenduan[26], shown in Figure 8-4.

Green-lipped mussels are present at low densities on the outfall structure, however the sign advising the public of the presence of the outfall and mixing zone directs that shellfish may not be collected there (refer Figure 10-2).

[26] The QMRA presented in Section 10 of this AEE includes a site 'Tasman Bay 2' to reflect the bivalve shellfish beds in this area.

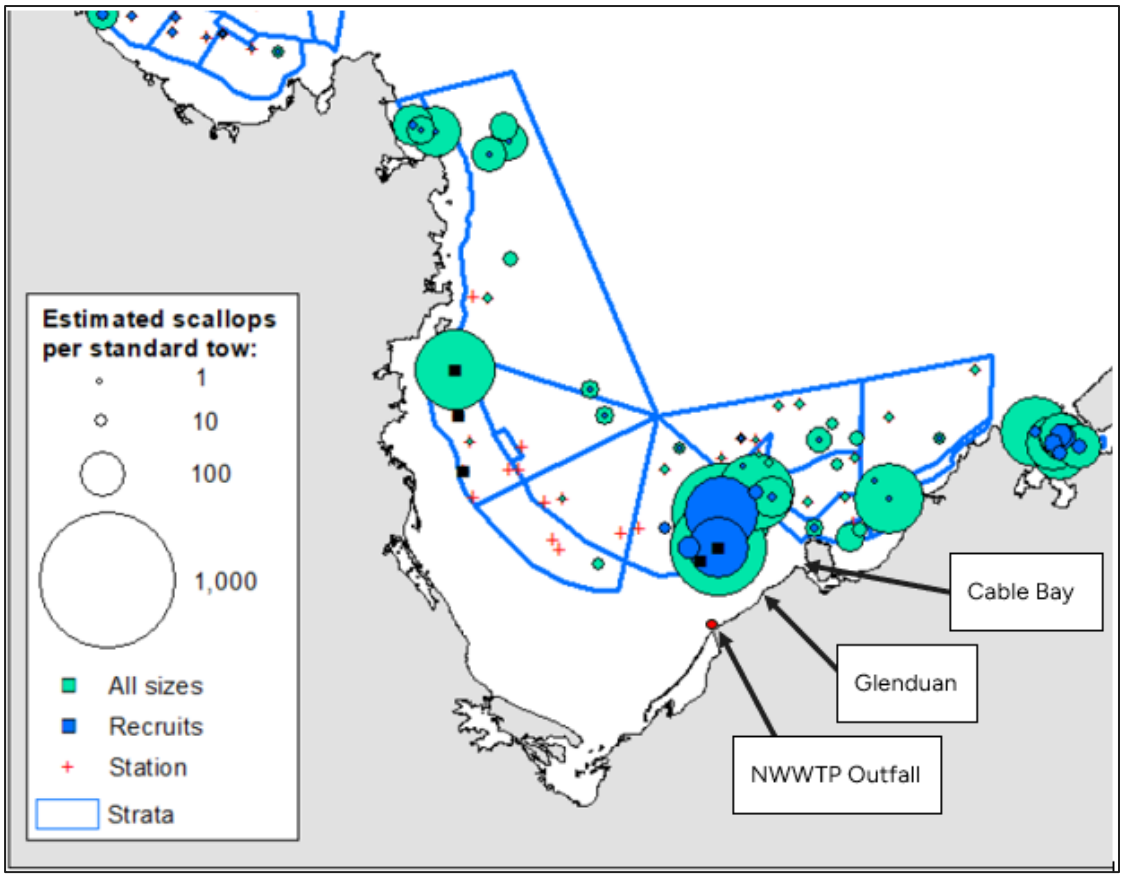


Figure 8-3: 2020 scallop survey (dredge tow) results within Tasman Bay (source: Williams et al, 2021) .

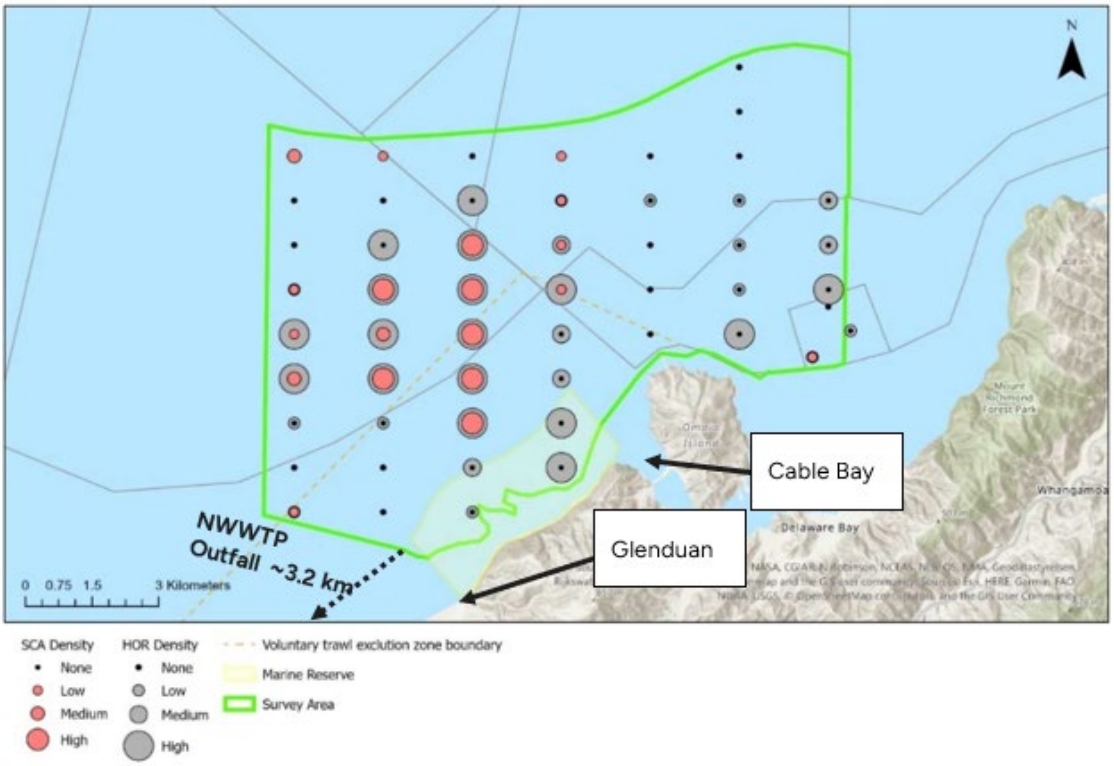


Figure 8-4: 2020 scallop (SCA) and horse mussel (HOR) video survey results (source: Williams et al, 2021).

The Council engaged SLR to undertake field surveys at 10 sites within Tasman Bay to ascertain whether there were any filter feeding kaimoana bivalve shellfish[27] present. SLR prepared a Technical Memorandum entitled 'Bivalve Shellfish Surveys – Nelson Wastewater Treatment Plant' (**SLR Bivalve Shellfish Survey Report**), a copy of which is included in Appendix K . The sites surveyed are shown in Figure 8-5, Figure 8-6, and Figure 8-7 and were sites included in the QMRA[28] (discussed in Section 10). The surveys involved intertidal/shallow subtidal surveys at all ten sites and subtidal surveys at five of the sites. The results of the bivalve shellfish surveys are summarised as follows:

- The only live bivalve shellfish found at the four sites[29] along the Boulder Bank were little black mussels (*Xenostrobus pulex*) and window oysters (*Pododesmus (Monia) zelandicus*) on boulders in the subtidal at Glenduan, Snapper Point, and Outer Boulder Bank. Little black mussels are not targeted for human consumption due to their very small size and window oysters are not known to be targeted for human consumption[30]. These two species are therefore not considered kaimoana bivalve shellfish;
- Blue and green-lipped mussels (*Mytilus galloprovincialis* and *Perna canaliculus*, respectively) and Pacific oysters (*Magallana gigas*) were found at The Cut;
- Blue and green-lipped mussels and Pacific oysters were found on rocks around Cable Bay. Some horse mussels (*Atrina zelandica*) were found within the bay. In addition, empty shells and siphon tubes of what was suspected to be New Zealand geoduck (*Panopea zelandica*) were observed;
- A green-lipped mussel, Pacific oysters, cockles (*Austrovenus stutchburyi*), and pipi (*Paphies australis*) were found at Akersten Street, with shell hash present suggesting other bivalve shellfish beds being present in the vicinity;
- Blue and green-lipped mussels and Pacific oysters were found around the Seafarers Memorial site on hard structures (steps, piles, and concrete walls);
- Extensive blue mussel beds with some green-lipped mussels and Pacific oysters were found at Magazine Point (including evidence that the public collect shellfish at this site); and
- Some pipi were found at Tahunanui Beach.

Based on the above, it is concluded that bivalve shellfish targeted by the public for consumption (i.e. kaimoana bivalve shellfish) are present at Cable Bay, The Cut, Akersten Street, Seafarers Memorial, Magazine Point, and Tahunanui Beach. In addition, it has been assumed that bivalve shellfish (scallops and possibly dredge oysters) may be present in deeper waters of Tasman Bay, these being represented by the 'Tasman Bay' and 'Tasman Bay 2' sites that were assessed as part of the QMRA.

[27] Filter feeding bivalve shellfish can bioaccumulate pathogens and the QMRA includes risks associated with consuming uncooked filter feeding bivalve shellfish.
[28] The two additional sites used in the QMRA, being 'Tasman Bay' and 'Tasman Bay 2' are offshore within Tasman Bay and were not surveyed but were assumed to potentially contain bivalve shellfish. The QMRA also included three sites within and on the edge of the mixing zone, however there is a notice advising the public to not collect shellfish within the mixing zone (refer Figure 10-2) so these sites were not surveyed by SLR.
[29] The sites referred to as Glenduan, Snapper Point, 900 m SW of outfall, and Outside Boulder Bank.
[30] Window oysters are a member of the Anomiidae family and according to Wikipedia the flesh of members of this family is unpleasantly bitter and not eaten (https://en.wikipedia.org/wiki/Anomiidae).

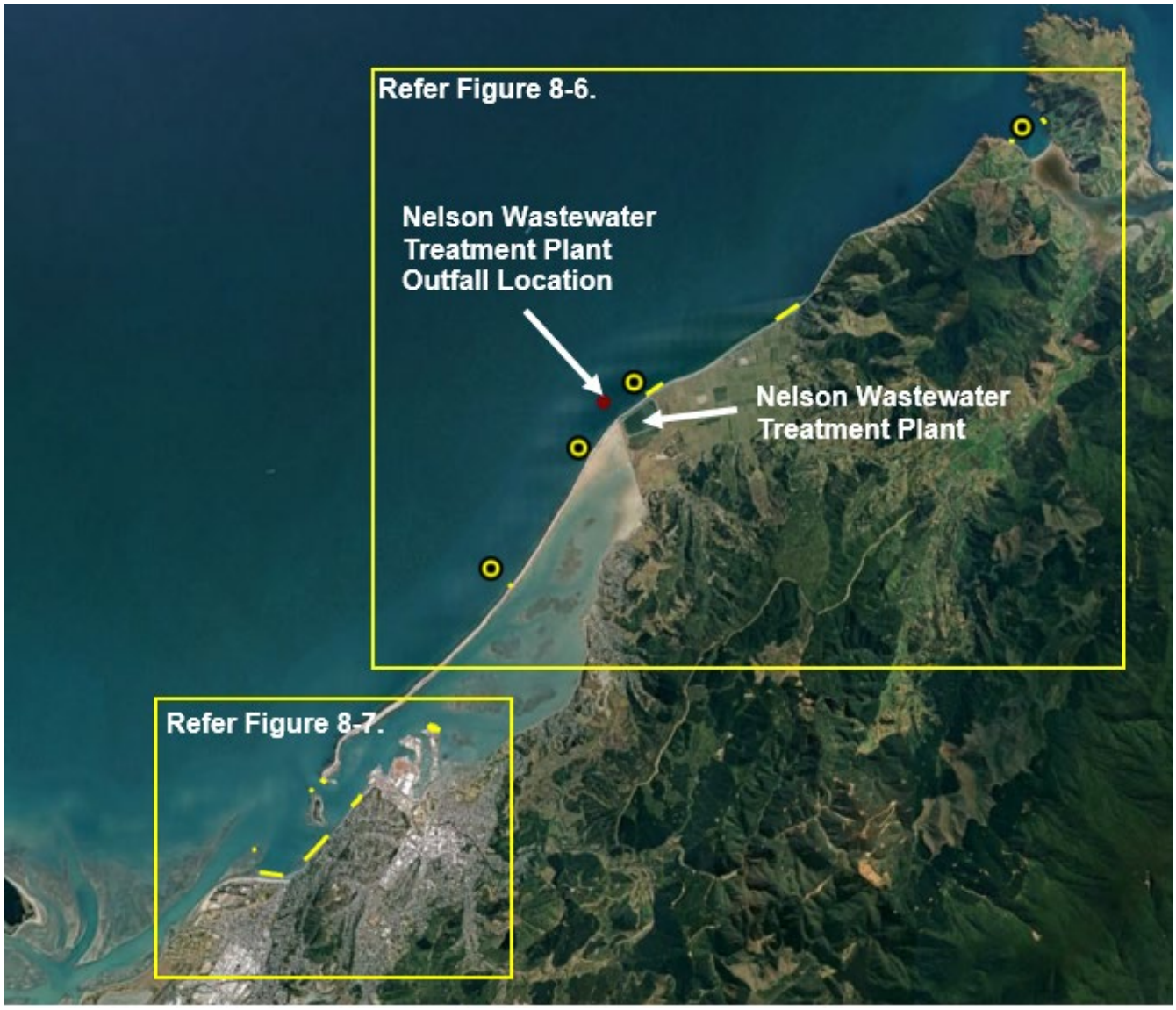


Figure 8-5: Overview Map of SLR kaimoana bivalve shellfish survey sites.

Yellow lines are intertidal/shallow subtidal areas surveyed and yellow/black points are start points for the subtidal surveys.

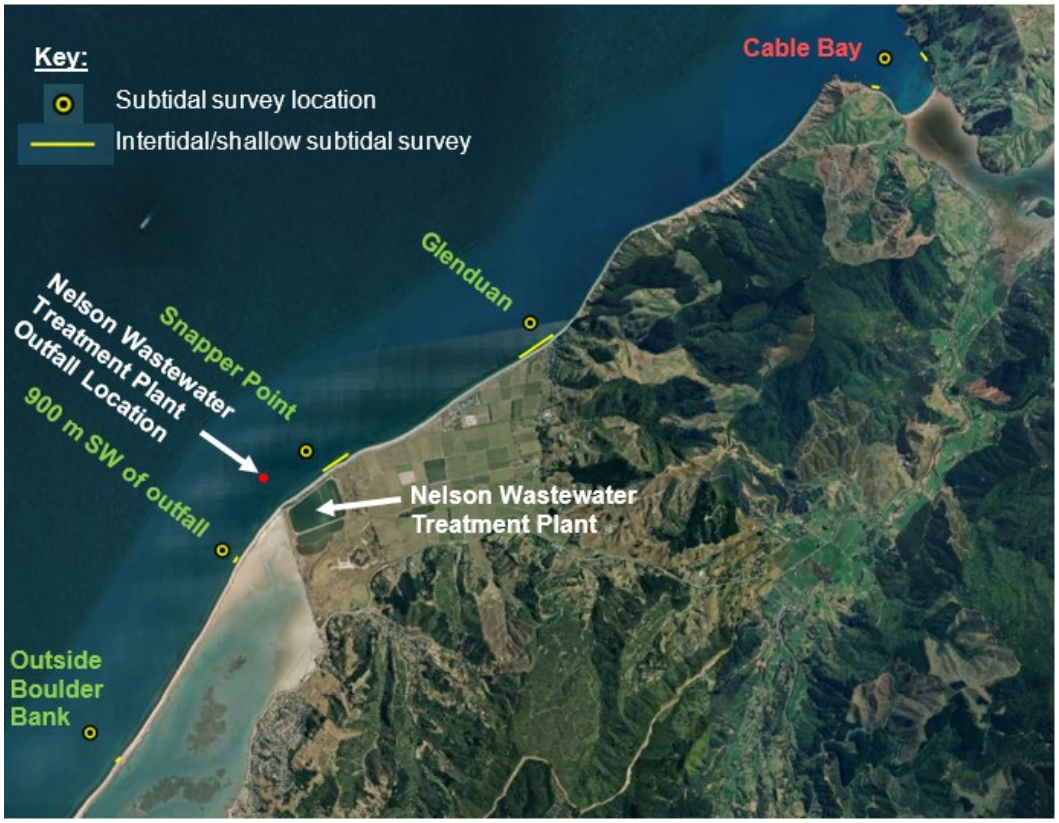


Figure 8-6: SLR kaimoana bivalve shellfish survey sites near the NWWTP.

Yellow lines are intertidal/shallow subtidal areas surveyed and yellow/black points are start points for the subtidal surveys. Red labelled sites had kaimoana bivalve shellfish present, green labelled sites did not.

Figure 8-7: SLR kaimoana bivalve shellfish survey sites around Nelson City.

Yellow lines are intertidal/shallow subtidal areas surveyed. Red labelled sites had kaimoana bivalve shellfish present.

8.9 Socioeconomic Environment

The Process Capability Assessment in Appendix B has calculated the population projections for the NWWTP, with the current population (as at 2023) connected to the NWWTP being 27,572 people and this is predicted to increase to 37,230 in 2059.

The coastal environment is an integral aspect of the lives of many people in the Nelson region, both from a commercial and recreational aspect. The coastal environment is a significant contributor to the region's economic through port, fishing, tourism, and aquaculture activities and is widely used by the community for enjoyment and recreation.

This importance can be seen based in the marine water quality standards within the NRMP as shown in Figure 8-8, which includes areas where water is managed for contact recreation purposes. These are areas which are valued for contact recreation, including Cable Bay (swimming, diving), The Glen[31] Beach (bathing, surfing), The Cut (a variety of activities), Tahunanui Main Beach (bathing, board sailing), Tahunanui Back Beach (swimming), and Monaco (swimming, water skiing). The Tasman Resource Management Plan includes similar water classifications and includes the main Rabbit Island beach (facing Tasman Bay) and a small area on the southern part of Rabbit Island within the Waimea Inlet. In addition, there is a designated kite boarding area at the western end of Tahunanui Beach and two designated water ski areas, one on the southern shore of the Monaco Peninsula and one between Rabbit and Bell Islands within the Waimea Inlet.

The most popular surfing break within the Nelson/Tasman region is at 'Snapper Point'[32], located to the north of the NWWTP outfall (refer Figure 8-8). An offshore boulder reef exists which creates waves featuring a right and left hand peak setup as shown in Figure 8-9.

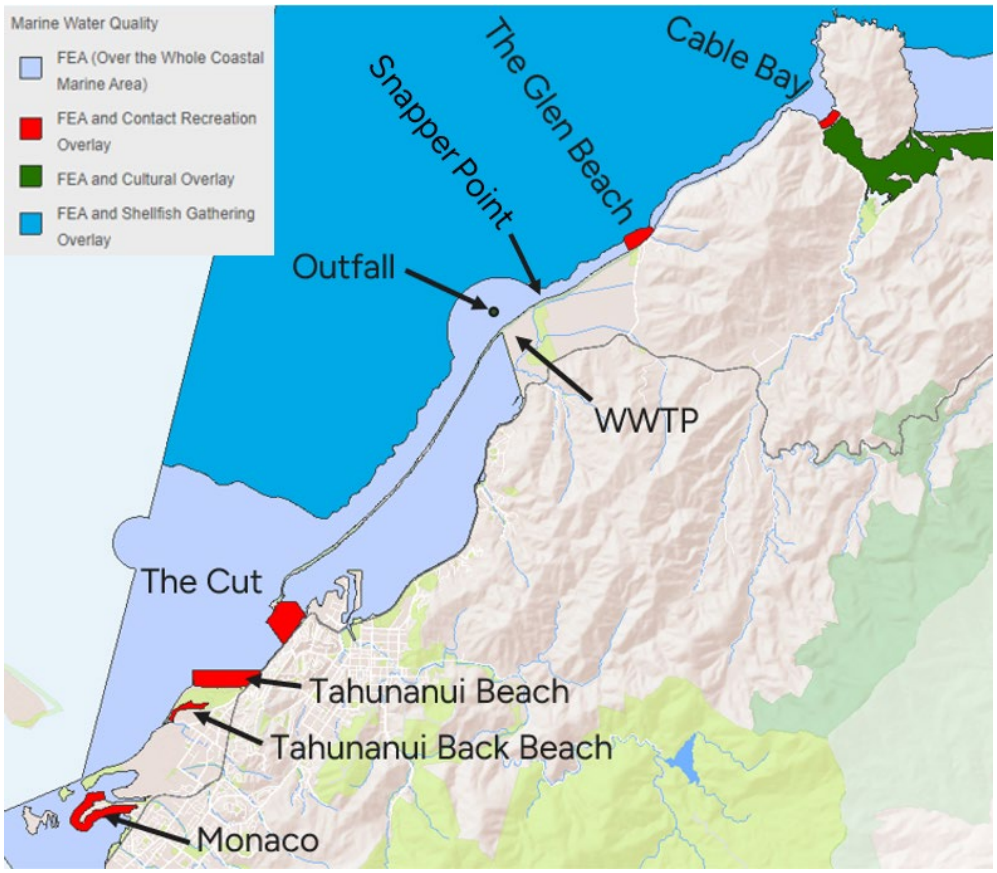


Figure 8-8: Areas within the NRMP with Contact Recreation water quality classifications.

[31] Glenduan is sometimes referred to as 'The Glen'.
[32] There are many different spellings for this location, including Snapper Point (used in this AEE), Snappers Point, Schnapper Point, and Schnappers Point.

Figure 8-9: Snapper Point surf break[33].

The Cawthron Aquaculture Park is located ~2 km to the east of the NWWTP and is owned by the Cawthron Institute. The site is a shared facility, purpose-built for aquaculture research, education, and commercial development. The Cawthron Aquaculture Park holds a coastal permit which authorises it to take up to 5,000 m^3 of seawater per hour from a culvert located just offshore of the Boulder Bank for use within the Park – for operational reasons water abstraction only takes place at high tides, meaning water is typically taken via the culvert for a maximum of four to five hours per high tide. In addition, the Cawthron Aquaculture Park holds a coastal permit to take up to 300 m^3 of seawater per hour from intakes located ~100 m offshore for use within the Park. Both the culvert and offshore intakes are located ~2.6 km northeast of the NWWTP's outfall diffuser. The location of the Cawthron Aquaculture Park and its seawater intakes are shown in Figure 8-10.

The Council has consulted with the Cawthron Institute, and it has advised that there have been no issues regarding the quality of the seawater it takes for the Cawthron Aquaculture Park. A letter from the Cawthron Institute confirming this is included within the stakeholder consultation supporting information provided in Appendix Y.

[33] https://www.surf-forecast.com/breaks/Schnappers-Point/photos/2464 (Photo: Rob Davies)

Figure 8-10: Location of Cawthron Aquaculture Park and Seawater Intakes.

8.10 Cultural Values and Associations

The Council has commissioned three cultural impact assessments (**CIA**s) from:

- Ngāti Tama ki Te Tau Ihu;
- Ngāti Rārua; and
- Ngāti Kuia and Ngāti Apa ki te Rā Tō (jointly).

These CIAs will outline the cultural values and associations which local iwi and hapu have with the local environment, including the receiving waters of Tasman Bay. The Council expects the CIAs to be completed by the end of February 2024 and will forward them to the consent authority once they are received. These CIA's will constitute Appendix T of this AEE.

9 Positive Effects of the Nelson Wastewater Treatment Plant

9.1 General

The definition of effects in section 3 of the RMA includes positive effects. The NWWTP has a significant number of positive effects for the residential, business, and industrial areas it serves. These positive effects include the following.

9.2 Provisions of a Safe Public Health and Sanitation System

The key positive effect of the NWWTP is the continued provision of a reticulated wastewater collection system that provides safe, reliable and public health sanitation is a positive effect. Without the NWWTP there would be significant environmental and human health issues, especially within rapid growing and populated urban areas.

9.3 Social and Economic Effects

Ensuring wastewater services are affordable for domestic ratepayers, and commercial and industrial operators who are a key part of the local, regional, and national economy. Further positive economic effects include continuing to make cost effective use of the existing infrastructure of the NWWTP.

The ability for new businesses and industries to establish and operate in the Nelson area in a viable and sustainable manner is considered a positive effect in relation to the NWWTP.

9.4 Provision for Growth

The ability to provide for residential, business, and trade/industrial growth and development is a key positive effect. This is addressed further in Section 16.2.4 of this AEE with regard to the National Policy Statement on Urban Development Capacity.

9.5 Environmental Effects

An important environmental consideration and positive effect of the continued provision of a reticulated wastewater collection system and the NWWTP is that it eliminates the need for individual on-site wastewater treatment and disposal where reticulation is available. The provision of the NWWTP therefore reduces potential adverse effects from these on-site schemes.

9.6 Other Positive Effects

The efficient use of the existing wastewater infrastructure is an important positive effect, as it provides the Nelson community with economically sustainable wastewater treatment systems. In addition to this, it is a requirement under section 104(2A) of the RMA for the consent authority to have regard to the value of the investment made in existing infrastructure by the consent holder. The replacement value of the existing NWWTP is in the order of $21.5M.

The presence of the NWWTP also provides positive effects in term of providing suitable habitat for fauna including a variety of avifauna species (in particular the New Zealand scaup), this is discussed in greater detail in Section 8.5.

10 Assessment of Effects of the Discharge of Treated Wastewater to Tasman Bay

10.1 Introduction

The discharge of treated wastewater to Tasman Bay has the potential to result in various effects which can be broadly divided into ecological effects and public health effects. These are discussed in the following sections.

10.2 Assessment of Ecological Effects

10.2.1 Introduction

The Council contracted Cawthron to provide an assessment of environmental effects of the discharge from the NWWTP on the ecological receptors within Tasman Bay as it has been involved with undertaking monitoring of the effects for many years. Cawthron prepared a report entitled 'Assessment of Effects of the Nelson North Wastewater Treatment Plant Discharge on Coastal Ecology and Kaimoana' (**Cawthron Ecological Report**), a copy of which is incldued in Appendix L .

In addition, Cawthron separately assessed the effects of the discharge on marine mammals, the effects of emerging organic contaminants (**EOCs**), and microplastics – these are discussed in separate sections below.

