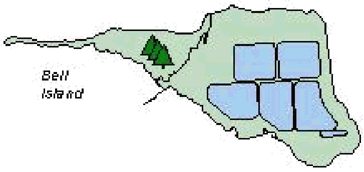
Nelson Regional Sewerage Business Unit



Wastewater Activity Management Plan 2021 – 2031

Mahere Waipara 2021 – 2031

Nelson City Council
te kaunihera o whakatū

tasman district council
Te Kaunihera o te tai o Aorere

Document Control

Title: NRSBU Wastewater Activity Management Plan 2021-2031					
Date	**Version**	**Description**	**Prepared by:**	**Reviewed by:**	**Authorised by:**
6/9/20	V6	Draft for NRSBU Board Meeting	Emma McFarlane, Tonkin & Taylor Consultants	Iain Satterthwaite, Activity Engineer NRSBU	Nathan Clarke, General Manager NRSBU
October 2020	V7	Draft for NCC and TDC November meetings	Morgelyn Leizour (on secondment to NCC)	Iain Satterthwaite, Activity Engineer NRSBU	Nathan Clarke, General Manager NRSBU
November 2020	V8	Comments incorporated from NCC SLT meeting of 19 October 2020	Morgelyn Leizour (on secondment to NCC)	Iain Satterthwaite, Activity Engineer NRSBU	Nathan Clarke, General Manager NRSBU
March 2021	V9	Updates to include agreed Capex Deferrals and Associated Opex changes.	Iain Satterthwaite Activity Engineer NRSBU	Nathan Clarke General Manager NRSBU	Nathan Clarke, General Manager NRSBU

Cover Photo:

Bell Island Wastewater Treatment Plant

Table of contents

Document Control i

Table of contents ii

Table of Figures v

1 Executive Summary 2

1.1 Our context 2
1.2 What we plan to do 2
1.3 What we cannot do 3
1.4 Managing the risks 3
1.5 What does it cost? 4
1.6 The next steps 5

2 Purpose of the Plan 7

3 AMP structure 7

4 Where are we now? 10

4.1 Nelson Regional Sewerage Business Unit 10
4.2 Services provided 10
4.3 Asset description 11
4.4 Key relationships 12
4.4.1 NRSBU's owners 12
4.4.2 Contributors 13
4.4.3 General stakeholders 13
4.5 NRSBU outcomes 14
4.5.1 Public health 14
4.5.2 Cultural sensitivity 14
4.5.3 Sustainability 14
4.6 Strategic goals 16
4.7 Strategic objectives 16

5 What is driving change? 17

5.1 Overview 17
5.2 Inflow and infiltration 18
5.3 Climate change 19
5.4 Population growth 21
5.5 Major changes by contributors 23
5.5.1 Changes in volume 23
5.5.2 Changes in load 24
5.6 Disposal drivers 24
5.6.1 Land disposal 24
5.6.2 Pathogenic contaminants 25
5.6.3 Emerging pollutants 25
5.7 Legislation 26

6 Reticulation 29

6.1 Issues 29
6.1.1 Condition 29
6.1.2 Hydraulic capacity 29
6.2 Preferred future state 29

7 Pump stations 30

7.1 Summary 30
7.2 Beach Road (Richmond) Pump Station 30
7.2.1 Description 30

7.2.2 Issues and options 31
7.2.3 Preferred future state 32
7.3 Whakatū Pump Station 32
7.3.1 Description 32
7.3.2 Issues and options 33
7.3.3 Preferred future state 34
7.4 Saxton Road Pump Station 34
7.4.1 Description 34
7.4.2 Issues and options 35
7.4.3 Preferred future state 36
7.5 Songer Street Pump Station 36
7.5.1 Description 36
7.5.2 Issues and options 37
7.5.3 Preferred future state 38
7.6 Airport Pump Station 38
7.6.1 Description 38
7.6.2 Issues and options 39
7.6.3 Preferred future state 40
8 Wastewater treatment and disposal 40
8.1 Overview 40
8.2 Wastewater treatment plant headworks 43
8.3 Effluent treatment 43
8.4 Effluent disposal 44
8.4.1 To Waimea Inlet 44
8.4.2 To land 45
8.5 Biosolids treatment and disposal 45
8.5.1 Overview 45
8.5.2 Biosolids Application Facility (BAF) 45
8.5.3 Disposal effects 46
8.5.4 Natural hazards 46
9 Financial projections 47
9.1 Capital budgets 47
9.2 Operating budgets 47
9.3 Funding sources 48
9.4 Debt forecasts 49
9.5 Assumptions and confidence in the forecasts 50
10 Our people 53
10.1 Governance structure 53
10.2 Organisational structure 53
10.3 Employees 54
10.4 Health and safety 54
11 Our community 54
12 Assets 55
12.1 Understanding our assets 55
12.1.1 Asset performance 55
12.1.2 Asset condition 56
12.2 Operating our assets 57
12.3 Maintaining our assets 58
12.4 Replacing our assets 59
12.5 Upgrading our assets 60

13 Risks **61**
13.1 Our key risks 61
13.2 Our risk management approach 62
13.3 Critical assets 63
13.4 Resilience 64
13.5 Lifelines 65
13.6 Covid 19 65
14 Systems **65**
14.1 Asset management systems 65
14.1.1 Current system 66
14.1.2 Preferred asset management system 66
14.2 Environmental management systems 67
14.3 Quality systems 68
14.4 Financial systems 69
14.4.1 Treasury and budgeting 69
14.4.2 Valuation 70
14.4.3 Insurance 71
14.4.4 Procurement 72

Appendix A: History of NRSBU
Appendix B : Industrial Contributors' Background
Appendix C : Risk Management Plan
Appendix D: Financial Forecasts
Appendix E: Valuation June 2020

Table of Figures

Figure 1-1: Capital expenditure for the next 30 years 4

Figure 1-2: Operational expenditure for the next 30 years 5

Figure 1-3: Forecast debt levels for the planned works 5

Figure 2-1: Relationship with other documents 7

Figure 4-1: Extent of area covered by NRSBU 10

Figure 4-2: Flow and loads per contributor as a proportion of totals received at Bell Island WWTP 11

Figure 4-3: Schematic of the NRSS 12

Figure 4-4: Linkages with owners and customers 13

Figure 4-5: Objectives categorised by each strategic goal 16

Figure 5-1: Extent of inundation from 1.0 m sea level rise shown in green (sourced from TDC website) 20

Figure 5-2: Potential growth areas (from Nelson Tasman Future Development Strategy 2019) 22

Figure 5-3: Indicative change in wastewater volume at the treatment plant 23

Figure 5-4: Indicative impact on wastewater loads (BOD and TKN) 24

Figure 5-5: Recreational areas (Bell Island WWTP Application and AEE 2017) 25

Figure 7-1: Photograph of the Beach Road Pump Station site 31

Figure 7-2: Estimated maximum half hourly average flow rate to Beach Road Pump Station (estimate provided by TDC) 32

Figure 7-3: Photograph of the Whakatū Pump Station site 33

Figure 7-4: Estimated maximum half hourly average flow rate to Whakatū Pump Station (placeholder values only until NCC provides updated flows) 34

Figure 7-5: Photograph of the Saxton Road Pump Station site 35

Figure 7-6: Estimated maximum half hourly average flow rate to Saxton Road Pump Station (placeholder values only until NCC provides updated flows) 36

Figure 7-7 Photograph of Songer Street Pump Station site 37

Figure 7-8: Estimated maximum half hourly average flow rate to Songer Street Pump Station (placeholder values only until NCC provides updated flows) 38

Figure 7-9: Photograph of Airport Pump Station site 39

Figure 7-10: Estimated maximum half hourly average flow rate to Airport Pump Station (placeholder values only until NCC provides updated flows) 40

Figure 8-1: Main components of the WWTP (from Bell Island WWTP Application and AEE 2017) 41

Figure 8-2: Schematic of WWTP 42

Figure 8-3: Bell Island WWTP inflow and outflow per year 44

Figure 8-4: Biosolids Application Facility on Moturoa/Rabbit Island (March 2020) 46

Figure 9-1: Capital budget forecast for the next 30 years 47
Figure 9-2: Operational budget for the next 10 years per category 48
Figure 9-3: Operational budget forecast for the next 30 years 48
Figure 9-4: Total charges for the five main contributors 49
Figure 9-5: Forecast debt over the next 30-year period 50
Figure 9-6: Forecast depreciation over the next 30-year period 50
Figure 10-1: NRSBU's organisational structure 53
Figure 12-1: Three-tiered approach to renewal planning 60
Figure 14-1: The Plan-Do-Check-Act Cycle 68

Overview

1 Executive Summary

1.1 Our context

The Nelson Regional Sewerage Business Unit (NRSBU) is a joint committee of Nelson City Council (NCC) and Tasman District Council (TDC), the two owners. It was established to look after the owners' interests in the Nelson Regional Sewerage Scheme (NRSS) and has been delegated authority to act on the owners' behalf. NRSBU provides wastewater services to NCC and TDC. It also services three major industrial operators as well as several minor customers (liquid waste operators).

Reflecting on the last three years and looking ahead to the next ten years, the key aspects of our context are:

- NCC and TDC are continuing to see incremental growth in their peak and average discharge volumes.
- There is uncertainty around one industrial contributor which ceased operations in September 2020. It is not known whether its flows and loads will be taken up by other operators within the site. The flows and loads from the other industrial contributors have been relatively stable.
- Longstanding concerns held by local iwi are being given increased priority.
- Network resilience has been identified as a strategic issue.
- A new operations contract is being prepared, which will introduce a collaborative, outcomes driven focus with the contractor.
- An application is underway for renewal of the resource consent for biosolids reuse on Moturoa/Rabbit Island.
- Understanding and managing the emissions from NRSBU's facilities has become a strategic issue.
- Central government is developing plans to increase regulation and aggregate service delivery in the three waters sector.
- NRSBU is beginning to recognise the long-term vulnerability of its sites to sea level rise.

1.2 What we plan to do

NRSBU plans to provide operation, maintenance, renewal and upgrades of the assets within the NRSS to meet the required levels of service and to be consistent with its annual budgets and long-term plans. The actions we are taking to address better planning and delivery of capital works are listed below.

Better planning: the key element of this is a 50-year master plan, with adaptive staging that has triggers for key decisions. Actions to support this plan include:

- Secure our future by identifying, purchasing and designating land.
- Continue investigating high-value end uses for treated wastewater and biosolids.
- Improve our working relationship with iwi and the community.
- Facilitate regional conversations to improve integration/coordination/synergies.
- Respond to industry changes as these develop.
- Monitor of emissions and investigate energy efficient solutions.

Capital works: to upgrade the resilience and capacity of the network and treatment plant. Works include:

- Adding capacity to accommodate foreseeable storm flows and future growth, i.e. duplicate key pipelines, increase pump station capacity and provide emergency storage.
- Installation of overflow screening and monitoring.
- Implementation of pilot plant for wastewater reuse.
- Implement and maintain redundancy for mechanical equipment so that components (N) have at least one independent backup component (+1).
- Implement and maintain emergency power generation at pump stations and wastewater treatment plant (WWTP). Install ring main for generators at WWTP.
- Increase seismic resistance of our facilities.
- Increase capacity through the treatment plant processes, e.g. additional screening, grit removal, aeration capacity, duplicate pipelines, odour control.

1.3 What we cannot do

NRSBU cannot provide the increased levels of service that its owners may desire without a significant impact on the costs of providing the services.

We cannot do everything that we, or our owners and community, would like. This is primarily due to the financial implications that this would have on our contributors. Key elements that we cannot do within the ten-year timeframe of this plan are:

- Deliver significant changes to our presence in the Waimea estuary or address other iwi concerns. The size of the capital investment required for this means we will need to make these changes over a long timeframe.
- Address some resilience issues with the network and treatment plant. These primarily relate to adding storage in the network to reduce the risk of overflows and provide better maintainability.

1.4 Managing the risks

Key risks for NRSBU have been identified as follows:

- Limited knowledge of our assets.
- Ageing infrastructure.
- Poor contract management.
- Extreme natural disasters.
- Lack of active business continuity plans.
- Inconsistent strategic documents.
- Overflows from our system.
- Blockages/bursts in our system.
- Faster growth and higher flows than forecast.

Managing the risks includes:

- Ensuring the systems NRSBU utilises are fit for purpose.
- Maintaining accurate data and continuously updating information on NRSBU assets.
- Implementing a programme of condition assessments and being proactive in carrying out works to prevent failures from occurring.
- Providing strong contract management and ensuring, where applicable, there are clear delineations between contracts.

- Allowing for climate change when designing new works and upgrading existing infrastructure.
- Having operation manuals and emergency procedures in place and maintaining business continuity plans.
- Forward planning that includes adequate consultation with landowners and acquisition of land where necessary.
- Maintaining communication between contributors to ensure documents e.g. AMPs, LTPs and Strategies are 'in sync'.
- Proactive maintenance of infrastructure, ensuring failures are minimised.

Risks are discussed further in Section 13.

1.5 What does it cost?

Our high-level capital and operational forecasts are shown in the figures below (Figure 1-1 and Figure 1-2).

