

Please find attached a Short Report which includes (in Appendix A) a set of volunteered conditions for the Bell Island Wastewater Treatment Plant consents. The Short Report presents background information to the conditions supplied 14 December 2017.

# Bell Island WWTP Resource Consent Application - Volunteered Conditions

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## 1 Introduction

The Nelson Regional Sewerage Business Unit (NRSBU), being a joint business unit of the Nelson City Council (NCC) and the Tasman District Council (TDC), operates the Bell Island Wastewater Treatment Plant (WWTP). On 6 November 2017 the NRSBU submitted its application and assessment of environmental effects (AEE) for new resource consents associated with the operation of the WWTP.

Section 19 (Volunteered Conditions) of the AEE document states that the NRSBU is in the process of preparing a set of volunteered conditions and that these would be provided to the consent authority. This Short Report contains the NRSBU's volunteered conditions and a commentary on the rationale behind the more significant of these.

## 2 Overall Approach to Conditions

The NRSBU has used the existing conditions of the three consents (NN000539V2, RM071151, and NN000541) that the NRSBU holds as a starting point for its volunteered conditions. Each of the existing conditions was reviewed and, in some cases, were not carried through to the volunteered set as they had already been complied with or were not considered relevant. Others were rationalised or amended where this was considered necessary.

The NRSBU's volunteered conditions are contained in Appendix A. It is our understanding that the consent authority would issue a single consent certificate for all five resource consents being sought, with a section on 'General Conditions', being conditions that apply to all the activities, and separate sections for specific conditions applicable to each of the five consented activities. We have followed this format for the volunteered conditions contained in Appendix A.

Section 3 of this Short Report discusses the rationale behind a number of the more important conditions – this section also discusses why some of the conditions on the existing consent are no longer considered relevant.

## 3 Discussion on Specific Conditions

### 3.1 General Conditions

#### 3.1.1 Condition 3 - Expiry

The NRSBU has requested, and justified in its AEE, a 35 year duration for all the consents. The final date that would be inserted (currently shown as yellow highlighted X XXXX) would be 35 years from the date of commencement of the consents.

#### 3.1.2 Condition 4 – Complaints Register

Condition 4 requires the NRSBU to maintain a Complaints Register to cover complaints received for all the activities authorised by the consents rather than having separate requirements for such a register/log under each of the consented activities.

### 3.1.3 Condition 5 – Annual Report

Condition 5 requires the NRSBU to prepare an Annual Report to collate, analyse and interpret all monitoring required by the conditions of the various consents, including a trend analysis of the past five years' data. The monitoring data from the most recent five year period is considered a reasonable period over which to assess whether any trends are occurring and this period is considered representative of the current quality of the discharge(s).

The Annual Report also needs to include copies of any records required by the conditions as well as a summary of complaints received.

### 3.1.4 Condition 6 – Asset Management Plan

This is a new condition volunteered by the NRSBU which requires it to always have an Asset Management Plan in place for the WWTP. The NRSBU currently reviews its Asset Management Plan for the WWTP every three years.

Importantly, in preparing the Asset Management Plan the condition requires the NRSBU to take into account technological changes and advances in relation to wastewater management, treatment, discharge, and beneficial reuse technologies that could be of relevance for possible future use in the Bell Island wastewater treatment and discharge facilities.

Further, the condition also requires the NRSBU to, as part of preparing its Asset Management Plan, to assess whether any newly available technology option(s) or combination of options identified through (a) above represent the Best Practicable Option (BPO) to minimise the adverse effects of the treated wastewater discharge.

### 3.1.5 Condition 7 – Management Plans

Condition 7 requires the NRSBU to maintain an Operations and Maintenance Plan, a Pond Management Plan, and an Odour Management Plan at all times. The latter plan is the only management plan that is required by the existing conditions, however the NRSBU also maintains an Operations and Maintenance Plan and a Pond Management Plan.

This condition requires the three plans to be reviewed at least every three years but provides that they may also be amended on an 'as required' basis as a result of any changes in the operation or management of the wastewater treatment plant and discharge facilities that could affect the quality and quantity of the discharges authorised by the consents.

## 3.2 Conditions for Discharge of Treated Wastewater to the Waimea Inlet

### 3.2.1 Condition 12 – Average Rate of Discharge

Condition 12 limits the average daily discharge to the Waimea Inlet to 20,000 cubic metres. This is the same limit as specified in Condition 8 of the existing consent (NN000539V2), however the existing wording is not clear whether compliance is to be assessed once per year or on a rolling average basis. The volunteered condition makes this clear that it is to be based on a rolling 365 day period.

### 3.2.2 Condition 13 – Maximum Daily Discharge Rate

Condition 13 limits the *maximum* rate of discharge to the Waimea Inlet to 25,000 cubic metres per any 24 hour period but allows for an additional 1,040 cubic metres per day to be irrigated to land should soil conditions allow. Condition 8 of the existing consent (NN000539V2) specifies the same maximum discharge rate but the 25,000 cubic metres includes the volume that may be irrigated to land.

The NRSBU seeks to change this limitation because, in some cases, the WWTP can receive high flows due to rain falling on the urban areas that it services but that same rain does not fall at Bell Island, meaning that the soils are suitable for irrigation. In such cases the NRSBU wishes the flexibility to not only discharge up to 25,000 cubic metres of treated wastewater to the Waimea Inlet over a 24 hour period, but also to irrigate up to 1,040 cubic metres of treated wastewater to land (provided soil conditions are appropriate) so that it can better

manage the high inflows at the WWTP. Importantly, in all cases the maximum discharge to the Waimea Inlet would be remain at the existing limit of 25,000 cubic metres in any 24 hour period.

### 3.2.3 Conditions 14 and 15 – Discharge Limits

Condition 14 specifies discharge limits for faecal coliforms, carbonaceous five-day biochemical oxygen demand (cBOD<sub>5</sub>), and total suspended solids (TSS). Median limits and 90 percentiles (%iles) are proposed for these determinands and the concentrations limits correspond to those of Condition 11 of the existing consent conditions (NN000539V2). However, the existing condition effectively specifies 93.75%iles and the NRSBU proposes that these be 90%iles because compliance is now proposed to be based on 20 samples (see below), not 12 and the maximum number of exceedances (two) equates to the 90%ile.

The NRSBU is also proposing to increase its sampling frequency for compliance purposes. The existing conditions require monthly sampling and compliance is assessed once per year based on the 12 monthly samples. Sampling frequency is now proposed to be fortnightly and compliance will be assessed on the latest 20 samples – that is, a rolling compliance period is proposed.

Condition 15 specifies limits for various metals and other substances in the treated wastewater. The determinands are the same as those specified by Condition 11(g) of the existing consent (NN000539V2), however the limits are updated because of apparent errors in how the previous limits were calculated and also to incorporate more up to date dilution factors.

The apparent errors in existing Condition 11(g) relate to:

- The limit for cadmium is stated as 0.28 g/m<sup>3</sup> but the evidence at the 2002 hearing shows that this should have been 0.028 g/m<sup>3</sup>;
- The limit for copper is stated as 0.028 g/m<sup>3</sup> but the evidence at the 2002 hearing shows that this should have been 0.052 g/m<sup>3</sup>;
- The limit for mercury was based on the ANZECC 95% protection trigger level but ANZECC recommends that the 99% protection trigger level for mercury should be used for slightly-moderately disturbed ecosystems;
- The derivation of the sulphide limit appears to have used an incorrect unionised sulfide percentage value from Table 8.3.10 of the ANZECC guidelines (a figure of 9% was used but the correct figure should be 4.5%).

The limits in Condition 11(g) were based on a dilution factor of 40 at a distance of 150 m from the point of discharge, this dilution factor being based on the dye testing undertaken in 1995. We have reviewed more recent information on the dilutions that are expected at the edge of the zone of reasonable mixing (being 250 m from the point of discharge) and have used an updated, but still conservative, dilution factor of 55 to determine new discharge limits for the specified determinands. Appendix B contains a letter report from Cawthron which explains the rationale behind the proposed limits.