The Cawthron Ecological Report includes the following:

- An outline of the ecological values of the receiving environment (summarised in Section 8 of this AEE).
- A description of the extent and nature of the mixing zone of the NWWTP discharge.
- An assessment of the effects of the current/historic discharge, both within the mixing zone, at the edge of the mixing zone and further afield. This assessment includes both water quality and sediment quality monitoring.
- Discussion of other inputs of contaminants into Tasman Bay and an assessment of the cumulative effect of the NWWTP discharge and these other inputs.

The results of the Cawthron Ecological Report are summarised in the following sections.

10.2.2 Zone of reasonable mixing

The concept of 'reasonable mixing' arises under the RMA and the NRMP in various contexts including:

- A note to the standards in Schedule Three of the RMA states that the standards apply after reasonable mixing.
- Section 107 of the RMA outlines certain restrictions in terms of water quality requirements that must be met after reasonable mixing for discharge permits or coastal permits that contravene section 15 of the RMA.
- The policies and rules of the NRMP that cover discharges of contaminants to fresh water and coastal waters refer to standards needing to be met after reasonable mixing.

The zone of reasonable mixing establishes a zone within which compliance with applicable water quality standards do not need to be met and adverse effects are accepted to occur. However, beyond the mixing zone the applicable water quality standards must be met.

Policy CM6.4 of the NRMP provides guidance on what constitutes a 'reasonable mixing zone' for discharges to coastal waters and states:

> *In considering what constitutes a "reasonable mixing zone", in any particular situation, account will be taken of:*
> *a) the purposes for which the water is managed, and*
> *b) the sensitivity of the receiving environment (i.e. available dilution and dispersal and the proximity of areas valued for ecological, recreational, cultural, shellfish gathering or commercial fishing reasons), and*
> *c) the nature of the discharge including contaminant type, concentration and volume, and*
> *d) the location and design of the proposed outfall and the potential for improving the same, and*
> *e) the proposed method of treatment and the potential for improving that method, and*
> *f) the need to confine any significant adverse effects to the mixing zone, and*
> *g) the desirability of keeping the size of the mixing zone as small as possible, and of keeping it away from the inter tidal area.*

A comprehensive study was undertaken in 1998 to determine the zone of reasonable mixing around the outfall. The study included drogue tracking, dye tracing, surface water sampling, water column profiling, and computer simulation modelling.

The 1998 study derived the size of the zone of reasonable mixing to be a rectangle measuring 500 m by 200 m[34], centred on the outfall, with the rectangle oriented in a northeast-southwest direction (along the axis of the predominant current directions). This mixing zone was accepted as being appropriate when the previous application was considered, and it was included as Condition 9 in the current consent – this condition also refers to an attached drawing as shown in Figure 10-1. Unfortunately, the figure attached to the current consent does not accurately reflect the consented mixing zone dimensions as the long edge of the rectangle measures only ~420 m and the correct (to scale) size of the mixing zone is shown as the red dashed rectangle on Figure 10-1.

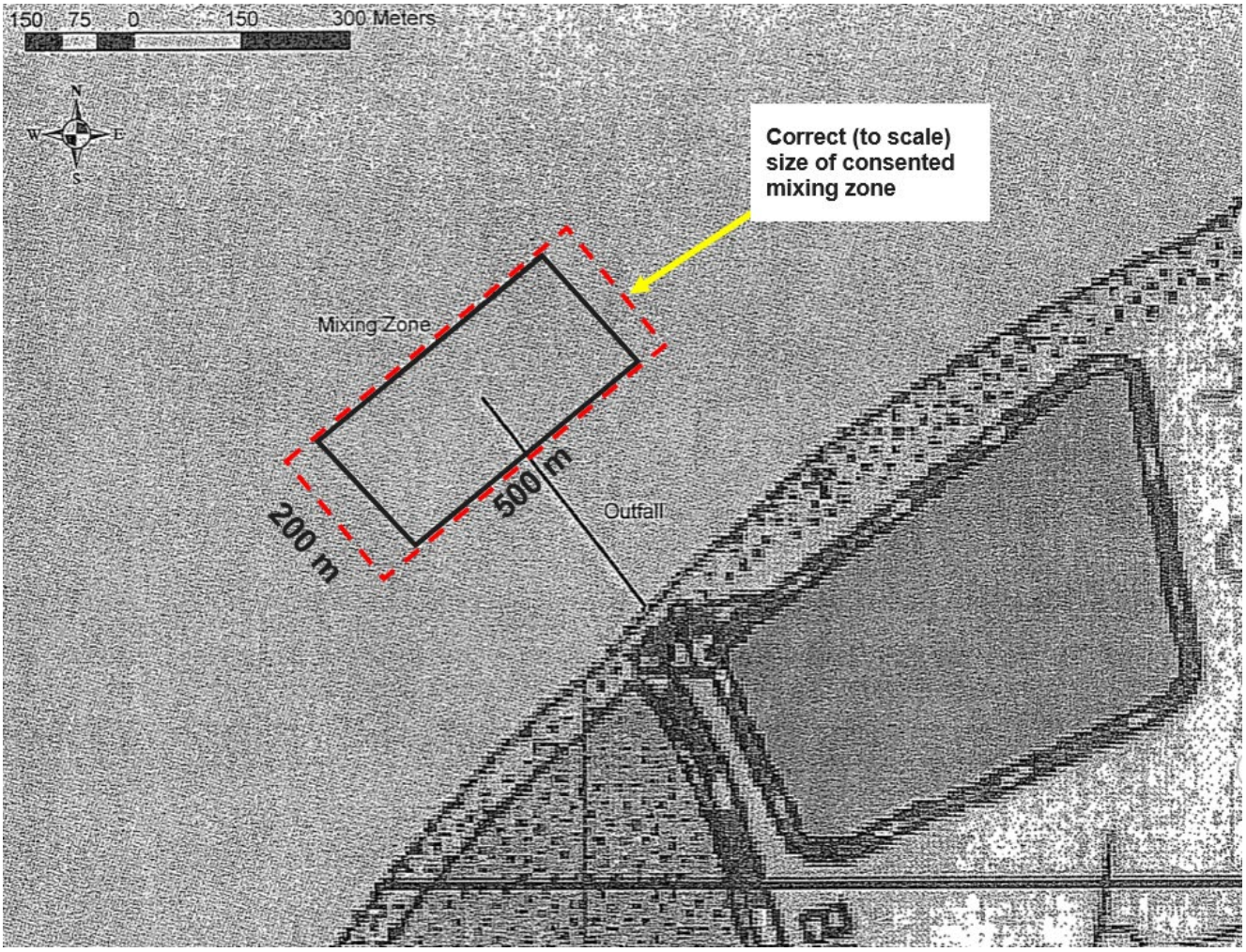


Figure 10-1: Mixing Zone (black rectangle) from Existing Resource Consent

The Council maintains a sign adjacent to the NWWTP, by the carpark at the end of Boulder Bank Drive, advising the public of the discharge and the mixing zone (including its dimensions), as shown in Figure 10-2. The sign advises the public not to swim or collect shellfish in the mixing zone.

[34] Condition 9 defines the rectangle as extending 250 m to the north and south of the diffuser (parallel to the Boulder Bank) and 100 m shoreward and seaward of the diffuser.

Figure 10-2: Public Sign at the NWWTP advising the Public of the Mixing Zone

A more refined hydrodynamic model of Tasman Bay has recently been developed by MetOcean and a copy of the report prepared by MetOcean entitled 'Nelson North Wastewater Treatment Plant (NWWTP) Dispersion Modelling' (**MetOcean Dispersion Modelling Report**) is included in Appendix Q . This model provides a robust, probabilistic estimate of the dispersion of the wastewater discharge from the NWWTP and subsequent dilution of contaminants. MetOcean assessed the distribution of available dilutions at 28 points located equal distances around the perimeter of the mixing zone at the seabed, mid-water, and at the sea surface. The assessment included both the current discharge rates from the NWWTP as well as predicted future rates. In addition, both El Nino and La Nina conditions were assessed. Available dilutions are presented as probabilities, a P50 representing the median dilution (i.e. 50% of the time the dilution will be lower and 50% of the time the dilution will be greater). Not surprisingly, the dilutions calculated for the predicted future discharge rate from the NWWTP results in the lowest dilution. Further, the dilutions during La Niña conditions were lower than El Niño conditions. The dilutions for future discharge rates under La Niña conditions (i.e. worst-case) are presented Table 10-1, the shaded cell shows the lowest available dilution, being 280 times. It should be noted that this is an extreme worst-case and dilutions exceed this value 99% of the time – the site where this extreme was calculated was halfway along the southwestern short side of the mixing zone rectangle (this is the same site used later in the QMRA labelled 'SW edge of mixing zone'). The median dilution rate is 2,356.

Table 10-1: Worst-case (lowest) dilutions around the edge of the mixing zone under predicted future discharge rates from the NWWTP under La Nina conditions.

Water Depth	Available Dilution (X:1)						
	Probability						
	P1	P5	P10	P50	P90	P95	P99
Surface	**280**	494	674	2,356	10,032	19,316	75,012
Mid-depth	328	536	724	2,742	12,414	27,440	84,406
Near bed	360	640	902	3,176	15,976	34,966	98,870

The mixing zone rectangle is centred on the middle of the existing outfall diffuser. In the event that the outfall diffuser is replaced then the mixing zone rectangle (with the same dimensions) will need to 'shift' to be centred on middle of the new outfall diffuser layout. The proffered conditions presented in Appendix W acknowledge this and would require the Council to provide the coordinates of the vertices (corners) of the shifted rectangle. An example of how the mixing zone rectangle may change is shown in Figure 10-3 – the solid red line being the existing mixing zone centred on the current diffuser (shown as the short yellow line) and the dotted red line representing a 'shifted' mixing zone based on the nominal OCEL concept design replacement outfall diffuser layout (shown as the two green lines).

Figure 10-3: Example of how the mixing zone rectangle may shift if outfall diffuser is replaced.

10.2.3 Assessment of effects of the discharge

10.2.3.1 Receiving water quality

The Cawthron Ecological Report includes information on water quality monitoring that has been undertaken within the receiving waters of Tasman Bay. The following section provides a summary of the results.

Bacteria

Microbiological water quality was monitored in the mixing zone of the outfall at 3-monthly intervals from November 2006 to March 2008, and then at 4-monthly intervals until April 2010. The duration of monitoring spanned the period from 2 years before to 2 years after the 2008 upgrade to the NWWTP. Samples were taken within the discharge surface 'boil' and at 250 m, 500 m, and 1,000 m northeast or southwest of the outfall, depending on the direction of tidal flow at the time. Samples were analysed for enterococci and faecal coliform bacteria.

Prior to commissioning of the NWWTP upgrade in March 2008, concentrations of faecal coliforms and enterococci were elevated (up to 1,200 cfu/100 mL for coliforms and 70 cfu/100 mL for enterococci) immediately around the boil on some sampling occasions and sometimes extended to the edge of the 250 m mixing zone boundary. Bacterial concentrations were generally low outside the mixing zone (maxima of 70 cfu/100 mL for coliforms and 5 cfu/100 mL for enterococci). Concentrations were generally below analytical detection limits (5 cfu/100 mL) on other sampling occasions prior to the NWWTP upgrade. Concentrations of faecal coliforms reduced after the upgrade (maximum of 30 cfu/100 mL), however, enterococci concentrations were similar before and after the upgrade. Concentrations of both variables were at or below limits of detection beyond the mixing zone.

Water samples were collected within Tasman Bay monthly between August 2020 and December 2021 at two sites referred to as 'CM AW 01 – Adjacent to NWWTP' (c. 20 m offshore) and 'CM AW 02 – Schnappers Pt' (c. 40 m offshore) as shown in Figure 10-4. The geometric mean concentrations of enterococci at these two sites during this monitoring was 13 cfu/100 mL at CM AW 01 and 21 cfu/100 mL at CM AW 02.

Nutrients

The Cawthron Ecological Report notes that the most important limiting nutrient (i.e. that which restricts plant growth) in Tasman Bay is nitrogen, in the form of DIN. Although inorganic phosphorus, iron and silica can also be limiting occasionally, these nutrients are not thought to significantly constrain phytoplankton production in Tasman Bay, although they may influence the types of phytoplankton present.

The monthly sampling over the period August 2020 to December 2021 at CM AW 01 and CM AW 02 (refer Figure 10-4) included analysis for nitrate/nitrite. The median concentration of nitrate / nitrite over this period was 0.014 g/m^3 at both sites. This concentration is similar to those for nitrate measured in Tasman Bay during an investigation into spatial and temporal distribution of inorganic nutrients in 1995–96 (0.003–0.040 g/m^3). The highest concentrations occurred from June to August 2021, consistent with the pattern of highest concentrations in late winter to spring reported in the 1995–96 study. Concentrations of dissolved reactive phosphorus were also highest during winter and early spring.

Figure 10-4: Location of the two Tasman Bay site sampled during 2020-2021.

The Cawthron Ecological Report states the additional nutrient load, particularly that of DIN, provided by the discharge from the NWWTP is not expected to result in local nuisance blooms of phytoplankton or macroalgae. Given that the generation time for coastal phytoplankton is normally in the range of a few days rather than hours, the rate of dilution as nutrients travel down-current from the outfall would be expected to preclude any measurable discharge-related enhancement of phytoplankton (including nuisance species).

Ammoniacal nitrogen is an important nutrient but is also toxic to organisms at high concentrations. The concentration ratio of the more toxic unionised form (ammonia, NH_3) to the ionised form (ammonium, NH_4^+) in solution depends on several factors, most notably temperature, pH, concentration of dissolved oxygen, and salinity. Ammoniacal nitrogen toxicity increases with temperature and pH and decreases with concentration of dissolved oxygen and salinity. For example, the ANZG 2018 default guideline for marine waters at pH 8.0 is 0.91 g/m^3 total ammoniacal nitrogen but decreases to 0.42 g/m^3 at pH 8.4.

Concentrations of total ammoniacal nitrogen in the NWWTP discharge between August 2020 and December 2021 ranged between 0.01-33 g/m^3. To estimate the potential for toxicity following initial mixing and dilution in the receiving environment, concentrations in the discharge were compared with the ANZG 2018 trigger values after allowing for a 220-fold dilution – this

being the minimum dilution predicted by modelling undertaken by MetOcean at the edge of the near field[35] discharge plume based on a range of discharge flow rates and ambient current speeds. This dilution occurred 155 m down-current from the point of discharge. A toxicity safety factor[36], defined as the ratio of the ANZG 2018 guideline to the discharge concentration at 220x dilution, was calculated for the minimum, median and maximum concentrations of ammoniacal nitrogen measured in the treated wastewater between August 2020 and December 2021. The highest toxicity potential arises from a combination of the highest ammoniacal nitrogen concentration measured in the treated wastewater, being 33 g/m^3, and the highest pH measured in the receiving environment, being pH 8.4. This worst-case combination results in a toxicity factor of 2.8, indicating that the potential for ammonia toxicity outside the near field mixing plume of the discharge is very low. The potential will be lower still at the boundary of the mixing zone, where the estimated minimum dilution is 355:1 under the current discharge conditions and 280:1 under predicted future (2059) conditions. Other mitigating factors include the fact that ammoniacal-N concentrations in the discharge are typically higher in winter, when seawater temperatures, and consequently ammonia toxicity, are lower. Ammonia is also a non-conservative contaminant and will be metabolised to other forms of nitrogen by microbial activity in the water column after discharge.

Trace Metals and Other Chemical Compounds

Recent discharge monitoring undertaken during the period August 2020–December 2021 to support the current consent application showed that the concentrations of trace metals and other chemical substances in the discharge were at or just over the limits of detection of the testing methods. Where results were detectable, the concentrations were much lower than the respective discharge consent limits and well below the trigger values for protection of 95% marine species with little or no dilution. Concentrations of volatile and semi volatile organic compounds and oil and grease in the treated wastewater during the same monitoring period were at or just over the limits of detection of the testing methods, except a single, relatively high, result of oil and grease detected at the wetland outlet (159 g/m^3).

Concentrations of trace metals and total phenols in the receiving waters were measured on a single occasion (24 March 2021) at two sites just offshore from the Boulder Bank ('Adjacent to NWWTP' and 'Schnappers Pt': see Figure 10-4). The concentration of copper exceeded the ANZG 2018 guideline for 'slightly to moderately disturbed' systems at both sites, but by a factor of 25 times at Schnappers Pt. The concentration of zinc (0.064 g/m^3) also exceeded the ANZG 2018 guideline at Schnappers Point, but not at the site adjacent to the NWWTP. These exceedances are much higher than the 95%ile values in the discharge for the period August 2020 to December 2021, suggesting that the concentrations at Schnappers Pt derive from another, unidentified source.

Wastewater treatment plant discharges are one of the main anthropogenic sources of phenolic compounds in coastal waters. Concentrations of total phenols (rather than the concentrations of individual phenolic compounds) were measured in the two receiving environment samples collected on 24 March 2021. The concentrations of total phenols (< 0.02g/m^3 adjacent to the NWWTP, 0.09 g/m^3 at Schnappers Point) were below the ANZG 2018 guideline for phenol (the parent compound: 0.4 g/m^3) at both sites. The concentration at Schnappers Point was above the guideline for pentachlorophenol (0.022 g/m^3), the only other phenolic compound for which a guideline has been derived. It is therefore possible that, if pentachlorophenol represented more than c. 25% of the total phenols, the guideline could have been exceeded. As with copper and zinc, the concentration at Schnappers Pt was higher than any value recorded in the discharge during the period August 2020 to December 2021, suggesting that the discharge was not the cause.

Chlorophyll-a

Monitoring of water quality off the Boulder Bank between August 2020 and December 2021 shows highest concentrations of chlorophyll-a in late winter and spring. The range of concentrations recorded during the 2020–21 survey was 0.0002–0.0046 g/m^3. These concentrations are consistent with those recorded in Tasman Bay between 1998 and 2003 (0.0005–0.0029 g/m^3), and the characterisation of Tasman Bay as oligotrophic (low) to mesotrophic (moderate) in terms of phytoplankton productivity.

Compliance with NRMP Water Quality Standards

As discussed in Section 6.4, the receiving waters around the discharge point are classified as FEA[37] with SG[38] waters being located >1 km from the point of discharge and the closest CR[39] waters being >3.5 km away at Glenduan.

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[35] 'Near field' mixing relates to the plume that is produced as the treated wastewater exits the diffuser and describes the zone of strong initial mixing that occurs due to the initial jet characteristic of momentum flux and buoyancy flux. This occurs within the 'mixing zone' discussed in Section 10.2.2 and therefore the near field dilution is lower than that which occurs at the edge of the mixing zone.

[36] A safety factor value larger than one indicates that the receiving water concentration is below the ANZG 2018 water quality guideline and no toxicity to fish or other marine organisms would be anticipated.

[37] Water quality standard for fishing, fish spawning, aquatic ecosystem, and aesthetic purposes.

[38] Water quality standard for shellfish gathering purposes.

[39] Water quality standard for contact recreation purposes.

The FEA standards apply outside the mixing zone. The FEA water quality standards relate to temperature, DO, no significant adverse effects on aquatic life, and not allowing section 107 RMA effects to occur (refer Section 6.4). The discharge is well mixed within the mixing zone and the temperature and DO standards are expected to be met beyond the mixing zone. This AEE has confirmed that there are no adverse effects on aquatic life. Section 107 RMA matters are discussed in Section 16.4 and it confirms there are no prohibitions on granting of these consents under that section of the RMA.

Overall, the discharge will comply with the NRMP water quality standards at and beyond the mixing zone.

Conclusion
Overall, based on the monitoring undertaken within the receiving waters of Tasman Bay it is concluded the effects of the discharge on water quality to protect ecological values at or beyond the mixing zone are low and acceptable. In terms of the RMA this level of effect is 'less than minor'.

10.2.3.2 Sediment

The 1998 study undertaken by Cawthron included an assessment of the sediments around and away from the outfall. There was no sign of organic enrichment with the sediments appearing brown and well oxygenated. Concentrations of organic matter and nutrients were low. Patches of macroalgae were present on the surface of the sand but there was no indication that their growth was more prolific near the outfall.

Cawthron collected sediment samples in November 2020 from four stations near the outfall, two being 250 m north and south of the outfall and two being 500 m in the same direction. The sediment samples were analysed for a range of metals (As, Cd, Cr, Cu, Pb, Hg, Ni, and Zn) and organic matter. There were no consistent differences between concentrations at locations closer to the outfall (25 m) and those further away (500 m) from it for any of the metals or organic matter. Cawthron states there is no indication that the discharge has caused any enrichment of these contaminants in the sediments and that this is not surprising given the low concentrations in the wastewater and the sandy nature and low organic content of the sediments (metals tend to bind preferentially to fine, organic particles). The concentrations of all metals were well below the ANZG 2018 DGV (being values above which adverse ecological effects may occur).

The Cawthron Ecological Report concludes that, from the present low concentrations of organic matter and trace metals in the sediments, the continued discharge is not expected to result in future adverse ecological effects on boulder or sand habitats or their respective communities. Nor is there any reason to expect that improvement in wastewater quality would have any discernible beneficial ecological effect, given the similarity between stations surveyed near and remote from the outfall.

Overall, it is concluded that the effects of the discharge on sediment quality are low and acceptable. In terms of the RMA this level of effect is 'less than minor'.

10.2.3.3 Benthic ecology

The Cawthron Ecological Report notes that an earlier (1998) study reported no indication of adverse ecological effects of the discharge on sediment-dwelling organisms around the outfall even with the lower quality of treated wastewater discharged before the 2008 upgrade to the NWWTP. The surface of the sand was largely barren at all sampling stations. The most conspicuous macrofauna were cushion stars (*Patiriella regularis*), and eleven-armed starfish (*Coscinasterias muricata*), hermit crabs (*Pagurus* spp.), sea cucumbers (*Australostichopus mollis*) and whelks (*Cominella virgata* and *Cominella adspersa*) were also widespread.

Animals living in the sediment (sampled by coring) were dominated numerically at all sampling stations by syllid polychaetes and amphipod crustaceans. The sediment fauna was similar between sites near the NWWTP outfall and the station furthest from it (1,000 m to the south), and there was no dominance by taxa known to be characteristic of organically enriched sediments.

The New Zealand lancelet (*Epigonichthys hectori*), a fish-like member of a group of primitive chordates (and, therefore, of scientific interest), was unexpectedly abundant in sandy sediments around the outfall. This species is endemic and occurs around New Zealand, but the top of the South Island is towards the southern limit of its distribution. They are apparently uncommon in shallow (i.e. diveable) waters but have been reported from other surveys in the Nelson–Marlborough area and are 'known from several bays within Tasman Bay and Croiselles Harbour'. Lancelets require clean, well-oxygenated sand with low mud content. Their presence at sites around the outfall supports the conclusion that the discharge has not adversely affected the surrounding sediment or the organisms living within it. Subsequent surveys have not sampled the sediment around the outfall, so it is not known whether the lancelet populations are still present.

Boulder habitat around the outfall was surveyed by in 1998 and resurveyed every five years as part of the monitoring for the existing consent. This habitat supports a community of encrusting and mobile taxa comparable to other parts of the Boulder Bank. Extensive macroalgal beds are notably absent from the length of the Boulder Bank, including the NWWTP outfall location. There is no sign of excessive sedimentation on rocky habitats near the outfall, nor any patterns in the distribution of organisms that might suggest an effect from the discharge.

Prominent taxa include cushion stars, eleven-armed starfish, kina, the snail Cookia sulcata, the ascidian Cnemidocarpa sp., nesting mussels (*Modiolarca impacta*) and window oysters (*Anomia zelandica*). The encrusting biota included coralline algae and various sponges (e.g. *Callyspongia ramosa, Raspailia topsenti, Ecionemia (Ancorina) alata, Aaptos aaptos and Tethya* spp.), and compound ascidians (including *Botryllus schlosseri* and *Didemnum candidum*). Few fish species were seen, the most common being variable triplefins (*Forsterygion varium*), spotties (*Notolabrus celidotus*) and blue cod (*Parapercis colias*).

In addition to those recorded on nearby boulder habitats, the organisms living on the outfall structure include high densities of the anemone *Actinothoe albocincta*. Densities of *A. albocincta* decrease to moderate levels on the boulders immediately surrounding the outfall and declined further with increasing distance. This matches the distribution of the species on the Nelson fisheries outfall, presumably due to the supply of food in the form of particulate organic material.

In a review of the results from the 2006, 2013, and 2018 surveys, Cawthron concluded that there was no visual indication of the accumulation of discharge constituents or discharge-related effects on hard substrata within the vicinity of the diffuser. Benthic faunal communities associated with both the diffuser structure and the surrounding boulders showed no obvious patterns in the distribution of species to suggest an adverse effect from the discharged wastewater. Re-examination of fixed quadrats showed that many individual organisms did not persist from one survey to the next. This turnover of encrusting organisms was attributed partly to their limited lifespan, but also to episodic disturbance by storms, followed by resettlement.

Overall, the Cawthron Ecological Report assesses the adverse effects of the discharge on benthic communities are low and acceptable. In terms of the RMA this level of effect is 'less than minor'.

The Cawthron Ecological Report includes a section on threatened or at-risk indigenous taxa and ecosystems that may be present within the receiving environment as this is relevant in the context of Policy 11(a) of the NZCPS which seeks to avoid adverse effects on such taxa. The Cawthron Ecological Report states that it is reasonable to conclude that threatened or at-risk indigenous taxa and ecosystems are not present and, if they are present then they are unlikely to be adverse effects on them from the discharge of treated wastewater from the NWWTP.

10.2.3.4 Emerging organic contaminants

Emerging organic contaminants (EOCs) are synthetic or naturally occurring chemicals or micro-organisms that are not commonly monitored but have the potential to enter the environment and cause adverse ecological and/or human health effects. The Council engaged Cawthron to analyse a suite of EOCs (chemicals only) in samples of treated wastewater from the NWWTP and assess their ecological and human health risks. Cawthron prepared a report entitled 'Risk Assessment of Emerging Organic Contaminants in the Treated Discharge from the Nelson North Wastewater Treatment Plant' (**the Cawthron EOCs Report**), a copy of which is included in Appendix M .