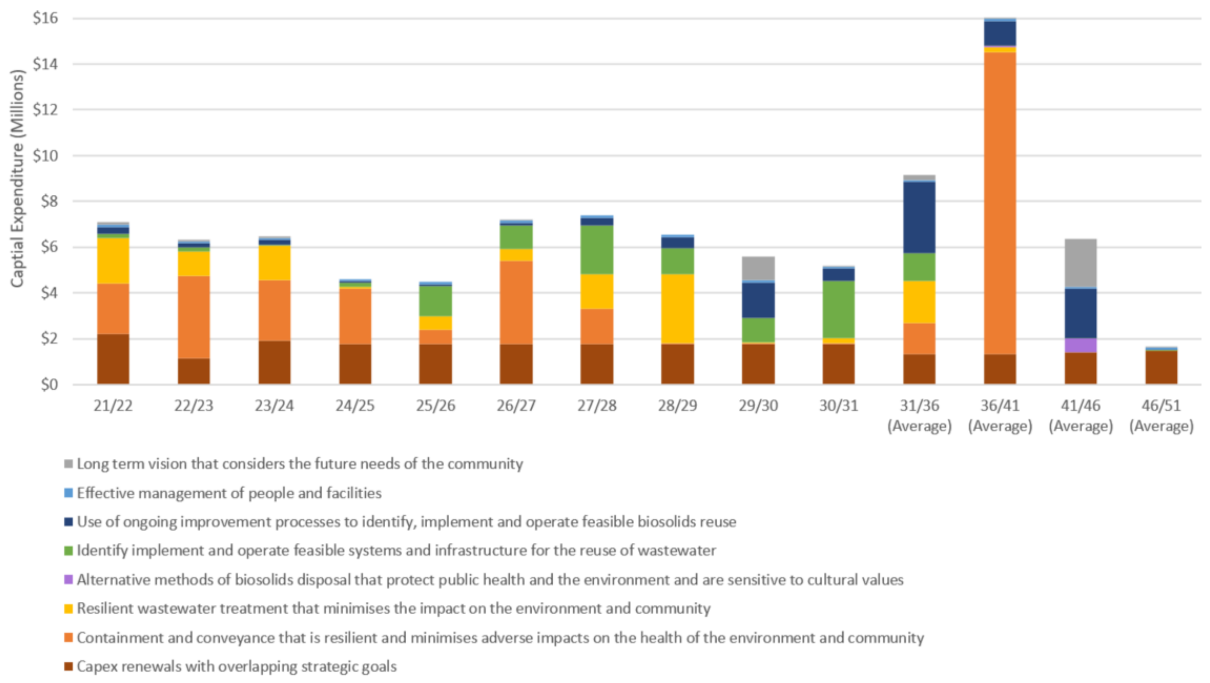


Figure 1-1: Capital expenditure for the next 30 years

Our operational expenditure is expected to increase, as shown in Figure 1-2, due to the implementation of new processes and infrastructure. Overall, our proposed capital programme will result in an increase from current debt levels (Figure 1-3).

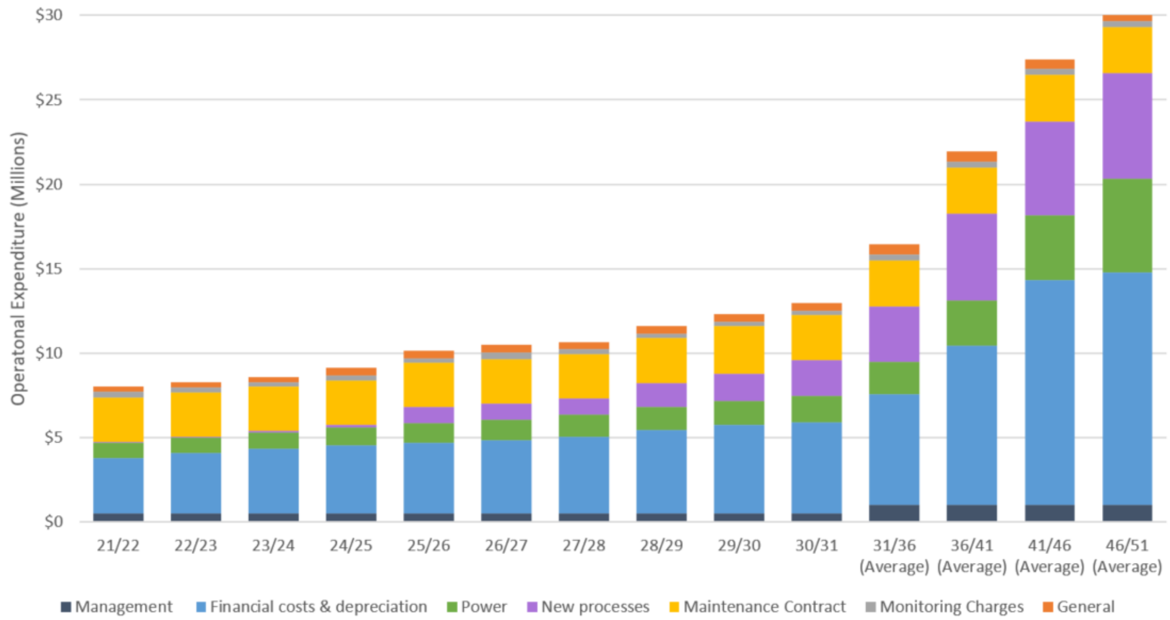


Figure 1-2: Operational expenditure for the next 30 years

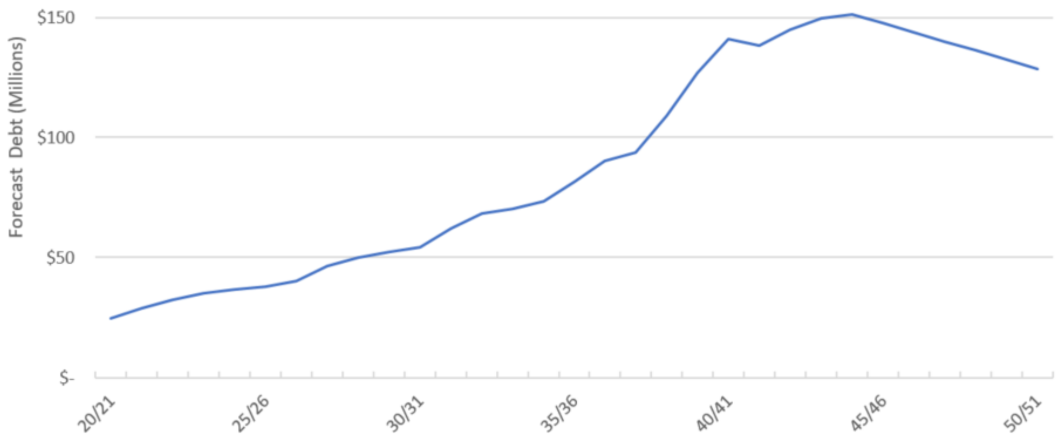


Figure 1-3: Forecast debt levels for the planned works

1.6 The next steps

The total capex budgets for the next ten years, including the planned renewals budget, are shown in Table 1-1 while capex projects (excluding renewals) are identified in Table 1-2. Total planned capital expenditure for the ten year period from 2021/22 to 2030/31 is $58.334M.

Table 1-1: Total capex budgets 2021-2031 ($ thousands)

Capex	Total years 1-10	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
LoS	31,105	4,800	4,850	4,325	2,575	2,085	1,200	3,950	1,550	2,570	3,200
Growth	5,000						500	1,500	3,000		
Land	2,500						1,500			1,000	
Renewals	20,209	2,194	1,146	1,924	1,835	2,185	3,785	1,785	1,785	1,785	1,785
Total	**58,814**	**6,994**	**5,996**	**6,249**	**4,410**	**4,270**	**6,985**	**7,235**	**6,335**	**5,355**	**4,985**

Table 1-2: Planned capital projects excluding renewals ($ thousands)

Project	Capex	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Pump station overflow screens and monitoring systems	LoS	300									
Regional pipeline capacity upgrades	LoS	3,720	2,470	2,150	2,000						
Pump and discharge pipework upgrades at pump stations	LoS		2,050	350	250						
Strategic review and seismic strengthening of PSs	LoS			50		100		500			
Flood protection of pump stations	LoS										
Storage at pump stations	LoS			50	50	110	100	1,000			
Saxton Road PS- land purchase for storage	Land						1,500				
Additional screening and duplicate grit trap at WWTP	LoS				50	500					
Hydraulic capacity upgrades at WWTP	LoS		80	1,500							
Power supply upgrades at Best Island and WWTP	LoS							500			
Aeration basin and clarifier capacity upgrade	Growth						500	1,500	3,000		
Design of system to remove algae from pond	LoS	20									200
Desludging ponds	LoS	400			25						
New technology assessments to meet Consent	LoS	50				50					
Design of sludge processing improvements at WWTP	LoS						50	50	200	500	500
Biosolids drying	LoS		100				50	250	250	1,020	
Odour and equipment upgrades at Rabbit Island	LoS	200		150							
Buffer storage at WWTP	LoS			25	200	1,000					
Ultrafiltration plant and re-use water pipework	LoS							150	100	1,050	2,000
UV disinfection for re-use water	LoS					50	500				
Best Island irrigation	LoS		100	50		250	500	1,500	1,000		
Bell Island irrigation and effluent re-use	LoS	110	50								
Rabbit Island Irrigation	LoS					25					500
Purchase and designate land for future Clockwise PS	Land									1,000	
Total LoS, growth and land driven capex upgrades	**38,605**	**4,800**	**4,850**	**4,325**	**2,575**	**2,085**	**3,200**	**5,450**	**4,550**	**3,570**	**3,200**

2 Purpose of the Plan

This Activity Management Plan (AMP) is intended to demonstrate how NRSBU will achieve its required strategic goals and objectives. This plan focusses on the activities, outcomes and services NSRBU is delivering and the assets needed to deliver them.

The relationship of this plan with the other documents in the NRSBU's planning framework is shown in Figure 2-1 below.

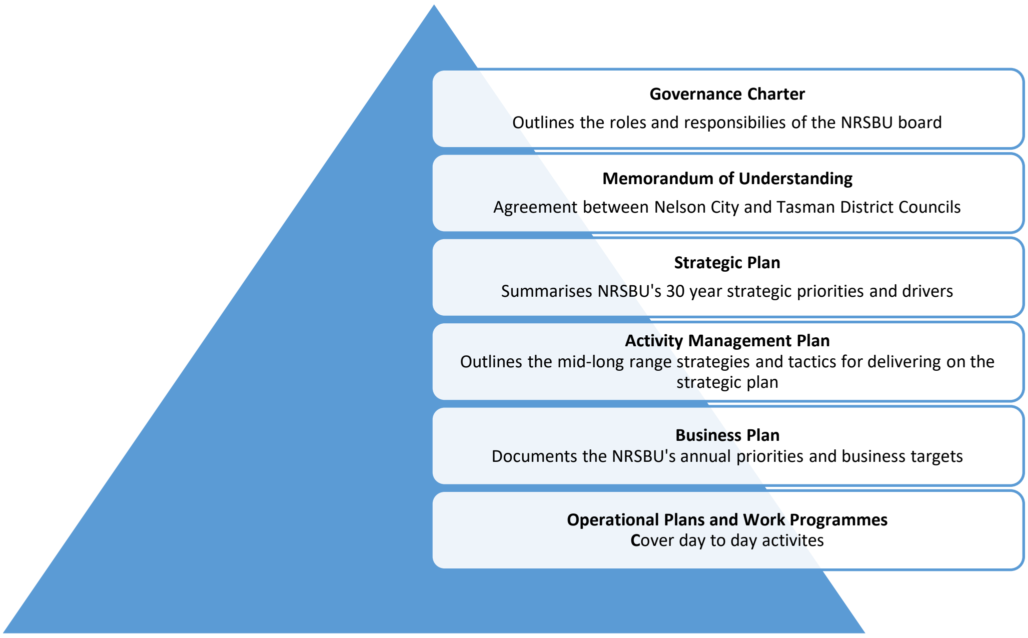


Figure 2-1: Relationship with other documents

3 AMP structure

Following this overview, the AMP is structured in three parts:

- **Part A: Our strategic context.** This outlines our existing business, what is driving change as we look to the future and how we plan to respond to this.
- **Part B: Where we want to be.** This section describes our reticulation, pump station, treatment and disposal assets and outlines the issues, options and preferred future state of these assets. This section also includes our financial projections for the next 30-year timeframe.
- **Part C: How we manage what we have.** This outlines our existing management approaches for our people, assets, risks and systems. It also documents where we consider there to be gaps in our management practices and what plans we have to reduce those gaps.

Through the AMP, we wish to demonstrate that we:

- Understand the needs of our contributors.
- Understand our asset and non-asset requirements to provide our strategic levels of service into the future.
- Improve our knowledge of our assets on a proactive and ongoing basis.
- Are transparent about the processes in place for managing, operating, maintaining, renewing and extending our assets in ways that consider risk, quality and cost.
- Consider what is the appropriate level of sophistication for managing our assets and have plans in place to address gaps between actual and target maturity.

- Consider adequately the class of risks this activity faces and have systematic processes in place to mitigate identified risks.
- Plan for adequate funding of asset operations, maintenance, renewals and upgrades.
- Have processes that continually improve the outcomes delivered by the assets, as measured against the requirements of the contributors and to other internally and externally imposed standards.

Part A: Our strategic context

4 Where are we now?

4.1 Nelson Regional Sewerage Business Unit

The role of NRSBU is to manage and operate the wastewater facilities at Bell Island and the associated reticulation network efficiently and in accordance with the required resource consent conditions to meet the needs of its contributors. NRSBU shall plan for future needs of the community in a cost-efficient manner rather than focus on making a financial return. A Memorandum of Understanding, signed by the two Mayors and CEO's of NCC and TDC in May 2019, governs the operation of NRSBU.

4.2 Services provided

NRSBU treats municipal wastewater from the following contributors (Figure 4-1):

- Nelson City - Stoke and Tahunanui areas.
- Tasman District - Richmond, Wakefield, Brightwater (the Waimea Basin) and Māpua.
- Industrial wastewater from the Alliance Group, Turners and Growers (ENZA), Nelson Pine Industries.

Minor customers such as fish/chicken waste, trade waste, stock effluent and septage users disposing into the septage disposal facility.