### 3.2.4 Condition 16 – Nitrogen

Condition 16 requires the NRSBU to collect fortnightly samples of treated wastewater between 1 December and 31 March each year (ie. over summer months) and analyse these for total nitrogen (TN) concentrations – summer months are when there is the greatest risks of adverse effects occurring within the receiving environment due to nitrogen within the WWTP discharge. If the median of the samples collected over the summer months (which are converted to mass load of TN discharged) exceeds 400 kg/day, then the NRSBU would be required to undertake an investigation to determine if any significant adverse effects have occurred within the receiving environment as a result of the WWTP discharge. The 400 kg/day trigger is the same as is currently specified in Condition 15A of the existing consent (NN000539V2) except that a median is proposed rather than an average.

In the event the investigation shows that the TN discharged from the WWTP has resulted in significant adverse effects then the NRSBU would be required to prepare a nutrients limits report that outlines a monitoring programme and timeframe to derive site-specific treated wastewater quality limits for nitrogen which, if complied with, will ensure that the discharge of treated wastewater does not result in significant adverse effects within the receiving environment. The NRSBU would then implement the monitoring programme and derive the treated wastewater quality limits for nitrogen – these could be concentration or mass load limits for TN and/or nitrogen species (if the latter is deemed to be more appropriate). These limits would need to be certified by the Council and, once certified, the NRSBU would need to comply with the limits.

The existing consent (NN000539V2) includes TN mass load limits for different times of the year (conditions 11 (d) and (e)), however these appear to have been carried over from the original 1993 Water Right and the 2002 resource consent. We understand that the existing limits are based on anticipated WWTP performance in terms of TN rather than being based on environmental effects. The receiving environment monitoring to date has shown that the WWTP discharge has not resulted in any significant adverse TN effects and Cawthron considers that no changes in ecological characteristics are expected due to predicted TN increases over the next 35 years. Further, Cawthron considers that the approach of monitoring the receiving environment for effects, including the use of the 400 kg/day median TN mass load over the summer months as a trigger for further investigation is more appropriate than setting absolute TN discharge limits (ie. carrying over the existing limits) which is not effects based.

The NRSBU acknowledges that, should site-specific treated wastewater quality limits for nitrogen need to be derived through the process outlined in Condition 16, that the WWTP may need to be upgraded to achieve the new limits. However, the available information does not suggest that this will be required over the 35 year term sought in the application.

### 3.2.5 Condition 17 – Sampling

Condition 17 is new and specifies how "representative" samples are to be collected. The sample is to be a composite of three subsamples collected at least five minutes apart. This type of sampling is preferred over single grab samples as it will provide a more accurate representation of the quality of the treated wastewater.

### 3.2.6 Condition 20 – Receiving Environment Monitoring

Condition 20 would require the NRSBU to monitor the receiving environment in accordance with Appendix 2 attached to the consent. Appendix 2 is based on the Annexes 2 and 3 of the existing consent (NN000539V2) but it has been reviewed and updated to reflect the current monitoring programme that Cawthron undertakes on behalf of the NRSBU.

There are two parts to the monitoring programme of Appendix 2 – Part 1 and Part 2. Part 1 focusses on benthic and sediment quality monitoring and is undertaken every five years at 10 sites within the Waimea Inlet and Tasman Bay. A new sampling site (W11) is proposed on the western side of the Nelson Airport as recommended by Cawthron in its Report Number 3077<sup>1</sup> included as Appendix D of the AEE. This monitoring aims to assess whether the discharge from the WWTP is affecting the benthic environment and sediment quality.

Part 2 of the monitoring programme focusses on water quality and is divided into two sub-parts. Sub-Part A involves five-yearly monitoring of water quality and analyses of shellfish samples. Sub-Part B involves six monthly monitoring of shellfish and water quality.

## 3.3 Conditions for the Irrigation of Treated Wastewater to Land

### 3.3.1 Condition 24 – Irrigation Treated Wastewater to Land

Condition 24 prohibits irrigation following specified rainfall events, being the same limitation specified by Condition 4(a) of the existing consent (RM071151). Condition 4(b) of the existing consent, prevents irrigation occurring if more than 50 mm of rain is forecast. This condition is considered to be no longer appropriate as not all rain that is forecast actually arrives at Bell Island or if it does arrive it is often not as severe as forecasted. The NRSBU considers rain forecasting should not form the basis for prohibition of irrigation. Provided surface ponding and runoff doesn't occur (as volunteered by Condition 26) then irrigation should not be prohibited simply because rain is forecast.

### 3.3.2 Condition 29 – Control Groundwater Monitoring Bore

Condition 29 requires the NRSBU to arrange for a suitable control bore to be made available for the purpose of undertaking groundwater quality monitoring. The control bore specified in the existing consent is located in an area which is influenced by fertiliser application, so the samples collected are not a true representation of the quality of the groundwater up gradient of the irrigation area. The NRSBU proposes to use one of the other existing bores on Bell Island or it will install a new bore.

<sup>1</sup> Capacity of the Marine Receiving Environment of the Bell Island Wastewater Treatment Plant to Assimilate Additional Nutrients

### 3.3.3 Condition 30 – Groundwater Monitoring

Condition 30 requires the NRSBU to monitor the quality of groundwater. The requirements are the same as what are specified by Condition 13 of the existing consent (RM071151), however the sampling is proposed to be undertaken more frequently – annually rather than once every three years.

Condition 11 of the existing consent (RM071151) requires soil samples to be collected and analysed annually, however the NRSBU considers that the monitoring data obtained to date shows that the wastewater irrigation is having no detrimental effect on the soils and ongoing soil quality monitoring is not necessary. The purpose of the soil monitoring is to assess whether the exchangeable sodium is increasing to levels which pose a risk to soil structure instability. The highest the exchangeable sodium percentage has reached is 0.7%, which is significantly below the 5% which is commonly used as a guideline above which soil structural problems may occur.

## 3.4 Conditions for the Discharge of Contaminants (Odour) to Air

### 3.4.1 Condition 33 – Odours

Condition 33 prohibits discharges to air causing objectionable or offensive odours beyond the property boundary. This condition covers not only the discharges from the WWTP but also those from the irrigation area.

### 3.4.2 Condition 34 – Best Island Residents Annual Meeting

Condition 34 requires the NRSBU to meet with the Best Island residents annually. The purpose of these meetings shall be to inform the residents of the actions taken to minimise odour from the wastewater treatment plant and to provide an opportunity for comment and consultation on any necessary amendments to the management plans. This condition is based on Condition 12 of the existing consent (NN000541).

## 3.5 Conditions for the Discharge of Treated Wastewater to Land via Seepage

### 3.5.1 Condition 35 – Protection of Pond Liner(s)

Condition 35 is a new condition which requires the NRSBU to take all practicable steps to avoid damaging or interfering with the clay liners of the treatment ponds, including during desludging. This is to ensure that seepage from the base of the ponds does not occur through damage to the liner material.

## 3.6 Conditions for the Pipe and Outlet Diffuser Structure

### 3.6.1 Condition 37 – Pipe and Outlet Diffuser Structure Inspection and Maintenance

Condition 37 is a new condition which requires the NRSBU to inspect the existing pipe and outlet diffuser structure and check that the diffuser ports are clear of significant marine growths at least every five years. Further, if the inspection shows that the pipe has become exposed then the Council and the Harbourmaster must be notified.

# 4 Conclusion

The NRSBU considers that the volunteered conditions contained in Appendix A, are appropriate to avoid, remedy or mitigate potential adverse effects identified by the AEE. The monitoring programme has been updated to reflect the current monitoring undertaken by Cawthron and the NRSBU and it is considered that the monitoring now proposed is appropriate to identify whether the activities for which consents are sought are resulting in effects as described and predicted in the AEE.