EOCs were analysed in two samples of treated wastewater from NWWTP (Sample 1 – dry weather; Sample 2 – wet weather), and the results compared the concentrations obtained with those detected in other WWTPs in New Zealand, including identification of those EOCs whose concentrations in treated wastewater which may pose a risk within the receiving environment of Tasman Bay. A total of 45 of the 84 individual EOCs analysed were detected in at least one of the NWWTP samples. These included alkyl phosphate flame retardants (7); phenolic antimicrobial chemicals (5); paraben preservatives (3); industrial alkylphenols, including the industrial mixture of technical nonylphenols (3); insect repellents (3); polycyclic and nitro-musk fragrances (5); acidic pharmaceuticals (7); plasticisers (9); and steroid hormones (3) (numbers in brackets identify classes of chemical compounds).

Of the 45 EOCs detected in the treated wastewater samples for which there are data from other WWTPs around New Zealand to compare against, the concentration of 23 EOCs exceeded their previous maximum measured concentrations from other WWTPs. The concentrations of the remaining EOCs detected in the NWWTP samples either fell below, or were within the range of, those previously measured at other WWTPs (noting that these other WWTPs use a broad range of treatment technologies, some of which differ significantly from the treatment that occurs at the NWWTP). The concentrations of EOCs were generally higher in Sample 1 than in Sample 2. The concentrations of 41 of the 45 EOCs detected in both treated wastewater samples were greater in Sample 1. The concentrations of the industrial alkylphenols 4-tert-octylphenol and technical nonylphenol, the pharmaceutical cetaminophen and the plasticiser metabolite monomethyl phthalate were all higher in Sample 2.

Some EOCs were measured at concentrations two orders of magnitude higher than their respective predicted no-effect concentration (PNEC) values and a minimum of 100:1 dilution of the wastewater is required within the receiving environment to reduce the risk posed by the EOCs to marine biota (as suggested by the respective PNEC values). The worst-case dilution ratio predicted by the hydrodynamic modelling undertaken by MetOcean under existing median discharge rates was 3,200:1 at the mixing-zone boundary. Under predicted future (2059) discharge rate scenarios, a worst-case dilution of 2,300:1 is predicted for median flow rates and 280:1 for the lowest 1% of flow rates (1%ile). These available dilutions under median discharge rates are more than one order of magnitude greater than that required to reduce the concentrations of EOCs below their corresponding PNEC values.

The assessment of risk based on the modelled available dilution is conservative, not only due to the assumption of worst-case conditions for dispersion, but because the buoyant freshwater plume is unlikely to have more than limited contact with the seabed within the immediate vicinity of the discharge. Biota in the water column are likely to experience only short duration exposures due to the high level of available dilution as water moves through the mixing zone.

The relatively high concentrations of many of the detected EOCs in the wastewater samples from the Nelson WWTP suggest that the treatment plant is not removing EOCs as effectively as other WWTPs in New Zealand. However, it is important to note that the samples provided for analysis were treated wastewater (effluent) only and the brief was to analyse EOCs solely in the dissolved phase of the wastewater samples. In the absence of hydraulically linked influent samples combined with analysis of EOCs in both the dissolved and particulate phases of the samples, a mass balance for the EOCs cannot be calculated and the efficacy of Nelson WWTP to remove or reduce EOCs cannot be fully determined. Further, the Cawthron EOCs Report states There are several caveats to interpreting the relatively elevated EOC concentrations in these samples with respect to plant performance:

- Absence of sample replication or an extended time series of sampling carries the potential that samples may be atypical of normal operation.
- Absence of influent samples hydraulically-linked to those of the discharge does not allow assessment of true reductions across the process.
- Only three of the eleven WWTPs in the comparative dataset were for a comparable (secondary) level of treatment.

10.2.3.5 Microplastics

Plastic pollution is a worldwide issue due to the mass production and wide-ranging use of these materials and their potential detrimental effects on the environment. Discharges from wastewater treatment plants are one of many sources of plastic pollution to the marine environment. Wastewater treatment processes may not completely remove microplastics (plastic particles < 5 mm in size), hence the importance of quantifying the removal of microplastics at different stages of the treatment process and assessing their fate in discharge-receiving environments.

The Council engaged Cawthron to: 1) characterise the concentrations of microplastics in samples of untreated and treated wastewater from the NWWTP; 2) compare the concentrations with those found in other WWTPs; and 3) discuss the risks of microplastics within the discharge to the ecology of Tasman Bay. A copy of Cawthron's report entitled 'Risk Assessment of Microplastics in the Treated Wastewater Discharge from the Nelson North Wastewater Treatment Plant' (**the Cawthron Microplastics Report**) is included in Appendix N.

Wastewater samples were taken from the influent screening chamber, oxidation ponds, and wetlands on four occasions (two sets of dry-weather and two sets of wet-weather samples). The samples were processed to isolate plastic particles by sieving, oxidation, and filtration and subsequently analysed under a stereomicroscope. Each plastic particle was characterised by polymer type, colour, morphotype, and length.

Microplastics were found at all stages of the treatment process. Abundance was variable, with the highest concentrations found in influent samples (24.1 ± 13.7 microplastics/L) and the lowest concentrations in treated wastewater samples (2.7 ± 0.7 microplastics/L). The dominant polymer type was polyethylene terephthalate (polyester) (58%), which is widely used in packaging and fabrics. Overall, fibres accounted for 70% of particles, followed by fragments (27.8%), films (2.1%), and microbeads (0.1%). Similar proportions of colourless, black and blue particles were detected between treatment stages (25–27.4%).

Due to differences in sample processing methods, comparisons of these results with mean microplastic concentrations reported in the literature should be considered indicative only. The mean concentration in samples of treated wastewater from the NWWTP (2.7 microplastics/L) is similar to those detected in treated wastewater samples from other New Zealand WWTPs, and some overseas studies have found much higher concentrations (> 50 microplastics/L). Microplastic removal rates could not be determined because sampling intervals were not synchronised with wastewater transit times.

The study undertaken by Cawthron confirms the discharge from the NWWTP into Tasman Bay contains microplastics. In general due to their small size, microplastics can be ingested by marine species, sometimes when mistaken for food, and can lead to harmful physical effects (chocking, blocked digestive tracts, etc.). Various chemicals are incorporated into plastics as raw materials or additives during manufacture. Consequently, microplastics can introduce toxicity throughout the marine food web and eventually reach humans through bioaccumulation. Microplastic surfaces can also provide habitat for microbial colonisation and biofilm formation, allowing for transport of opportunistic pathogens and invasive species. However, the Cawthron Microplastics Report notes there is insufficient evidence linking microplastic concentrations typically detected in coastal environments and those reported to affect feeding, reproduction, and growth of marine organisms.

The Cawthron Microplastics Report recommends that continued efforts to reduce the release of plastic material into the environment should be a priority. This requires a combination of technological solutions, community awareness, behaviour change campaigns, and regulatory measures. The Cawthron Microplastics Report notes that New Zealand's Waste Minimisation Act 2008 seeks to reduce waste generation through imposing levies on waste disposed in landfills and supports funding of waste minimisation initiatives – this Act can be used to ban certain plastic products, including the manufacture and sale of products that contain microbeads.

10.2.3.6 Marine mammals

Marine mammals can be susceptible to the effects of contaminants that are contained in treated wastewater discharges into coastal waters. The Council engaged Cawthron to assess the potential effects of the discharges from the NWWTP on local and visiting marine mammal species. A copy of Cawthron's report entitled 'Nelson North Wastewater Treatment Plant Discharge: Assessment of Effects on Marine Mammals' (**the Cawthron Marine Mammals Report**) is included in Appendix O .

The Cawthron Marine Mammals Report states the marine mammals most likely to be affected by the NWWTP's discharges are those species that frequent the inner Tasman Bay water throughout the year or on a semi-regular basis. These species include New Zealand fur seal, bottlenose dolphin, dusky dolphin, orca, and Hector's dolphin. Several other species have life-history dynamics that may make them vulnerable to effects from contaminants that can be present in NWWTP discharges. However, the Cawthron Marine Mammals Report states there is no evidence that any species have home ranges or foraging habitats restricted solely to nearshore waters along the Boulder Bank, or in proximity to the outfall. Based on this knowledge, the Cawthron Marine Mammals Report states the nearshore waters immediately around the outfall are not considered ecologically more significant in terms of feeding, resting, or breeding habitats for any marine mammal species relative to other regions along the top of the South Island.

The Cawthron Marine Mammals Report states the long lifespans and occurrences in nearshore coastal waters of some marine mammals make them susceptible to the long-lasting accumulation of contaminants in their thick blubber layers, due to the persistent, fat-soluble nature of several chemicals. Moreover, marine mammals occupy a high trophic position in the food chain, making them potentially vulnerable to high concentrations of chemicals from lower-order prey. The extent of any effects from wastewater contaminants on marine mammals is determined by: 1) the type, and amount, of contaminants present; 2) the frequency and duration of exposure; 3) the individual's or species' susceptibility to the contaminant; and 4) the individual's health when exposed.

The Cawthron Marine Mammals Report states that predicting the possible impacts on New Zealand marine mammal species from a single source is complex. Given the present state of knowledge, this must be based mainly on the quality and type of discharges and the expected exposure risk of each species. The overall adverse effect from the NWWTP discharge is expected to be low for those marine mammal species with the highest potential sensitivities and risk of exposure. Exposure to any discharge contaminants would most likely occur via the food chain (through prey species). However, the species known to occur in Tasman Bay are generalist feeders, potentially ranging and foraging along the coastline (and beyond). Since no marine mammals reside along the Boulder Bank and larger Tasman Bay region year-round, the likelihood of an individual animal foraging on prey, or swimming through waters exposed to the discharge, would be very low. The Cawthron Marine Mammals Report states that, based on the recent monitoring of the discharge and receiving environment, and the available information on the dispersion and dilution of the wastewater in the bay, any potential effects on marine mammals from the renewal proposal are considered negligible and no further mitigation is warranted.

10.2.3.7 Other inputs and cumulative effects

The Council engaged Cawthron to assess the cumulative effects within Tasman Bay. A copy of the Cawthron report on cumulative effects entitled 'Assessment of Cumulative Effects Associated with the Nelson North Wastewater Treatment Plant Discharge and Other Discharges in the Nelson Catchment' (**Cawthron Cumulative Effects Report**) is included in Appendix P . The following section presents a summary of that report.

The Cawthron Cumulative Effects Report notes the NWWTP discharge is one of many sources of nutrients, trace metals and other contaminants to Tasman Bay; other sources include private- and Council-owned discharges, industrial discharges and inputs from rivers and streams. Monitoring to date has found no visible indication of accumulation of discharge constituents or discharge-related effects on benthic communities in the immediate vicinity of the outfall diffuser. Mean concentrations of total nitrogen (TN) and total phosphorus (TP) in the discharge have been typical of those found in tertiary-treated effluents during baseflow conditions. Concentrations of trace metals in the discharge have been below their respective consent limits.

The Cawthron Cumulative Effects Report notes elevated levels / concentrations of physico-chemical parameters may be detectable near the sources – particularly during high-flows (during and shortly after rain events) – and have a cumulative water quality effect on the Nelson CMA. However, given the distance of the NWWTP discharge from other urban sources (e.g. stormwater outfalls, pump station overflows) and the strong water movements in Tasman Bay, cumulative effects on the seabed and water column in the vicinity of the NWWTP discharge are unlikely. Based on previous studies, the Maitai River and its tributaries are clearly identified as the main contributors of TN and TP to the CMA. However, it should also be noted that a number of streams in the Hillwood / Todd Valley area (where the NWWTP is located) are associated with higher TN and TP loadings than some urban areas in the lower Nelson catchment. Water quality in the Maitai declines downstream as the river is affected by tributary contaminant loads. Previous mass balance studies have indicated that rivers and streams may contribute approximately 70% of the TN loading to Tasman Bay.

Using both New Zealand and overseas guidelines / standards, comparisons of measured TN and TP concentrations at sites in the inner Tasman Bay suggest that there is capacity for assimilation of additional nutrients without expression of adverse water quality effects in the discharge receiving environment.

10.2.3.8 Proposed discharge standard for metals, cyanide, and phenol

The current discharge standards for metals, cyanide, and phenol are based on the ANZECC 2000 water quality guidelines which were applicable in 2003 when the previous application was being considered. The discharge standards were derived by back-calculation using the ANZECC guidelines and an assumed dilution within the receiving waters.

The ANZECC 2000 guidelines have been superseded by the ANZG 2018 and there have been changes to some of the guideline values. Further, the current discharge standards were all derived from the 95% protection of species level guideline values, which are applicable for slightly-moderately disturbed ecosystems. However, both the ANZECC 2000 and ANZG 2018 guidelines recommend that, for cadmium, nickel, and mercury, the 99% level of protection should be used for slightly-moderately disturbed ecosystems. In addition, the MetOcean Dispersion Modelling Report included an assessment of available dilutions under various scenarios at the edge of the mixing zone (the results presented in Section 10.2.2) – the worst-case dilution being 280:1, which has been used to derive revised discharge standards for metals and other compounds.

Table 10-2 presents the current ANZG 2018 guideline values (including level of protection used), the proposed discharge standards for metals, cyanide, and phenol (and the current discharge standards), and the maximum concentration of these determinands measured in the treated wastewater discharged between 2013-2023 (including the additional monitoring undertaken monthly between August 2020 and December 2021). Some of the proposed discharge standards are lower than the current standards, some are similar, and some are greater; however it is considered that they are based on the most up to date information in terms of the guidelines and a conservative dilution rate within the mixing zone. Importantly, the maximum concentrations measured in the discharge are significantly lower than the proposed discharge standards.

Complying with the proposed discharge standards for the listed metals, cyanide, and phenol will ensure that adverse effects on marine organisms at and beyond the mixing zone will not occur.

Table 10-2: Proposed Discharge Standards for Metals, Cyanide, and Phenol

Determinand (see note 1)	ANZG 2018 Guideline (% level of protection in brackets) All units g/m^3	Proposed Discharge Standard Based on Back-calculation 280:1 Dilution (current discharge standard in brackets) All units g/m^3	Maximum Concentration Measured in Discharge Since 2013 All units g/m^3
Total cadmium	0.0007 (99%)	0.196 (0.275)	<0.0021
Total copper	0.0013 (95%)	0.364 (0.065)	0.005
Total nickel	0.007 (99%)	1.96 (3.5)	0.011
Total zinc	0.008 (95%)	2.24 (0.75)	0.023
Total chromium VI (see note 2)	0.0044 (95%)	1.232 (1.37)	<0.011
Total lead	0.0044 (95%)	1.232 (0.22)	<0.0021
Cyanide	0.004 (95%)	1.12 (0.2)	0.04
Phenol (see note 3)	0.4 (95%)	112 (20)	<0.01
Total inorganic mercury (see note 4)	0.0001 (99%)	0.028 (0.02)	<0.0021 (see note 5)

Note 1: The current consent does not specify 'total' concentrations as being applicable, however both the ANZECC 2000 and ANZG guidelines apply to 'total' concentrations.
Note 2: Chromium VI is used as it is the most toxic form of the metal.
Note 3: The current consent refers to 'phenols', however both the ANZECC 2000 and ANZG 2018 guidelines apply to the compound 'phenol' or hydroxybenzene. Phenols, sometimes called phenolics, are a class of chemical compounds consisting of one or more hydroxyl groups (−OH) bonded directly to an aromatic hydrocarbon group. The simplest of these compounds is phenol.
Note 4: The current consent only refers to 'mercury', however both the ANZECC 2000 and ANZG 2018 guidelines apply to the 'inorganic' form of mercury.
Note 5: No samples have had mercury greater than the detection limit of 0.0021 g/m^3.

10.3 Assessment of Public Health Effects

10.3.1 Overview

The Council engaged NIWA to undertake a QMRA to determine the potential risk of illness associated with recreational uses of the receiving water, and likely to arise from consumption of uncooked bivalve shellfish gathered from waters containing diluted, treated wastewater. A copy the QMRA report prepared by NIWA entitled 'Quantitative Microbial Risk Assessment for Nelson North Wastewater Treatment Plant' (**NIWA QMRA Report**) is included in Appendix R .

The QMRA was undertaken in recognition of the requirements of the *"Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas"* published by the Ministry for the Environment and the Ministry of Health (2003).

This section of the AEE outlines the relevant guidelines, summarises the results of the NIWA QMRA Report which addresses the outcomes for a range of scenarios, compares the QMRA results to previously defined levels of calculated risk in New Zealand guidelines, and identifies the reduction in virus concentrations through the wastewater treatment plant for the individual's illness risk to be less than the No Observed Adverse Effects Level (**NOAEL**).

This section then provides an overview of the expected virus LRV through the treatment process. Log reductions or removals refer to the reduction in virus concentrations through the treatment process – "log" being shorthand for logarithms, which in this case are to base 10 (ie. $\log_{10}$). Essentially the log number is the number of zeroes in the removal efficacy figures – for example a 1,000-fold removal is referred to as "log 3" removal.

10.3.2 QMRA guidelines

10.3.2.1 Background

It is recognised that defining an acceptable level of risk of symptomatic infection is difficult. When considering the calculated risk of infection, it is important to recognise the risk levels inherent in the existing bathing water guidelines.

10.3.2.2 Microbiological water quality guidelines for marine and freshwater recreational areas

The Ministry for the Environment originally published the Microbiological Water Quality Guidelines for Marine and Freshwater Recreational Areas (**the Guidelines**) in June 2002. An updated version of the Guidelines was completed in June 2003. The Guidelines are based on the use of faecal indicator bacteria (**FIB**) and were developed over an extensive period of consultation with regional and local councils and health authorities and present a preferred approach to monitoring recreational waters, as well as interpretation of monitoring data to describe likely health risk.

The Guidelines use a combination of qualitative risk grading of the catchment, supported by the direct measurement of appropriate faecal indicators to assess the suitability of a site for recreation. In addition, alert and action guideline levels are used for surveillance throughout the bathing season. The two components to providing a grading for an individual site are:

- The Sanitary Inspection Category (SIC), which generates a measure of the susceptibility of a water body to faecal contamination;
- Historical microbiological results, which generate a Microbiological Assessment Category (MAC) and provides a measure of the actual water quality over time.

The two criteria provide an overall Suitability for Recreation Grade (SFRG), which describes the general condition of a site at any given time, based on both risk and indicator bacteria counts. This grade provides the basis for telling people whether or not the water is suitable for recreational use from a public health perspective.

The MAC system for receiving waters comprises a four-tiered scale for the individual illness risk (IIR), with three risk cut-offs for individual illness risks associated with each tier. The risk cut-offs are different for gastrointestinal illness and respiratory illness and are presented later in this section.

However, the Guidelines make it clear that FIB should not be used for human health risk assessment under several circumstances or for specific purposes, such as:

1. "to directly determine water quality criteria for wastewater discharges because there is the potential for the relationship between indicators and pathogens to be altered by the treatment process. The relationship between indicator bacteria and disease-causing bacteria, viruses and protozoa in the discharge needs to be established";
2. "to assess the microbiological quality of water that is impacted by a nearby point source discharge of treated wastewater without first confirming that they are appropriate …… when planning the location and degree of treatment for wastewater treatment plants to recognise that the guideline values are not necessarily a guarantee of safety"; and
3. during periods of "exceptional circumstances", such as when there is a major outbreak of a potentially waterborne disease in the community, and where that community's sewage contributes microbiological contaminants to receiving waters.

To overcome the limitations imposed by inadequate relationships between indicator organisms and pathogens, risk assessments must consider the actual or likely content of pathogens discharged in the treated wastewater, and the subsequent health risk to individuals exposed to residual pathogens. QMRA is increasingly used to quantify the human health risks associated with wastewater treatment and disposal schemes. This procedure uses dose-response data for representative and specific pathogens – rather than for one or more indicator – alongside water users' exposure to potentially contaminated water. The procedure may be easily extended to include health risks arising from consumption of harvested food (including mahinga kai such as shellfish) that may be exposed to treated, diluted wastewater. These data are used in a set of calculations to estimate an individual's infection or illness risk.

For **gastrointestinal illness** (e.g. due to infection by enterovirus or norovirus), the four tiers of individual illness risk represent:

- NOAEL in most epidemiological studies – taken to be less than one illness in every 100 exposures (i.e. < 1%). This is a Microbiological Assessment Category (**MAC**) A
- A detectable increase in risk level above the threshold level for reported illness (this is the termed Lowest Observed Adverse Effects Level, **LOAEL**) – equivalent to an average probability of five illnesses in every 100 exposures (i.e. between 1% and 5%). This is a MAC B
- A substantial elevation in the probability of all adverse health outcomes for which dose-response is available – equivalent to an average probability of one illness in every 10 exposures (i.e. between 5% and 10%. This is a MAC C
- A significant risk of high levels of illness (i.e. greater than a 1 in 10 chance of illness or 10%). This is a MAC D.

For **respiratory illness** (e.g. due to infection by adenovirus), the four tiers of individual illness risk represent:

- A NOAEL (i.e. MAC A) – taken to be less than three illnesses in every 1000 exposures (i.e. < 0.3%).
- A LOAEL (MAC B) – equivalent to an average probability of 19 illnesses in every 1,000 exposures (i.e. between 0.3% and 1.9%).
- A substantial elevation in the probability of all adverse health outcomes for which dose-response is available – equivalent to an average probability of 39 illnesses in every 1,000 exposures (i.e. between 1.9% and 3.9%. This is a MAC C.
- A significant risk of high levels of illness, i.e. greater than 3.9% (about 1 in 25) chance of illness. This is a MAC D.

10.3.3 QMRA

10.3.3.1 QMRA approach

The QMRA was carried out on a range of scenarios to determine the individual illness risk associated with potential activities that could be undertaken at various locations within the receiving water. These activities included various forms of primary and secondary contact recreation and the consumption of uncooked bivalve shellfish that could potentially be collected from popular sites in the receiving environment.

Primary contact recreation involves activities such as swimming whereas secondary contact recreation covers activities such as boating, kite surfing, kayaking, and sailboarding. The QMRA uses ingestion of water as the pathway for pathogens for primary contact recreation and breathing/respiration as the pathway used for secondary contact recreation. The NIWA QMRA Report discusses whether secondary water uses should also consider risks from water ingestion because they can involve some regular immersion (i.e. primary contact). However, the NIWA QMRA Report states overseas studies have shown ingestion rates for such secondary contact activities is significantly lower than for swimming and no assessment of gastrointestinal illness risk is included for secondary water contact.

In terms of assessing risks associated with bivalve shellfish, the QMRA assumes collected bivalve shellfish are consumed in an uncooked (raw) state. The assessment is based on filter feeding bivalve shellfish (e.g. oysters, scallops, cockles, pipi, mussels). These types of shellfish can accumulate bacteria and viruses in their flesh if they are present in the waters and the QMRA applies a bioaccumulation factor to allow for this process.

The QMRA approach is shown in Figure 10-5.

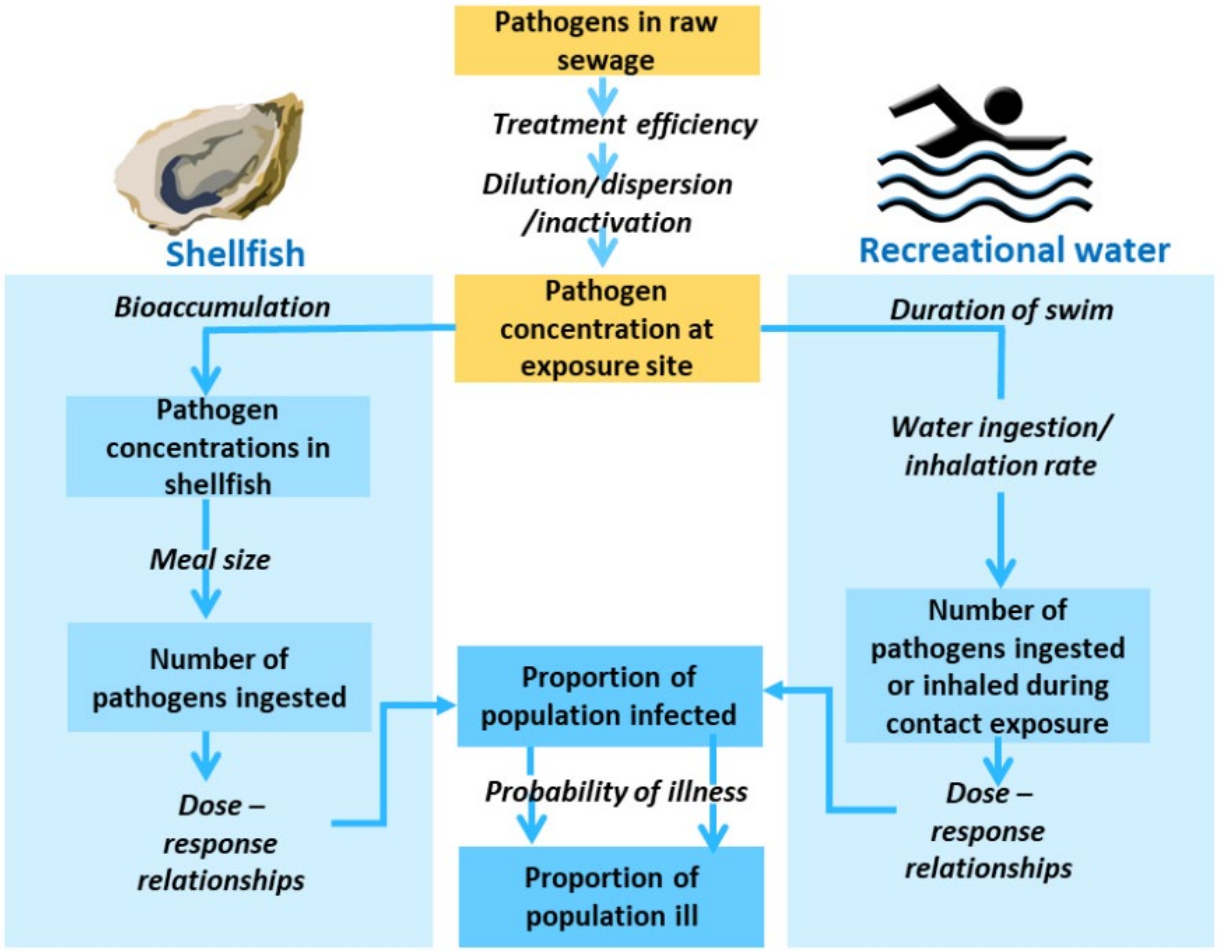

Figure 10-5: QMRA Approach

The QMRA assessed the risks associated with the current rates of discharge from the NWWTP as well as the rates forecast for 2059.

The methodology used to carry out the QMRA is detailed in the NIWA QMRA Report contained in Appendix R .