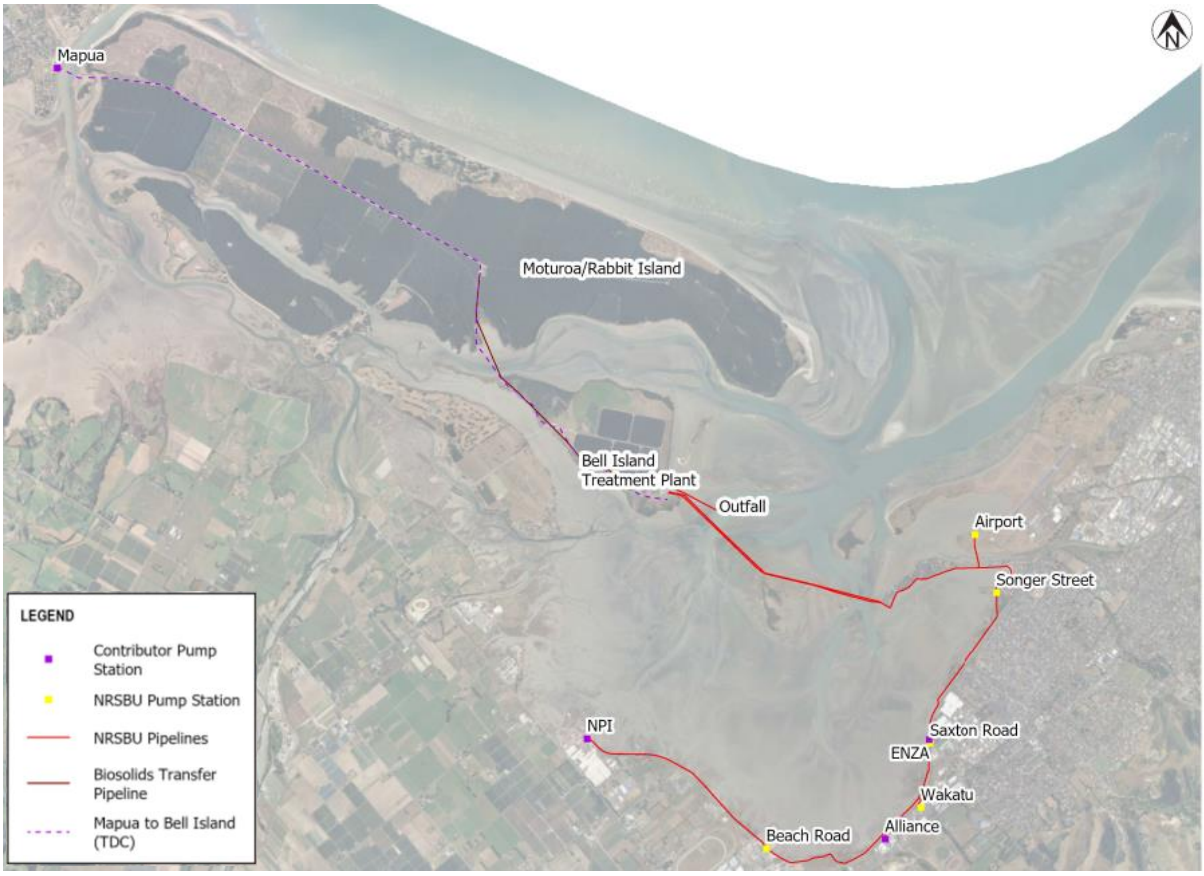
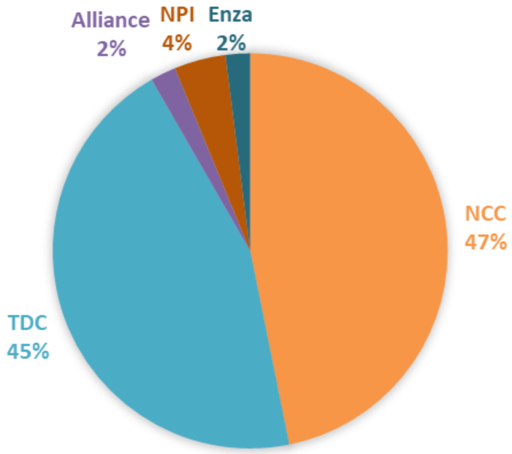


Figure 4-1: Extent of area covered by NRSBU

The following figure (Figure 4-2) outlines the proportion of average daily flow and average BOD load per contributor for the year 2019.

Average daily flow per contributor

Most wastewater flows to the treatment plant are from the two councils. The remaining flows are spilt between the industry contributors.



Average daily load (BOD) per contributor

The differences between the two councils can be contributed to the Whakatū and Saxton Catchments which include significant industrial flows. Both these catchments are part of NCC contracted flows.

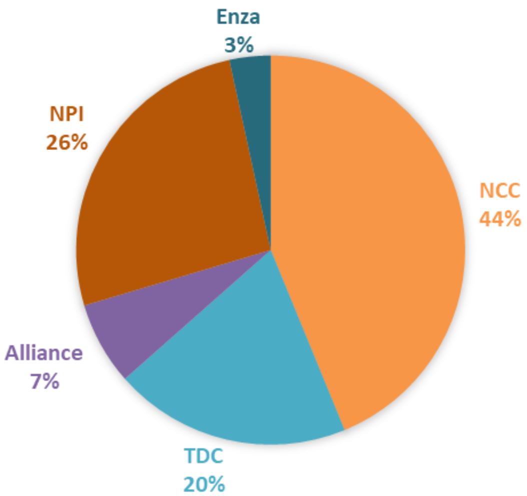


Figure 4-2: Flow and loads per contributor as a proportion of totals received at Bell Island WWTP

4.3 Asset description

NRSS includes:

- 16.8 km of rising mains
- Five pump stations
- Wastewater Treatment Plant (WWTP)
- 712 m outfall
- Biosolids Application Facility (BAF)

A schematic of NRSS, with the pump stations and the WWTP is shown in Figure 4-3 below.

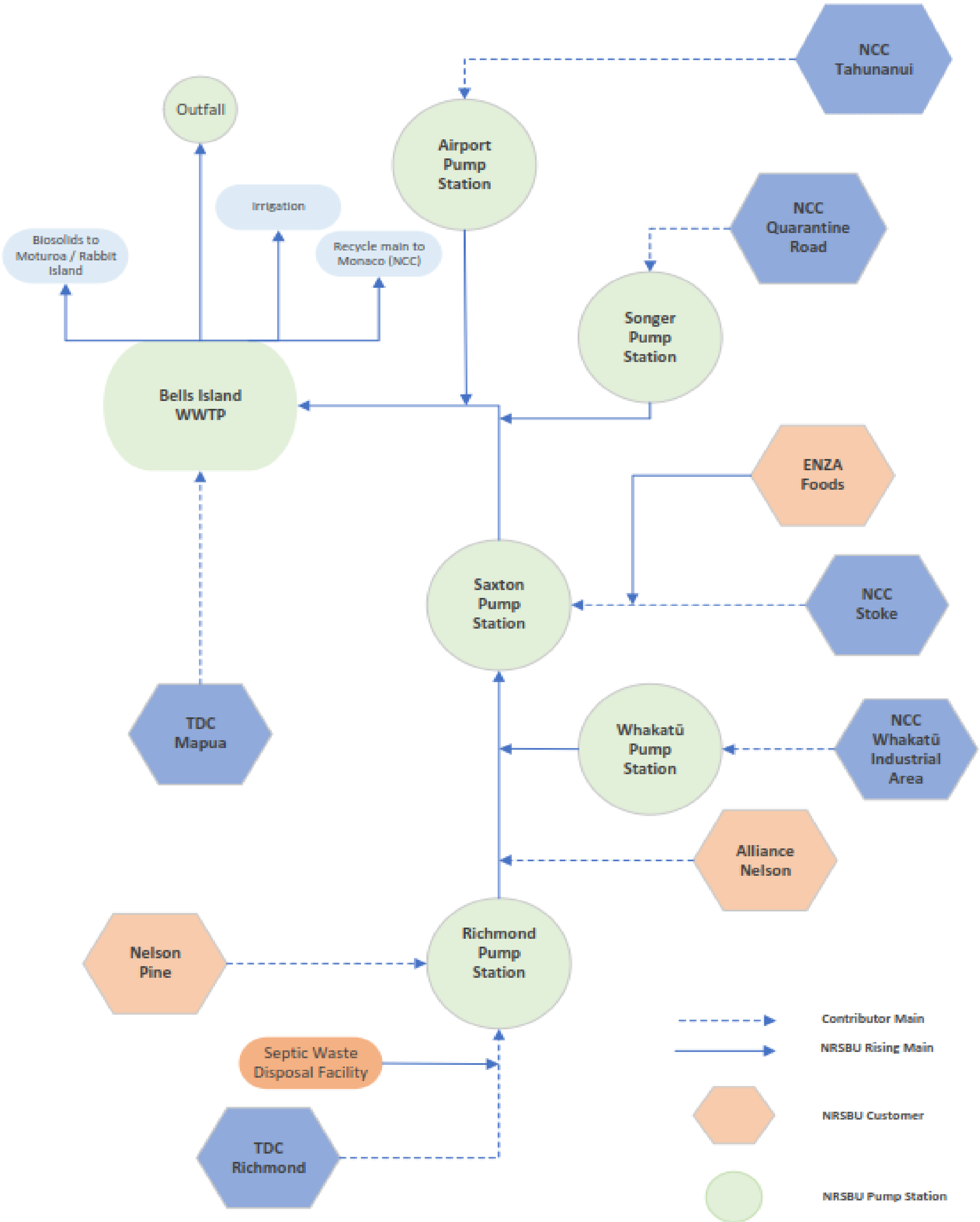


Figure 4-3: Schematic of the NRSS

4.4 Key relationships

4.4.1 NRSBU's owners

NRSBU is jointly owned by NCC and TDC. NRSBU has relationships with the two councils at multiple levels including strategic, management and business relationships. The strategic outcome for the two councils as owners and service providers is to meet the current and future needs of their customers in way that is cost-effective and environmentally sustainable. NRSBU's Long Term Plan (LTP) and ultimately this AMP feed directly into the LTPs of each of the councils.

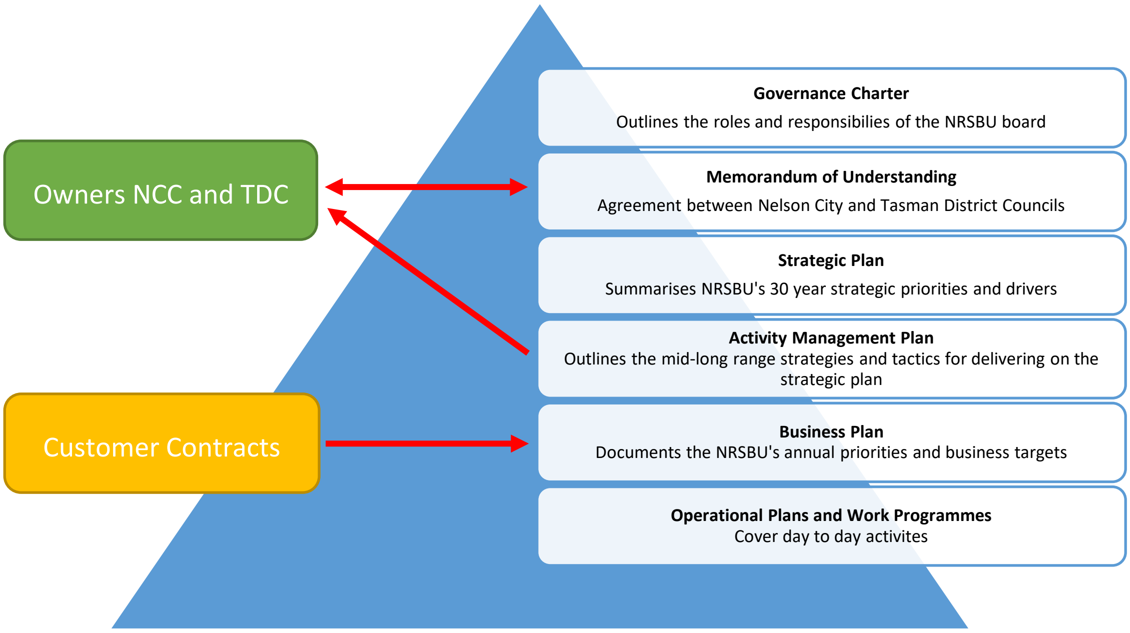


Figure 4-4: Linkages with owners and customers

4.4.2 Contributors

NRSBU's contributors include the two councils and significant waste producing industries in the region (Nelson Pine, ENZA Foods and Alliance Group). These contributors each have individual Disposal of Trade Waste Agreements with NRSBU, which outline their flow and demand requirements. The following table (Table 4-1) summarises what we believe are the desired outcomes for our contributors.

Table 4-1: Contributors' desired outcomes

Contributors	Desired Outcome
NCC and TDC as contributors	Long Term Strategy and Business plan, and delivery of strategic outcomes as per the memorandum of understanding
Industrial contributors	Ability to dispose of effluent in a sustainable manner

4.4.3 General stakeholders

In addition to the owners and customers outlined above there are key external stakeholders who have specific involvement with the assets and/or the service facilitated by the assets. Table 4-2 describes their main interests.

Table 4-2: General stakeholders' outcomes

Stakeholder	Desired Stakeholder Outcome
TDC and NCC as unitary authorities	Adhering to relevant resource consents and regional plans.
Local Government New Zealand or Central Government	Ensure that Local Government Act is complied with (via Auditor-General).