# Appendix A – Volunteered Conditions

**Resource consent numbers:** RMXXXXXX, RMXXXXXX, RMXXXXXX, RMXXXXXX, and RMXXXXXX

Pursuant to section 104B of the Resource Management Act 1991 ("the Act"), the Tasman District Council ("the Council") hereby grants resource consents to:

**Nelson Regional Sewerage Business Unit**  
(hereinafter referred to as "the Consent Holder")

**Activities authorised by these consents:**

- RMXXXXXX:** Coastal Permit – To discharge treated wastewater to the Waimea Inlet
- RMXXXXXX:** Discharge Permit – To discharge treated wastewater to land via irrigation
- RMXXXXXX:** Discharge Permit – To discharge contaminants (primarily odour) to air
- RMXXXXXX:** Discharge Permit – To discharge treated wastewater to land via seepage from clay-lined facilities (ponds)
- RMXXXXXX:** Coastal Permit – To occupy the coastal marine area (Waimea Inlet) and to use and maintain an existing pipe and diffuser outlet structure

The above activities are associated with the operation and maintenance of the Bell Island Wastewater Treatment Plant

**Location details:**

Address of property: 150 Bell Island Access, Best Island  
 Legal description: Island No 2 Bell Waimea East District  
 Certificate of title: CT 56/193  
 Co-ordinates:

Wastewater Treatment Plant: Easting: 1614468E Northing: 5428724N (NZTM)  
 Irrigation area: Easting: 1615481E Northing: 5428066N (NZTM)  
 Outlet structure and discharge to Waimea Inlet: Easting: 1615481E Northing: 5428066N (NZTM)

Pursuant to section 108 of the Act, these consents are issued subject to the following conditions:

**GENERAL CONDITIONS**

1. The Consent Holder shall ensure that the activities authorised by these consents are undertaken in general accordance with the information provided with the application RMXXXXXX – RMXXXXXX, entitled 'Bell Island Wastewater Treatment Plant – Resource Consent Application and Assessment of Environmental Effects' prepared by Stantec New Zealand dated 6 November 2017 and also in accordance with the management plans for the wastewater treatment plant required by Condition 8. In the event that there is any conflict between these documents and any condition(s) of these consents, the conditions shall prevail.
2. These consents shall not lapse until their expiry.
3. These consents shall expire on X XXXXX 2053.
4. The Consent Holder shall maintain a Complaints Register for the activities authorised by these consents. All complaints received by the Consent Holder in relation to the activities authorised by these consents shall be logged immediately in the Complaints Register. The Complaints Register shall record:
  - (a) The date, time, location, duration, and nature of the alleged event/ incident;
  - (b) Name, phone number and address of the complainant unless the complainant wishes to remain anonymous;
  - (c) Any remedial action taken by the Consent Holder in response to the complaint and when it was undertaken;
  - (d) The possible cause of the relevant event/ incident that lead to the complaint;
  - (e) The weather conditions at the time of the relevant event/ incident including estimates of wind direction, wind strength, temperature and cloud cover;

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- (f) The date and name of the person making the entry; and
  - (g) Details of any complaints received that may indicate non-compliance with the conditions of these consents shall be provided to the Council's Coordinator Compliance Monitoring within 24 hours of receipt of the complaint or on the next working day. All other complaints shall be included in the Annual Report required by Condition 5.
5. The Consent Holder shall prepare an Annual Report and provide it to the Council's Coordinator Compliance Monitoring by 31 May of each year. The Report shall cover the period from 1 April to 31 March and include, but not necessarily be limited to, the following:
- (a) Collate, analyse, and interpret the monitoring results required by the conditions of these consents. This assessment shall include an analysis of the past five years' monitoring data and identification of any trends in the results;
  - (b) Copies of any records required by any condition(s) of these consents;
  - (c) A summary of complaints, if any, received by the Consent Holder.
6. The Consent Holder shall, at all times, have an Asset Management Plan in place and make this Plan available to the Council's Coordinator Compliance Monitoring upon request. In preparing the Asset Management Plan, the Consent Holder shall:
- (a) Take into account technological changes and advances in relation to wastewater management, treatment, discharge, and beneficial reuse technologies that could be of relevance for possible future use in the Bell Island wastewater treatment and discharge facilities; and
  - (b) Assess whether any newly available technology option(s) or combination of options identified through (a) above represent the Best Practicable Option (BPO) to minimise the adverse effects of the treated wastewater discharge.
7. (a) The Consent Holder shall, at all times, have an Operations and Maintenance Plan, a Pond Management Plan, and an Odour Management Plan in place and make these plans available to the Council's Coordinator Compliance Monitoring upon request. The objective of these plans is to provide a framework for the operation and management of the wastewater treatment plant and discharge facilities to ensure compliance with the conditions of these consents. These plans shall, as a minimum, cover:
- (i) An overview description of the wastewater treatment plant and discharge facilities (being the irrigation system and pipe/diffuser outlet structure);
  - (ii) A description and schedule of the routine inspection, monitoring, and maintenance procedures to be undertaken to ensure operation of the wastewater treatment plant and discharge facilities complies with the conditions of these consents;
  - (iii) A description of the sampling location(s) and methodology for sampling the treated wastewater discharge and receiving environment;
  - (iv) A schedule of the critical aspects of the wastewater treatment plant and the detailed response and contingency plans to remedy any possible variations from normal plant operation that could potentially affect discharge quality;
  - (v) Details of contingency plans and procedures to address a critical power or equipment failure at the wastewater treatment plant;
  - (vi) Procedures for recording routine maintenance and all major repairs that are undertaken;
  - (vii) The Consent Holder's chain of command, responsibility and notification protocols; and
  - (viii) Details of the complaints procedure, record keeping and response procedure.
- (b) These plans shall be reviewed and updated at least every three years by the Consent Holder but may also be amended 'as required' as a result of any changes in the operation or management of the wastewater treatment plant and discharge facilities that could affect the quality and quantity of the discharges authorised by these consents.
8. The Council may, in accordance with section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the condition of any or all of these consents annually between 1 June and 1 August for any one or more of the following purposes:
- (a) To deal with any adverse effect on the environment arising from the exercise of these consents which was not foreseen at the time the application was considered and which is appropriate to deal with at the time of review; or

- (b) To require the Consent Holder to adopt the best practicable option to remove or reduce any adverse effect on the environment resulting from the exercise of these consents.

*Advice Note: The Council may, in accordance with section 128 of the Resource Management Act 1991, serve notice on the Consent Holder of its intention to review the conditions of these consents:*

- (a) to enable standards set by a new rule(s) in any regional plan that has been made operative since the granting of these consents to be met;
- (b) when relevant national environmental standards have been made; or
- (b) if the information made available to the consent authority by the Consent Holder for the purposes of the application contained inaccuracies which materially influenced the decision on the application and the effects of the exercise of the consent(s) are such that it is necessary to apply more appropriate conditions.

**CONDITIONS FOR RMXXXXXX – Discharge Treated Wastewater to the Waimea Inlet**

- 9. The Consent Holder shall maintain a measuring device to ±5% accuracy to record the times and rates of discharge of treated wastewater to the Waimea Inlet. These records are to be supplied electronically to the Council's Coordinator at least every two months, upon written request, and included in the Annual Report required by Condition 5.
- 10. The accuracy of the measuring device referred to in Condition 9 shall be tested at least once every five years and confirmation of the accuracy shall be included in the Annual Report required by Condition 5 for the year the testing is undertaken.
- 11. The discharge of treated wastewater to the Waimea Inlet shall, under normal operating conditions, only occur for a period of up to three hours after any high tide which occurs at the outlet structure.
- 12. The average daily rate of discharge of treated wastewater to the Waimea Inlet, based on a rolling 365 day averaging period, shall not exceed 20,000 cubic metres per day (m<sup>3</sup>/day).
- 13. The maximum volume of treated wastewater to the Waimea Inlet over any 24 hour period shall not exceed 25,000 metres (m<sup>3</sup>) and where wastewater is irrigated to land under resource consent RMXXXXXX the combined volume discharged to land and to the Waimea Inlet shall not exceed 26,040 m<sup>3</sup>.
- 14. (a) The quality of treated wastewater discharged to the Waimea Inlet shall meet the following standards:

Determinand	Unit	Median Limit	90 <sup>th</sup> Percentile Limit	Compliance Period
Faecal coliforms	cfu/100 mL	20,000	100,000	20 most recent fortnightly samples
Carbonaceous five day biochemical oxygen demand (cBOD <sub>5</sub> )	mg/L	40	50	20 most recent fortnightly samples
Total suspended solids (TSS)	mg/L	100	150	20 most recent fortnightly samples

- (b) Compliance with these limits shall be based on a representative sample of treated wastewater collected fortnightly and analysed for faecal coliforms, cBOD<sub>5</sub>, and TSS concentrations.
- (c) For the purposes of this condition, to determine compliance with median limits for faecal coliforms, cBOD<sub>5</sub>, and TSS, no more than 10 samples out of any 20 consecutive fortnightly samples shall exceed the specified median limit. To determine compliance with the 90<sup>th</sup> percentile limit, no more than 2 samples out of any 20 consecutive fortnightly samples shall exceed the specified 90<sup>th</sup> percentile limit.