The approach used to carry out the QMRA comprised the following steps:

1. Identification of sensitive receiver locations, which for contact recreation and bivalve shellfish gathering/consumption are as follows:

   i) Fifteen sites were selected where primary and secondary contact recreation are popular or could occur , as shown in Figure 10-6 and Figure 10-7. This included three sites in and on the edge of the mixing zone as this area is traversed by kayaks and other water users; and

   ii) Eight sites were selected[40] where filter feeding bivalve shellfish targeted by the public for harvesting and consumption have been shown to occur or are presumed to occur. As discussed in Section 8.6.5, SLR undertook field surveys to determine whether there were bivalve shellfish at the contact recreation sites. This work confirmed the presence of potentially harvestable shellfish at six of these sites (Cable Bay, The Cut, Akersten Street, Seafarers Memorial, Magazine Point, and Tahunanui Beach). In addition, it was assumed that offshore bivalve shellfish beds could be present (or develop over time) at the 'Tasman Bay' and 'Tasman Bay 2' sites and the risks at these two sites were assessed. The bivalve shellfish sites are shown in Figure 10-8.

[40] The NIWA QMRA report contained in Appendix R includes a bivalve shellfish risk assessment for all 15 contact recreation sites, however that work was done prior to the SLR field work which confirmed which sites had bivalve shellfish present. Only the QMRA results from the eight sites where bivalve shellfish are known (or in the case of the two Tasman Bay sites presumed) to occur or likely to occur are therefore presented in this Section.

2. A decision-making process that considered multiple factors when identifying and selecting the pathogens of concern, based on water-related diseases that may arise (i.e. gastrointestinal illness and respiratory illness) and have been commonly used to define water quality standards. The pathogens chosen for contact recreation were:
    - Adenovirus (linked with respiratory diseases)
    - Enteroviruses (linked with gastroenteritis)
    - Norovirus (linked with gastroenteritis)

3. Assessment of the level of exposure of water users to likely pathogen concentrations, determined separately using hydrodynamic modelling carried out by MetOcean and provided to NIWA as input to the QMRA. Four scenarios were assessed: 1) current discharge rates under El Niño conditions; 2) current discharge rates under La Niña conditions; 3) future (2059) discharge rates under El Niño conditions; and 4) future (2059) discharge rates under La Niña conditions.

4. Assessment of exposure to the pathogens, based estimates of pathogen concentrations achieved in final effluent following treatment to a range of theoretical virus LRV for the NWWTP (i.e. 1 log to 6 log reduction).

5. Characterisation of the pathogen's dose-response, based on published studies and data from viral illness outbreaks and infection.

6. Calculate the health risks, using Monte Carlo statistical modelling to reflect the likely variations in a range of assumptions that define the treated wastewater quality (i.e. log reduction achieved in the treatment process), an individual's exposure and an individual's risk of infection and illness. A random sample is taken from each distribution to calculate an individual's risk of illness. The sampling procedure is repeated many thousands of times to simulate likely health outcomes for a large population exposed to water that may, on occasion, be contaminated.

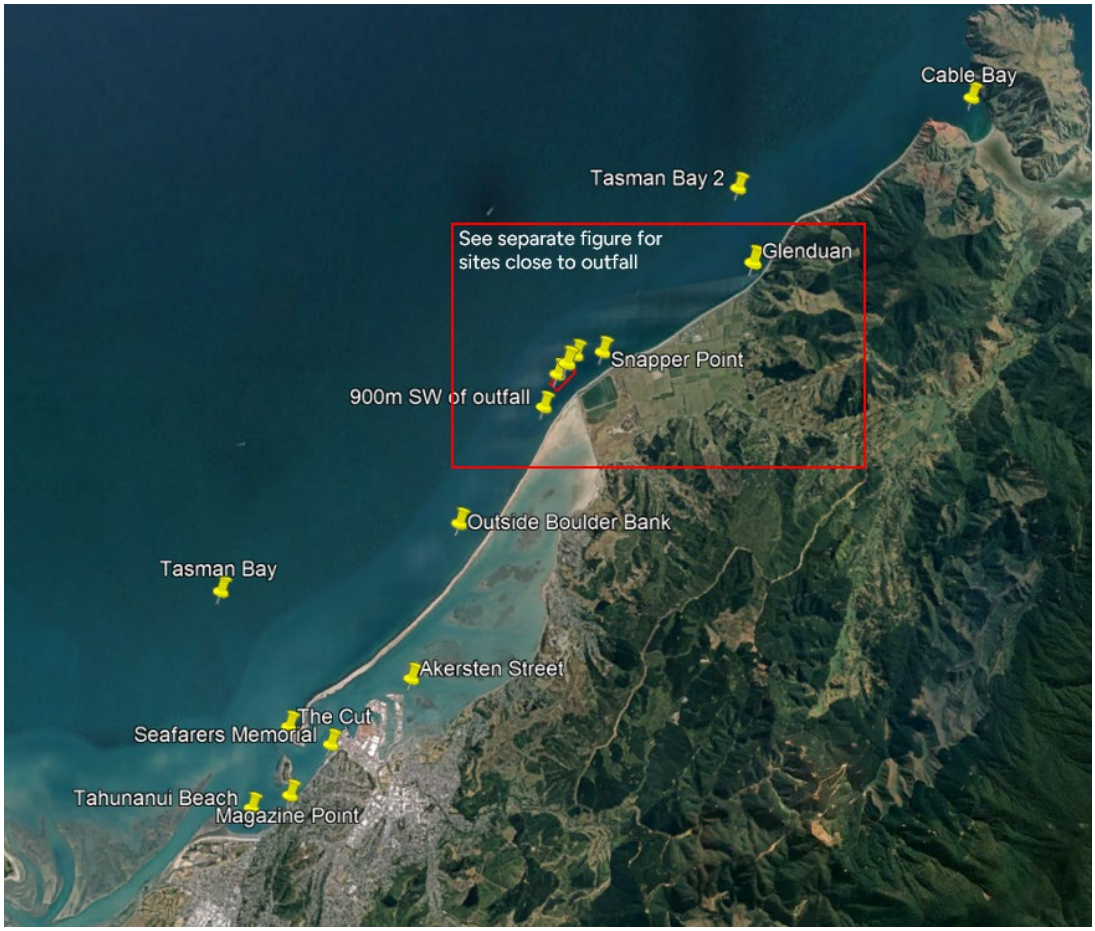

Figure 10-6: QMRA Assessment Sites for Primary and Secondary Contact Recreation

Figure 10-7: Selected QMRA Assessment Sites near the Outfall for Primary and Secondary Contact Recreation

Figure 10-8: QMRA Assessment Sites for Bivalve Shellfish Gathering and Consumption

10.3.3.2 Individual illness risk

A summary of the results of the QMRA in terms of the average (or mean) individual illness risks (IIR) is presented in Table 10-3 and Table 10-4 for the sites identified for primary and secondary contact recreational activities respectively and in Table 10-5 for consumption of uncooked of bivalve shellfish.

With the exception of the Cable Bay site, the highest average IIRs calculated were for the future discharge (2059) scenario under La Nina conditions. For Cable Bay the highest average IIRs were calculated for the future discharge scenario under El Nino conditions. For primary contact recreation assessment norovirus (in disaggregated, non-clumping form) resulted in greater average risks than enterovirus and norovirus (aggregated). The average IIRs[41] presented in Tables 10-3 to 10-5 are the highest average risks calculated for any of the scenarios assessed.

Cells within each of the tables have been colour coded to provide a visual comparison of risk levels. As outlined in Section 10.3.2.2, the MAC system in the Guidelines comprises a four-tiered scale with different risk cut-offs for the mean individual illness (respiratory and intestinal) risk and these are shown in the tables as follows: MAC A (i.e. the IIR is below the NOAEL) is shaded green, MAC B (i.e. the IIR is below the LOAEL) is shaded light orange, MAC C is shaded medium orange, and MAC D is shaded dark orange.

Table 10-3: Average Individual Illness Risk (%) for Primary Contact Recreation Activities (Swimming)

Location	Log (Percent) reduction in Virus Concentration in NWWTP					
	1 (90%)	2 (99%)	3 (99.9%)	4 (99.99%)	5 (99.999%)	6 (99.9999%)
Outfall	0.97	0.11	0.01	<0.01	<0.01	<0.01
NE edge of mixing zone	0.47	0.06	<0.01	<0.01	<0.01	<0.01
SW edge of mixing zone	0.42	0.05	<0.01	<0.01	<0.01	<0.01
Snapper Point	0.22	0.02	<0.01	<0.01	<0.01	<0.01
Glenduan	0.29	0.03	<0.01	<0.01	<0.01	<0.01
Cable Bay	0.09	0.01	<0.01	<0.01	<0.01	<0.01
900 m SW of outfall	0.20	0.02	<0.01	<0.01	<0.01	<0.01
Outside Boulder Bank	0.08	<0.01	<0.01	<0.01	<0.01	<0.01
Tasman Bay	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Tasman Bay 2	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
The Cut	0.06	<0.01	<0.01	<0.01	<0.01	<0.01
Akersten Street	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Seafarers Memorial	0.15	0.02	<0.01	<0.01	<0.01	<0.01
Magazine Point	0.18	0.02	<0.01	<0.01	<0.01	<0.01
Tahunanui Beach	0.05	<0.01	<0.01	<0.01	<0.01	<0.01

[41] NIWA also presents the 95%ile IIRs in its report contained in Appendix R, which provides an indication of the calculated range of risks.

Table 10-4: Average Individual Illness Risk (%) for Secondary Contact Recreation Activities (Inhalation)

Location	Log (Percent) reduction in Virus Concentration in NWWTP					
	1 (90%)	2 (99%)	3 (99.9%)	4 (99.99%)	5 (99.999%)	6 (99.9999%)
Outfall	0.14	0.02	<0.01	<0.01	<0.01	<0.01
NE edge of mixing zone	0.07	<0.01	<0.01	<0.01	<0.01	<0.01
SW edge of mixing zone	0.06	<0.01	<0.01	<0.01	<0.01	<0.01
Snapper Point	0.04	<0.01	<0.01	<0.01	<0.01	<0.01
Glenduan	0.05	<0.01	<0.01	<0.01	<0.01	<0.01
Cable Bay	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
900 m SW of outfall	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Outside Boulder Bank	0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Tasman Bay	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Tasman Bay 2	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
The Cut	0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Akersten Street	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Seafarers Memorial	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Magazine Point	0.03	<0.01	<0.01	<0.01	<0.01	<0.01
Tahunanui Beach	0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 10-5: Average Individual Illness Risk (%) Associated with the Consumption of Uncooked Bivalve Shellfish

Location	Log (Percent) reduction in Virus Concentration in NWWTP					
	1 (90%)	2 (99%)	3 (99.9%)	4 (99.99%)	5 (99.999%)	6 (99.9999%)
Cable Bay	4.42	0.83	0.13	<0.01	<0.01	<0.01
Tasman Bay	1.43	0.25	0.04	<0.01	<0.01	<0.01
Tasman Bay 2	3.99	0.74	0.11	0.01	<0.01	<0.01
The Cut	4.04	0.74	0.10	0.01	<0.01	<0.01
Akersten Street	0.83	0.12	0.01	<0.01	<0.01	<0.01
Seafarers Memorial	6.29	1.32	0.21	0.03	<0.01	<0.01
Magazine Point	6.85	1.54	0.25	0.03	<0.01	<0.01
Tahunanui Beach	3.64	0.67	0.10	<0.01	<0.01	<0.01

The results of the QMRA illustrate that:

- With a one (1) log reduction in virus concentration in the NWWTP, the average IIR associated with primary and secondary contact recreation activities is reduced to below the NOAEL at all the sites assessed (including at the discharge and at the edge of the mixing zone).
- For the consumption of uncooked bivalve shellfish, the average IIR is reduced to below a LOAEL (i.e. <5%) with a two (2) log reduction in human norovirus concentration in the NWWTP at all of the bivalve shellfish locations assessed. A two (2) log reduction in human norovirus concentration in the WWTP results in an average IIR to below the NOAEL (<1%) at all the bivalve shellfish sites except Seafarers Memorial and Magazine Point, and a human norovirus LRV somewhere between 2 and 3 through the NWWTP is needed to reduce the average IIR at these two sites to below the NOAEL (<1%).

10.3.4 Expected virus log reduction value at the NWWTP

The Council has commissioned Stantec to assess the expected virus LRV at the NWWTP and it prepared a Technical Memorandum entitled 'Expected Virus Log Removal at NWWTP' (**Stantec LRV Assessment**), a copy of which is included in Appendix S . The following section summarises the Stantec LRV Assessment.

The key treatment processes that reduce viruses at the NWWTP are the facultative pond, maturation pond, and wetland system, with the wetland essentially operating as an extension of the maturation pond (ie three ponds in series). The pre-treatment system (clarifier and trickling filter) could provide further virus reduction; however, it is only operated intermittently so was not considered in the Stantec LRV Assessment.

The primary mechanism for virus reduction in pond-based systems is attributed to sun-mediated mechanisms as well as other mechanisms such as grazing by protozoans and invertebrates, and settlement through virus adsorption onto solids. Factors that influence virus reduction in pond-based systems include greater sunlight exposure (solar irradiation intensity and day light hours), warmer wastewater temperature, longer hydraulic retention time, shallower pond depth, the number of ponds in series, minimised hydraulic short circuiting, and operating ponds to manage pond organic loading, wastewater turbidity, and pond sludge levels.

Globally, various researchers have reviewed the observed virus reduction through pond-based systems, with some providing typical virus LRV and others deriving models to predict virus LRV based on the observed performance of a variety of pond configurations.

Historic variations in NWWTP daily inflows and ambient air temperatures were reviewed from 2012 to 2022 to understand their seasonal variability and to identify appropriate values to use to provide a conservative of typical virus LRV through the pond system.

The Stantec LRV Assessment considered four scenarios:

- Base (2022) and future (2059) "drier" summer flows. The normal operating water levels were used to estimate 'summer' hydraulic capacity.
- Base (2022) and future (2059) typical and extreme "wet" winter flows.
- Base (2022) and future (2059) winter and summer ambient air temperatures, assuming a nominal one degree increase in temperature due to climate change in both winter and summer.
- No accumulation and 20% accumulation of sludge across the pond-system, based on normal operating water depths.

A lower LRV is predicted for greater inflows, lower air temperatures, and greater sludge accumulation. For current (2022) flows with and without 20% sludge accumulation, the expected virus 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. For future (2059) flows, the expected virus LRV range reduces to between 2.1 and 2.3 in winter and between 2.7 and 3.0 in summer, with lower values being with 20% sludge accumulation or for extreme wet winter flows.

The predicted virus LRV presented above is based on adopted inflows and ambient air temperatures and assumes that the pond system continues to be well managed and operated optimally, including utilising plant flow buffering capacity and actively managing pond sludge levels. The recent pond sludge survey at NWWTP (March 2022) showed a high apparent sludge volume in both the facultative pond (32%) and maturation pond (36%); the wetlands were not surveyed.

10.3.5 Summary of effects on public health and upgrade of the NWWTP

The level of risk to public health within the receiving waters of Tasman Bay that the discharge of treated wastewater from the NWWTP poses depends on:

- the concentration of pathogens (particularly human norovirus) entering the treatment plant;
- the level of treatment the wastewater receives before being discharged, in particular the LRV for human norovirus;
- the degree of dispersion and dilution that occurs within the receiving waters; and
- what activities occur within the receiving waters and their locations.

The QMRA assesses risks associated with primary and secondary contact recreation as being very low, with the average IIR <1% at all sites assessed with a virus LRV of 2. The greatest public health risks associated with the discharge from the NWWTP relate to the consumption of uncooked bivalve shellfish due to the presence of human norovirus in the discharge. With a human norovirus LRV of 2 the average IIR associated with the consumption of uncooked bivalve shellfish are >1% (the NOAEL), but <5% (the LOAEL) at Magazine Point and Seafarers Memorial. A human norovirus LRV somewhere between 2 and 3 is needed at the NWWTP to reduce the average IIR at these two sites to <1% (the NOAEL).

Under current discharge rates it is *expected* to be in the order of 2.3-2.4 (during winter); by 2059 the virus LRV is predicted to reduce to between 2.1-2.3 (during winter). These 'expected' and 'predicted' LRVs are for 'viruses' and may not accurately reflect the NWWTP's ability to reduce human norovirus, being the particular pathogen of concern for uncooked bivalve shellfish consumption.

The Council has commenced monitoring for human norovirus at the NWWTP to determine its LRV for this pathogen (including for future predicted flows to the NWWTP). The results of this monitoring will be used to determine whether the NWWTP needs to be upgraded to improve reduction in human norovirus concentrations – this decision will be based on a review and updating of the QMRA.

The process the Council proposes follow is to:

- Collection of representative samples of influent wastewater and final treated wastewater once every two weeks commenced on 5 September 2023 and will continue for a period of 12 months. The samples are analysed for human norovirus (GI, GII) concentrations (genome copies/L) by reverse transcription real-time quantitative polymerase chain reaction (RTqPCR). In addition, the Council had access to samples collected and stored (frozen) from the WWTP by the Institute of Environmental Science and Research (ESR) as part of the Covid-19 wastewater monitoring programme and eight influent samples[42] were analysed. These additional samples are relevant because of the hydraulic retention time through the WWTP, meaning the first treated wastewater sample can be compared to the frozen sample collected on 19 July, being 41 days earlier to get a better indication of the LRV through the WWTP.
- Engage a suitably qualified and experienced person to review the results of the monitoring and calculate the human norovirus LRV of the NWWTP under current flows to the NWWTP and predicted LRV under future flows.
- Engage a suitably qualified and experienced person to review and update the QMRA using the results of the monitoring. The QMRA will assess the uncooked shellfish consumption risks for human norovirus at the sites which support bivalve shellfish beds (Cable Bay, The Cut, Akersten Street, Seafarers Memorial, Magazine Point, Tahunanui Beach, Tasman Bay, and Tasman Bay 2 sites).
- A report will be prepared by a suitably qualified and experienced person, which presents the results of monitoring and assesses whether the calculated human norovirus LRV for NWWTP is sufficient to ensure the mean IIR for uncooked bivalve shellfish consumption at the sites beyond the mixing zone that support shellfish beds are <1%. If the calculated human norovirus LRV for NWWTP is not sufficient, the report will specify the additional reduction of human norovirus needed to achieve this risk at these sites or any other sites identified as being used for bivalve shellfish gathering. The Council expects this report will be ready by the time a hearing is held.
- If the report concludes that additional treatment for human norovirus is needed at the NWWTP to reduce the mean IIR for uncooked bivalve shellfish consumption at the sites outside the mixing zone that support bivalve shellfish beds assessed in the QMRA to <1% then the Council will, no later than 31 December 2034, upgrade the NWWTP to incorporate additional treatment to ensure the required human norovirus LRV is able to be achieved. The Council will aim to upgrade the NWWTP ahead of this date (should an upgrade be needed), however the date specified provides for some contingency should there be unforeseen circumstances which result in delays.
- In the event that the NWWTP is required to be upgraded, the Council proposed to submit a report prepared by a suitably qualified and experienced person which sets out a proposed compliance monitoring methodology to ensure the upgraded NWWTP achieves the required human norovirus LRV. This report would be provided to the Consent Authority's Manager Consents and Compliance for certification. The Council would implement the certified compliance monitoring following commissioning of the upgrade to the NWWTP.
- The Council would also provide progress updates to the Consent Authority (in the Annual Report) on the upgrade of the NWWTP (if an upgrade is required).

The Council considers the above approach is a prudent and responsible one given that it is not certain that the risks of the current (and future) discharge from the NWWTP are unacceptable or not. Any upgrade will involve a significant investment and the Council needs to ensure such expenditure is shown to be necessary before committing it for an upgrade.

The approach outlined above, including potentially upgrading the WWTP to reduce human norovirus concentrations, will ensure the actual and potential effects of the discharge on public health will be very low and acceptable.

[42] These samples were fortnightly samples collected between 2 August 2023 and 13 September 2023.

11 Assessment of Effects of the Existing Pipeline and Outfall Diffuser Structure

11.1 Introduction

As outlined within Section 4.4, the Council may need to replace the outfall diffuser structure within the next 35 years. so that the treated wastewater is better mixed within the receiving waters of Tasman Bay. The existing diffuser will be left on the seabed. An assessment of effects from these activities is set out below.

11.2 Pipeline and Outfall Diffuser Structure

Details of the existing pipeline and outfall diffuser structure are presented in Section 3.2.3. The existing pipeline is a 1,200 mm diameter concrete pipe which is buried beneath the seabed and progressively becomes partially, then fully, exposed along its length. The final ~20 m of the pipeline contains nine outlet holes (300 x 300 mm) spaced ~2 m along the pipe with alternating opening angles along the top of the pipe.

Section 4.4.1 provides details of the details of a potential replacement outfall diffuser structure, but as a summary, the concept design consists of two 100 m long polyethylene pipes (630 mm in diameter) that extend from the start of the existing diffuser at an angle of 30 degrees. The pipes would be placed on ballast weights with footings to prevent movement of the pipes.

The construction methodology is outlined in detail within Section 4.4.1 and not repeated here, save to say the area of seabed disturbance may be in the order of ~350-400 m^2.

11.3 Positive Effects of the Presence of the Existing Outfall Diffuser Structure

The Council proposes to leave the existing outfall diffuser structure on the seabed following in the event that it is replaced during the term of the new consents. As outlined within Section 10.2.3.3, the existing outfall diffuser structure has effectively created an anthropogenic reef structure for a variety of taxa in an otherwise sandy habitat. This creates a positive effect as its presence provides a substrate for both mobile and encrusting taxa which, as discussed in Section 10.2.3.3, show no indication of adverse ecological effects from the discharge itself.

The Council considers the benefits the existing outfall diffuser structure provides outweigh the adverse effects associated with its removal.

11.4 Effects of Maintenance of the Structure

The outfall diffuser structure will require regular maintenance in order to remove any significant marine fouling at the ports to enable the maximisation of dilution of the treated wastewater.

The outfall diffuser structure will be regularly inspected to ensure its outlet ports are not being obstructed by marine fouling. Any maintenance needed will be undertaken to ensure the ports function as intended to ensure adequate dispersal of the treated wastewater. The use of duck-bill diffuser ports, if used on any replacement diffuser structure, will minimise the need for maintenance.

If maintenance of the outfall diffuser structure is required, it will involve manually removing material from the fouled diffuser ports. This removal process, if necessary, will result in material depositing on the seabed surrounding the diffuser which will result in temporary disturbance. These effects will be short term in nature and considered to be less than minor.

11.5 Effects of Replacing the Structure

The replacement of the outfall diffuser structure will result in construction related effects, including the introduction of suspended sediment and its associated effects on pelagic species, and direct effects on benthic biota, each of which are described below.

Construction of a replacement outfall diffuser structure will result in disturbance of the benthic environment in the immediate vicinity of the new structure. The exact area and volume of seabed disturbance associated with this construction will ultimately depend on the final construction methodology; however, based on the OCEL concept design the disturbance is likely to be around ~350-400 m^2- for the purposes of this assessment (and the proposed conditions of consent) it has been assumed the area of seabed disturbance could be up to 500 m^2. The construction activity will generate minor sediment plumes – these will likely be similar in nature to that suspended naturally be coastal processes, such as coastal storms. The

suspended sediment will dissipate with the aid of currents and tidal action and ultimately incorporated into the background sediment within a relatively short distance.

This temporary suspended sediment will likely cause pelagic species to avoid the area during construction activities, however, it is expected that they will return to the area once the sediment plumes have dissipated.

Noise associated with the construction will be minimal, mainly originating from the vessels involved in the works and the cutting of the existing pipe.

Construction related activities will result in mortality of some individuals in the immediate vicinity of the new diffuser structure. As outlined within Section 10.2.3.3 the sediment fauna was similar between sites near the outfall structure and those sites surveyed furthest from it. Therefore, these effects will be on taxa that are common and widespread in the surrounding environment which will likely recolonise the area surrounding the new structure(s) once construction is completed.

The wider Tasman Bay area provides extensive alternative habitat of a similar quality and nature and therefore the potential for the outfall upgrade to displace fish or directly affect benthic habitat is considered to be less than minor.

11.6 Mitigation Measures

It is considered that the effects of the presence of the pipeline and existing outfall diffuser structure and the effects of replacing the existing outfall diffuser structure can be mitigated through consent conditions:

- Limiting the use and occupation of the CMA to the pipeline and the outfall diffuser structure and any temporary structures associated the with the repair and maintenance of the structure(s);
- Maintain the structure(s) in a state that is consistent with its purpose, that being the conveyance of treated wastewater and maximisation of dilution at the outfall; and
- Require a suitably qualified and experience coastal engineer to inspect the pipeline and outfall diffuser structure at least every five years and, within one month of this inspection, prepare a report to demonstrate that the pipeline and outfall diffuser structure is/are in sound repair and the diffuser ports are clear of any significant marine growths.

12 Assessment of Effects of Seepage to Groundwater from Treatment Facilities

12.1 Background

Seepage of wastewater to ground via the base of the treatment ponds and the wetlands at the NWWTP may occur and, as a result, may affect groundwater, freshwater, and/or coastal water quality. This also includes discharges of leachate that may occur from the geotextile bags that are stored within the buffer pond during and following desludging. A discharge permit is sought to authorise seepage from the base of the treatment ponds, the wetlands, and the buffer pond.

The Council contracted Stantec to prepare three reports related to the effects of seepage from the NWWTP:

- The Stantec Groundwater Report contained in Appendix H which assesses seepage quantities and flow paths;
- The Stantec Surface Water Report contained in Appendix I, which assesses water quality within adjacent streams; and
- The Stantec Ecological Report contained in Appendix J which assesses the ecological impacts within the terrestrial, freshwater, and estuarine receiving environments .

12.2 Description of Receiving Environment

The receiving environment is set by the soils, topography and general location details of the existing NWWTP site. Details of these features are given in the respective parts of Section 8 and in the Stantec Ecological Report (Appendix J). In particular the NWWTP is located close to Nelson Haven, Hillwood Stream, Hillwood Stream North, and Tasman Bay and therefore any seepage from the base of the NWWTP has the potential to migrate to these water bodies through the movement of groundwater.

Some of the key features that are of particular importance to this assessment are summarised below:

- Topographically the area where the ponds are situated is generally flat, with some slight undulations.
- The soils in general are predominantly poorly drained with low hydraulic conductivity.
- The NWWTP site and surrounds are highly modified, however, important ecological values exist within the Wakapuaka Sandflats and within the Nelson Haven

12.3 Effects of Seepage on Groundwater and Surface Water

12.3.1 Groundwater

The Stantec Groundwater Report contained in Appendix H assesses the actual and potential effects of the seepage from the ponds and the buffer pond (referred to in the Stantec Groundwater Report as the sludge storage facility (SSF)).