Stakeholder	Desired Stakeholder Outcome
Government departments and agencies, including Ministry for the Environment, Ministry of Health, Audit NZ	Treated water quality is suitable, consistently assured, and does not spread diseases. Enhance conservation value of natural waterways.
Tangata Whenua comprising eight Iwi. Ngāti Apa ki te Rā Tō, Ngāti Kuia, Rangitāne o Wairau, Ngāti Koata, Ngāti Rārua, Ngāti Tama ki Te Tau Ihu, Te Ātiawa o Te Waka-a-Maui, and Ngāti Toa Rangatira.	Enhance and maintain the water quality of waterways and Te Waihora for mahinga kai, and cultural/spiritual values and minimise discharge impacts on coastal waters.
Contractors and Consultants	Fair contracts, good relationships, and efficient and reliable service.
Wider Community	Dispose of waste safely and sustainably.

4.5 NRSBU outcomes

NRSBU's mission statement is: "Resilient, reliable, and effective infrastructure that supports and protects our community and environment".

This mission statement plays out in three key areas: public health, cultural sensitivity and sustainability. The implications of each of these is summarised below.

4.5.1 Public health

Public health is important to aiding and prolonging life. A well-managed, resilient wastewater collection, conveyance, treatment, and disposal system benefits public health, reducing the risk of spreading chronic diseases and protecting the environment, thereby enabling communities to enjoy active and healthy lifestyles.

NRSBU's Master Plan and Programme of Works is directed at making improvements to its sewerage, increasing the level of treatment of wastewater such that the by-products of the treatment processes are suitable for reuse rather than being disposed of to land or water.

4.5.2 Cultural sensitivity

NRSBU is cognisant of iwi concerns regarding discharge of treated wastewater effluent to water and is planning on increasing the amount it discharges to land. Land was purchased at Best Island at the end of the 2019/20 financial year and planning is underway to develop and implement an irrigation system to augment the existing irrigation system at Bell Island. In addition, implementation of a pilot ultrafiltration plant is ongoing to treat wastewater to an acceptable quality for reuse, for example as a dust suppressant or use in manufacturing processes. NRSBU is increasingly engaging with iwi and has plans to adapt a dwelling it acquired with its Best Island land purchase, to hold an annual Hui.

4.5.3 Sustainability

Sustainability is a widely used term which has a variety of meanings depending on the context in which it is used.

The Brundtland Commission of the United Nations on 20 March 1987 defined sustainable as "*meeting the needs of today's generation without compromising the ability of future generations to meet their own needs*."

In a similar manner, the Resource Management Act 1991, which provides the guiding principles behind sustainable management in NZ, defines sustainable management as:

"managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural wellbeing and for their health and safety while:

- Sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- Safeguarding the life-supporting capacity of air, water soil and ecosystems; and
- Avoiding, remedying, or mitigating any adverse effects of activities on the environment."

Within New Zealand, local authorities are entrusted with ensuring the health and wellbeing of their communities are protected by providing the necessary infrastructure, as such, it is becoming increasingly important for public entities to work and think in ways that take account of long-term sustainability. For local authorities, taking a sustainable development approach is a requirement of the Local Government Act 2002.

NRSBU does not have its own Sustainable Strategy or policy but works in general accordance with NCC's policy and recognises the importance of incorporating economic, environmental, and social/cultural concerns into its activities. NRSBU has a programme of works, which is directed at adopting technologies which promote sustainability, investigating treatment of wastewater and biosolids for reuse and upgrading infrastructure to be resilience to the impacts of climate change.

Key challenges for NRSBU

There are a diverse range of challenges that NRSBU will need to navigate as they work towards achieving their strategic objectives and implementing their programme of works.

Key challenges include:

- Affordability- NRSBU is investigating measures to increase the efficiency and therefore the affordability of its operations and is also investigating methods for reuse and creating additional value of the by-products of its processes, with the intention of generating revenue streams to offset operational costs. Actions include conducting energy audits to identify areas where power savings can be made, setting emissions reduction targets, and investigating/implementing operational changes for water recycling and biosolids reuse.
- Ageing infrastructure/Asset Management Data- NRSBU is updating the information stored in its asset information system (Infor), which it has failed to regularly update in the past and is investigating procurement of a system to record assets in the field to obtain physical details, condition and so forth. This will better enable NRSBU to plan renewals, reactive and routine maintenance, review useful lives etc.
- Growth- NRSBU plans for growth using data from its contributors to programme capital works such that growth can be accommodated within its network. Specific measures include acquiring land, upgrading/duplicating assets and providing buffer storage capacity. This also aids preparations for climate change and network resilience.
- Climate Change- NRSBU is protecting its assets from sea level rise and erosion by monitoring and understanding the impacts, developing sea level rise defences (up to 1.0m SLR), implementing drainage, dewatering and stormwater/seawater pumping and landscape planning and planting with saline tolerant species.
- Resilience of infrastructure- NRSBU is duplicating/providing redundancy and storage of critical assets.

4.6 Strategic goals

The strategic goals as detailed below take due regard to the mission statement above, with its three areas of focus, and the objectives detailed in the Memorandum of Understanding between NCC and TDC. These goals have been summarised into three categories:

Our Approach: Implement and operate infrastructure considering the needs of our community. Our priorities for this are the protection of public health, the environment and cultural values.

Our Aspiration: We will work toward the beneficial reuse of resources.

Our Conduct: We will undertake our activities transparently, fairly, respectfully, in a timely manner and we will encourage co-ordinated regional infrastructure development.

4.7 Strategic objectives

To achieve these goals, ten objectives have been developed and are displayed in Figure 4-5 . These objectives are used throughout this AMP to categorise the planned works and future capital budgets. The programme of works for the next ten years, showing projects greater than $0.3M, is included in Appendix D.

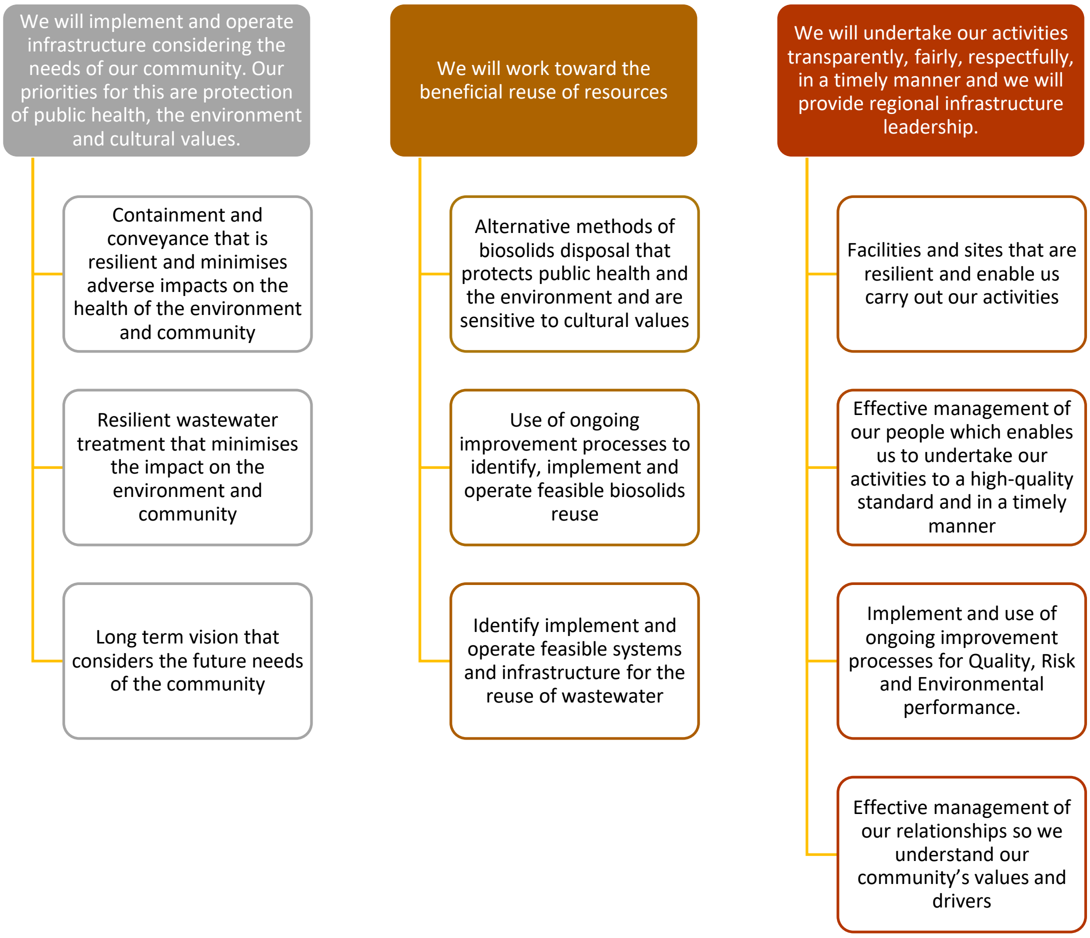


Figure 4-5: Objectives categorised by each strategic goal

NRSBU is conscious of the impacts of its budgets and actions on its Contributors. Therefore, the following framework shown in Table 4-3 has been developed to classify the urgency and importance of projects and the timeframe in which they should be implemented. This framework has been used to prioritise the capital expenditure over the next 10 years.

Table 4-3: Importance level framework

Importance	Purpose	Timeframe	Category of activity
High	Core function	1 – 3 years To align with annual plan and long-term plan timeframes	• Capital works to avoid overflows • Capital works to avoid breaches of Resource Consents (due to effluent quality, odour, discharge volume, etc.) • Capital works to convey contracted flows • Health and safety improvements • Future planning to continue core functions
Medium	Do better	4 – 10 years To align with activity management plan and long-term plan timeframes	• Resilience (ability to maintain 'core functions' if something goes wrong, e.g. mechanical failure, flood, seismic event, etc.) • Future proofing (beginning to act in preparation for changes in technology, growth, climate changes, etc.) • Regional thinking and coordination • Beneficial reuse (reuse of effluent/biosolids to replace potable water or fertiliser) • Operational improvements (Undertaking core functions better, more efficiently)
Low	Achieve Excellence	11 – 30 years To align with activity management plan and infrastructure strategy timeframes	• Improved quality of treatment (over and above the requirements of the Resource Consents) • Operational convenience (making it easier to maintain and operate assets) • Odour reduction (over and above achieving Resource Consent conditions) • Non-beneficial reuse (reuse of effluent/biosolids to avoid discharge to sea/landfill but not providing a resource that is 'needed') • General 'doing good'

5 What is driving change?

The section provides information on areas of change that we anticipate will impact on the levels of service we can provide and our response to those issues.

5.1 Overview

The key issues for our services and the impact this could have on our service levels are summarised in Table 5-1 below.

Table 5-1 Drivers for change

Driver	Summary of expected/possible impacts
Inflow and infiltration	Inflow and Infiltration (I&I), primarily into our contributors' networks, is the main source of the large wet weather flows which currently overwhelm parts of our system. I&I is expected to increase over time as our contributors' assets get older. This will impact our levels of service for untreated wastewater overflows and treatment stability (odours).
Climate change and sea level rise	Climate change will likely increase the frequency/severity of storm and drought events. Increased rainfall will drive additional I&I, further exacerbating I&I impacts on levels of service over time. More droughts will increase the volatility of our income from volumetric charging. Sea level rise could threaten the long-term viability of our treatment and disposal sites, as well as our pump stations.
Growth	Population growth increases wastewater volumes. High quality construction of new residential networks can reduce peak flow factors from the catchment, however if poorly constructed and not maintained an extension of the network may increase I&I.
Contributor changes	A contributor leaving could impact cost sharing for the other contributors. A contributor adding additional flow or load could impact our ability to avoid overflows or treat waste adequately without upgrades.
Disposal Perceptions	Increase community and cultural concern regarding disposal to the environment will put pressure to move away from marine disposal and eliminate overflows in the system.
Legislation Changes	Legislation is likely to require a higher quality of treatment before disposal and more stringent monitoring and quality processes.

5.2 Inflow and infiltration

The local authority demands are the most influential on the overall system. The ingress of stormwater into the sewer system through direct inflow and infiltration (known as I&I) is the largest contributor to wet weather flows. These peak flows can overwhelm the network and require the implementation and maintenance of over-sized infrastructure.

There is a need for NRSBU contributors to control their I&I, as ingress of stormwater can exceed the NRSBU system capacity very quickly and the "do nothing" option is not appropriate. Monitoring of flows during rain events has shown peak flows from both local authorities exceeding agreed peak discharge levels, resulting in overflows.

NRSBU has begun investing in additional capacity to mitigate overflow risk, however NRSBU needs to have systems, communication and processes that incentivise its contributors to ensure that they maintain focus on reducing I&I. It will be difficult and expensive for NRSBU to achieve our strategic goal of implementing and operating infrastructure that protects public health, the environment and respects cultural values, if our contributors do not maintain effective control of their I&I.

I&I is expected to increase over time due to ongoing aging of the network, increased severity of storm events and the potential extension of the residential network. NRSBU relies on its contributors to supply accurate forecasts in order to plan and size infrastructure accordingly. Errors in forecasting are possible and due to the setup of NRSBU the costs of these errors will ultimately be borne by the contributors.

NRSBU will manage I&I by encouraging and assisting contributors to achieve less than five times peaking within each of their catchments. NRSBU will regularly supply data to the contributors that highlights where I&I issues may be occurring and will communicate with its contributors to ensure that they are aware of the issues. Commitment to I&I reduction can be inferred through financial commitment reflected in:

- Upgrades within existing reticulation;
- Sewer renewal programmes (dependant on age profile); and
- Specific I&I reduction programmes.

Though we can limit flows from our contributors' points of discharge (as per our agreements) this causes wastewater discharges from an upstream point on our contributors' networks, which is neither constructive nor helpful and does not reflect our strategic goals.