15. (a) In addition to the limits specified in Condition 14, the maximum concentrations of the following substances in the treated wastewater discharged to the Waimea Inlet shall not exceed the following:

Total arsenic	1.98 g/m <sup>3</sup>
Total cadmium	0.039 g/m <sup>3</sup>
Total chromium	0.24 g/m <sup>3</sup>
Total copper	0.072 g/m <sup>3</sup>
Total lead	0.24 g/m <sup>3</sup>
Inorganic mercury	0.006 g/m <sup>3</sup>
Total nickel	0.39 g/m <sup>3</sup>
Total zinc	0.83 g/m <sup>3</sup>
Cyanide	0.22 g/m <sup>3</sup>
Phenols	22 g/m <sup>3</sup>
Total sulphides	1.2 g/m <sup>3</sup>

- (b) Compliance with these limits shall be based on a representative sample of treated wastewater collected annually and analysed for the listed determinands.

16. (a) The Consent Holder shall collect a representative sample of treated wastewater fortnightly between 1 December and 31 March every year and these samples shall be analysed for total nitrogen (TN) concentrations.

- (b) The daily mass of TN discharged on each day that samples are collected, as required by clause (a) of this condition, shall be calculated by multiplying the TN concentration in each sample collected by the volume of treated wastewater discharged on the day that the sample was collected.

- (c) The median mass load of TN discharged to the Waimea Inlet between 1 December and 31 March shall be calculated within five working days of receipt of the last sample result from the laboratory. The calculated median mass load of TN discharged shall be based on all daily TN masses calculated in accordance with clause (b) of this condition.

- (d) In the event that the median mass load of TN discharged to the Waimea Inlet between 1 December and 31 March in any year, required to be calculated by clause (c) of this condition, exceeds 400 kilograms per day (kg/day) the Consent Holder shall:

- (i) Undertake an investigation to assess whether any significant adverse environmental effects within the receiving environment have occurred as a result of the discharges authorised by these consents;

- (ii) Within 2 months of completion of the investigation required by clause (d) (i) submit a nitrogen effects assessment report, prepared by a suitably qualified and experienced marine ecologist/scientist, to the Council's Coordinator Compliance Monitoring. The nitrogen effects assessment report shall outline the results of the investigation required by clause (d) (i) of this condition and include a conclusion as to whether any significant adverse environmental effects within the receiving environment have occurred as a result of the discharges authorised by these consents. In addition, the nitrogen effects assessment report shall include recommendations on whether any amendments to the monitoring programme(s) specified in Appendix 2 (attached to these consents) should be made to better assess the effects of the discharges authorised by these consents; and

- (iii) In the event that the nitrogen effects assessment report required by clause (d) (ii) recommends amendments to the monitoring programme(s) specified in Appendix 2 (attached to these consents) then those amendments shall be made and implemented provided they are first agreed to in writing by the Council's Coordinator Compliance Monitoring.

- (e) If the nitrogen effects assessment report required by clause (d) (ii) concludes the discharges authorised by these consents have caused any significant adverse environmental effects within the receiving environment, the Consent Holder shall:

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- (i) Within 2 months of the date the nitrogen effects assessment report is submitted in accordance with clause (d)(ii), submit a nitrogen limits report, prepared by a suitably qualified and experienced marine ecologist/scientist, to the Council's Coordinator Compliance Monitoring for certification. The nitrogen limits report shall outline a proposed monitoring programme and timeframe to derive site-specific treated wastewater quality limits for nitrogen which, if complied with, will ensure that the discharge of treated wastewater does not result in significant adverse effects within the receiving environment. These discharge limits may either be concentration or mass load limits for TN and/or, if more appropriate, specific nitrogen species;
- (ii) Once certified, the monitoring programme required by clause (e)(i) of this condition shall be implemented. Within one month of the completion of the monitoring programme a report, prepared by a suitably qualified and experienced marine ecologist/scientist, shall be submitted to the Council's Coordinator Compliance Monitoring for certification. The report shall outline the derivation of site-specific discharge limits for TN or specific nitrogen species which, if complied with, will ensure that the discharge of treated wastewater does not result in significant adverse effects within the receiving environment; and
- (iii) Comply with the TN or specific nitrogen species discharge limits from the time they are certified by the Council's Coordinator Compliance Monitoring.

**Advice Note:** *The discharge of treated wastewater to the Waimea Inlet is not expected to result in any significant adverse effects as a result of TN. However, this condition requires the Consent Holder to undertake regular monitoring of TN and, if the specified TN mass load trigger is exceeded, monitoring within the receiving environment to assess potential effects. Should that monitoring show that the discharge has resulted in significant adverse effects then the Consent Holder is required to derive site-specific TN (and/or nitrogen species) discharge limits which must then be complied with.*

- 17. For the purposes of Conditions 14, 15, and 16 a 'representative sample' shall consist of a composite sample made up of at least three subsamples collected at least 5 minutes apart. All samples shall be collected in laboratory supplied containers and using appropriate procedures as directed by the accredited environmental testing laboratory and shall be transported to the laboratory under chain of custody.
- 18. The results of the monitoring specified in Conditions 14, 15, and 16 shall be included in the Annual Report required by Condition 5. Notwithstanding the above, the Consent Holder shall report any exceedance of any limit to the Council's Coordinator Compliance Monitoring within five working days of any exceedance being detected.
- 19. The discharge shall not cause any of the following effects in the receiving water outside the zone of reasonable mixing shown in Figure 1 included in Appendix 1 (attached to these consents):
  - (a) The production of any conspicuous oil or grease film, scums or foams, or floatable or suspended material;
  - (b) Any conspicuous change of colour or visual clarity;
  - (c) Any emission of objectionable odour; or
  - (d) Any significant adverse effect on marine aquatic life.
- 20. The Consent Holder shall undertake monitoring of the receiving environment in accordance with the monitoring programme(s) contained in Appendix 2 attached to these consents. The Consent Holder may amend the monitoring programme(s), including determinands to be monitored/analysed and frequencies of monitoring provided this is first agreed to in writing by the Council's Coordinator Compliance Monitoring.

## CONDITIONS FOR RMXXXXXX – Discharge Treated Wastewater to Land via Irrigation

21. The total rate of treated wastewater discharged to land via irrigation shall not exceed 1,040 cubic metres per day and shall occur over an irrigation area not exceeding 20.5 hectares shown on Figure 2 included in Appendix 1 (attached to these consents).
22. The maximum application rate for irrigation shall not exceed 15 millimetres (mm) in any 24 hour period and 35 millimetres in any consecutive seven day period.
23. The Consent Holder shall maintain a measuring device to  $\pm 5\%$  accuracy to record the volumes of irrigation. The daily irrigation volume(s) be recorded and included in the Annual Report required by Condition 5.
24. Irrigation shall not occur within 24 hours of a 20 mm rainfall event occurring as measured at the site office on Bell Island. Information required to assess compliance with this condition shall be recorded and included in the Annual Report required by Condition 5.
25. The Consent Holder shall ensure there is no spray drift beyond the property boundary.
26. The irrigation gun located at the end of the centre-pivot irrigator shall be disabled so that no irrigation may occur within the arc shown in red and labelled "No Gun Spraying" in Figure 2 included in Appendix 1 (attached to these consents).
27. There shall be no surface water ponding, direct discharge, or run-off into any water body as a result of the irrigation.
28. No fertiliser which contains nitrogen compounds shall be applied within the irrigation area shown on Figure 2 included in Appendix 1 (attached to these consents).