The Stantec Groundwater Report has used all available information, including groundwater level and faecal coliforms monitoring (completed as part of the currently operating consent), and more recent automated monitoring and additional groundwater sampling. The groundwater study area and location of groundwater monitoring bores is shown in Figure 12-1.

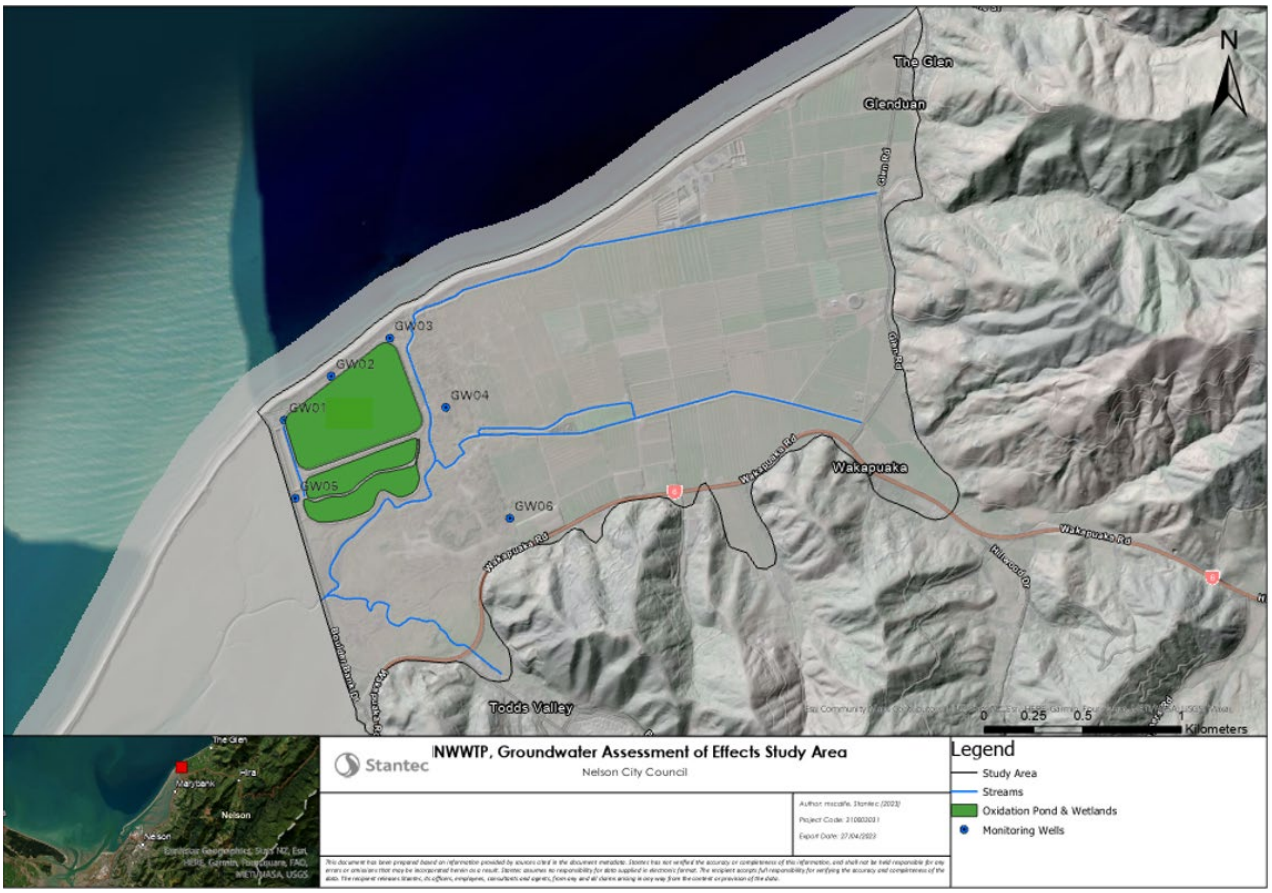

Figure 12-1: Groundwater study area and location of groundwater monitoring bores.

Monitoring generally indicates groundwater levels were less than 1 m below the ground level. Groundwater sampling indicates that of the six NWWTP monitoring bores, two had significantly poorer water quality. These bores had geometric median concertation of total nitrogen, total ammoniacal nitrogen, total phosphorus, and dissolved reactive phosphorus three to ten times higher than the other bores.

Numerical groundwater flow modelling has been used to assess groundwater levels, seepage from the NWWTP, and inputs to nearby streams, the Haven, and Tasman Bay. Flow modelling indicates the ponds are connected to the groundwater and have caused significant mounding. While mounding was significant (>1 m) it was highly localised, bound between the Hillwood Stream North and Hillwood Stream, the Nelson Haven, and Tasman Bay with strong hydraulic gradients between the ponds and these features.

Particle tracking modelling has been used by Stantec to assess flow paths and contaminant travel time to nearby surface water features.

In summary, the Stantec Groundwater Report states:

- Contaminants from the NWWTP are entering the groundwater.
- The hydraulic conductivity of the material underlying the NWWTP is low.
- The hydraulic conductivity of the sludge on the bottom of the ponds is low, similar to the underlying soils.
- Expected outflow volumes from the ponds to groundwater are less than 45 m³/day, with the vast majority being from the ponds and a small amount from the wetlands.
- Expected flows from NWWTP to:
  - the Hillwood Stream and Hillwood Stream North are less than 5 m³/day.
  - the Nelson Haven are less than 15 m³/day.
  - the Tasman Bay are less than 25 m³/day.
- Contaminants from the ponds are very slow moving and likely to take hundreds of years to reach the Hillwood Stream North, Nelson Haven, and Tasman Bay.
- Contaminants may have reached small sections of the Hillwood Stream and are probably at similar concentrations as monitored in GW01 and GW03.
- Sludge formed on pond bases is not reducing treated wastewater infiltration. Desludging activities will not increase seepage rates or environmental effects.

Overall, monitoring and modelling indicates seepage of wastewater from NWWTP is having a relatively insignificant effect on the aquifer due to the slow-moving nature of contaminants and localised extent of mounding. The modelled seepage rate (less than 45 m³/day) represents ~0.5% of the average daily flows to the NWWTP.

Modelling indicates sea level rise would lower the hydraulic gradients around the ponds reducing the groundwater infiltration, velocity, and subsequent effects.

While the assessment indicates the seepage from the NWWTP is resulting in relatively insignificant effects, uncertainties remain. Stantec recommends:

- Telemetered groundwater level monitoring is continued at all bores and collected annually.
- Groundwater quality sampling and analyses for the same determinands as recent testing continues for all bores annually.

The Stantec Groundwater Report recommends the results of continued monitoring should be compiled annually and assessed for any ongoing trends serving to validate model findings. Should water quality be shown to degrade at any bore over a 5-year period, an assessment as to the reasons for the degradation should be undertaken in line with industry best practice.

Prolonged drawdown of the aquifer may result in the inland migration of the seawater/freshwater interface and increased release of contaminants from the NWWTP. The Stantec Groundwater Report recommends that ongoing monitoring be completed for a minimum of a two year period and the monitoring programme reviewed based on the data received.

12.3.2 Surface water

The Stantec Surface Water Report contained in Appendix I summarises existing water quality within the freshwater receiving environment, utilising data collected between November 2020 and December 2021 from sampling sites around the NWWTP site. The sampling sites are shown in Figure 12-2. The Stantec Surface Water Report also utilised water quality data from the LAWA monitoring site on the Hillwood Stream located further to the east of the NWWTP as shown in Figure 12-2.

The Stantec Surface Water Report notes that the modelling results presented in the Stantec Groundwater Report indicate that there is minimal seepage occurring between the NWWTP and the freshwater receiving environment. The Stantec Surface Water Report concludes that it is likely that the water quality of the freshwater receiving environments is primarily being influenced by the land use activities occurring upstream, which include a large dairy farm to the east of the NWWTP.

In summary, the Stantec Surface Water Report concludes that:

- Faecal contamination (indicated by *E.coli)* has historically been an issue for the Hillwood Stream, with the overall trend described as 'very likely degrading'. Results obtained as part of this study indicated that for the majority of the 9-month monitoring period, *E.coli* counts at all sampling locations exceeded the NPS-FM National Bottom Line.
- Total nitrogen concentrations typically exceeded the ANZG 2018 80%ile species protection guideline value[43] and peaked in July 2021 which coincided with a large rainfall event. This large rainfall event likely produced significant runoff from the surrounding dairy farm which would have spiked overall nitrogen concentrations within Hillwood Stream. The same trend was also observed in total Kjeldahl nitrogen (sum of organic nitrogen and total ammoniacal nitrogen) concentrations, which also spiked / peaked in July 2021.
- TSS concentrations and water temperatures within both the Hillwood Stream and Hillwood Stream North peaked in the summer months, whilst the dissolved oxygen concentrations dropped during these same months, indicating a more anoxic environment which can be harmful to ecological receptors.
- Seasonal variations were also observed in total ammoniacal nitrogen concentrations, which peaked during January 2021 (summer). Dissolved reactive phosphorus concentrations within both the Hillwood Stream and Hillwood Stream North also peaked during the summer months. These results indicated that there could have been an algal bloom occurring during this time, as a combination of elevated nitrogen and phosphorus observed. These increased levels are primarily related to other surrounding land uses. Excessive algal growth in waterbodies can be harmful to the ecology of a stream as this can reduce overall oxygen concentrations which is a stressor for the streams' inhabitants. Historical dissolved reactive phosphorus concentrations for the Hillwood Stream are currently sitting within the "C" attribute band (as outlined by the NPS-FM) but the overall trend is described as 'very likely degrading'. Whilst historical total ammoniacal nitrogen concentrations currently sit within the "B" attribute band (as outlined by the NPS-FM), but the overall trend is described as 'very likely degrading'.

[43] Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2018, 80%ile species protection (default guideline values for physical and chemical stressor) - cool dry low elevation REC.

Figure 12-2: Location of surface water sampling sites.

An assessment of effects was undertaken based on the information available regarding existing water quality within the freshwater receiving environment (including monitoring of discharges under the current consent, and background water quality) and likely changes that may occur as a result of continued discharges under the proposed new consent. The assessment found that the following effects could be expected to occur only at a **low** or **very low** level:

- Change in suitability of physical habitat
- Change in availability of food for aquatic life
- Toxic effects on aquatic life
- Changes to physical condition of water (nutrient-related, e.g. toxic algal bloom)
- Changes to physical condition of water (physico-chemical)

The last two effects in the list above would potentially occur at a low level (i.e. to a slightly greater extent) at locations closest to the NWWTP, such as in the vicinity of SW01 WW monitoring site, and between that site and Nelson Haven. This is namely due to a higher magnitude of effect, based on historic issues with contaminants such as TSS and nutrients downstream of the discharge point.

The assessment found that none of the identified potential effects would occur at moderate or higher levels.

In general, the Hillwood Stream catchment is highly modified due to historic activities not related to the NWWTP and, as such, has limited water quality values (i.e. historically poor water quality, and highly disturbed aquatic habitats including riparian margins). This has contributed to a lower level of effect potentially arising from the proposed discharges.

The Stantec Surface Water Report makes a number of recommendations in terms of future monitoring – these are outlined in Section 9 of that report and are not repeated here, however they have been incorporated in the proffered conditions.

12.3.3 Ecological effects

The Stantec Ecological Report describes the ecological values of the area surrounding the NWWTP. It notes the NWWTP is situated within a highly modified environment. The site would originally have been part of the transitional zone between the Nelson Haven mudflats and surrounding salt marshes. The establishment of Boulder Bank Drive and associated flood gates are considered to be the main driver for the habitat changes within the Wakapuaka sandflats area and the lower Hillwood Stream and Todd Valley Stream. Vegetation within the Wakapuaka sandflats is slowly losing its saline herbaceous vegetation which is being replaced with native shrubs and exotic/invasive grasses. The Stantec Ecological Report notes the conclusions of the Stantec Surface Water Report that water quality within the Hillwood Stream is considered degraded due to upstream land use including farming. However, regardless of the degraded water quality, aquatic habitat and ongoing changes within the flora community the Wakapuaka sandflats provide habitat for a wide range of fauna including threatened and at risk avian and fish species. The Nelson Haven estuary and Boulder Bank reserve provides a multitude of ecological and social-economic services and is valuable habitat for a wide range for fauna, including substantial numbers of threatened and at-risk species of fish, avians and reptiles. In general, the habitats and flora and fauna species adjacent to the NWWTP can be considered to be of high ecological value.

The Stantec Ecological Report notes the conclusions of the Stantec Groundwater Report that seepage from the NWWTP is minimal. Compared to the mean annual flow within the Hillwood Stream and frequent tidal flushing of the Nelson Haven, any seepage from the NWWTP is expected to have a negligible to very low level of adverse effect on water quality and soil nutrient concentrations within the surrounding environments. The Stantec Ecological Report states that this consequently limits the potential for indirect effects on habitat integrity and flora and fauna species, including fish, avian, reptile and plant populations and communities. Considering the very low seepage rates the overall level of effect of the NWWTP discharges to land on the Boulder Bank, Wakapuaka sandflats, Hillwood Stream, and Nelson Haven are considered to be very low.

The Stantec Ecological Report notes that the ponds and wetlands that form part of the NWWTP do not form part of the ‘receiving environment’. Despite this, these waterbodies are openly accessible to avifauna and have been shown to provide suitable permanent or intermittent habitat for several threatened and at-risk species. Furthermore, a recent study has shown the dependency of the local New Zealand scaup on the NWWTP waterbodies for providing suitable forging and breeding habitat. The presence of the NWWTP ponds and wetlands can be considered a positive effect (net gain) for several avifauna species.

13 Assessment of Effects of Discharges to Air

13.1 Background to the existing consents

The previous application in 2004 noted that the NWWTP had been the subject of a number of odour complaints during periods when the ponds 'crashed'. These occurred when high BOD loadings or other factors caused the pond biological processes to fail. The application proposed construction of pretreatment facilities at the NWWTP to provide the Council with a better ability to control the treatment processes.

The upgrades were completed in 2008, however, the Council received further odour complaints and, following further investigations, the Council concluded that a significant amount of sludge had accumulated in the facultative pond which was affecting its treatment capacity making it anaerobic from time to time. The pond had not been desludged since its construction. The Council was granted a suite of consents (RM1355229/A/B) in December 2013 to enable the pond to be desludged. The desludging of the facultative pond occurred between May and September 2014.

The desludging consents expired on 1 January 2022, however, the Council will need to desludge the ponds and/or wetlands over the next 35 years and this application therefore includes the activity of discharging contaminants to air during desludging activities.

Further, the Council has, since the granting of the existing consents, installed a diesel-powered back-up electricity generator on the NWWTP site and the regular testing of this generator also requires a discharge permit.

13.2 Greenhouse Gases

In terms of discharges to air, the existing consents dealt with the potential odourous effects of the gases that are emitted during the wastewater treatment process. Some of the gases generated and emitted are also considered to be 'greenhouse gases' (**GHGs**) and, up until 30 November 2022, consent authorities were restricted from considering the effects that greenhouse gas discharges have on climate change when considering resource consents (by the then section 104E). However, the RMA was amended on 30 Nov 2022 which included repealing section 104E – these changes now mean that if a consent authority chooses to do so, it can consider the effects of GHGs under section 104(1)(c) of the RMA (other matters) if it considers relevant and reasonably necessary to determine the consent.

It should be noted that there is very little guidance provided by the Government on how GHGs should be considered in the context of consent applications for activities that include emissions of such gases. There is no guidance given within the NRMP (because it was drafted at a time when consideration of GHGs was not allowed under the RMA). Despite this, the Council has undertaken an assessment of the current GHG emissions from the NWWTP.

13.3 Technical Assessment

The Council has engaged PDP to undertake an assessment of air quality effects relating to odour discharges, combustion discharges from the emergency generator, and GHG emissions. A copy of the PDP Air Quality Report is included as Appendix D and the results summarised in the following sections.

13.4 Receiving Environment, Local Meteorology, and Terrain

13.4.1 Receiving environment and potential sensitive receptors

The NWWTP is located at Boulder Bank Drive at the northern end of Nelson Haven and Tasman Bay is located to the north of the NWWTP. The NWWTP site is located on a relatively flat land adjacent to Tasman Bay, and the land immediately around the NWWTP is also flat, as shown in Figure 13-1. East of the NWWTP are the Wakapuaka Flats and the land use on the flats is predominantly pastoral farming. Further south-east of the NWWTP, the topography is hilly, generally occupied by the Hira Forest, with these hills extending south to Nelson city.

Several settlements, including Glenduan, Wakapuaka, Todds Valley, Marybank, and Atawhai, are located near the NWWTP (refer Figure 13-1 and also Figure 3-1). Glenduan is to the north-east of the NWWTP, Wakapuaka to the east, and Hira further to the east. Todds Valley, Marybank and Atawhai are located adjacent to the Nelson Haven, and up valleys, at the foot of the hills that extend southwards to Nelson.

Figure 13-1: Topography of land around the NWWTP and location of settlements

Condition 6 of the existing consent prohibits objectionable or offensive odours "… *at any point on or south of State Highway 6*". This wording would potentially allow odour to be experienced all the way east to, and beyond, Glenduan as well as within all of the Nelson Haven. The PDP Air Quality Report considers that a better odour buffer should be defined, with the suggested area shown in Figure 13-2 and called the "Odour Management Boundary" (**OMB**). The rational for this area is that it is based on the shortest distance to State Highway 6 (based on the rationale of the existing buffer), being 350 m from the NWWTP site boundary, and therefore effectively provides the same level of protection to the NWWTP, while removing the anomaly discussed above for residents in the area.

Land use within the OMB is a mixture of rural land, the Wakapuaka Sandflats Esplanade Reserve, the Boulder Bank Scenic Reserve, and Boulder Bank Road. Importantly, there are no residential dwellings located within the OMB. The closest residential dwelling is located ~650 m from the NWWTP on the southern side of State Highway 6.

Figure 13-2: Odour Management Boundary around the NWWTP.

Section 4.2 of the PDP Air Quality Report discusses meteorological conditions around the NWWTP. The predominant wind direction is from the southwest with winds frequently also from the northeast. The average wind speed is 3.3 m/s.

13.4.2 Odour complaints

Between 2013 and 2018 there were 74 complaints registered regarding odours from the NWWTP. These predominantly related to odours from the ponds, in particular major events included:

- March 2013 where many residents complained due to odours caused due to parasitic infection of algae (the trickling filter was operated, nitrate dosing undertaken and the ponds were seeded to deal with the imbalance).
- March 2015 where residents complained due to odours caused by ponds out of balance with load, or seasonal change (Sodium nitrate was added to the ponds, and monitoring was undertaken).
- May 2016 where residents complained due to odours caused by ponds coming from the temporary pipeline installed for remedial works for the Council (seeding and aeration was undertaken).
- October 2018 where residents complained due to odours caused by the ponds due to an algal infection which depleted oxygen producing algae (pre-treatment plant was used, sodium nitrate added, microbiologist contacted as part of the pond management team, increased monitoring, seeding and sludge thickening and removal off site was implemented) – this event and response is described in more detail below

The most notable recent event is the significant pond odour event in October 2018 (Labour weekend). Prior to the event, the facultative pond largely contained a monoculture of Euglena with a low level of infection (1% to 6% of population infected). Over the course of three days, the level of infection increased exponentially, ultimately wiping out the Euglena population. The sudden loss of the main oxygen producing algae in the pond saw a marked drop in pond dissolved oxygen and ORP, a change in pond colour, and a production of strong odours which drifted well beyond the site boundary, with odour complaints received from 23 October to 1 November.

The Pond Management Team responded by:

- algae seeding (from the wetlands as well as tankering of algae from Bell Island WWTP);
- sodium nitrate dosing; and
- 'full' pond deloading by running the pre-treatment facility with sludge thickened and tankered off-site.

These measures saw the ponds recover quickly, with a marked improvement in pond health seen within two weeks such that algal seeding was ceased and then about a week later pond loadings were returned to normal. Following this event, the Pond Management Team reviewed its procedures and has taken a more proactive approach to minimise the risks of a similar event occurring. Pond management to avoid events like these in the future is further addressed in Section 6.5 of the PDP Air Quality Report There have been no further instances of major odour events from the ponds since 2018.

13.5 Sources of Emissions

13.5.1 Introduction

This application seeks authorisation to discharge contaminants to air from two sources, the first being gases from the NWWTP processes, and the second being combustion products from the diesel-powered electricity generator. These sources are described in the following sections.

13.5.2 Discharges from wastewater treatment

The treatment of wastewater at the NWWTP involves a number of processes that produce gases, with those being odourous being generally derived from anaerobic conditions in the wastewater and sludge.

The PDP Air Quality Report describes the various sources/locations for potential odour in the existing NWWTP as follows:

- Inlet Channel
- Inlet Pump Station
- Screens
- Primary Clarifier
- Trickling Filter
- Biofilter
- Unthickened Sludge Storage Tank
- Rotary Drum Thickener
- Thickener Room
- Thickened Sludge Storage Tank
- Facultative Pond (P1)
- Maturation Pond (P2)
- Wetlands
- Final Wastewater Channel
- Desludging Procedures

In addition, the wastewater treatment process can generate methane and nitrous oxide which are considered to be GHGs. Methane is produced as a by-product of organic breakdown and nitrous oxide can be formed as an intermediate step in the processes of nitrification and denitrification, widely used in the removal of ammonia and total nitrogen.

13.5.3 Discharges from the electricity generator

As discussed in Section 3.2.6, the Council operates a diesel powered emergency electricity generator at the NWWTP. The key contaminants associated with the operation of the generator are products of combustion, with the key contaminants being particulate matter, nitrogen dioxide, and carbon monoxide.

13.6 Effects Assessment

13.6.1 Odours

The PDP Air Quality Report assesses the effects of odour discharges from the NWWTP. The assessment method used is based on the Ministry for the Environment (MfE) Good Practice Guide for Assessing and Managing Odour, 2016 (GPG Odour) and the Institute of Air Quality Management (IAQM) Guidance on the assessment of odour for planning, Version 1.1, 2018. (IAQM Guide).

Under the RMA, the primary concern with odour is its ability to cause an effect that could be considered 'offensive or objectionable'. Whether an odour has an offensive or objectionable effect requires an overall judgement that considers the frequency, intensity, duration, offensiveness/character, and location of the odour event – these are known as the **FIDOL** factors and are presented in Table 13-1. Appendix AQ10 of the NAQP also endorses the use of the FIDOL tool for assessing the potential for odour to be offensive or objectionable.

Table 13-1: Description of the FIDOL Factors

FIDOL Factor	Description
Frequency	How often an individual is exposed to the odour.
Intensity	The strength of the odour.
Duration	The length of exposure.
Offensiveness/character	The character relates to the 'hedonic tone' of the odour, which may be pleasant, neutral or unpleasant.

The findings of PDP's FIDOL assessment indicate that, if not appropriately managed, there is the potential for acute off-site odour effects to visiting public at the Boulder Bank Drive carpark and walkway from the inlet screen. The potential for all other sensitive receptors to experience odours that are offensive or objectional effects to is extremely low due to the frequency, intensity, and pond management in place at the site as set out in the NWWTP OMP.

In conclusion, PDP has determined that, while distinct to strong odours are immediately present directly adjacent to NWWTP, and subsequently where public access is allowed, effects are not expected to offensive or objectionable beyond the property boundary as a result of the NWWTP if the mitigation and management measures set out in the PDP are implemented in conjunction with the additional mitigation recommended (discussed later in Section 13.7.3).

13.6.2 Electricity generator discharges

PDP assessed the potential effect of the discharges from the generator using the Scree3 (Version 4.0.1) model developed by the United States Environmental Protection Agency. The model has been used to calculate ground level concentrations for a 1.5 m high receptor located 20 m from the discharge source, this being the distance from the source to the closest boundary fence of the NWWTP. The model assumed the generator is run for 1 hour every month, this being conservative as the Council typically runs it for around 30 minutes each month. The results have been compared against the National Ambient Air Quality Guidelines (AAQGs) published by the Ministry for the Environment in 2002 following a comprehensive review of international and national research and are widely accepted among New Zealand air quality practitioners. The AAQG criteria provide the minimum requirements that ambient air quality should meet in order to protect human health and the environment.

The modelling undertaken by PDP shows that all predicted concentrations do not exceed the AAQG concentrations with the exception of NO_2 for the 1-hour averaging period. PDP notes the outcomes of the model represent the worst case concentrations at the least favourable meteorological conditions for dispersion. To experience the predicted concentrations the testing of the generator would need to align with the worst-case meteorological conditions which would be rare circumstances. This 1-hour NO_2 exposure is therefore expected to be highly infrequent, and it is unlikely that anybody would be in the immediate vicinity of the nearest boundaries (standing adjacent to the fence while testing occurs) to be exposed to these concentrations.

PDP concludes that the effects of discharges form the generator are expected to be negligible, and risks of any person being exposed to NO_2 above the 1-hour averaging period, are extremely low.

13.6.3 Greenhouse gas emissions

As discussed in Section 13.2, there is very little guidance from the Government on how emissions of GHGs are to be assessed in the context of resource consent application. GHG emissions have been considered under Fast Track consenting as a requirement of the COVID-19 Recovery (Fast-track Consenting) Act 2020 (**FTCA**). Section 19(e) of the FTCA provides for consideration of the potential for significant adverse environmental effects, including GHG emissions. This framework suggests what should be considered for inclusion when considering climate change and indicates the following:

Applicants should provide enough information to determine whether their project is likely to have:

- a significant net *negative* emissions impact (increase in emissions), or
- a significant net *positive* emissions impact (decrease in emissions), or
- a minimal or uncertain emissions impact.

Details of the size and scale of the emissions source or associated activity are required to understand the impact. In the absence of any RMA specific guidance, PDP has therefore adopted the above assessment approach and prepared an assessment of effects from greenhouses from the NWWTP.