Ongoing assessment of NRSBU charges and process will be undertaken to encourage proactive I&I reduction. Should these processes not result in ongoing maintenance of improvement of I&I, then NRSBU may need to consider implementing the financial incentives available in the contributors' contracts to encourage contributors that exceed agreed peak discharge levels.

5.3 Climate change

The Tasman/Nelson Region is likely to experience more extreme weather events, which will both directly and indirectly impact our assets in the long term. The following table (Table 5-2) summarises the impact upon NRSBU's ability to convey and treat wastewater and achieve our strategic goals.

Table 5-2 Impacts on system due to climate change

Climate Change	Direct Adverse Impact	Indirect Impact
Heavy Rainfall	Pump stations inundated by surface flooding. Reduced pond storage volume.	Increase in wastewater flows from inflow and infiltration.
Drought	None.	Reduced wastewater flows which results in reduced revenue for NRSBU. Declining water resources will make wastewater reuse more necessary. Reduced volumes of discharge due to increase evaporation at the ponds.
Rising Sea Levels	Access to the WWTP is cut off. Land for biosolids disposal is reduced. Increased erosion to Rabbit, Bell and Best Islands. Pump stations are inundated from storm surge.	Relocation of communities may result in increase/decrease of wastewater volume at each pump station and overall. Likely increase in infiltration, due to elevated groundwater levels.
Severe temperature changes	Impact on the biological reactions to treat the wastewater. Strain on existing infrastructure.	Increase in fire risk, which could impact on biosolids disposal to pine forest on Moturoa/Rabbit Island. Increase corrosion in pipes and pump stations due to increased speed of reactions of wastewater in sewers.

We have not completed our own climate change related projections and currently rely on hazard mapping completed by NCC and TDC to understand the infrastructure at risk. The rate of sea level rise is uncertain and depends on the representative concentration pathways (RCPs), which predict how future global warming may contribute to climate change and sea level rise.

Currently, it is thought that sea level increase is in the range of 3 – 6 mm per year and this could increase. Figure 5-1*,* taken from the TDC website, shows that Bell, Best and Moturoa/Rabbit Islands are susceptible to sea level rise. Moturoa/Rabbit Island is not only used for wastewater disposal but also shelters Bell Island from further erosion. The current WWTP location is thought to be able to be used for a long period (at least to 2080) and therefore it is appropriate to continue to invest in activities on the Bell Island site. We do recognise that taking a "do nothing" approach is not appropriate if we want to continue providing wastewater conveyance, treatment and disposal in the long-term future. We will therefore take an adaptive management planning approach and work towards the following:

- complete a vulnerability study by 2025; and
- secure a site and required designations (second decade) for future relocation of the WWTP.

The projects that we are planning to manage the impacts of climate change are discussed in Section 7 (Pump stations), Section 8 (Treatment and Disposal) and Section 13 (Risk).

Figure 5-1: Extent of inundation from 1.0 m sea level rise shown in green (sourced from TDC website)

It is NRSBU's responsibility to monitor and manage its emissions. The following table (Table 5-3) summarises the improvement programme planned for 2021-2022, which will work towards our goal of implementing and operating infrastructure considering the needs of our community.

Table 5-3: Emissions improvement works

Level of Service	Task	Sub task
Have systems in place	Have systems in place for the ongoing monitoring and reporting of emissions	Undertake audit of current emissions, identify target areas for improvement
		Setup framework for ongoing monitoring and reporting
Reduction in emissions	Ongoing reduction in carbon emissions and diesel consumption to follow regulations and align with government targets	Formally include emissions & energy consumption as criteria in all NRSBU decision making
		Set targets for reduction over time (scaled with increase in influent over time)

5.4 Population growth

The total population across the districts is expected to increase significantly, which will increase the total flow and load coming to our network from the council contributors.

There is a need to size and plan upgrades to accommodate future population growth as increases in total flows and loads are likely to exceed the existing system capacity and result in overflows. The "do nothing option is not appropriate" as we will be unable to achieve our strategic goal of providing for the needs of our community if our infrastructure is undersized. Additionally, in order to achieve our goal of beneficial reuse of wastewater we must identify reuse opportunities and we may need to secure and purchase land as appropriate. Availability of land will likely become further constrained as the population grows.

We have undertaken rudimentary reviews of future populations of some catchments using the councils' Future Development Strategies where information from contributors has not been readily available. However, independent population forecasts are not NRSBU responsibility. We are required to provide capacity to meet the current and foreseeable needs of our contributors and as such we rely strongly on our contributors supplying accurate forecasts for their individual needs. We expect our contributors to estimate their demand for the next 30 years, as well as undertaking an annual review of their load and flow demands.

NCC and TDC maintain Future Development Strategies (FDS), which inform their long-term plans. The expected areas for growth are shown in Figure 5-2: Potential growth areas. The FDS provides for approximately 14,000 houses by 2048, including expansion in the Kaka Valley, Saxton and Richmond South areas.

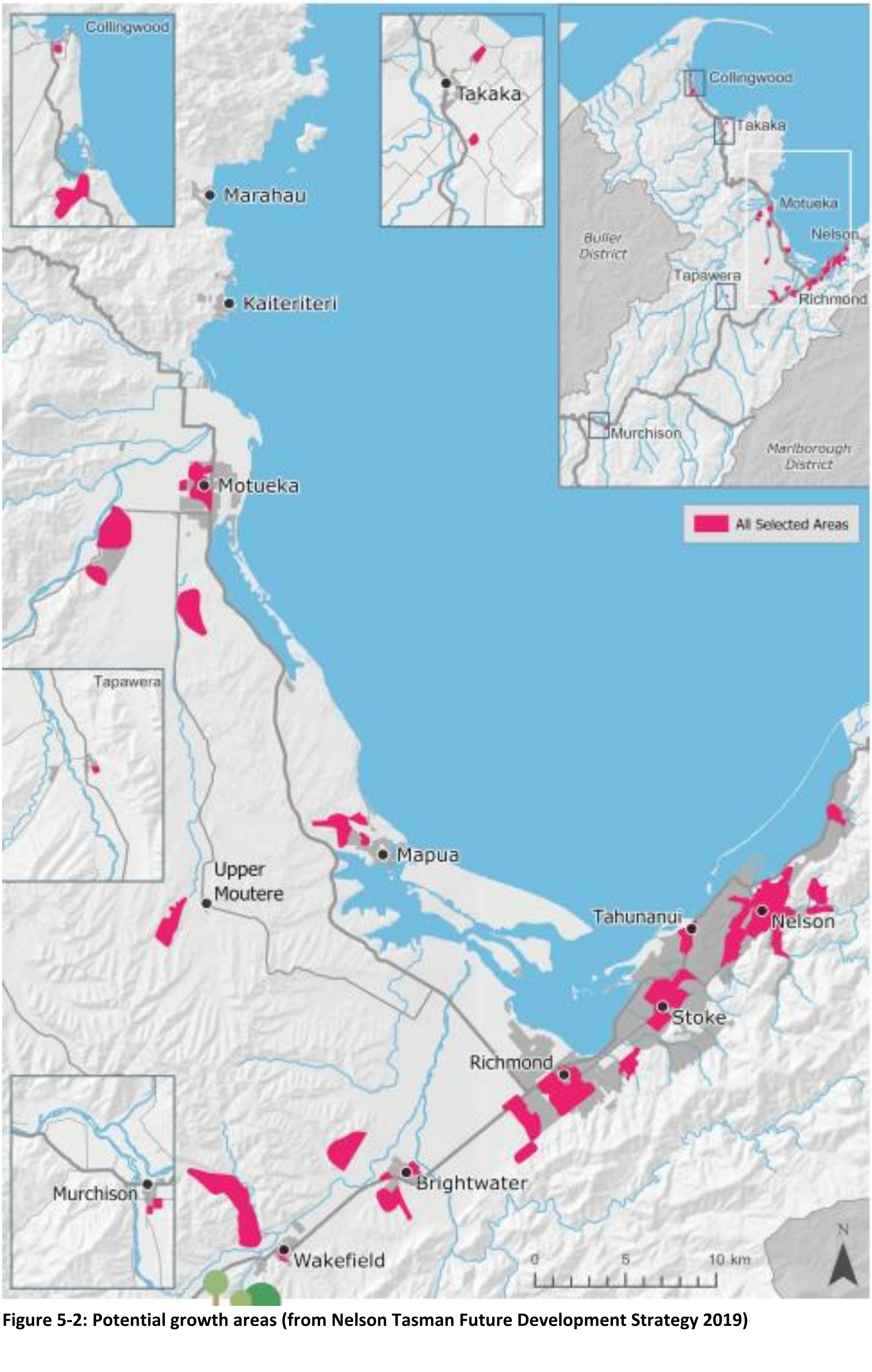


Figure 5-2: Potential growth areas (from Nelson Tasman Future Development Strategy 2019)

We expect that this growth will result in increased flow and load demands in the near future and that this will be incorporated into the Agreement for Disposal of Trade Waste with NCC and TDC. The projects that we are planning to address these impacts are discussed in Section 7 (Pump Stations) and Section 8 (Treatment and Disposal).

5.5 Major changes by contributors

Major changes to discharges by the current contributors are possible and are a risk that NRSBU is aware of. This risk is partly offset by the return on capital charge included in NRSBU contributors' trade waste contracts.

5.5.1 Changes in volume

Major changes to the volume of wastewater from NCC and TDC would require significant additional investment and infrastructure that is currently not included in NRSBU's long term plan and budget. Future scenarios could include, but are not limited to:

- TDC decommissions Motueka WWTP and directs flows to Bell Island for treatment.
- NCC decommissions Nelson North WWTP and directs flows to Bell Island for treatment.
- Wastewater flows from Wakefield and Brightwater are no longer treated at Bell Island.
- A significant industry leaving our district or ceasing to trade, resulting in reduced load and flow.

The estimated change in wastewater volume at the Bell Island WWTP for these scenarios is included in Figure 5-3.

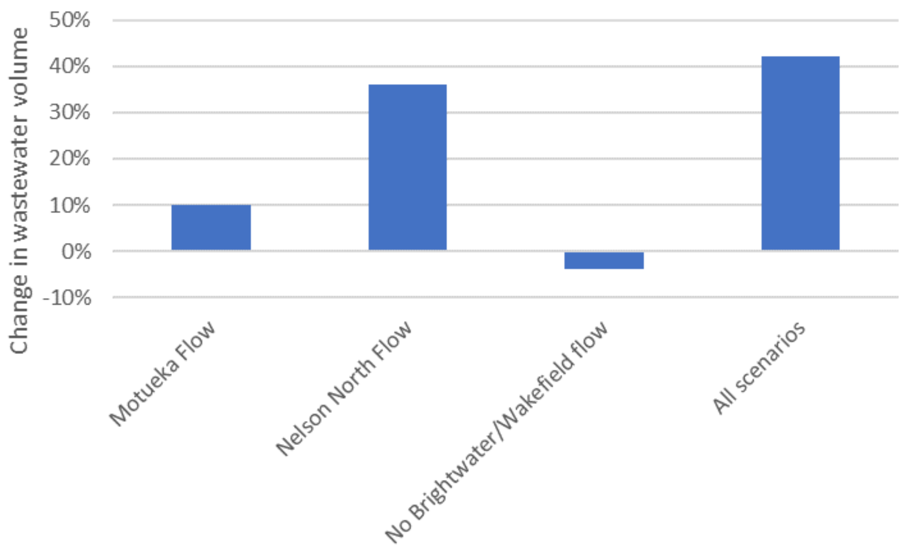


Figure 5-3: Indicative change in wastewater volume at the treatment plant

Any of the above scenarios involving a local authority would be a major change for the relevant council and we have assumed that these would be signalled well in advance with at least 10 years notice. Where an industry ceases to trade or relocates its operations this is likely to happen at short notice and will have consequences to the NRSBU revenue base. The future projections used in *'Part B: Where we want to be'* have assumed no changes to the current contributor configuration, although we are aware that the ENZA Foods NZ's activities have ceased in our region.

5.5.2 Changes in load

The industrial contributors are not major contributors of wastewater by volume, but they do have a material impact on treatment load at the WWTP. Based on their advice, we do not anticipate any increase in load from the industrial contributors in the long-term. The most likely scenario is that one or more of the contributors leaves, which would decrease treatment loads and NRSBU's revenue. An example of the likely reduction in Biochemical Oxygen Demand (BOD) and Total Kjeldahl Nitrogen (TKN) load from each of the contributors leaving impact is demonstrated below (Figure 5-4).

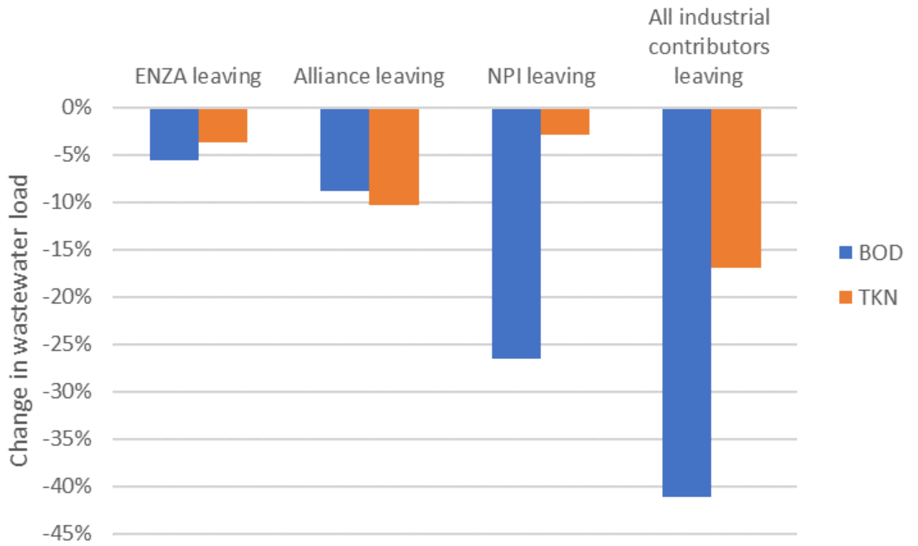


Figure 5-4: Indicative impact on wastewater loads (BOD and TKN)

NRSBU believes that industrial load changes will likely be offset by an increase in residential loads from TDC and NCC and therefore, while there may be a period of load reduction, we do not think the risk is significant, and we are not yet planning to manage these changes until they occur.