*Advice Note: The Consent Holder has volunteered this condition, however other fertilisers can be applied to the irrigation area provided they do not contain any nitrogen compounds. Fertilisers containing nitrogen may be applied to other parts of Bells Island which are outside the irrigation area.*

29. The Consent Holder shall, within six months of the date of commencement of these consents, arrange for a suitable 'control' groundwater bore to be available so that groundwater monitoring can occur at a site not likely to be influenced by either the irrigation or applied fertilisers.

*Advice Note: The current control bore is in an area which is influenced by fertiliser application. This condition requires the Consent Holder to either use one of the other bores on Bell Island as a control bore or to install a new bore – in either case the bore will need to be located so that it is not influenced by the irrigation or by fertiliser applications.*

30. (a) The Consent Holder shall monitor groundwater quality at the following locations:
  - (i) the shallow bore located within the irrigation area shown on Figure 2 included in Appendix 1 (attached to these consents); and
  - (ii) the control bore referred to in Condition 29.
- (b) Monitoring shall occur annually during the month of February and the bores shall be purged sufficiently prior to any groundwater samples being collected to ensure that samples collected are representative of the local groundwater quality.
- (c) On each occasion that groundwater samples are collected the Consent Holder shall also measure the depth to the groundwater. This measurement shall be undertaken prior to the bore being purged.
- (c) Groundwater samples shall be taken using laboratory supplied containers and using appropriate procedures as directed by the accredited environmental testing laboratory. Samples shall be transported to the laboratory under chain of custody and shall be tested for the following:
  - (i) pH;
  - (ii) electrical conductivity;

- (iii) nitrate-nitrogen (NO<sub>3</sub>-N);
  - (iv) total ammoniacal nitrogen [(NH<sub>3</sub>+NH<sub>4</sub>)-N];
  - (v) *Escherichia coli*; and
  - (vi) Faecal coliforms.
- (d) The pH and electrical conductivity shall be measured in the field using an appropriately calibrated meter.
31. The Consent Holder shall include the following information in the Annual Report required by Condition 5:
- (a) The dates on which irrigation occurred and for each day that irrigation occurred;
    - (i) The duration of irrigation;
    - (ii) The volume of irrigation;
    - (iii) The area that was irrigated; and
    - (iv) The depth of rainfall as recorded at the site office on Bell Island.
  - (b) The results of groundwater monitoring required by Condition 29; and
  - (c) A discussion on trends, if any, in groundwater quality based on the past five years' monitoring data.
32. The Consent Holder shall provide and maintain adequate signage at the perimeter of the irrigation area warning the general public that treated wastewater is irrigated and notifying persons not to enter unless they are authorised to do so.

#### **CONDITIONS FOR RMXXXXXX – Discharge Contaminants (primarily Odour) to Air**

33. There shall be no discharges to air from the wastewater treatment plant or irrigation area that are objectionable or offensive beyond the property boundary.
34. The Consent Holder shall facilitate meetings with residents of Best Island annually. The purpose of these meetings shall be to inform the residents of the actions taken to minimise odour from the wastewater treatment plant and to provide an opportunity for comment and consultation on any necessary amendments to the management plans referred to in Condition 7. Whenever practicable, the Consent Holder shall take all reasonable measures to inform the residents of Best Island of the likelihood of an odour event prior to its occurrence. In such cases, the Consent Holder shall inform residents of the cause and likely duration of the event and the actions being taken to remedy or mitigate its effects.

#### **CONDITIONS FOR RMXXXXXX – Discharge Treated Wastewater to Land via Seepage**

35. The Consent Holder shall take all practicable steps to avoid damaging or interfering with any liner(s) that are present at the base of any treatment ponds, including during desludging.

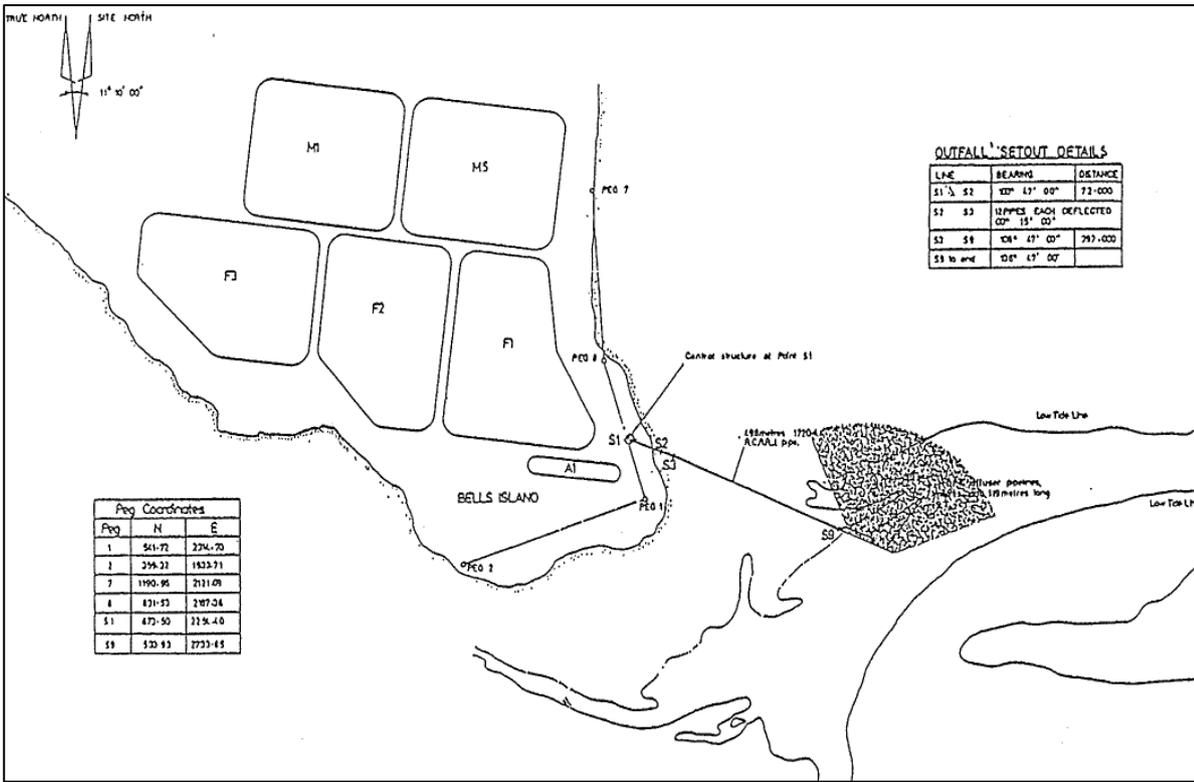
#### **CONDITIONS FOR RMXXXXXX – Use and Maintenance of a Pipe and Diffuser Outlet Structure within the Waimea Inlet**

36. The use and occupation of the coastal marine area (the Waimea Inlet) shall be limited to the pipe and the outlet diffuser structure to convey and discharge treated wastewater and any temporary

structures associated with the installation, repair, and maintenance of the offshore outlet pipe and outlet diffuser structure. The pipe and outlet diffuser structure is shown in Figure 3 included in Appendix 1 (attached to these consents).

37. (a) The Consent Holder shall, at least every five years, provide to the Council's Coordinator Compliance Monitoring a report prepared by a suitably qualified and experienced person(s) to demonstrate that the pipe and outlet diffuser structure is:
- (i) In sound repair and the diffuser ports are clear of any significant marine growths; and
  - (ii) The pipe is not exposed above the seabed floor other than the diffuser outlet structure.
- (b) In the event that the Consent Holder becomes aware that the pipe is exposed (other than the diffuser outlet section that is designed to be exposed), either as a result of an inspection carried out or at any other time, the Consent Holder shall immediately notify the Council's Coordinator Compliance Monitoring and the Harbourmaster's Office. Within 10 working days of that notification, the Consent Holder shall prepare and submit a report to the Council's Coordinator Compliance Monitoring to assess any adverse environmental effects resulting from the exposed pipe and outline any proposed remediation or risk management to be undertaken.
38. The structures authorised by this consent shall be maintained in a good and sound condition, and any repairs that are necessary shall be made as soon as reasonably practicable.