The Council engaged T&T in 2022 to measure, record, and report its GHG footprint for all wastewater management activities within its jurisdiction. PDP has summarised the T&T assessment in its report, which divides the GHG emissions into three 'scopes' as follows:

- Scope 1 emissions associated with the NWWTP are predominantly from the treatment of the wastewater. To estimate these emissions, seasonal accumulation chamber surveys were conducted over a year by T&T to account for variation in operational and environmental parameters. Average annual emissions of 5,151 t CO_2-e/yr (Tonkin & Taylor Ltd, 2022) were estimated across four surveys. Vehicle use at the NWWTP was also accounted for, with an estimated 21 t CO_2-e/yr of emissions associated with transport of sludge.
- Scope 2 emissions are indirect emissions associated with purchased energy by the Council. Emissions from electricity usage at the NWWTP were estimated using a total emissions factor of 0.1167 kg CO_2-e/kWh (which is the MfE 2020 emissions factor for electricity usage with transmission and distribution losses included), resulting emissions from energy usage of between 44 to 51 t CO_2-e/yr.
- Scope 3 emissions are all indirect emissions that occur in the value chain of an organisation and have been excluded the purposes of GHG assessment for consent renewal at the NWWTP site with the exception of transmission and distribution losses as accounted for above.

The estimated GHG emissions associated with Scopes 1 and 2 of the NWWTP equate to ~5,200 t CO_2-e/yr.

PDP notes that the renewal of the consent for NWWTP does not include any proposed changes in terms of wastewater treatment processes that produce GHGs, meaning that GHG emissions will remain unchanged, and therefore a *neutral* emissions impact is expected. Increased wastewater loads of BOD_5 and nitrogen which may be experienced with future population growth in the over the next 35 years will result in an associated increase of methane and nitrous oxide generation from the NWWTP. However, an increase in GHGs associated with increased loads are expected from any NWWTP process and PDP states the immediate impact can still be considered *neutral* as the wastewater processing design will remain the same and loads in the term will not be increased over the expected trajectory.

13.7 Mitigation Measures

13.7.1 Management plans

The Council implements an OMP, with a copy of the latest version being included as an appendix to the PDP Air Quality Report included in Appendix D . PDP has reviewed the OMP and considers it contains effective mitigation and management for odour on the site. Key mitigation and management measures currently implemented for the NWWTP through the OMP are discussed in detail in the PDP Air Quality Report. The OMP also refers to the standard operating procedures in the O&M Manuals for each component, which have been integrated into everyday maintenance to ensure odour is always considered and controlled.

The OMP also makes reference to the PMP is a stand-alone document that underpins the optimum approach to management of the facultative pond, the maturation pond, and the wetlands at the NWWTP. The PMP is focused on pond health and pond performance with standard operating procedures for the ponds being covered in a separate O&M manual.

13.7.2 Odour control

The odour control system was designed to extract and treat air from equipment and areas that may emit malodours or require ventilation. The duty / standby odour extraction fans extract air from the following process areas: Inlet Channel, Inlet Pump Station, trickling filter, Unthickened Sludge Storage Tank, and Thickened Sludge Storage Tank. A simplified process flow diagram for the air extraction system is demonstrated in Figure 13-3.

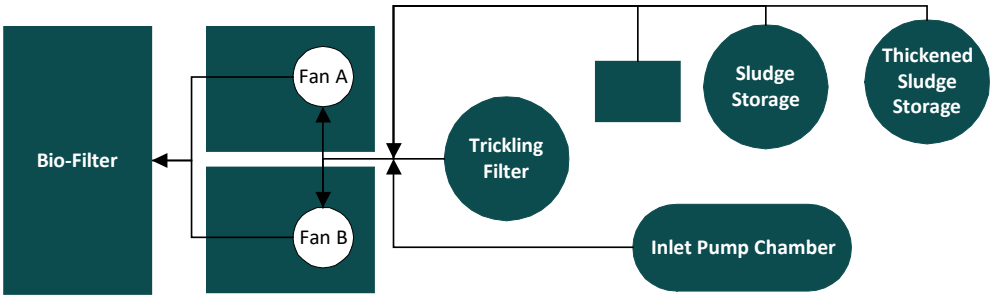

Figure 13-3: Process Flow Diagram of the Air Extraction Odour Control System

A scrubber system is installed to extract odours and hydrogen sulphide (H_2S) from the Rotary Drum Thickener and Thickener Room. The highest demand of the odour control system is the trickling filter when it is in operation; it requires a minimum air supply to meet the process requirements. The extracted air is then passed through a bark biofilter, where it is treated via a combination of adsorption and microbial action. An irrigation system is used to maintain optimal humidity/saturation within the biofilter.

The NWWTP biofilter is a bark media with fixed sprinkler systems. Operation of the biofilter is covered in detail in the O&M manuals for it. Moisture content of the media is critical to biological activity. At present this is not monitored, and operator judgement is relied on for moisture control. PDP consider this can be improved by the use of handheld, moisture meters. A further enhancement could be permanent meters linked to automate sprinkler control.

Media must be maintained at the correct pH level, as wastewater gases are often associated with low pH. pH correction by the addition of granulated lime or similar is recommended by PDP. pH measurement of media is carried out 6-monthly by the media supplier in conjunction with air fill porosity (AFP) to determine the condition of the media. The supplier may recommend some addition of an additive to help correct the pH.

PDP recommend that media effectiveness should be monitored regularly (6-12 monthly intervals) and media should be replaced when shown to be ineffective or at least every three to five years.

Regular inspections of the biofilters are carried out as follows to ensure they are maintained in an operable fashion:

- Weekly monitoring of manometer pressure differential <100 mm.
- Maintaining the bark in a weed free condition by regular weed spraying.
- Visual checks for short-circuiting and turning over the bark at six monthly intervals.
- Six monthly assessment of media pH and AFP to determine when the bark media required to be changed and if addition of lime or similar is necessary. These tests are carried out by the media supplier who provides a recommendation on media quality and when it is required to be replaced.

13.7.3 Odour monitoring

The PDP Air Quality Report includes a number of recommendations regarding monitoring that should be undertaken during and following pond desludging operations, as follows:

- That a dedicated OMP be prepared for the desludging operations.
- Regular odour surveys around the Odour Management Area should occur. This monitoring was undertaken during the desludging which occurred in 2014.
- Regular checks and maintenance of the drainage system to ensure no ponding of leachate occurs within the buffer pond or around the geotextile bags.
- Any opened geotextile bag with sludge that has not been transferred to the landfill should be covered with a well-anchored cover system.
- In the event that significant odours occur then a sprayer delivering odour masking and/or suppression compounds should be used, and the bags may be covered with soil/mulch to act as a biofilter.

The Council proposes to implement these mitigation measures and they are included in the proffered conditions presented in Appendix W .

13.7.4 Recommended improvements to mitigate odour effects

PDP recommends the following measures be implemented, with the first one being 'necessary' and the other measures being as required:

- improved air extraction capacity to draw more air from the wet well through biofilter treatment; and
- upgrading and increasing the size of the biofilter to improve odour treatment capacity once air extraction capacity is increased, introducing:
  - moisture control: At present this is not monitored, and operator judgement is relied on for moisture control. This can be improved by the use of handheld, moisture meters or further enhancement could be permanent meters linked to automatic sprinkler control; and
  - off-gas monitoring of H_2S could be implemented to measure efficacy of biofilter operation.
- seeding the trickling filter prior to start-up when the pre-treatment facility is required; and
- an improved clarifier cleaning procedure to practically remove residual wastewater from the base once emptied to avoid this aging and generating odours on start-up during the next high loading period.

The Council has assessed the need for additional or improved air extraction from the wet well. One of the two fans has recently been replaced and additional air extraction capacity is needed then the second fan will be replaced. Should the assessments show that the biofilter is undersized and resulting in offensive or objectionable odours then the Council will upgrade it to ensure no offensive or objectionable odours occur at or beyond the OMB. The other PDP recommendations may be implemented, if required, to ensure compliance with the odour boundary condition. These are operational matters which, if necessary, would be incorporated in the OMP and/or O&M manuals.

14 Assessment of Effects on Cultural Values and Associations

As discussed in Section 8.8, the Council has commissioned three CIAs from:

- Ngāti Tama ki Te Tau Ihu;
- Ngāti Rārua; and
- Ngāti Kuia and Ngāti Apa ki te Rā Tō (jointly).

These CIAs will include assessments of how the proposed activities affect the cultural values and associations which local iwi and hapu have with the local environment, including the receiving waters of Tasman Bay. The Council expects the CIAs to be completed by the end of February 2024 and will forward them to the consent authority once they are received.

15 Natural Hazards and Climate Change

Section 6(h) of the RMA requires decision makers to recognise and provide for the management of significant risks from natural hazards. Section 7(i) of the RMA requires that particular regard is also paid to the effects of climate change.

T&T prepared a report for the NWWTP entitled 'Nelson North Wastewater Treatment Platn – Natural Hazards Assessment' (**T&T Natural Hazards Report**), a copy which is included in Appendix U. The T&T Natural Hazards Report summarises:

- Current state of various hazard models and results datasets that consider the area local to the NWWTP;
- The natural hazards that may impact the site over a 50-year time horizon, based on current datasets; and
- What affect these may have on the site.

A summary of the natural hazards identified, the occurrence probability and the key consequences at the NWWTP are included in Table 15-1. For a full description the reader should refer the T&T Natural Hazard Report.

Table 15-1: Natural Hazards Summary for the NWWTP

Natural Hazard		Feasible to Cause Ground Damage at the NWWTP Site?	Present Day Event Annual Exceedance Probability, AEP (Average Recurrence Interval, ARI in Brackets) that is likely to cause significant damage	Probability of one Occurrence in a 50-year time period	Key Potential Damages
Coastal storm inundation		Yes	>= 1% AEP (1 in 100 year). In the future, sea level rise will increase the frequency of damaging events	<39%	- Surface flooding and water damage to structures - Damage to low lying electrical systems - Loss of inflow if vulnerable Atawhai Rising Main (AMR) breaks
Coastal Erosion		Yes	NA, expected to occur as a cumulative effect of smaller events	>50%	- Erosion expected around the outlet/discharge chamber and interceptor box
Rainfall induced flooding		Yes	>= 1% AEP (1 in 100 year)	<39%	- Access to site may be hindered. - Only limited damage expected. - Increased inflows, or loss of inflow if vulnerable ARM break
Tsunami		Yes	~0.5% AEP (1 in 200 year). In the future, sea level rise will increase the frequency of damaging events	22%	- Significant damage to structures - Inundation with saltwater - Scour damage to surfaces and embankments - Loss of/difficult access to site - Debris inundation - Loss of inflow if vulnerable ARM breaks
Earthquake & related hazards	Fault rupture	No	NA	NA	NA
	Ground shaking	Yes	2% AEP (1 in 50 year)	64%	- Earthquake damage at this level of shaking is likely to be controlled by liquefaction, refer below
	Liquefaction related hazards	Yes	2% AEP (1 in 50 year)	64%	- Significant damage to structures, including differential settlement. - Lateral spreading of pond embankments, possibly causing leakage to the surrounding area - Scour damage to surfaces and embankments. - Pipe breaks - Loss of inflow if vulnerable ARM breaks
	Cyclic softening of clays	Yes	1% AEP (1 in 100 year)	39%	- Significant damage to structures, including differential settlement
Wildfire hazards		Yes	TBC	TBC	- Cut off site access - Could jump from vegetation to buildings
Landslip/slope instability		No	NA	NA	NA

Of particular importance from the T&T Natural Hazards Report is the potential natural hazards coastal storm inundation and rainfall induced flooding which are discussed in further detail below.

Coastal Storm Inundation:
This potential natural hazard risk is of particular importance to the NWWTP due to the location of the NWWTP and the increased risk of inundation occurring based on sea level rise. The likelihood of a single coastal storm event causing inundation at the site, expressed as the percent probability of occurrence once within a 50-year time window, derived from the T&T report '2022 Nelson Coastal Inundation Mapping Update - Phase A, Investigations', dated May 2022 shows that:

- During present day events, around a 1% Annual Exceedance Probability (AEP, equivalent to a 1 in 100 year) coastal storm is required to inundate the ground around the NWWTP buildings. This event has a 40% probability of occurring one time within a 50-year period.
- In the year 2050, assuming Shared Socioeconomic Pathway 8.5 sea level rise, around a 20% AEP coastal storm (equivalent to a 1 in 5-year event) is required to begin inundating the ground around the NWWTP buildings. Once this sea level rise has been reached, this event has >90% probability of occurring one time within a 50-year period.

The potential damage this type of event could result in includes:

- Damage to structures from flooding, including damage to low lying fixtures, items and electrical systems.
- Saltwater intake due to inundation of upstream network.
- Surficial flooding around the NWWTP buildings.
- Saltwater flooding of below ground installations, such as the inlet and bypass channel.
- Network impacts that could affect the NWWTP:
  - There is a risk that coastal pumpstations and/or the ARM could be damaged, reducing or prohibiting inflows,
  - Conversely, there is a risk that there are very large inflows due to sudden stormwater influx into the wastewater network.

Rainfall Induced Flooding:
This potential natural hazard risk is of particular important to the NWWTP based on recent weather events (at the time of drafting this AEE) and the resultant impacts that this caused to the operation of the NWWTP. There are multiple flood models for the catchments and rivers around Nelson. The NWWTP lies within the bounds of the Wakapuaka Flood Model. The Wakapuaka Flood Model for both present day scenario and 2070 Representative Concentration Pathway 8.5, shows that the NWWTP is not expected to be inundated by flood waters in up to 1% AEP events.

During events larger than 1% AEP, some inundation may occur, however, the current modelling has not assessed what that AEP would be. Based on the above, given the current datasets, it can be said that there is <39% likelihood that the NWWTP site will be inundated by a rainfall induced flood within a 50-year time period.

Evidence of the extent of the August 2022 flooding on the Wakapuaka flood plain was compared to the Present Day flood modelling results. Based on this, it was assessed that the August 2022 rainfall resulted in flooding between the calculated 1% (1 in 100 year) and 2% (1 in 50 year) AEP flood extent. The only effect on the NWWTP is that the daily wastewater inflow peaked on the 19 August at 55,270 m^3/d, 5-6 x the normal August daily inflow, and was diluted due to large amounts of stormwater entering the wastewater network. Historical photos of the Wakapuaka flood plain during the 2022 and 2011 floods are shown in Figure 15-1. In both events "freeboard" remained between flood level and external pond bunds.

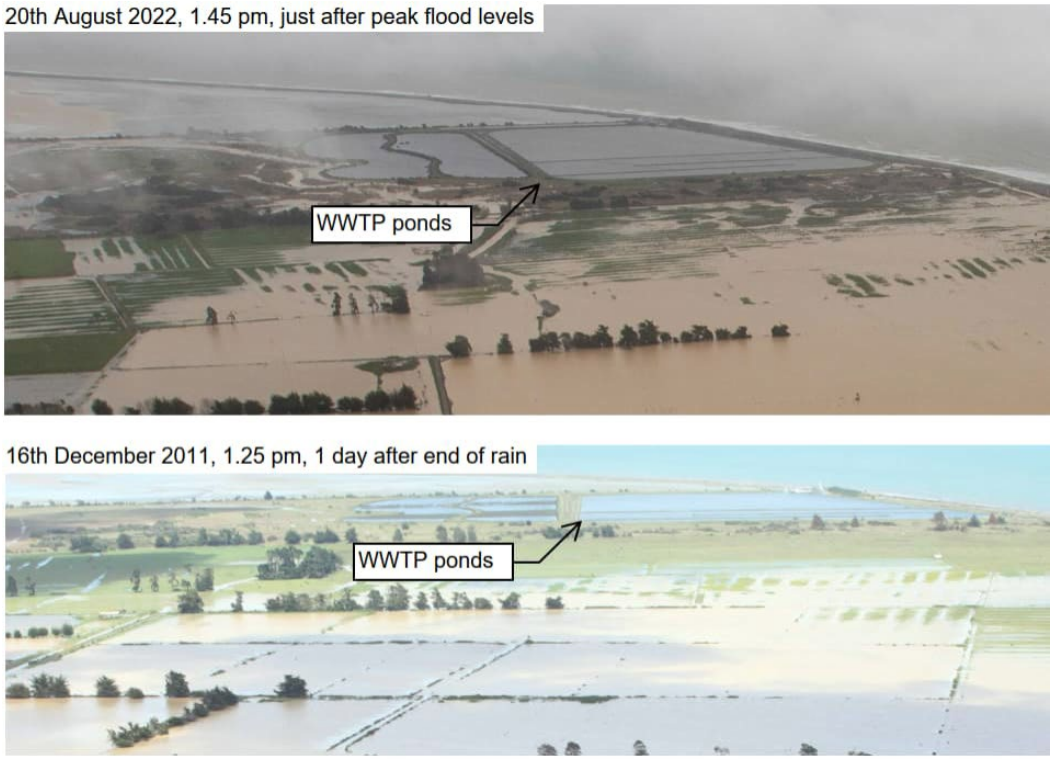

Figure 15-1: Historical Photographs of the Wakapuaka flats.

Knowledge of the site, and a literature search for types of damage that have been observed at historic examples of WWTPs that have been subjected to flooding, it is expected that the following effects and/or types of damage could occur at the site:

- For up to approximately 1% AEP (1 in 100 year) events:
  - Increased inflows,
  - Access to and from Nelson may be difficult due to rainfall induced landslides on SH6.
- Events larger than 1% AEP are not considered in the current models and datasets.

16 Statutory Assessment

16.1 Introduction

Section 104, 105 and 107 of the RMA is relevant for this application, as is Part 2 of the RMA. These are discussed in greater detail in the following sections.

It should be noted that the Council embarked on a review of its statutory planning documents, namely the Nelson Regional Policy Statement, the NRMP, and the NAQP. This review culminated in the preparation of the Draft Nelson Plan which is intended to be a combined plan that incorporates a regional policy statement, a regional coastal plan, a regional plan, and a district plan. The Council released the Draft Nelson Plan and invited comments from the public, however the Council has decided to pause the release of the Draft Nelson Plan for now, primarily due to the risk that new legislation, expected later this year will require significant changes to plans. Instead, Council will make changes in the short term under the existing Nelson Resource Management Plan. This means that the Draft Nelson Plan has no legal status and, accordingly, its provisions have not been considered in this section of the AEE.

16.2 Section 104 of the RMA

Section 104 of the RMA sets out the matters a consent authority must, subject to Part 2 – Purpose and Principles of the Act, have regard to when considering resource consent applications. The matters that are of relevance in considering these applications are outlined below.

16.2.1 Section 104(1)(a) of the RMA: actual and potential environmental effects

Section 104(1)(a) of the RMA states the consent authority must have regard to any actual and potential effects on the environment of allowing the activity. Table 16-1 sets out which sections of this AEE describe any actual and potential environmental effects associated with the activities for which resource consents are being sought.

Table 16-1: Actual and Potential Effects on the Environment

Effects of the Proposed Activities in Relation to:	Section of this AEE
Positive effects of the NWWTP	Section 9
Effects of the discharge of treated wastewater to Tasman Bay	Section 10
Effects of the pipeline and outfall diffuser structure	Section 11
Effects of seepage to groundwater	Section 12
Effects of discharges to air	Section 13
Effects on tangata whenua	Section 14

16.2.2 Section 104(1)(ab) of the RMA: measures proposed or agreed to by the applicant for the purpose of ensuring positive effects

Section 104(1)(ab) of the RMA requires the consent authority to have regard to any measures proposed or agreed to by the applicant for the purpose of ensuring positive effects on the environment to offset or compensate for any adverse effects on the environment that will or may result from allowing the activity. No such measures are proposed or are considered necessary in this case.

16.2.3 Section 104(1)(b)(i) of the RMA: National Environmental Standards

Section 104(1)(b)(i) of the RMA requires the consent authority to have regard to any relevant provisions of NESs. The NESs that are relevant to this application are the National Environmental Standard for Air Quality (NES-AQ) and the NES-CS.

The NES-CS includes regulations that allow soil to be disturbed as either a permitted, controlled, restricted discretionary, or a discretionary activity and is discussed within Section 5.2.

The NES-AQ specifies concentration limits, and in some instances, allowable exceedances of those limits. A review of the NES-AQ in 2011 introduced regulations to restrict the granting of resource consent for industry after 2013 if they exceed PM10 (fine particulate matter) concentrations. An assessment of the discharge to air associated with this

application, including against the limits specified within the NES-AQ is contained within the PDP Air Quality Report contained in Appendix D .

16.2.4 Section 104(1)(b)(iii) of the RMA: National Policy Statement

Section 104(1)(b)(iii) of the RMA requires the consent authority to have regard to any relevant provisions of any National Policy Statement (NPS). The only NPS that is potentially relevant when considering this application is the NPS on Urban Development 2020 (NPS-UD). The NPS-UD recognises the national significance of having well-functioning urban environments and providing sufficient development capacity to meet the different needs of people and communities.

Policy 10 of the NPS-UD requires local authorities to engage with providers of development infrastructure and additional infrastructure to achieve integrated land use and infrastructure planning. The NWWTP provides a critical element of achieving integrated land use and infrastructure planning to achieve an effective and efficient urban environment. Therefore, it is considered that this application will meet the relevant objectives and be consistent with the relevant policies of the NPS-UD.

16.2.5 Section 104(1)(b)(iv) of the RMA: New Zealand Coastal Policy Statement

Section 104(1)(b)(iv) of the RMA requires the consent authority to have regard to any relevant provisions of the New Zealand Coastal Policy Statement 2010 (NZCPS). The NZCPS is the only mandatory National Policy Statement under the RMA. The purpose of the NZCPS is to state policies to promote the sustainable management of natural and physical resources in relation to the coastal environment of New Zealand.

The NZCPS sets out policies regarding the management of natural and physical resources in the coastal environment. Local authorities are required by the RMA to give effect to the NZCPS through their plans and policy statements. Resource consent decision-makers must also have regard to relevant NZCPS policies.

The NZCPS has not been given effect to by the RPS or the NRMP and, as such, it provides the most accurate guidance for this application on fulfilling Part 2 of the RMA. However, it should be noted that the scope of the NZCPS is national and that the regional community under RMA has not addressed the NZCPS, Schedule 1 RMA, through a local lens. That exercise provides more granular regional strategic planning and resolves any conflicting and vital environmental and societal values underpinned by directory policy.

The first step in interpreting national policy is to consider the text faithfully and attempt to reconcile the provisions. If there are tensions between directory provisions, the ideal situation is that these are evaluated through the Schedule 1 process in the usual way to provide better guidance on the appropriate policy outcomes and to guide consent assessments better. In this case, avoidance policies do not apply. So, the potential conflict that might arise between those policies and other policies supporting activities such as this wastewater discharge into coastal waters that are functionally necessary (considering the absence of realistic alternatives as evaluated in this AEE) and which provide critical social, economic, and cultural services do not arise in ways seen in the leading Supreme Court case law.

Objective 6 of the NZCPS recognises that people and communities must provide for the social, economic and cultural well-being and that protecting the ecosystem and natural values of the coastal environment does not preclude use and development. The NWWTP represents an efficient use of an existing wastewater treatment plant. Without any other practical alternatives, the continuation of the use of existing physical resources and the assimilative capacity of the coastal receiving waters to provide for the essential social, economic and cultural needs of the Nelson community is supported by the NZCPS. Given the alternatives assessment, the discharge can only be functionally achieved by a coastal outfall.

Other NZCPS policy directs that discharges must be performed in a way that safeguards the natural environment, recognises the interests of tangata whenua, and makes provision for those interests even though these will not operate as a veto. A key policy is Policy 23, governing the discharge of human sewage which one can assume aims to provide, in part, for tangata whenua interests described in other policy. This policy acknowledges the need for such activities, and the aim of Policy 23(1) is to set some parameters around the management of discharges to ensure that the operational capability of the treatment facility delivers the best practicable environmental outcome. Bottom lines are set out in Policy 2, which are met by the proposal. Policy 2(d) of the NZCPS is important and states: "*provide opportunities in appropriate circumstances for Māori involvement in decision-making, for example when a consent application of requirement is dealing with cultural localities or issues of cultural significance, and Māori experts, including pukenga, knowledge not otherwise available*." In the section concerning cultural values and consultation with tangata whenua, the Council has demonstrated that it has afforded tangata whenua extensive opportunities for information that inform better project design while recognising that the continued discharge of human discharge is not regarded as culturally appropriate for tangata whenua.

The Council assesses that the application sits comfortably within the objectives and policies of the NZCPS properly reconciled and applied to the circumstances of Nelson.

Appendix V includes a list of the relevant objectives and policies of the NZCPS that are of relevance to this application. However, the key objectives and policies from the NZCPS relevant to this application are Objective 1, Policy 11, and Policy 23 and these are discussed below.

Objective 1 of the NZCPS states:

> *To safeguard the integrity, form, functioning and resilience of the coastal environment and sustain its ecosystems, including marine and intertidal areas, estuaries, dunes and land, by:*
> • *maintaining or enhancing natural biological and physical processes in the coastal environment and recognising their dynamic, complex and interdependent nature;*
> • *protecting representative or significant natural ecosystems and sites of biological importance and maintaining the diversity of New Zealand's indigenous coastal flora and fauna; and*
> • *maintaining coastal water quality, and enhancing it where it has deteriorated from what would otherwise be its natural condition, with significant adverse effects on ecology and habitat, because of discharges associated with human activity*

Comment: The assessments presented in Section 10 of this AEE confirm that the activities will not adversely affect the natural biological processes in the coastal environment and coastal water quality will be maintained at and beyond the mixing zone.

Policy 11 of the NZCPS states:

> ***Policy 11**: Indigenous biological diversity (biodiversity)*
> *To protect indigenous biological diversity in the coastal environment:*
> *(a) avoid adverse effects of activities on:*
> *(i) indigenous taxa4 that are listed as threatened or at risk in the New Zealand Threat Classification System lists;*
> *(ii) taxa that are listed by the International Union for Conservation of Nature and Natural Resources as threatened;*
> *(iii) indigenous ecosystems and vegetation types that are threatened in the coastal environment, or are naturally rare;*
> *(iv) habitats of indigenous species where the species are at the limit of their natural range, or are naturally rare;*
> *(v) areas containing nationally significant examples of indigenous community types; and*
> *(vi) areas set aside for full or partial protection of indigenous biological diversity under other legislation; and*
> *(b) avoid significant adverse effects and avoid, remedy or mitigate other adverse effects of activities on:*
> *(i) areas of predominantly indigenous vegetation in the coastal environment;*
> *(ii) habitats in the coastal environment that are important during the vulnerable life stages of indigenous species;*
> *(iii) Indigenous ecosystems and habitats that are only found in the coastal environment and are particularly vulnerable to modification, including estuaries, lagoons, coastal wetlands, dunelands, intertidal zones, rocky reef systems, eelgrass and saltmarsh;*
> *(iv) habitats of indigenous species in the coastal environment that are important for recreational, commercial, traditional or cultural purposes;*
> *(v) habitats, including areas and routes, important to migratory species; and*
> *(vi) ecological corridors, and areas important for linking or maintaining biological values identified under this policy.*

As discussed in Section 10.2.3, the Cawthron Ecological Report states that it is reasonable to conclude that the threatened or at-risk indigenous taxa and ecosystems are not present and, if they are present then they are unlikely to be adverse effects on them from the discharge of treated wastewater from the NWWTP.