ENZA (purchased by Cedenco in 2018) announced in March 2020 that it will relocate its apple processing from Nelson to its existing Hastings sites at the end of the 2020 Season. ENZA operates on the Turners and Growers Site and is the main contributor to the waste discharged under the Turners and Growers Discharge Agreement. Communication with Turners and Growers has not identified whether Turners and Growers wishes to maintain its discharge license in the long term or not. ENZA ceased operations in September 2020. ENZA is a minor contributor and therefore the adverse effect of them leaving is not expected to be significant. NRSBU is likely to offer its capacity to an existing contributor should Turners and Growers choose to significantly reduce its capacity or cease to be a contributor.

5.6 Disposal drivers

5.6.1 Land disposal

The disposal of human waste to waterways is unacceptable to Māori and undesirable to the community. The Waimea inlet is not only a key source of kai moana (food) but a recreational area for residents and tourists, as shown in Figure 5.5. Therefore, there is pressure from the community to move towards land-based disposal options.

The "do nothing" option will not enable us to work towards increased land disposal or the beneficial reuse of resources. Therefore, to move towards land-based disposal we will need:

- Additional land for disposal;

- Infrastructure to transport treated wastewater to the disposal area;
- Changes to the treatment plant to accommodate additional treatment, as required for land-based disposal; and
- Changes to biosolids treatment and disposal due to the increased treatment of wastewater that may be required.

NRSBU is focussing on options that enable us to work towards the beneficial reuse of resources. The projects that we are planning to address changes in disposal drivers and move towards land-based disposal are discussed in Section 8 (Treatment and Disposal).

Figure 5-5: Recreational areas (Bell Island WWTP Application and AEE 2017)

5.6.2 Pathogenic contaminants

Cawthron Institute, in partnership with the University of Tokyo, the Prefectural University of Toyama and colleagues at ESR (institute of Environmental Science and Research), is studying the efficiency of virus removal and the impacts on the environment at various WWTPs, including Bell Island. NRSBU proposes to work with a range of providers with expertise in these fields to increase our knowledge regarding these contaminants and their risks within our system.

Once we receive the findings of this study, we will have a better understanding of our pathogen removal process and the works required to improve these. This is expected to be undertaken over the next three years.

5.6.3 Emerging pollutants

There is increasing concern regarding the impact of residual drugs and chemicals on our ecosystem. Emerging contaminants include chemicals in pharmaceuticals, personal care products and preservatives. NRSBU, as part of its ongoing monitoring, will be maintaining awareness of the emerging trends in this area and will implement monitoring of the relevant chemicals as they become known as a potential issue. This will include not only chemicals within the influent wastewater (including assessments of drug use), but also contaminants that could contribute to land contamination within our biosolids reuse facility.

5.7 Legislation

The government is reviewing how to improve the regulation and supply of three waters services (water, stormwater and wastewater). Future changes to legislation are likely to put more onerous restrictions on NRSBU.

These changes are intended to enable smaller communities to increase the level of service, improve service delivery and improve asset maintenance and management, which will better protect the health of the community and the environment and are therefore likely to align with our strategic goals.

The following changes in legislation are expected to occur within the next few years:

- The establishment of Taumata Arowai (as agreed by Cabinet on 30 September 2019) – the water services regulator, which will provide oversight of and advice on the regulation, management and environmental performance of wastewater networks. This will likely lead to improved and stricter monitoring of water, wastewater and stormwater consents.
- Stronger central oversight of wastewater regulation.
- National environmental standard for wastewater discharge and overflows which will be progressed alongside the Ministry for the Environment’s Essential Freshwater programme.
- Amalgamation of some (or all) water and wastewater providers into larger corporate models, (similar to Watercare).

It is likely that these changes will require better processes and documentation of quality, risk and environmental performance, which are discussed in Part C: How we manage what we have.

To understand the potential implications of these changes, the Department of Internal Affairs commissioned a report titled “The Three Waters Review: Cost estimates for upgrading wastewater treatment plants that discharge to the ocean", which reviewed and developed minimum discharge standards. We do not currently meet the proposed quality targets to discharge into an area with poor dilution (e.g. into estuaries or shelter bays). Significant changes to our infrastructure and processes would need to occur to meet these standards. To reduce this risk and pre-empt any future changes, we believe that we must progress towards land disposal while we maintain a clear understanding of our environmental and economic drivers. The projects that we are planning to achieve this are discussed in Section 8 (Treatment and Disposal).

Further, there is an unclassified cabinet paper released by the current government “Three Waters Delivery and Funding Arrangements: Approaches to Reform, Office of the Minister of Local Government”. Discussion in the paper around service delivery, ranges from the status quo (which Councils may not like to lose as it would affect their “powers” and financial compensation), to regional and multi-regional bodies. The cabinet paper summarised that three waters infrastructure and services are lifeline utilities that provide essential services to communities. A lack of regulatory oversight, infrastructure underinvestment and capability constraints have meant that in many parts of the country, consumers cannot be certain that their water is safe to drink, or that the three waters system is contributing to good environmental or regional development outcomes.

Three potential models for service delivery outlined in the paper are:

- one national, publicly-owned water provider delivering water services across New Zealand;
- three to five multi-regional, publicly-owned water providers delivering water services across multiple regions; and

- regional, publicly-owned providers delivering water services within regional boundaries.

Initially, service delivery reform is to focus on water supply and wastewater services with local councils continuing to provide stormwater services. Government officials have been directed to concentrate on the multi-regional and regional models. No further work is being undertaken on the national model for now. Government officials are working with local government on voluntary reform with a deadline of the end of 2020 established to determine whether the local government sector is committed to progressing voluntary change to service delivery arrangements by initiating work to investigate either within regions or in partnership with other regions. In late 2020/early 2021, Councils completed a Department for Internal Affairs' Request for Information co-ordinated by the Water Industry Commission for Scotland. Responses were submitted by the deadline of 1 February 2021. In early 2021 Councils were advised that stormwater would also be included in the reform programme. Councils have until end 2021 to decide whether to participate in the new delivery system.

As there is no clear direction as to which model will be adopted (if any), the future of service delivery has not been included in the risk analysis of this AMP.

Part B: Where we want to be

6 Reticulation

6.1 Issues

6.1.1 Condition

The condition of the rising mains is unknown. The lack of storage or bypass facilities make it difficult to conduct CCTV inspections or remove sections of pipe for detailed inspection without significant expense and risk of overflow.

To mitigate the risk of failure of the rising main within the estuary, a duplicate PE pipeline was installed from Monaco to Bell Island in 2012. With the duplicate pipeline in place, further work is now required to assess the condition of the concrete sections of the original rising main. These inspections are scheduled for 2020/21.

6.1.2 Hydraulic capacity

To date, staff knowledge and experience has been used to determine which sections of the reticulation have inadequate hydraulic capacity. No detailed future demand projections have been made by NRSBU as we rely on our contributors to forecast their future demand. Our contributors are responsible for providing these forecast demands, based on their own plans for the future. Therefore, NRSBU is unable to accurately state that the network has capacity to accept future wet weather flows.

If we do not assess and address the condition and hydraulic capacity of the reticulation, our risk of breakages and overflows will increase and work will be carried out on an entirely reactive basis. Although we can develop a renewals programme and a hydraulic model of the network, without the construction of duplicate lines and/or sufficient storage we will be unable to inspect, or proactively maintain, the entire network.

Incoming flows from our contributors are likely to increase and therefore the capacity of the reticulation needs to increase to suit. We need to develop a good understanding of the hydraulic capacity of our reticulation in order to plan and implement specific hydraulic upgrades of rising mains and pump stations in a timely manner.

6.2 Preferred future state

Our strategic goal is to deliver conveyance (reticulation) that is resilient and minimises adverse impacts on the health of the environment and community. To achieve this goal, we must have a network which has sufficient capacity to cope with peak flows and is readily maintained and has resilience to overcome issues that can foreseeably occur. This will be achieved by:

- Development of a detailed network hydraulic model to assess capacity for current and future demands.
- Construction of duplicate pipelines so there are two pipelines from each pump station. This will enable inspections and maintenance of the network and increase the capacity to cope with demand.
- Development and implementation of an inspection program for the reticulation network.

7 Pump stations

7.1 Summary

To implement and operate infrastructure considering the needs of the community we must have pump stations which:

- Have sufficient capacity to cope with peak wet weather flows
- Are resilient to mechanical and electrical failures (have emergency storage and backup power) and natural hazards
- Can be readily maintained.

NRSBU operates five pump stations, which receive flows from the five contributors (councils and industry). Table 7-1 summarises whether each pump station currently meets the desired levels of service. The issues and planned projects for each pump station, to bring them up to the required standard and enable us to achieve our strategic goals, are discussed in the following sections.

Table 7-1 Summary of existing pump stations

Pump station	Capacity for current and future PWWF	Emergency storage and power generation for PWWF	Ease of maintenance (either storage or duplicate pipe system)	In good condition	Protection against predicted sea level rise	Overflow screening and capacity are being implemented
Beach Road	No	No	No	Yes	No	No
Whakatū	Yes	Yes+	Yes	Yes	No	Yes
Saxton Road	No	No	No	Yes	No	Yes
Songer Street	Yes	No	No	Yes	No	Yes
Airport	Yes	No*	No	Further work required	No	Yes

+ Future requirements need to be confirmed by contributors

* Storage is available but not owned by NRSBU

Estimated current and future flows in the following sections have been derived from a very limited data set using a very high-level approach. These flow values are to be used as placeholders only, until the NRSBU contributors provide updated contracted flow values. Due to limitations in the data, these placeholder values should not be used for sizing infrastructure without further investigation and analysis.

In particular, NRSBU's contributors should be able to comment on the effect of their own planned future works on future flows whereas even very detailed analysis of NRSBU's own flow data can only ever be retrospective and limited to an unknown degree by contributors' network capacity and operating regime.

7.2 Beach Road (Richmond) Pump Station

7.2.1 Description

The Beach Road Pump Station receives flows from the Tasman District sewage network (Richmond, Brightwater, Wakefield and Hope communities), plus a smaller quantity from NPI (approximately 23 l/s). Flows from this pump station are pumped via a 500 mm OD PE rising main to Saxton pump station.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 176 l/s and two storm pumps with a combined capacity of 430 l/s.

Overflows: The contracted peak flows from TDC have been exceeded on occasion in previous years. These high flows have generally occurred during rainfall events and have resulted in overflows.

Condition: From visual inspections the pump station is in good condition.

Resilience: There is no emergency storage or power generation for the storm pumps at this pump station. The pump station is located on low lying land near the estuary and was inundated in 2018 during cyclone Gita. The inundation resulted in the electrical system failing in the pump station and a loss of service for around 12 hours.

Septage Reception Facility:

Also located at the Beach Road Pump Station is the Septage Reception Facility, which receives septic tank waste and other tanked wastes for discharge to the pump station. The facility was installed in 2009 and has a reception unit, controls, washdown facilities and solids disposal. The facility is rated in good condition.

Figure 7-1: Photograph of the Beach Road Pump Station site

7.2.2 Issues and options

The contracted peak flows from TDC have been exceeded throughout the years; it is expected that the updated contracted flows to be supplied by TDC will reflect this increase in flows. Additionally, the flows are expected to continue to increase due to intensification within the catchment. Options to address these capacity concerns include 'do nothing' or upgrading duty pumps to deal with current contracted flows.

The pump station is currently not very resilient to electrical faults/power outages or natural hazards such as flooding. Options to increase the resilience of the pump station include the construction of emergency storage, sufficiently sized generators and flood protection works. The site, however, is low-lying with existing space constraints, so improvements are likely to involve the purchase of additional land. The programme of works includes the purchase of land and relocation of the pump station in the second decade.