**APPENDIX 1 – FIGURES REFERRED TO IN CONDITIONS**



**Figure 1.** Zone of reasonable mixing, being defined as the area delineated by a 250 metres radius north of the outfall and within 45° included angles.



**Figure 2.** Location of Wastewater Irrigation Area (shown in Yellow) and Monitoring Bores.



**Figure 3.** Location of Pipe and Outlet Diffuser Structure.

## APPENDIX 2

### BELL ISLAND WASTEWATER TREATMENT PLANT RESOURCE CONSENTS

#### RECEIVING ENVIRONMENT MONITORING PROGRAMME

##### **PART 1 – Five-yearly Benthic and Sediment Monitoring Programme**

The following monitoring shall be undertaken at five-yearly intervals and shall coincide with the Tasman District Council's five-yearly State of the Environment (SoE) monitoring undertaken within the Waimea Inlet.

1. A field survey of the sites shown in Figure A attached to this monitoring programme (and as described in Cawthron Report No. 2979<sup>2</sup>), recording:

- Sediment type;
- Visible macrofauna;
- Macrophyte species and coverage;
- Sediment profiles; and
- Any obvious signs of enrichment or pollution (e.g. microalgal mats, H<sub>2</sub>S, odours, fats, oils, unnatural debris etc.)

2. Analysis of the following characteristics in sediment samples from the sites shown in Figure A:

- Particle size;
- Total nitrogen content;
- Organic matter content;
- Chlorophyll-a content – only at sites where there is visual evidence of microalgal films on the surface of the sediment; and
- Infauna species and abundance (0.5 millimetre sieve sizes)

3. Analysis of the following trace metals in samples of sediment and shellfish (cockles, where present) from the sites shown in Figure A attached to this monitoring programme:

- Total mercury (sediment only);
- Total arsenic;
- Total cadmium;
- Total chromium;
- Total copper;
- Total lead;
- Total nickel; and

<sup>2</sup> Cawthron Report 2979 (Part 1): Morrisey D, Webb S 2017. Coastal effects of the Nelson (Bell Island) regional sewerage discharge: benthic monitoring survey 2016. Prepared for Nelson Regional Sewerage Business Unit. Cawthron Report No. 2979. 32 p.

- Total zinc

**NOTES:**

The monitoring programme shall be based on previous studies with modifications as recommended in Cawthron Report No. 2979.

The above benthic monitoring may be co-ordinated with the testing programme outlined in Part 2 (Microbiological and Nutrient Assessment Monitoring).

The sites will be located to reflect the likely dispersal patterns of the treated wastewater discharge and the location of the mixing zone.

## **PART 2 – Microbiological and Nutrient Assessment Monitoring Programme**

The objective of this programme is to provide a statistically and scientifically rigorous assessment of the effects of the discharge of treated wastewater from the Bell Island wastewater treatment plant on the microbial and nutrient status of the Waimea Inlet and the microbial status of the Rabbit Island and Tahunanui beaches.

The programme shall consist of two sub-parts (Sub-Part A and Sub-Part B).

### **Sub-Part A**

A full receiving water survey shall be undertaken at five-yearly intervals and may be carried out as part of, or in conjunction with, other water quality monitoring programmes in the area, including the five-yearly benthic monitoring programme outlined in Part 1. Sampling shall be scheduled to commence during the ebb tide during favourable weather conditions and after periods of at least three days with no significant rainfall. The sampling locations are shown on Figure B attached to this monitoring programme and as described in Cawthron Report No. 2945<sup>3</sup>.

Sampling (as described in Cawthron Report No. 2945) shall consist of:

- at least three treated wastewater samples collected at timed intervals during the ebb tide discharge period;
- seawater samples taken from the Waimea Inlet and inner Tasman Bay at the sites shown in Figure B and as described in Cawthron Report No. 2945;
- shellfish samples taken from Waimea Inlet and Tasman Bay at a subset of the sites as shown in Figure B and described in Cawthron Report No. 2945. Shellfish samples shall be comprised of Greenshell™ mussels (*Perna canaliculus*) deployed in baskets as described in Sub-Part B, below, and in Cawthron Report No. 2945.
- depth profiles of salinity and temperature at all sites shown in Figure B, and profiles of salinity, temperature, dissolved oxygen, turbidity, light (as photosynthetically active radiation) and chlorophyll-a at sites T3, T4, T5 and T6 in inner Tasman Bay shown in Figure B.

A composite of the treated wastewater samples shall be tested for:

- nutrients (nitrate, nitrite, ammonia, dissolved inorganic nitrogen, total nitrogen, dissolved reactive phosphorus and total phosphorus).
- faecal indicator bacteria (faecal coliforms and enterococci, MPN or CFU/100 mL, using membrane filtration technique).

The seawater samples shall be tested for:

- nutrients (nitrate, nitrite, ammonia, dissolved inorganic nitrogen, total nitrogen, dissolved reactive phosphorus and total phosphorus);
- faecal indicator bacteria (faecal coliforms and enterococci, MPN or CFU/100 mL); and
- phytoplankton species and abundance (Tasman Bay sites only).

The shellfish samples shall be tested for:

- faecal indicator bacteria (faecal coliform and enterococci, MPN or CFU/100 g).

<sup>3</sup> Cawthron Report 2945 (Part 2A): Morrisey D, Johnston O, Newcombe E 2016. Impact of the Nelson (Bell Island) regional sewerage discharge on the coastal environment: receiving water survey—August 2016. Prepared for Nelson Regional Sewerage Business Unit. Cawthron Report No. 2945. 21 p.