Policies 23(1) and (2) of the NZCPS are key policies relevant to this application and state:

> ***Policy 23**: Discharge of contaminants*
> *(1) In managing discharges to water in the coastal environment, have particular regard to:*
> *(a) the sensitivity of the receiving environment;*
> *(b) the nature of the contaminants to be discharged, the particular concentration of contaminants needed to achieve the required water quality in the receiving environment, and the risks if that concentration of contaminants is exceeded; and*
> *(c) the capacity of the receiving environment to assimilate the contaminants; and:*
> *(d) avoid significant adverse effects on ecosystems and habitats after reasonable mixing;*
> *(e) use the smallest mixing zone necessary to achieve the required water quality in the receiving environment; and*
> *(f) minimise adverse effects on the life-supporting capacity of water within a mixing zone.*
> *(2) In managing discharge of human sewage, do not allow:*
> *(a) discharge of human sewage directly to water in the coastal environment without treatment; and*
> *(b) the discharge of treated human sewage to water in the coastal environment, unless:*

(i) there has been adequate consideration of alternative methods, sites and routes for undertaking the discharge; and

(ii) informed by an understanding of tangata whenua values and the effects on them.

Comment: The matters in Policy 23(1) have been discussed in previous sections of this AEE. No significant effects on ecosystems or habitats will occur after reasonable mixing. In terms of Policy 23(2), the discharge is treated wastewater and alternative methods, sites, and routes have been considered in Sections 4.3 and 7. In addition, the Council has engaged with tangata whenua, and the application continues to be informed by the understanding of values and the effect of the discharge on these values.

Overall, it is considered that the application will meet the relevant objectives and be consistent with the relevant policies of the NZCPS.

16.2.6 Section 104(1)(b)(v) of the RMA: Regional Policy Statement

Section 104(1)(b)(v) of the RMA requires the consent authority to have regard to the Nelson Regional Policy Statement (NRPS). The NRPS became operative on 10 March 1997 and sets out how Nelson City Council will achieve integrated management of the significant resource management issues of the area.

The NRPS is currently under review through the Nelson Plan project, which is a full review of all of the Council's RMA plans. Because there has been no public notification of a proposed Nelson Regional Policy Statement (or the Nelson Regional Management Plan) the provisions of the draft Nelson Regional Policy Statement have no legal effect and therefore have not been assessed.

The NRPS contains several objectives and policies that are relevant to this application (see Appendix V). The key policies are discussed below:

Policy CO1.3.16: To recognise that some uses and developments dependent on the natural and physical resources in the coastal environment are important to the social, economic and cultural well-being of the people and the community, should be provided for within the coastal environment providing that the quality of the environment is maintained.

Comment: The NWWTP is dependent on the coastal waters of Tasman Bay to operate and it is important to the social and economic well-being of the Nelson community. The quality of the coastal environment will be maintained and therefore this policy supports the proposed activities.

Policy WA1.3.3: To control point discharges through the use of resource consents and appropriate conditions in order to ensure that water quality classifications are met and sustained.

Comment: The discharge is the subject of this consent application and conditions have been proffered in order to ensure relevant water quality guidelines (including the water quality classification of the NRMP) are met after reasonable mixing.

Overall, it is considered that the application will meet the relevant objectives and be consistent with the relevant policies of the NRPS.

16.2.7 Section 104(1)(b)(vi) of the RMA: Plan or Proposed Plan

Section 104(1)(b)(vi) of the RMA requires the consent authority to have regard to a plan or proposed plan when considering an application for a resource consent. There are two plans that are of relevance to this application, listed below and discussed further in the following sections.

- NRMP; and
- NAQP.

16.2.7.1 Nelson Resource Management Plan

The NRMP is Nelson City Council's combined regional coastal plan, regional plan, and district plan. The regional and district plan sections became operative on 1 September 2004 and the regional coastal plan became operative in part on 1 May 2006.

The NRMP was prepared before the NZCPS 2010 came into effect and, as a consequence, there are some gaps in the NRMP in terms of alignment with the current national policy direction, as the NRMP policy framework gives effect to the 1994 version of the NZCPS. Accordingly, where there are objectives or policies in the NRMP which give effect to the former NZCPS, and these differ to, or conflict with, the operative NZCPS provisions, then the latter should be afforded significantly more weight.

In terms of marine water quality standards, the NRMP relevant water quality classifications in the vicinity of the outfall are shown in Figure 6-1. The area around the discharge has an FEA classification. The area to the north and south of the outfall located between 0-10 m water depth also has an FEA classification, except offshore of The Glen (Glenduan)

which has a CR classification, and this is located >3.5 km from the outfall. Deeper coastal waters between 10-40 m water depth (with the exception of the area around the outfall) are classified as FEA and SG. The distance between the outfall and SG waters is >1 km. Part CMs of the NRMP presents the water quality standards that apply to these classifications and these apply 'after reasonable mixing' (discussed in greater detail in Section 6.4), these are replicated in Table 6-1**.** As discussed in Section 6.4, the NRMP classifies the coastal waters in the vicinity of the discharge as class FEA, with SG standards applying.

The assessment of effects has been undertaken against these water quality standards as well as other (more recent) water quality guidelines.

The NRMP contains several objectives and policies that are relevant to this application (see Appendix V), the key objectives and policies are discussed below:

Policy CM6.4: In considering what constitutes a "reasonable mixing zone", in any particular situation, account will be taken of:

a) the purposes for which the water is managed, and
b) the sensitivity of the receiving environment (i.e. available dilution and dispersal and the proximity of areas valued for ecological, recreational, cultural, shellfish gathering or commercial fishing reasons), and
c) the nature of the discharge including contaminant type, concentration and volume, and
d) the location and design of the proposed outfall and the potential for improving the same, and
e) the proposed method of treatment and the potential for improving that method, and
f) the need to confine any significant adverse effects to the mixing zone, and
g) the desirability of keeping the size of the mixing zone as small as possible, and of keeping it away from the inter tidal area.

Comment: The matters outlined in Policy CM6.4 have been taken into account in determining the mixing zone and has been determined to be appropriate for the discharge.

Policy CM6.1: Coastal marine water quality standards should be maintained or enhanced to reflect community aspirations and tangata whenua values for:

a) management for fisheries, fish spawning, aquatic ecosystem, and aesthetic purposes over the whole Coastal Marine Area; and
b) contact recreation, shell fish gathering, or cultural purposes, in specified parts of the Coastal Marine Area.

Policy CM6.2: Coastal marine water quality standards shall be managed for the purposes set out in the following water quality classes and associated standards:

a) Fisheries, fish spawning, aquatic ecosystem, and aesthetic purposes, Class: FEA, Area of application: to the entire Coastal Marine Area; or
b) Contact recreation purposes, Class: CR, Area of application: generally 200 metres seaward of mean high water springs within the areas identified as "Contact Recreation Overlay " on Planning Map A1; or
c) Shell fish gathering purposes, Class: SG, Area of application: the area identified as "Shell Fish Gathering Overlay" on Planning Map A1, which encloses a zone extending from the 10m-40m depth contour in Tasman Bay; or
d) Cultural purposes, Class: C, Area of application: Delaware Inlet (refer Planning Map A1, 'Cultural Overlay').

Policy CM6.3: Discharges to coastal water should not, after reasonable mixing, result in a breach of classification standards or a reduction in water quality and the discharge should not (either by itself or in combination with other discharges) give rise to any significant adverse effects on habitats, feeding grounds or ecosystems.
Policy CM6.5: When considering new proposals or applications to discharge contaminants directly to water, or reviewing existing discharges, matters to be taken into account include:

a) the water quality classification for the receiving environment, and
b) the total contaminant load (composition/concentration/flow rate) of the discharge, and
c) the presence or absence of toxic constituents, and the potential for bio- accumulative or synergistic effects, and
d) the assimilative capacity (including available dilution and dispersal) of the water and the existing water quality, and
e) actual or potential uses of the water body and the degree to which the needs of other water users are, or may be, compromised, and
f) scenic, aesthetic, amenity, recreational and commercial fisheries values, and
g) the cultural and spiritual values of tangata whenua, and
h) the actual or potential risk to human health from the discharge.

Objective DO7.2: Maintenance and enhancement of the quality if Nelson's coastal water at or to a level which safeguards its life supporting capacity is safe for contact recreation and for gathering and consumption of seafood.

Policy DO7.2.1: Discharges of contaminants to water or land within the coastal environment should not, after reasonable mixing, result in a breach of classification standards or a reduction in water quality and the discharge should not (either by itself or in combination with other discharges) give rise to any significant adverse effects on habitats, feeding grounds or ecosystems either in the Coastal Marine Area or on land.

Comment: Policies CM6.1 to CM6.3 and CM6.5, objective DO7.2 and policy DO7.2.1 all relate to ensuring coastal water quality is maintained or enhanced and that the water quality standards outlined in the NRMP are met after reasonable mixing. The AEE has shown that quality of the receiving coastal waters will be maintained and the relevant receiving water quality classifications will be met at and beyond the mixing zone.

Policy CM6.7: The discharge of treated human sewage directly into coastal water, without passing through land, should only be permitted where:

a) it better meets the purpose of the Act than disposal onto land; and
b) there has been consultation with tangata whenua in accordance with tikanga Māori; and
c) there has been consultation with the community generally; and
d) marine water quality standards are not breached as a result of the discharge; and
e) the method of treatment prior to discharge adopts the BPO.

Comment: Policy CM6.7 reflects, in part, Policy 5.1.2 of the 1994 NZCPS, which as been replaced by the 2010 version and Policy 23 of the new NZCPS essentially supersedes Policy CM6.7 of the NRMP. Interestingly, the 1994 NZCPS included 'restricted coastal activities' one of which included the discharge of human sewage to the CMA which has not passed through soil or wetland. The previous application initially sought to include a rock bed filter at the end of the maturation pond as iwi had requested some form of land treatment prior to discharge. However, further consultation resulted in iwi recommending that a full wetland system be added and that this replace the rock bed filter – these wetlands were subsequently constructed.

Objective CM1: To maintain or enhance the life-supporting capacity of coastal ecosystems

Policy CM1.1: Activities should avoid as far as practicable adverse effects on the life-supporting capacity of the Coastal Marine Area, including effects on one or more of:

a) the quality and quantity of habitats;
b) the integrity of essential ecological processes;
c) the viability of species populations, except where the species is unwanted aquatic life being eradicated subject to Section 97(1)(a)(iii) of the Fisheries Act 1996;
d) the yield or quality of harvested populations and populations where the potential for harvest is clearly evident;
e) spawning, nursery or feeding areas for marine life (including access by marine life to these areas) energy flows and nutrient cycling;
f) shellfish gathering areas, and fishing areas;
g) flora or fauna, including birdlife;
h) water quality;
i) movement of water (including tidal flushing of estuaries), sediment transport or the composition of natural substrates

Comment: Objective CM1 (which is similar to Objective 1 of the NZCPS) and policy CM1.1 seek to ensure activities avoid adverse effects on the life-supporting capacity of the CMA. The AEE has confirmed that this is achieved at and beyond the mixing zone.

Policy CM3.2: Priority shall be given to avoiding the adverse effects of activities on the conservation values of areas of significant conservation value.

Comment: The Boulder Bank ASCV extends approximately 15 km from The Glen south to Fifeshire Rock. The Boulder Bank is considered a landform of international importance and has been formed through a natural process of sediment along-shore movement and deposition. A small number of rare variable oystercatchers nest along the Boulder Bank, while the threatened banded dotterel breed on adjacent saltmarsh areas. Gulls and white fronted tern breed on the Boulder Bank. The discharge will not affect these values.

Overall, it is considered that the application will meet the relevant objectives and be consistent with the relevant policies of the NRMP.

16.2.7.2 Nelson Air Quality Plan

The NAQP promotes the sustainable management of Nelson's air resource. The NAQP became operative on 3 November 2008. The NAQP contains several objectives and policies that are relevant to this application (see Appendix V), The key policy is discussed below:

Policy A5-1.7: Discharges of contaminants to air should avoid, remedy or mitigate any adverse effects beyond the site of the discharge, having particular regard to:

a) Impacts on ground level concentrations and ambient air quality, and on surrounding activities; and
b) Adverse effects on human health; and
c) Adverse effects on cultural and amenity values; and
d) Adverse visual effects, and impacts on visibility; and
e) Impacts on water quality, and on other natural resources including ecosystems; and
f) The production of objectionable, noxious or offensive odour, dust, particles or other effects; and
g) Adverse abrasive or corrosive effects; and

h) The actual or potential cumulative effects of the discharge in combination with other discharges; and
i) Any likely effect on the environment of not allowing the discharge; and
j) The sensitivity of the receiving environment (including reverse sensitivity)

Comment: The assessment undertaken by PDP and summarised in Section 13 confirms that the activities will not result in offensive or objectionable odours beyond the Odour Management Area boundary, nor will the discharges from the emergency generator result in adverse effects on human health.

Overall, it is considered that the application will meet the relevant objectives and be consistent with the relevant policies of the NAQP.

16.2.8 Section 104(1)(c) of the RMA: "Other matters"

Section 104(1)(c) of the RMA enables the consent authority to consider any "other matters" relevant and reasonably necessary to determine the application. This this application, it is considered the following are relevant other matters:

- Marine and Coastal Area (Takutai Moana) Act 2011 (**MACA Act**);
- Statutory Acknowledgement areas;
- Iwi management plans; and
- The LGA.

These other matters are discussed in the following sections. In addition, various guidelines are also relevant to consider under section 104(1)(c) and those were previously discussed in this AEE.

As discussed in Section 13, up until 30 November 2022, consent authorities were restricted from considering the effects that greenhouse gas discharges have on climate change when considering resource consents (by the then section 104E). However, the RMA was amended on 30 November 2022 which included repealing section 104E – these changes now mean that if a consent authority chooses to do so, it can consider the effects of GHGs under section 104(1)(c) of the RMA (other matters) if it considers relevant and reasonably necessary to determine the consent. However, there is no policy guidance, either within the NRMP or in any documents/polices provided by the Government, on how GHGs should be managed when considering resource consents.

16.2.8.1 Marine and Coastal Area (Takutai Moana) Act 2011

The MACA Act acknowledges the importance to all New Zealanders of the marine and coastal area (that is, the area between mean high water mark and 12 nautical miles from shore, being equivalent to the CMA under the RMA). The MACA Act provides for the legal recognition and protection of customary interests through the granting of:

- Protected customary right (PCR) – allows certain traditional practices to be exercised without undue regulatory constraint; and/or
- Customary marine title (CMT) – a mechanism similar to (but not) ownership.

To have their customary interests in a common area officially recognised, iwi, hapū or whānau could apply by 3 April 2017 in two ways: by applying to the High Court and/or by directly engaging with the Crown. The High Court is processing the applications but there have only been a small number of decisions made. Despite this, sections 62(2) and (3) of the MACA Act states that, before a person may lodge an application for a resource consent that relates to a part of the common marine and coastal area where an applicant group has applied to the Court for recognition of CMT or entered into negotiation with the Crown, the person must:

(a) Notify the applicant group about the application; and
(b) Seek the views of the group on the application.

There were eight applications or direct engagements for CMT and PCR made for areas that include Tasman Bay as follows:

- Ngāti Tama ki Te Tau Ihu;
- Trustees of Te Ātiawa o Te Waka-a-Māui Trust;
- Ngāti Apa ki te Ra To;
- Te Runanga o Ngāti Rārua;
- Ngāti Toa Rangatira
- Trustees of Te Runanga a Rangitane o Wairau Trust
- Te Ātiawa o Te Waka a Maui Trust (Whakatu/Te Hoiere)
- Te Rūnanga o Rangitāne o Kaituna Inc

The Council has notified each of the applicant groups and has invited them to provide any comments regarding this application any responses received are acknowledged in Section 17 and Appendix X .

16.2.8.2 Statutory acknowledgements

- A Statutory Acknowledgement is a formal acknowledgement by the Crown that recognises the particular cultural, spiritual, historical, and traditional association an iwi has with a site of significance or resource identified as a statutory area. Statutory Acknowledgement Areas only relate to Crown-owned land and include areas of land, geographic features, lakes, rivers, wetlands, and CMA.
- The functions of a Statutory Acknowledgement are—
  (a) to require relevant consent authorities, the Environment Court, and the Historic Places Trust to have regard to the Statutory Acknowledgement; and
  (b) to require relevant consent authorities to provide summaries of resource consent applications, or copies of notices of resource consent applications, to the relevant trustees; and
  (c) to enable the relevant trustees and members of the relevant iwi to cite the Statutory Acknowledgement as evidence of the iwi's association with the 'statutory area'.
- On and from the effective date, a relevant consent authority must have regard to the Statutory Acknowledgement relating to the 'statutory area' in deciding, under section 95E of the RMA, whether the relevant trustees are affected persons in relation to an activity within, adjacent to, or directly affecting the 'statutory area' and for which an application for a resource consent has been made.
- Consent authorities, the Environment Court, and the Historic Places Trust are required to have regard to a Statutory Acknowledgement when determining whether the relevant iwi may be adversely affected by the granting of a resource consent for activities within, adjacent to or impacting directly on the 'statutory area'.
- The following settlement acts are relevant to the Marlborough region:
  - Ngāti Kōata, Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, and Te Ātiawa o Te Waka-a-Māui Claims Settlement Act 2014;
  - Ngāti Apa ki te Rā Tō, Ngāti Kuia, and Rangitāne o Wairau Claims Settlement Act 2014; and
  - Ngāti Toa Rangatira Claims Settlement Act 2014.
- Tasman Bay is within the CMA Statutory Acknowledgement Area for all eight iwi.

16.2.8.3 Iwi management plans

The following iwi management plans are relevant to the Tasman Bay area and are considered below:

- Ngāti Kuia Pakohe Management Plan 2015;
- Nga Taonga Tuku Iho Ki Whakatū Management Plan 2004;
- Ngāti Koata Iwi Management Plan 2002; and
- Te Tau Ihu Mahi Tuna (Eel Management Plan) 2000
- Ngāti Tama ki Te Waipounamu Trust Environmental Management Plan 2018
- Piopioia Te Ao Turoa Ngāti Rārua Environmental Strategy 2021
- Te Ātiawa o Te Waka –a-Māui Iwi Environmental Management Plan 2014

The Ngati Kuia Pakohe Management Plan 2015 Plan focuses specifically on the management of Pakohe (argillite, metosomatised mud stone). Whist the NWWTP is located within the tribal area of influence of Ngāti Kuia, it is not located within or adjacent to the mineral belt.

The Nga Taonga Tuku Iho Ki Whakatū Management Plan 2004 was developed to:

- Raise awareness and understanding within the Nelson City Council and wider community of the holistic way in which tangata whenua view the natural environment and how this view can be applied to the management of natural resources;
- Share information and knowledge held by tangata whenua;
- Provide a foundation for the development of tangata whenua environmental indicators;
- Guide the development of policies, plans, protocols and agreements which impact on tangata whenua values and interests; and
- Assist with the development of cultural impact assessments.

The primary purpose of the Ngati Koata Iwi Management Plan 2002 is to provide a means by which Ngati Koata are properly and fully considered in decision making affecting their interests in Te Tauihu. The Plan has a number of themes relevant to this application, namely:

- Progressively eliminate discharges of human sweater direct to the CMA from land-based wastewater treatment facilities, except where there has been consultation with the tangata whenua in accordance with tikanga Māori
- Ensure every coastal permit to discharge contaminants to the CMA contains conditions requiring the discharger to monitor the effects of the discharge and compliance with the shellfish gathering (SG) water quality classification

Te Tau Ihu Mahi Tuna (Eel Management Plan) 2000 focuses specially on the management of tuna (eel) which are considered a taonga. Whilst the NWWTP is located in the Te Tau Ihu Eel Management Area, the discharge of treated wastewater is not to a natural wetland, waterway, or river catchment.

The purpose of the Ngāti Tama ki Te Waipounamu Trust Environmental Management Plan 2018 is to highlight Ngāti Tama aspirations for managing ancestral whenua, awa, wāhi tapu and wāhi taonga in the Ngāti Tama rohe (from Whangamoa in the east to Kahurangi in the west). The Plan has a number of themes relevant to this application, namely:

- Increasing levels of wastewater treatment – wastewater is treated to the highest standard possible before being discharged to land
- Require a five-yearly review of wastewater disposal operations to provide the opportunity for consent holders to consider and implement technological improvements
- Require wastewater schemes to develop environmental plans as a condition of consent which include contingency measures to cope with faults, breakdowns, natural disasters, or extreme events
- Cultural impact assessment to give emphasis to the importance of relocating wastewater treatment facilities away from water environments to inland areas where disposal can be made to land
- Water is protected from being used as a medium for transporting and treating waste – recognition that wastewater entering water results in physical and spiritual degradation of wai and contamination of kaimoana beds and coastal fisheries
- Ngāti Tama to be actively involved in monitoring

The Piopioia Te Ao Turoa Ngāti Rārua Environmental Strategy 2021 is a tool to assist Ngāti Rārua to effectively and authentically engage in environmental management. The Strategy has a number of themes relevant to this application, namely:

- Oppose the discharge of human wastewater, even when treated, to aquatic receiving environments as this is culturally offensive and harmful to the mauri of wai, human health, and mahinga kai
- Oppose the location of wastewater infrastructure and treatment plants on or near ngā wāhi taonga tuku iho or mahinga kai

While the Te Ātiawa o Te Waka –a-Māui Iwi Environmental Management Plan 2014 is about managing the rohe of Te Ātiawa in Marlborough, it also embraces Te Ātiawa tikanga and aspirations in both Marlborough and the greater Tasman areas. It sets out, in a generic sense, those values that are common to Te Ātiawa and recognises the different challenges that Te Ātiawa face in each of their different rohe. The Plan notes the relationship of Te Ātiawa with the coastal and marine environments is of the utmost importance, both in terms of maintaining relevant customs and traditions associated with the sea, and as kaitiaki. The Plan identifies discharges of wastewater (referred to as 'sewerage' in the Plan) to be a threat to sustaining the mauri of coastal waters.

16.2.8.4 Local Government Act 2002

The purpose of the LGA is to:

"Promote the social, economic, environmental and cultural wellbeing of communities in the present and for the future".

Local Authorities are required under section 77 of the LGA to consider the benefits and costs of in the decision making process in terms of the present and future social, economic, environmental and cultural wellbeing of their district.

In addition, in the case of a significant decision that relates to land or a body of water, the local authority is also required to take into account the relationship of Māori and their culture and traditions with their ancestral land, water, sites, waahi tapu, valued flora and fauna and other taonga.

The local authority has to assess each option by considering the extent to which community outcomes would be promoted or achieved in an integrated and efficient manner by each option, and the impact of each option on the local authority's capacity to meet present and future needs in relation to any statutory responsibility of the local authority.

The views and preferences of persons likely to be affected by, or to have an interest in any matter have to be considered at every stage of the decision making process.

Section 123 of the LGA requires local authorities to undertake assessments of sanitary services which includes assessment of alternatives, quality, and quantity of wastewater discharge.

16.2.9 Section 104(2) of the RMA: permitted activity baseline

Section 104(2) of the RMA states that, when forming an opinion on the scale of adverse effect under subsection 104(1)(a), a consent authority *may* disregard an adverse effect of the activity on the environment if a national environmental standard or the plan permits an activity with that effect. This is commonly referred to as the 'permitted baseline' (or 'permitted activity baseline'). The permitted baseline may also be applied when decisions on notification[44] and/or affected persons[45] is made. It is considered that there are no adverse effects on the environment from this activity that would be permitted under an NES or plan; therefore, the permitted activity baseline has not been applied when assessing the adverse effects.

16.2.10 Section 104(2A) of the RMA: value of investment

Under section 104(2A) of the RMA, when considering an application affected by section 124 of the RMA, a consent authority must have regard to the value of the investment of the existing consent holder. As outlined within Section 4.4.4, the Council and its customers have invested in a substantial and regionally significant infrastructure asset in terms of the NWWTP. The replacement value of the existing NWWTP is in the order of $21.5 million.

16.2.11 Section 104(2D) of the RMA: wastewater environmental performance standards

The Water Services Act 2021 amended section 104 of the RMA so, that when considering a resource consent application that relates to a wastewater network, a consent authority cannot grant the consent contrary to a wastewater environmental performance standard made under section 138 of the Water Services Act. The consent authority must also include as a condition of granting the consent, requirements that that are no less restrictive than is necessary to give effect to the wastewater environmental performance standard. At the time of this resource consent application, no such wastewater environmental performance standards have been developed.

16.3 Section 105 of the RMA: Matters Relevant to Certain Applications

Because the applications involve the discharge of contaminants, section 105 of the RMA requires the consent authority to consider the following additional matters:

a) the nature of the discharge and the sensitivity of the receiving environment to adverse effects (refer Sections 10 and 12 for water quality and Section 13 for air of this AEE); and
b) the applicant's reasons for the proposed choice (refer Sections 0 and 4 of this AEE); and
c) any possible alternative methods of discharge, including discharge into any other receiving environment (refer Sections 4.3 and 7.3 of this AEE)

16.4 Section 107 of the RMA: Restriction on Grant of Certain Discharge Permits

Section 107(1) of the RMA restricts a consent authority from granting a consent to discharge contaminants into the CMA if, after reasonable mixing, the contaminant is likely to give rise to all or any of the following effects in the receiving waters:

(c) the production of any conspicuous oil or grease films, scums or foams, or floatable or suspended materials; and
(d) any conspicuous change in the colour or visual clarity; and
(e) any emission of objectionable odour; and
(f) ….. (not relevant to coastal water)
(g) any significant adverse effects on aquatic life.

Despite this, section 107(2) of the RMA allows a consent authority to grant a consent that allows any of the above effects if it is satisfied:

(a) that exceptional circumstances justify the granting of the permit; or
(b) that the discharge is of a temporary nature; or
(c) that the discharge is associated with necessary maintenance work

[44] Section 95D(b) of the RMA when determining whether the adverse effects are more than minor.
[45] Section 95E(2)(a) of the RMA when determining whether the adverse effects on a person are minor or more than minor.