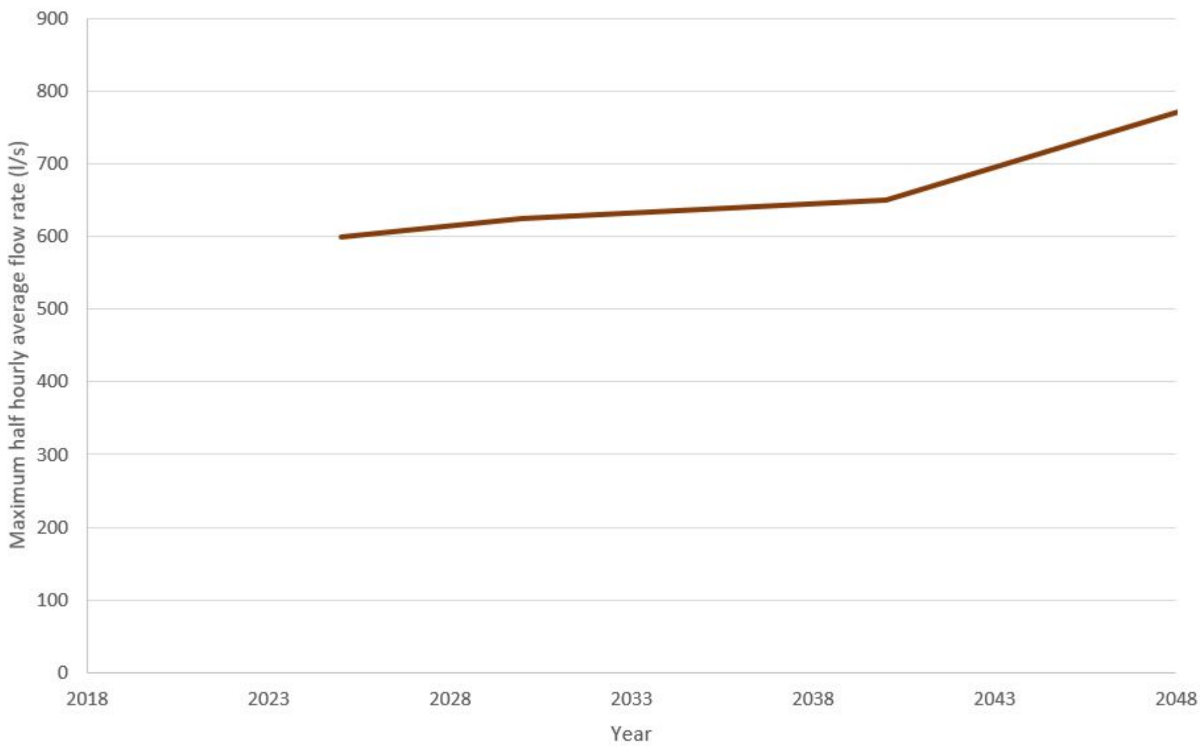


Figure 7-2: Estimated maximum half hourly average flow rate to Beach Road Pump Station (estimate provided by TDC)

7.2.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work at the Beach Road Pump Station is programmed:

- Install and maintain emergency power generation to duty and storm pumps (2020/21).
- Construct additional rising main from Beach Road Pump Station to Saxton Road Pump Station to accommodate 2050-year foreseeable storm flows (by 2024/25).
- Seismic resilience improvements at the pump station (from 2023/24).
- Construct flood protection bund around the pump station perimeter (2020/21).
- Wet well cover replacement (2020/21).
- Purchase additional land in an alternative location to allow managed retreat in future from the current Beach Road site (second decade).
- Purchase additional land for emergency storage and install emergency storage to hold six hours of ADWF (second decade), noting that this could be at the future site.

7.3 Whakatū Pump Station

7.3.1 Description

Whakatū Pump Station receives flows from the Whakatū Industrial area (NCC is the sole contributor) and injects into the Beach Road to Saxton Road rising main.

Pump capacity: The pump station consists of two pumps in a duty/standby pump arrangement. The pump capacity is currently 40 l/s and can be increased to 80 l/s by installing larger pumps.

Overflows: There have been no overflows at this site. It is understood that the current capacity of this site does not create overflows, however low points in the upstream council network have not been surveyed relative to the pump station. The installation of an overflow screen is a requirement of the resource consent for emergency discharge.

Resilience: The pump station has emergency storage to hold about 140m^3. The pump station currently has no backup power supply and backup power generation for the existing pumps needs to be installed.

Condition: From visual inspections the pump station is in a good condition.

Figure 7-3: Photograph of the Whakatū Pump Station site

7.3.2 Issues and options

There is ongoing development in the local catchment (Hill Street) and further growth planned (see Figure 7-4). This will likely increase the flows into the pump station and the size of the pumps will need to be upgraded accordingly. Additionally, the storage available may not be sufficient in the future to provide six hours of ADWF. Options to address these capacity concerns and maintain good performance of the pump station include increasing the capacity of the pumps, installing back up power supply, and installing overflow screening equipment.

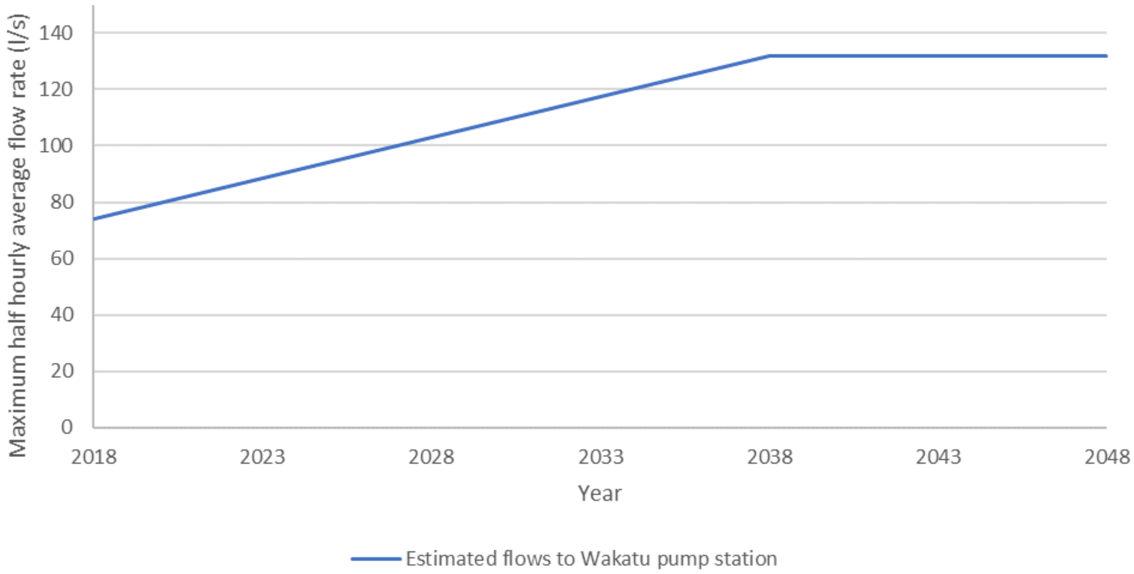


Figure 7-4: Estimated maximum half hourly average flow rate to Whakatū Pump Station (placeholder values only until NCC provides updated flows)

7.3.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Whakatū Pump Station:

- Overflow screen and monitoring systems (2020/21).
- Capacity to accommodate future average and storm flows (2024/25).
- N+1 redundancy for critical mechanical equipment (2023/24).
- Cross-connection into the dual Beach Road to Saxton Road rising mains (2023/24).
- Seismic resilience improvements at the pump station (from 2023/24).
- Flood protection up to a 1% AEP event and 1.0 m SLR (2027/28).
- Security fences.

7.4 Saxton Road Pump Station

7.4.1 Description

The Saxton Road Pump Station receives flows from NCC's network, Alliance Group, ENZA, Whakatū Pump Station and Beach Road Pump Station. Wastewater flows from this pump station are then pumped via a 710 mm OD diameter PE rising main towards the WWTP.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 192 l/s and two storm pumps with a combined capacity of 580 l/s.

Overflows: There have been no overflows at this pump station site and NRSBU is not aware of any overflows upstream in the NCC network. However, NRSBU has a resource consent (RM165114) for this pump station, which allows "aberrational" discharges to the estuary. This has occurred due to mechanical failure in the past. Overflow screening and monitoring is required on this pump station.

Resilience: This pump station is the only one in the network, which receives flows from another NRSBU pump station (Beach Road). It is therefore a critical component in the network and must be resilient to power failure and natural hazards. Currently, there is no emergency storage or power generation for the storm pumps at this pump station. The pump station has not flooded or been damaged in recent storms; however, it is likely at risk of inundation from predicted sea level rise.

Condition: From visual inspections the pump station is in good condition.

Figure 7-5: Photograph of the Saxton Road Pump Station site

7.4.2 Issues and options

The largest flow into the pump station is from the Beach Road Pump Station and any work to upgrade this upstream pump station will need to be planned carefully to tie into works at Saxton Road Pump Station. Although no overflows have occurred it is known that the pumps are undersized for recent growth in the catchment and for increased flows from the Beach Road Pump Station. As discussed in the previous section, the flows from Beach Road are likely to substantially increase within the next 30 years, leading to an increase in flows at Saxton Road Pump Station, as shown in Figure 7-6.

Overflow screening and monitoring systems are required to meet our consent conditions (resource consent number RM165114). These screens will be installed next year (2021/2022). Backup generation will also be installed this year (2020/2021), adequate to run the full capacity of the existing pumps and the future pumps following the projected capacity increase.

A detailed condition assessment has not been undertaken, however from visual assessments the pump station appears to be in good condition. There is no emergency storage at the pump station and limited space on the existing site on which storage could be located. It is likely that additional land will need to be acquired to install a storage facility.

This pump station does not have interlocks with Beach Road Pump Station and until this is in place there is a significant risk of overflow at Saxton Road if a failure occurs. Even with these interlocks, until emergency storage is constructed (2038/39) there is a risk that overflows could occur from high inflows from the local catchment.

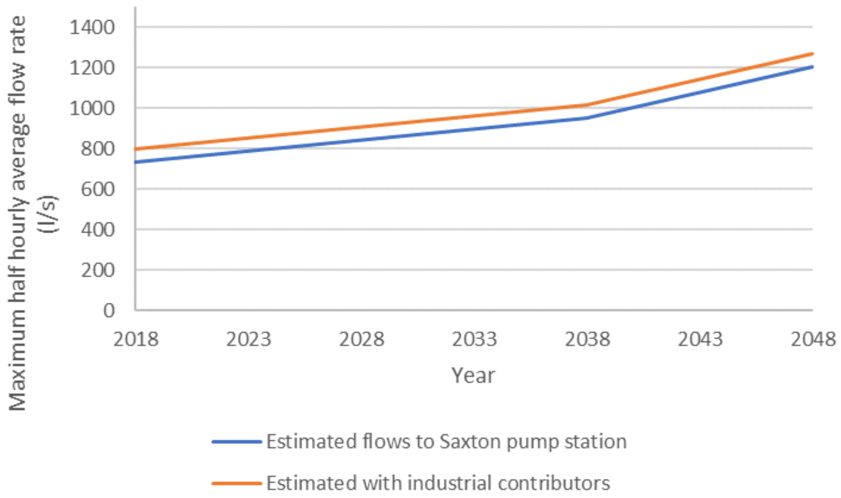


Figure 7-6: Estimated maximum half hourly average flow rate to Saxton Road Pump Station (placeholder values only until NCC provides updated flows)

7.4.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Saxton Road Pump Station:

- Overflow screening and monitoring system (2021/22).
- Wet well cover replacement (2020/21).
- Emergency power generation to run the pumps at full capacity (2020/21).
- Pump capacity to accommodate future average and storm flows (from 2022/23).
- N+1 redundancy for critical mechanical equipment (2022/23).
- Dual rising main to Monaco (by 2022/23).
- Seismic resilience improvements at the pump station (from 2023/24).
- Security fencing.

7.5 Songer Street Pump Station

7.5.1 Description

Songer Street Pump Station receives flows from the NCC network and injects into the Saxton Road to Bell Island WWTP rising main.

Pump capacity: The pump station consists of one duty pump with a pump capacity of 119 l/s and two storm pumps with a combined capacity of 217 l/s.

Overflows: There have been no overflows in the last two years (2018-2020). NRSBU has a resource consent (RM165114) for this pump station which allows "aberrational" discharges to the estuary. This consent has a number of specific requirements. NRSBU is not currently compliant with some of these.

Resilience: There is no emergency storage or power generation for the storm pumps at this pump station. The pump station is located near the coast on low lying land and while it has been flooded (seawater ingress to network) it has not been damaged in recent storms.

Condition: From visual inspections the pump station is in good condition.

Figure 7-7 Photograph of Songer Street Pump Station site

7.5.2 Issues and options

Songer Street Pump Station receives flows from the NCC network and injects into the Saxton Road to Bell Island WWTP rising main. The current contracted flows are greater than the duty pump capacity but less than the storm capacity (Figure 7-8). Some growth is expected in this catchment and the pumps may need to be upgraded.

A detailed condition assessment has not been undertaken, however from visual assessments the pump station appears to be in an acceptable condition. To improve the maintainability of this pump station an additional rising main to Monaco could be installed or the out of service 300 mm OD PE line to the airport could be rehabilitated to provide two rising mains from the pump station.

There is a small volume (50m^3) of emergency storage at this pump station. More emergency storage could be achieved by retrofitting the existing site with additional storage capacity. Backup power generation for the storm pumps will be installed this year (2020/21).

The pump station is located on low lying land, which is susceptible to coastal inundation. The pump station has not been damaged by recent storms; however, as the frequency and severity of these storms is likely to increase, works will be required to seal the pump station and protect it from future sea level rise. NRSBU is in the process of applying for a resource consent to install a sea level rise barrier alongside the pump station. This will form an interim bund to protect against sea level rise and storm surges.

The location and longevity of Songer Street Pump Station needs to be assessed regarding sea level rise, including consideration of managed retreat.

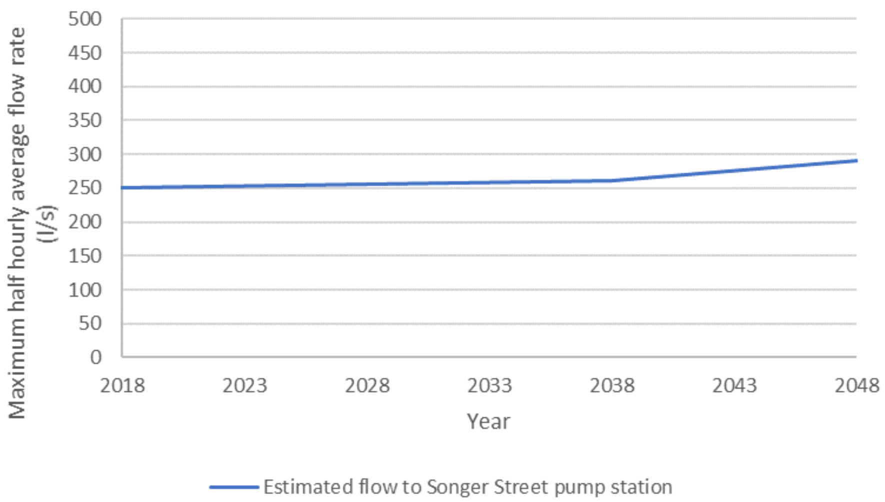


Figure 7-8: Estimated maximum half hourly average flow rate to Songer Street Pump Station (placeholder values only until NCC provides updated flows)

7.5.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Songer Street Pump Station:

- Overflow screening and monitoring system (2020/21).
- Emergency generation to run the pumps at full capacity (2020/21).
- Seismic resilience improvements at the pump station (from 2023/24).
- Flood bunds and sealed system (2020/21).
- Wet well cover replacement (2020/21).
- Storage for six hours of ADWF (2031/32).
- Inter-pump station automation system.
- Security/ Health & Safety fencing.
- Site beautification.