### Sub-Part B

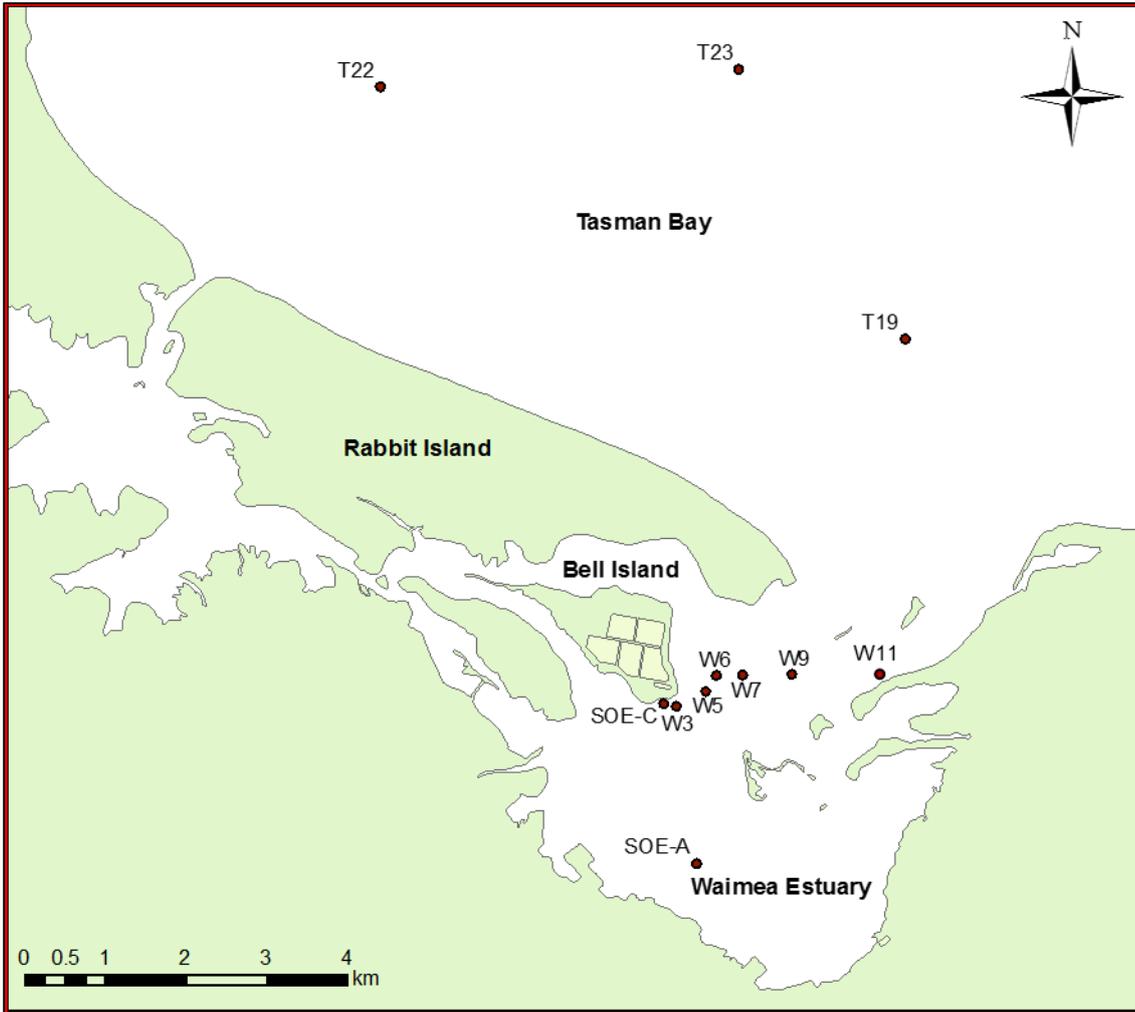
Sub-Part B shall be undertaken twice yearly (once during summer and once during winter) and shall include analyses of shellfish samples for faecal indicator bacteria (faecal coliform and enterococci, MPN or CFU/100 g) from the inner Tasman Bay sites shown in Figure C and as described in Cawthron Report No. 3093<sup>4</sup>. Shellfish samples shall be comprised of Greenshell™ mussels (*Perna canaliculus*) deployed in baskets. Mussel deployments shall be of approximately seven days duration (minimum three days, maximum 14 days), with minimum rainfall in the catchment for at least three days prior to recovery of the mussels. A subsample of mussels shall be analysed for faecal indicator bacteria at the start of deployment. Seawater samples shall also be collected from mussel deployment sites at the start and end of deployment and analysed for faecal coliform and enterococci (MPN or CFU/100 mL) and phytoplankton species and abundance.

Depth profiles of salinity, temperature, dissolve oxygen, turbidity, light (as photosynthetically active radiation), and chlorophyll-a shall be measured at each site at the start and end of the period of mussel deployment.

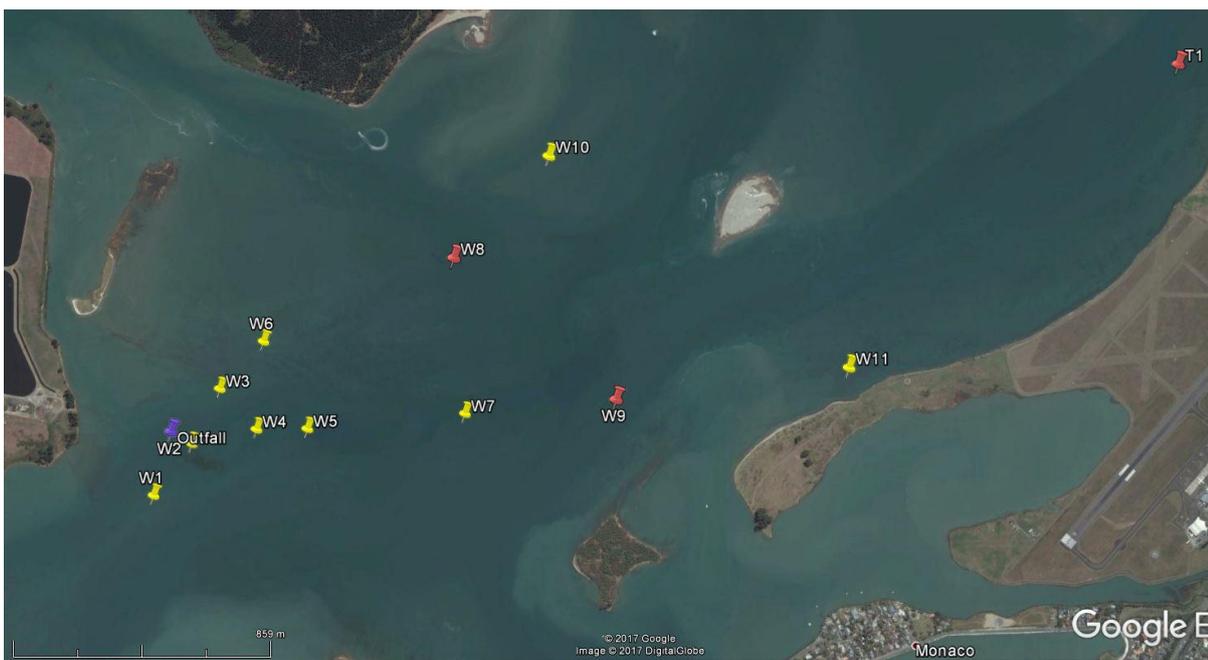
This assessment programme may be carried out as part of, or in conjunction with, other water quality monitoring programmes in the area, including the five-yearly programme outlined in Sub-Part A.

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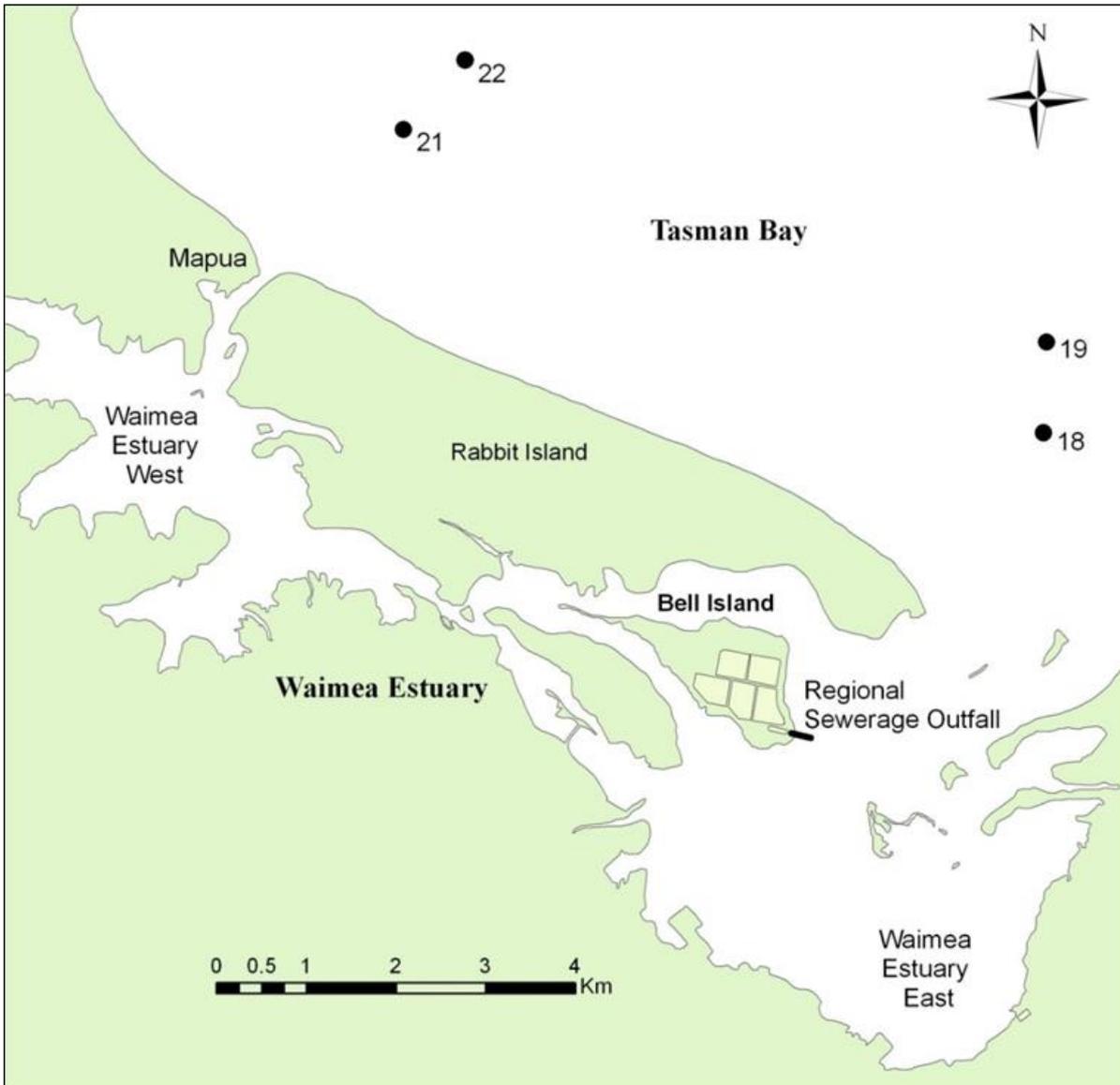
4 Cawthron Report 3093 (Part 2B): Cameron M 2017. Coastal effects of the Bell Island regional sewerage discharge: August 2017 mussel monitoring survey. Prepared for Nelson Regional Sewerage Business Unit. Cawthron Report No. 3093. 11 plus appendices p