The Cawthron Ecological Report included as Appendix L includes a discussion on compliance with the section 107 RMA matters. The Cawthron Ecological Report states that Barter and Forrest (1998) noted that in calm weather the discharge plume was discernible mainly as a change in surface tension where the buoyant low-salinity plume reaches the water surface. During 20 visits to the outfall over the course of a year, they did not see any conspicuous visual effects from the outfall, nor any floating or suspended material. A discharge plume was not visible and vertical profiles of the water column using a transmissivity sensor did not indicate any change in water clarity. Overall, Barter and Forrest's (1998) observations of the discharge area and measurements of water clarity found no evidence of films, scums, foams, floatable or suspended materials or conspicuous changes of colour or clarity.

However, the Cawthron Ecological Report does note that a qualitative examination of the sequence of satellite images of the area around the outfall in Google Earth™ revealed three images in which a plume appeared to be visible (from a total of 18 images of sufficient quality that a plume was likely to be visible if present). The cause of these 'plumes' are thought to be microalgae derived from the NWWTP. The satellite images do not suggest that it is a regular occurrence and, when it does occur, the visibility of the plume will be dependent on weather conditions, with windy conditions likely to make it less conspicuous. Further, it is noted that the satellite images are taken from directly above the outfall and it is unlikely that such plumes will be readily visible from either the land or on the water, but perhaps from aircraft flying overhead. Overall, if such plumes occur they are of a temporary nature and section 107(2)(b) means there is no restriction to granting the consent.

Section 10.2 of this AEE confirms the discharge does not result in significant adverse effects on aquatic life.

Overall, it is considered that section 107 of the RMA does not create any impediment to the granting of the application.

16.5 Part 2 of the RMA

The matters specified in section 104(1) of the RMA that must be considered are 'subject to Part 2' of the RMA. These words, and how they apply to the consideration of resource consent applications, has been the subject of a number of cases heard in the Environment Court, High Court, and the Court of Appeal. The Court of Appeal decision on RJ Davidson Family Trust v Marlborough District Council (CA97/2017 [2018] NZCA 316) (referred to as 'the Davidson decision') provides the latest, and most authoritative, position on this matter.

In summary, the Davidson decision directs that where the New Zealand Coastal Policy Statement (NZCPS) is relevant to an application and it is clear from the relevant NZCPS policies whether consent should be granted or refused, then there is no need for a decision maker to refer back to Part 2 RMA matters as it would not add anything to the required evaluative exercise – that is, separate recourse to Part 2 RMA matters is not required as those matters are already reflected in the NZCPS objectives and policies. As the Court of Appeal stated (at para [71]):

> *"Putting it another way, even if the consent authority considered pt 2, it would be unlikely to get any guidance for its decision not already provided by the NZCPS. But more than that, resort to pt 2 for the purpose of subverting a clearly relevant restriction in the NZCPS adverse to the applicant would be contrary to King Salmon and expose the consent authority to being overturned on appeal".*

The Davidson decision also provides guidance on whether Part 2 RMA matters need to be considered where the NZCPS provisions do not provide clear guidance on whether consent should be granted or refused, and situations for applications where the NZCPS is not relevant. In both situations the decision maker needs to determine whether the relevant plan has been 'competently prepared' under the RMA – that is, whether it contains a coherent set of policies designed to achieve clear environmental outcomes.

The regional and district plan components of the NRMP were made operative in September 2004 and the regional coastal plan components were made operative, in part, in May 2006, however those relating to port noise became operative in November 2012. The introductory sections of Chapter 13 (Coastal Marine Area) states that it must give effect to the NZCPS. The NRMP states that it "…*adopts some of the New Zealand Coastal Policy Statement policies directly and states rules and other methods to implement them. Other New Zealand Coastal Policy Statement policies will be implemented by taking them into consideration when resource consent applications are processed.*" It is considered that the NRMP contains a coherent set of policies designed to achieve clear environmental outcomes and therefore there is no need to consider Part 2 RMA matters. Where the NRMP does not give effect to the current NZCPS, it is considered appropriate to assess the application against the objectives and policies of that policy statement (as has been done) and there is no need to consider Part 2 RMA matters.

17 Consultation and Tangata Whenua Participation

17.1 Introduction

The Council recognises that consultation is a key component of the resource consent application process. Accordingly, the Council has undertaken consultation in a way that provides opportunities for key stakeholders and iwi partners to identify issues of concern, and to clarify, where possible, any such issues during the pre-consenting process.

The consultation undertaken, the key parties consulted, and the issues raised during consultation are discussed below.

17.2 Engagement with Tangata Whenua

The NWWTP reconsenting project builds on from previous work and assessment of past engagement with the eight iwi with statutory interests in Whakatū, Nelson in relation to wastewater management. It also reflects the Te Tauihu Statutory Acknowledgements 2014.

The objectives of the project were set in 2020 and key iwi related items include:

- incorporation of mātauranga Māori into engagement, planning and the environmental assessment that will be undertaken to obtain resource consent for BPO for the discharge of treated wastewater from the North Nelson Region.
- broader programme responds effectively and in good faith to the principles of partnership that have been developed between the Council and Te Tauihu o Te Waka a Māui (Te Tauihu) iwi.

The associated resource consent documentation draws from the collaborative work undertaken with Te Tauihu iwi as agreed in this engagement plan. Details of the engagement, presentations and hui regarding this project to date are included in Appendix X.

Te Tauihu iwi and the Council have worked together throughout the life of the NWWTP with the consent application in 2004, in the establishment and planting of the wetlands associated with the NWWTP in 2010 and desludging of the facultative pond in 2014.

Work towards renewal of the NWWTP resource consent began in 2019 and the project was introduced in May 2020 at the Te Ohu Taiao Hui, once there was enough information to provide an overview. At the Te Ohu Taiao hui in September 2020 the Terms of Reference for an iwi working group were discussed, and an open invitation was extended for attending site visits to the NWWTP. The Terms of Reference were not agreed to, but the discussion resulted in agreement of the Working Group set up.

The first working group for the resource consent renewal project was held in October 2020. A project overview was presented including key dates and the 35-year timeframe, a copy of the presentation is included in the documents for download under this project on the iwi engagement platform. The information was followed by a site visit in December 2020 attended by representatives of Ngāti Tama, Te Ātiawa, Ngāti Rārua, and Ngāti Koata.

Over 2021 and 2022, iwi working group met in February, May, and October 2021, with email correspondence keeping members updated in between hui. Throughout 2021 there were also individual iwi discussions and site tours as a response to iwi requests. The iwi partners involved at that time were Te Ātiawa (Daren Horne), Ngāti Tama (Kura Stafford), Ngāti Rārua (Rowena Cudby, Pete Keyanona), Ngāti Kuia (Julia Eason), and Ngāti Koata (Alice Woodward).

One of the key outcomes of the iwi working group hui was agreement for Te Ātiawa to update the 2014 CHI report, where iwi cultural values were considered against each of the nine options being reviewed in the MCA process...

In December 2021 Daren Horne undertook the CHI at the NWWTP with Shane Pene and John Katene and the report was received in April 2022. The 2022 CHI report is available in Appendix X .

Under the provisions of the MACA Act, on 24 May 2022 the Council sent a letter to claimants to provide some background detail on the application and to seek views about the application from claimants. These letters were sent to; Te Ātiawa o Te Waka-a-Māui, Rangitāne O Wairau, Ngāti Koata, Te Rūnanga o Rangitāne o Kaituna, Te Huria Matenga Trust, Te Ātiawa o Te Waka a Māui Trust Māpua, Ngāti Toa Rangātira Ngāti Tama ki Te Tau Ihu, and Ngāti Apa ki te Ra To.

In July 2022 a workshop was held to scope the work to move towards delivering the recommendations made in the 2022 CHI report. One of the actions resulting is to improve the Wetlands Area alongside the NWWTP, which was supported by Te Ātiawa (Daren Horne and Sylvie Filipo), Ngāti Tama (Dayveen Stephens), and Ngāti Rārua (Aneika Young). Apologies for not being able to attend the workshop were received from Ngāti Koata and Ngāti Kuia.

The wetlands improvements planning hui were held throughout 2022 and 2023 so far, with significant contributions by Sylvie Filipo (Te Ātiawa), Dayveen Stephens (Ngāti Tama), and Aneika Young (Ngāti Rārua). The minutes of these hui have been provided on the iwi engagement platform.

The site visit in October 2022 led to agreement from tangata whenua to confirm plant species and location with confirmation to follow from tangata whenua.

Agreement in principle followed that Te Ātiawa Trust would lead the work, and for Nelmac to provide resource to propose planting plans for iwi feedback. The concept planting plans by Nelmac were provided to iwi for feedback in June 2023.

In June 2023, there were several hui held for information sharing purposes. These provided an update on the findings of the AEE, an overview of the iwi engagement for the resource consent process so far, the current project status, and the upcoming opportunities for providing feedback.

In August 2023, a full copy of the draft application, AEE, and technical assessment were made available on the iwi engagement platform and several Q&A sessions held to enable open discussions around any questions regarding the draft resource consent application.

Following the Te Ohu Taio meeting held on the 25 October 2023, all Te Tauihu iwi were formally invited to provide a CIA in relation the NWWTP reconsenting. Four iwi (two of which jointly) have currently taken up this opportunity and agreements to complete CIA reports by 29 February 2024 have been prepared and signed.

17.3 Consultation with Stakeholders and Affected Parties

The Council has engaged with multiple key stakeholders throughout the project for the NWWTP Consent Renewal. In addition to individuals living close to NWWTP, we have had discussions throughout the process with Fish & Game, Department of Conservation, Te Whatu Ora Health New Zealand and numerous groups that are active in the area. The engagement and feedback from the registered interest parties was done via meetings, and emails. A stakeholders consultation communications record can be found in Appendix Y .

Public meetings have also been held at the Wakapuaka Hall on 17 November 2020 and 21 November 2023, at the beginning and end of the resource consent application preparation process with residents, neighbours and other key stakeholders interested in the Wakapuaka flats and surrounding area next to the NWWTP invited to attend.

17.4 Issues and Responses

Table 17-1 summarises the various issues raised during the iwi engagement and stakeholder consultation and the Council's response.

Table 17-1: Issues Raised During Stakeholder Engagement and the Council's Response

Issue Identified	Response
Iwi preference for wastewater discharge to go to land and not water.	Assessment of alternatives undertaken in 2003 and again as part of this AEE (section 7) looked at a wide variety of alternative discharge regimes including land application, managed aquifer discharge, potable, and non-potable reuse. Investigations showed that the surrounding area is not suitable for these options. 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 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.
Iwi opposed to a 35-year duration consent.	The rational for the consent sought is provided in Section 4.5. To achieve financial security and provide certainty for future investors, community and business growth, it is important for the Council to have long term certainty in terms of the on-going operation of the NWWTP. This is a critical consideration in seeking a 35-year duration for the proposed consent. The requested and consent term enables the Council to perform its statutory functions under the LGA according to the statutory principles and supports the sound financial management of the community's resources.

Issue Identified	Response
	Nelson residents are also (like other residents in New Zealand) facing a cost-of-living pressure. It is important to budget appropriately for services provided by the Council. Section 4.3.4.2 notes a budget over the first six years of the LTP has been allowed for scoping a major long-term upgrade that looks beyond the life of this consent. The consent period being sought in this application that would make provision for time for this process to be undertaken and alternative location(s) or discharge regimes if identified to be secured, consented, designed and constructed.
The application did not align with iwi aspirations and long-term goals.	The assessment of alternatives acknowledges that the discharge of treated wastewater to fresh water / coastal marine environment, is offensive to tangata whenua, degrades the mauri of wai, and culturally inhibits the ability of tangata whenua to harvest kaimoana from this environment. 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 Cultural Health Indicator monitoring is ongoing, and opportunities are provided to allow papatūānuku to filter and clean any impurities. As stated in Sections 8.10 and 14 the Council has commissioned three CIAs and is awaiting provision of these reports to assess if further provision needs to be made within the resource consent application and proffered conditions. The long-term goals and outcomes of the regional wastewater hui are still under development and will continue to inform the Council's Long term strategy.
Long term resilience of the plant to climate change and sea level rise	Section 15 and Appendix U provides further details of T&T's assessment of Natural Hazards identified the occurrence probability and the key consequences at the NWWTP. Provision for long term strategy beyond the life of this resource consent and dynamic adaptation pathway approach is being undertaken by the Council as a separate process to continue to consider future impacts from climate change in the region.
The long-term plans of the Wakapuaka flats to enhance habitat for wildlife and birds and recreational use of the area	As part of the ongoing operations of the NWWTP, the Council have been working with the Department of Conservation and iwi on a wetlands project which is creating more wildlife habitat around Hillwood Stream in line with the recommendations of the CHI monitoring report. A record of the hui that have occurred in relation to this work and a copy of the CHI are provided in Appendix T.
Te Whatu Ora, to ensure sufficient provision made for desludging the ponds to achieve high performance	The periodic desludging of the ponds is allowed for within the application and any potential impacts assessed as part of the AEE.
Te Whatu Ora, to ensure allowance made for future growth and increased flows	The urban area serviced by NWWTP has limited growth options. Future flows have been incorporated within the application and the identification of the BPO. The ability to provide for residential, business, and trade/industrial growth and development is a key positive effect. This is addressed further in Section 16.2.4 of this AEE with regard to the National Policy Statement on Urban Development Capacity.
Local resident preference to limit any changes to the footprint of the NWWTP	There are no changes to the designation boundary of the NWWTP proposed by this recourse consent process.
Local residence queried the site being fenced and limiting access to the wetlands for walking and bird watching	The operational part of the NWWTP footprint has been fenced for H&S reasons.
DOC preference to limit any disturbance to the Boulder Bank	There are no provisions made within this application to allow for the disturbance of the Boulder Bank. Section 4.4.1 provides a concept methodology for the replacement of the outfall diffuser.
Forest and bird preference to see birdlife to continue to thrive in the area.	The presence of the NWWTP provides positive effects in term of providing suitable habitat for fauna including a variety of avifauna species (in particular the New Zealand scaup), this is discussed in greater detail in Section 8.5.
DOC preference to let more seawater into the sand flats and recreating the estuarine mudflat and saltmarsh wetland area	The Council and the Department of Conservation have several projects in development for enhancements of the surrounding mudflat and saltmarsh areas. These are outside the scope of this resource consent.

18 Proffered Consent Conditions

A full set of proffered consent conditions are included in Appendix W . The conditions are based, in part, on those included on the current consents but also additional conditions to provide for the new activities proposed in this application. Discussion on the key conditions is presented below. The Council considers the conditions, both singularly and in total, are appropriate to avoid, remedy, or mitigate potential adverse effects identified in this AEE.

Condition 1 is a standard condition which requires the Council to undertake the activities in accordance with this application, this AEE, any further information provided by the Council following lodgement of the application (e.g. during the hearing), and the various management plans for the NWTTP required by Condition 5.

Condition 2 specifies the expiry date of 31 December 2059, being 35 years from the expiry of the current consents. In addition, Condition 2 clarifies that the consents do not lapse until their expiry date – the reason for this is discussed in greater detail in Section 4.6.

Condition 3 requires the Council to maintain a Complaints Register for all the activities, including identification of the cause of the complaint and any remedial measures in response to the complaint.

Condition 4 requires the Council to prepare and submit to the Consent Authority an Annual Report which outlines the results of all monitoring undertaken under the consents, a summary of any complaints, and progress towards upgrading the NWWTP in incorporate additional pathogen reduction should this be shown to be necessary (by Conditions 17 to 19, discussed below). The latter requirement (being clause (c) of Condition 4) only applies until the NWWTP is upgraded (if it needs upgrading) will only be proffered if the human norovirus testing currently being undertaken by the Council concludes that additional treatment for human norovirus is needed at the NWWTP to reduce the mean IIR for uncooked bivalve shellfish consumption at Seafarers Memorial and Magazine Point to <1% as a result of the discharge from the NWWTP.

Condition 5 requires the Council to have an O&M manual(s), an PMP, and OMP in place at all times and to operate the NWWTP in accordance with these documents. The condition allows the Council to amend any of these documents 'as required' but they must all be reviewed by the Council at least once every three years.

Conditions 6 and 7 relate to requirements associated with collection of samples and analysis of the collected samples by an accredited laboratory.

Condition 8 allows the Consent Authority to review the conditions of the consents annually during the months of October or November for one of two purposes, noting the advice allows the consents to be reviewed 'as of right' for three other purposes under the RMA. The months of October and November are specified because Condition 4 requires an Annual Report to be submitted to the Consent Authority 30 September each year, meaning the consent authority will have an opportunity to review the Report and decide if a review of the conditions is warranted in the next two months,

Conditions 9 to 12 relate to limits to the rate at which treated wastewater may be discharged to Tasman Bay, including requirements for these to be measured (by way of a calibrated meter). Two discharge rates are specified, one being an average daily discharge (based on a rolling 365-day averaging period), and one being a peak daily discharge. Condition 12 defines what a 'day' means for the purposes of the daily maximum discharge limit. The basis for these is discussed in Section 4.2 of this AEE.

Condition 13 specifies the discharge limits that must be met in terms of faecal coliforms, $cBOD_5$, and TSS. These are the same as what are on the current consent. Compliance with the discharge standards is based on the results of previous 12 most recent monthly samples (i.e. they are a rolling 12 month compliance limits). It should be noted that, in the event that the NWWTP is required to be upgraded (refer Conditions 17 to 19, discussed below), then additional requirements in terms of compliance monitoring will apply to ensure the NWWTP is able to reduce human norovirus concentrations.

Condition 14 specifies the discharge limits that must be met in terms of metals, cyanide, and phenol. These differ to the limits specified on the current consent and the rationale for them is presented in Section 10.2.3.8.

Conditions 15 and 16 relate to sampling and require the results to be included in the Annual Report. However, any exceedance of the discharge standards needs to be reported to the Consent Authority within five days of any exceedance being detected.

Conditions 17 to 19 will be proffered if the human norovirus testing currently being undertaken by the Council concludes that additional treatment is needed at the NWWTP to reduce the mean IIR for uncooked bivalve shellfish consumption at Seafarers Memorial and Magazine Point to <1%. If no upgrade to the NWWTP is shown to be needed, then these three conditions will be removed and the subsequent conditions will be renumbered – the Council will be in a position to confirm this by the time a hearing is held for this application. If an upgrade to the NWWTP is shown to be needed then Condition 17 requires the Council to upgrade the NWWTP no later than 31 December 2034 (i.e. 10 years from the date of commencement of the consents). As discussed in Section 4.4.2, if the upgrade is needed the Council aims to have it

completed within five to seven years. Condition 18 requires the Council to prepare a report at least six months prior to the upgrade being completed which sets out a proposed compliance monitoring methodology to ensure the upgraded NWWTP achieves the required human norovirus LRV. The proposed methodology would need to be certified by the Consent Authority's Manager Consents and Compliance Monitoring that the methodology will enable compliance with Condition 17 to be monitored and then, once it is certified, implemented following commissioning of the upgrade. Condition 19 requires the Council to report on progress towards upgrading the NWWTP annually (in the Annual Report). This condition only needs to be complied with until the NWWTP has been upgraded.

Condition 20 covers the requirements of section 107 of the RMA (discussed in Section 16.4) and includes reference to the mixing zone (shown in Figure 2 attached to the conditions). The mixing zone is the same as that prescribed in the current consents, but the condition also acknowledges that the location of the mixing zone rectangle may need to be shifted if the outfall diffuser is replaced. In all cases the mixing zone rectangle will be the same dimensions (200 × 500 m) centred on the middle of the outfall diffuser.

Condition 21 requires the Council to maintain a sign which advises the public not to take shellfish or swim within the mixing zone. If the mixing zone rectangle shifts due to a replacement outfall diffuser being installed, then the sign needs to be updated to reflect the new location of the mixing zone rectangle.

Conditions 22, 28, and 29 require the Council to undertake the monitoring outlined in Appendix 2 attached to the conditions. This monitoring consists of a five-yearly qualitative survey of the seabed around the outfall diffuser, groundwater level monitoring in six groundwater bores around the NWWTP (which are required to be maintained by Condition 27), groundwater quality monitoring, and surface water quality monitoring around the NWWTP. In the case of the groundwater and surface water monitoring, the conditions require this monitoring to be undertaken for two years from the date of commencement of the consents and may be discontinued after this time with the written agreement of the Consent Authority.

Condition 23 confirms the coastal permit to place, use, and maintain the pipeline and outfall diffuser structure is limited to the existing structures and also any the area covered by any replacement outfall diffuser that the Council may install during the 35-year term of consent.

Condition 24 allows the Council to replace the outfall diffuser structure if this is considered necessary but places a spatial seabed disturbance limit of 500 m^2 for any such structure (refer to discussion in Section 11). While a nominal design has been provided in this application and AEE, the Council may revisit this in the future and this condition requires a Diffuser Design and Installation Management Plan which needs to include the design details of the new outfall diffuser structure, its construction methodology/sequencing, and area of seabed disturbance that will occur to be provided to the Consent Authority prior to any construction works commencing. The condition also requires 'as-built' plans to be provided to the Consent Authority after the replacement diffuser has been installed. It should be noted that this condition is discretionary for the Council to comply with.

Condition 25 requires the structures to be inspected at least every five years and a report of the inspection provided to the Consent Authority following the inspection. Condition 26 requires the Council to ensure the pipeline and outfall diffuser structure to be maintained in a state consistent with their intended purpose.

Conditions 27 to 30 were discussed earlier in this section.

Condition 30 and 31 relate to preparatory works required within the buffer pond prior to any desludging occurring. These conditions are based on the conditions that were on the consents issued for the most recent desludging operations.

Condition 32 prohibits discharges to air from the NWWTP which are offensive or objectionable beyond the OMB, a map of which is attached to the conditions. This condition creates the environmental bottom line for the discharges to air.

Condition 33 requires the Council to maintain a weather station on-site. This information will be used should any complaints be received so that the prevailing weather conditions at the time are able to be documented.

Condition 34 includes specific requirements during desludging operations, including odour walkover surveys around the on-land part of the OMB by a person who does not work at the NWWTP (so that they are not desensitised by NWWTP odours). These surveys must occur daily during desludging, for 30 days following desludging, and following any complaints.

Conditions 35 and 36 specify limitations for the use of the diesel-powered generator during non-emergency times. These conditions allow for the monthly testing and annual load testing for the generator.

The Council considers the proffered conditions, both singularly and in total, are appropriate to avoid, remedy, or mitigate potential adverse effects identified in this AEE.

19 Conclusions

The Council operates the NWWTP. The NWWTP is a critical piece of regional infrastructure for both the Council and the community. The NWWTP provides significant positive effects as it provides for the safe and sanitary treatment of municipal, commercial, and trade wastes generated by the residents of Nelson City. The Council holds a number of resource consents associated with the operation of the NWWTP and this application seeks new consents to allow its continued operation.

The discharge from the NWWTP contains a variety of pathogens which have the potential to result in adverse effects on public health. The QMRA assesses risks associated with primary and secondary contact recreation as being very low, with the average IIR <1% at all sites assessed with a virus LRV of 2.

The greatest public health risks associated with the discharge from the NWWTP relate to the consumption of uncooked bivalve shellfish due to the presence of human norovirus in the discharge. With a human norovirus LRV of 2 through the treatment plant the average IIR associated with the consumption of uncooked bivalve shellfish are >1% (the NOAEL), but <5% (the LOAEL) at two of the sites where bivalve shellfish beds have been verified to occur, namely Seafarers Memorial and Magazine Point. A human norovirus LRV somewhere between 2 and 3 is needed at the NWWTP to reduce the average IIR at these two sites to <1% (the NOAEL). The predicted LRV for viruses through the NWWTP are within this range, but the actual LRV is currently unknown. Therefore, to address these information gaps and uncertainties the Council has commenced monitoring for human norovirus at the NWWTP to determine its LRV for this pathogen (including for future predicted flows to the NWWTP). This testing is proposed to continue for a 12-month period and will be completed in September 2024.

The results of this monitoring will then be used to determine whether the NWWTP needs to be upgraded to improve reduction in human norovirus concentrations – this decision will be based on a review and updating of the QMRA. If this additional work shows that an upgrade at the NWWTP is needed, then this will be undertaken within five to seven years (at latest 10 years). The Council expects to confirm, or otherwise, whether an upgrade at the NWWTP is needed by the time a hearing is held for this application.

The Council has undertaken a comprehensive consideration of alternatives in terms of treatment options and location of the discharge(s). This has included a robust assessment of the BPO for the NWWTP. The BPO assessment concludes that the NWWTP should remain where it is but that additional works be undertaken to mitigate effects. Some of these works are mandatory whereas others, such as the upgrade to the NWWTP to provide for additional pathogen reduction, are dependent on the results of additional monitoring to be undertaken.

Further, the activities are generally consistent with the relevant statutory planning documents. The activities have been shown to meet the purpose of the RMA and there are no reasons why the resource consents sought should not be granted. The Council has volunteered a suite of conditions which will ensure that the ongoing adverse effects are appropriately mitigated and continue to be compliant with conditions of consent.

Overall, it is considered there are no statutory impediments to this application being granted.

Appendices

We design with community in mind

Appendix A Existing Resource Consents

Appendix B Process Capability Assessment

Appendix C Flow Limits Assessment

Appendix D PDP Air Quality Report

Appendix E Alternatives Assessment (BPO)

Appendix F PDP Land Application and Managed Aquifer Recharge Report

Appendix G OCEL Concept Design

Appendix H Groundwater Report

Appendix I Surface Water Quality Report

Appendix J Freshwater and Terrestrial Ecological Report

Appendix K SLR Bivalve shellfish survey Report

Appendix L Cawthron Ecological Report

Appendix M Cawthron Emerging Organic Contaminants Report

Appendix N Cawthron Microplastics Report

Appendix O Cawthron Marine Mammals Report

Appendix P Cawthron Cumulative Effects Report

Appendix Q MetOcean Dispersion Modelling Report

Appendix R NIWA Quantitative Microbiological Risk Assessment Report

Appendix S Virus Log Reduction Assessment

Appendix T Cultural Impacts Assessment

Appendix U T&T Natural Hazards Report

Appendix V Assessment of Objectives and Policies

Appendix W Proffered Consent Conditions

Appendix X Iwi Engagement Supporting Information

Appendix Y Stakeholder Consultation Supporting Information

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.

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