**Figure A.** Sampling locations for Part 1 of the Monitoring Programme – Five-yearly Benthic and Sediment Monitoring Programme.



**Figure B.** Sampling locations for Sub-Part A of Part 2 of the Monitoring Programme – Five-yearly Microbiological and Nutrient Assessment Monitoring Programme (Upper image: overview of all locations. Lower image: detail of locations in eastern Waimea Inlet). Red markers indicate water sampling and mussel deployment sites, yellow markers indicate water sampling only.



**Figure C.** Sampling locations for Sub-Part B of Part 2 of the Monitoring Programme – Six-monthly Microbiological and Nutrient Assessment Monitoring Programme in inner Tasman Bay.

## Appendix B – Cawthron Letter Report

14 December 2017

Dr Rob Lieffering  
Stantec  
Level 1  
66 Oxford Street  
Richmond 7020

ID:1754

Dear Rob

### Proposed consent limits for the Bell Island WWTP discharge

As discussed by email this week, please find attached my suggested limits for toxicants in the discharge from the Bell Island WWTP.

Please don't hesitate to contact me if you have any questions.

Scientist



Don Morrisey  
Senior Coastal Scientist  
Cawthron Institute

Reviewed by



Ross Sneddon  
Environmental Scientist  
Cawthron Institute

## Proposed Condition 15.a for the discharge from the Bell Island WWTP outfall in Waimea Inlet

Condition 15.a In addition to the limits specified in Condition 14, the maximum concentrations of the following substances in the treated wastewater discharged to the Waimea Inlet shall not exceed the following (previous limits in brackets):

Total arsenic	1.98 g/m <sup>3</sup> (0.5)
Total cadmium	0.039 g/m <sup>3</sup> (0.28)
Total chromium	0.24 g/m <sup>3</sup> (0.176)
Total copper	0.072 g/m <sup>3</sup> (0.028)
Total lead	0.24 g/m <sup>3</sup> (0.176)
Inorganic mercury	0.006 g/m <sup>3</sup> (0.016)
Total nickel	0.39 g/m <sup>3</sup> (0.28)
Total zinc	0.83 g/m <sup>3</sup> (0.6)
Cyanide	0.22 g/m <sup>3</sup> (0.16)
Phenols	22 g/m <sup>3</sup> (16)
Total sulphides	1.2 g/m <sup>3</sup> (0.44)

### Rationale for proposed limits

The concentrations listed above for cadmium, chromium, copper, lead, mercury, nickel, zinc, cyanide and phenols are derived from the ANZECC trigger values (Table 3.4.1 of ANZECC 2000). The values used are those suggested by ANZECC for 'slightly-moderately disturbed systems'. In most cases this is the 95% level of protection (% of species protected) but for cadmium, mercury and nickel ANZECC suggest the 99% level of protection (the previous consent condition used the 95% condition for mercury). The chromium trigger used is that for chromium VI (the most toxic form of the metal) but, for simplicity, total chromium is the proposed form to monitor, making the limit more conservative.

The concentration for arsenic is derived from the US EPA's *National Recommended Water Quality Criteria – Aquatic Life Criteria*<sup>1</sup> because the value provided by ANZECC (page 8.3–105 of ANZECC (2000)) is described as 'a low reliability trigger value, to be used only as an indicative interim working level'. The US EPA value for arsenic is derived from toxicity data for arsenic III but is applied by the US EPA to total arsenic.

The concentration for sulphides is derived from the ANZECC moderate reliability trigger value of 1 µg/L, expressed as un-ionised hydrogen sulphide. This was corrected to total sulphide based on a percentage of 4.5% of hydrogen sulphide in total aqueous sulphide solutions at pH8 and salinity 32.5 psu (Table 8.3.10 of ANZECC 2000).

<sup>1</sup> US EPA (<https://www.epa.gov/wqc/national-recommended-water-quality-criteria-aquatic-life-criteria-table#table>), accessed 11 December 2017.

The various water-quality criteria provided by ANZECC and the US EPA are listed below:

<b>Determinand</b>	<b>Criterion (g/m<sup>3</sup>)</b>
Total arsenic (US EPA)	0.036
Total cadmium (ANZECC)	0.0007
Total chromium (ANZECC)	0.0044
Total copper (ANZECC)	0.0013
Total lead (ANZECC)	0.0044
Inorganic mercury (ANZECC)	0.0001
Total nickel (ANZECC)	0.007
Total zinc (ANZECC)	0.015
Cyanide (ANZECC)	0.004
Phenols (ANZECC)	0.4
Total sulphides (ANZECC, ph8, 32.5 psu <sup>2</sup> , 18 °C)	0.022

The water-quality criteria provided by ANZECC and the US EPA apply at the boundary of the mixing zone. The previous consent assumed a dilution factor of 40 at 150 m from the outfall (the boundary of the mixing zone is 250 m from the outfall), based on the modelling by Bell et al. 1995<sup>3</sup>. For the limits proposed here, we reviewed the dilution factors derived from the recent modelling using CORMIX and SCHISM (MetOcean 2017<sup>4</sup>) and from measurements of various dissolved contaminants (nutrients) in the wastewater and the receiving environment during discharge (Morrisey & Berthelsen 2017<sup>5</sup>). These are summarised below:

<b>Source</b>	<b>Distance from outfall (m)</b>	<b>Dilution factor</b>
Bell et al. (1995)	250	40–66
CORMIX	12–86	16–99
SCHISM	250	204–235
Morrisey & Berthelsen (2017)	220–290	TN: 55–110 TP: 75–325

The lower estimates of dilution derived from measurement of contaminants in the receiving environment are close to the value used to derive the previous limits (40). Using the smallest dilution factor based on measured concentrations of nutrients in the discharge and at the boundary of the mixing zone (55 times dilution) provides limits that are slightly higher than those presently used but that are still conservative. Multiplying the ANZECC or US EPA criterion for each contaminant at the boundary of the mixing zone by the dilution factor provides the concentration limit for the corresponding contaminant in the wastewater.

<sup>2</sup> Practical salinity units.

<sup>3</sup> Bell RG, Williams BL, Gibbs MM 1995. Bell Island outfall mixing zone study. NIWA Report No. BCH011/1. Prepared for Nelson Regional Sewerage Authority. 24 p.

<sup>4</sup> MetOcean 2017. Bell Island discharge plume and dilution investigation. MetOcean Solutions Ltd report prepared for Nelson City Council. 69 p.

<sup>5</sup> Morrisey D, Berthelsen A 2017. Bell Island Wastewater Treatment Plant consent renewal: Assessment of environmental effects. Cawthron Report No. 3006. Prepared for Nelson Regional Sewerage Business Unit. 2 p. plus appendices.