7.6 Airport Pump Station

7.6.1 Description

The Airport Pump Station receives flows from NCC (Tahunanui Catchment) and injects into the Saxton Road to Bell Island rising main. Prior to 2012, the Songer Street Pump Station pumped directly to the Airport Pump Station; however, this configuration has since changed resulting in a reduction in wastewater flows to the Airport Pump Station.

Pump capacity: The pump station consists of two duty pumps with a combined pump capacity of 183 l/s and one storm pump with a capacity of 410 l/s.

Overflows: There has been one overflow at this pump station within the last two years (2018 to 2020) due to electrical/mechanical failures. NRSBU has a resource consent (RM 165114) for this pump station, which allows "aberrational" discharges to the estuary. This consent has a number of specific requirements. NRSBU is not currently compliant with some of these.

Resilience: There is no emergency storage or power generation for the storm pumps at this pump station. The pump station is located near the coast on low lying land but has not flooded or been damaged in recent storms.

Condition: From visual inspections the pump station is in a good condition, however there are known issues with the condition of the pipework upstream of the pump station.

Figure 7-9: Photograph of Airport Pump Station site

7.6.2 Issues and options

The Airport Pump Station receives flows from NCC (Tahunanui Catchment) and injects into the Saxton Road to Bell Island rising main. The flows at the pump station have decreased since 2012 due to a change in network configuration (Songer Street no longer pumps directly to the Airport Pump Station). The Airport Pump Station only has one storm pump, but the projected future flows are less than the current storm pump capacity.

A detailed condition assessment of the pump station has not been undertaken however from visual assessments the pump station is in a good condition and from what can be visually inspected, the pipework leading to the pump station is in poor condition.

There is no emergency storage at this pump station, however there is storage on the site in the form of an old digester and clarifier (currently owned by NCC). NRSBU plans to acquire this infrastructure and convert it into a storage facility that is easily usable by NRSBU.

An overflow occurred in July 2019 due to an electrical fault. There is a discharge consent, which requires overflows screening and monitoring systems to be in place. These screens are being installed (2020/21).

The accessway to the pump station is located on low lying land, which is susceptible to coastal inundation. The pump station itself did not suffer damage in the 2018 storms, however the access to the facility was cut off during the event. It is anticipated that with sea level rise, further works will be required to seal the pump station, improve flood resilience and improve access.

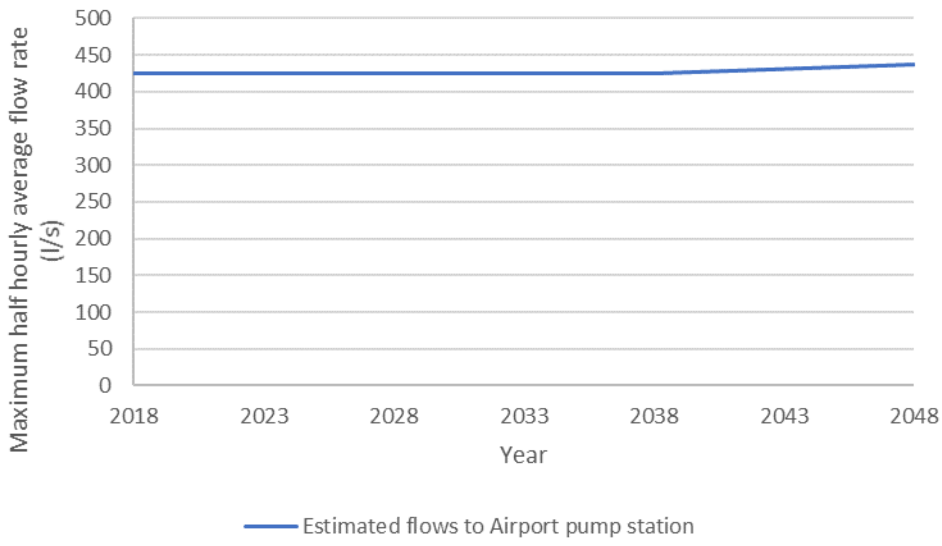


Figure 7-10: Estimated maximum half hourly average flow rate to Airport Pump Station (placeholder values only until NCC provides updated flows)

7.6.3 Preferred future state

To achieve NRSBU's long term strategic goals and level of service targets, the following work is programmed at Airport Pump Station:

- Overflow screening and monitoring system (2020/21).
- Emergency power generation to run the pumps at full capacity (2020/21).
- N+1 redundancy for critical mechanical equipment (2020/21).
- Seismic resilience improvements at the pump station (from 2023/24).
- Wet well cover replacement (2020/21).
- NRSBU owned and operated storage (2022/23).
- Inter-pump station automation system.
- Security fencing.

8 Wastewater treatment and disposal

8.1 Overview

In general terms, the wastewater treatment process at the plant consists of the following (refer also to Figure 8-2):

- Flow entering the WWTP though an inlet screen and grit chamber. Flow in excess of the capacity of the screens is bypassed directly to one facultative pond;
  - Solids from both the screen and grit chamber are sent for disposal at York Valley landfill.
- After the grit chamber, flow in excess of the capacity of the Activated Sludge (AS) treatment stream is bypassed directly to the facultative ponds. The AS treatment stream comprises of:
  - a primary clarifier,
  - an activated sludge aeration basin,

– and a secondary clarifier.

- A bypass line is provided to the facultative ponds after the primary clarifier to convey flow in excess of the capacity of the activated sludge aeration basin;
- All flow which passes through the grit chamber and any subsequent processes is split between the three facultative ponds in parallel;
- Flow exiting the facultative ponds passes through two maturation ponds in series, then on to the outfall discharge, which operates during the outgoing tide (with a proportion discharged to land when conditions allow);
- Sludge from the primary clarifier passes either through a belt thickener or is discharged directly to the sludge holding tanks;
- Activated sludge from the secondary clarifier is split into Return Activated Sludge (RAS), returned to the aeration basin, and Waste Activated Sludge (WAS);
- WAS is thickened by the DAF system and combined with the primary sludge in the sludge holding tanks;
- Sludge is fed from the holding tanks to the ATADs (Autothermal Thermophilic Aerobic Digesters) and then into the biosolids storage tank at Bell Island; and
- The biosolids are then pumped to storage tanks at Moturoa/Rabbit Island for subsequent disposal by application to land composed of forestry blocks.

Figure 8-1: Main components of the WWTP (from Bell Island WWTP Application and AEE 2017)

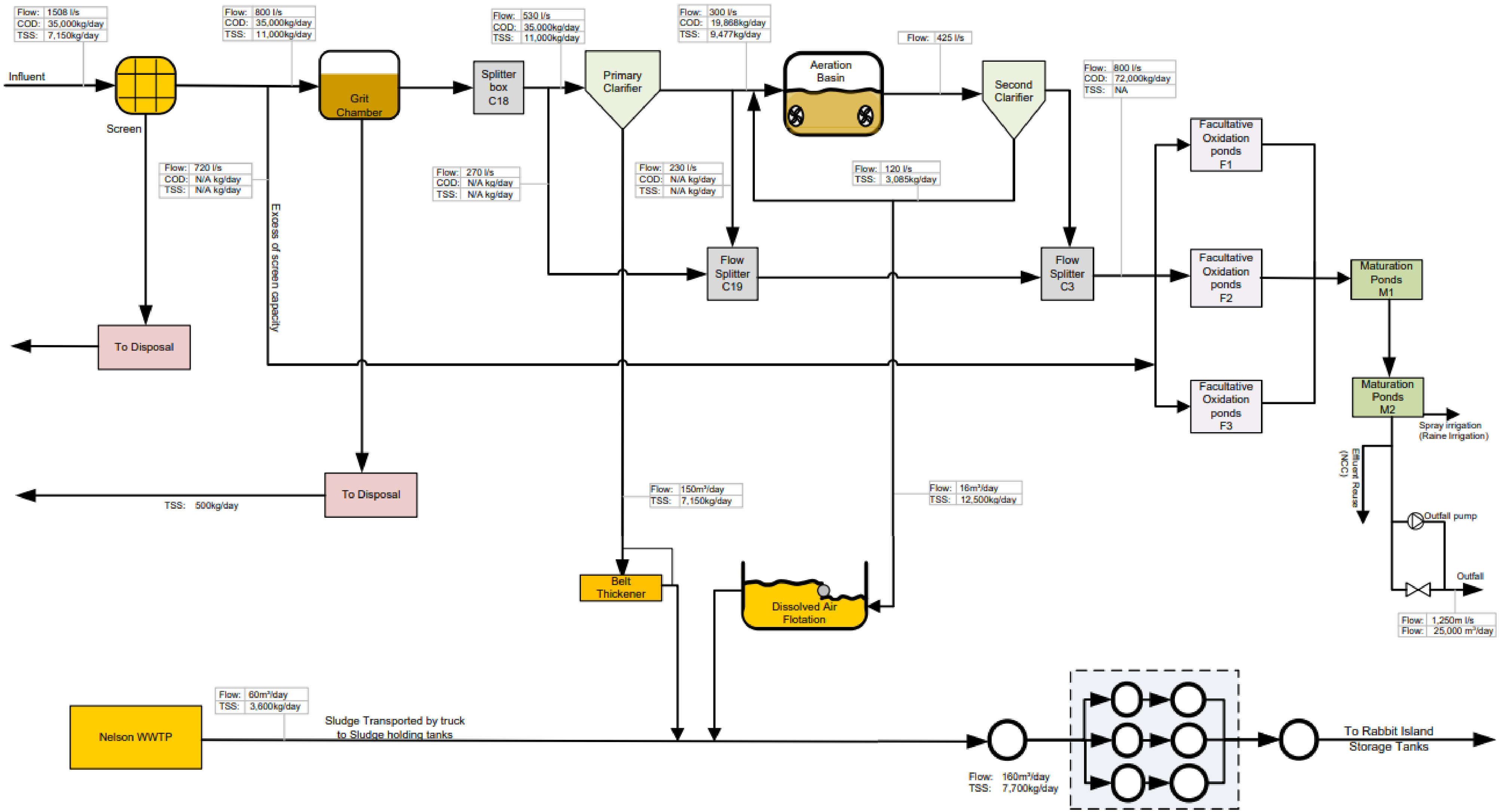


Figure 8-2: Schematic of WWTP

8.2 Wastewater treatment plant headworks

The treatment plant consists of an inlet equipped with two grit removal milliscreens. The inlet has capacity to accept up to 1,508 l/s, however the screens have no redundancy at peak flow and the grit chamber only has a capacity of 800 l/s. Flows greater than this are bypassed directly to Facultative Oxidation Pond F1. This can result in excess oxygen demand in the pond and serious odour and treatment issues.

The preferred future state is to increase the capacity at the inlet to have redundancy for peak wet weather flows. Works include revision of the screening technology and duplication of the grit trap (2025/26). This will protect downstream infrastructure from unscreened flows, provide redundancy during peak dry weather flow, and increase maintainability at the inlet. Additionally, the bypass configuration should be changed to reduce the possibility of odour issues and increase the resilience of the ponds (2023/24).

8.3 Effluent treatment

After passing through the primary clarifier, flows can be:

- Passed through the aeration sludge basin and secondary clarifier to the oxidation ponds.
- Passed directly to the oxidation pond.
- Spilt between the aeration basin and the oxidation ponds.

The hydraulic capacity of these units is given in the table below, Table 8-1:

Table 8-1 Existing hydraulic capacity (as per Bell Island WWTP Capacity Assessment Report 2014)

Process	Peak Flow (l/s)
Primary Clarifier	530
Aeration Basin	300 (Primary clarifier online)
	500 (Primary clarifier offline)
Secondary Clarifier	300 (Primary clarifier online)
	500 (Primary clarifier offline)

The current peak dry weather flows exceed the capacity listed above and result in wastewater flow being discharged directly to the ponds. The consequence of this is that plant performance is at risk and the ponds are at risk of creating odour issues and may exceed our consent condition.

The preferred option to deal with these issues is to install a complete second treatment stream (aeration basin and secondary clarifier 2028/29). This would increase the capacity to accommodate current and future diurnal flows and increase maintainability as flows could be diverted through one stream without being bypassed to the oxidation ponds.

The capacity of the WWTP is largely governed by the pond system, which comprises of three ten hectare facultative oxidation ponds (FOP) in parallel and two ten hectare maturation ponds in series. The typical retention time for wastewater through these ponds is greater than 30 days. The WWTP has traditionally been operated to meet the target biochemical oxygen demand (BOD) loading rate for the FOPs. This rate varies through the year, with lower rates in winter months. The FOPs have no spare capacity during the winter months but have additional organic load capacity during other times of the year. The current consent conditions for the quality of treated wastewater discharged to the Waimea Inlet are provided in RM171238. These consent conditions have the effect of reducing the capacity of the ponds.

Options to ensure that we have capacity in the ponds throughout the year to meet these conditions include:

- Desludging of the ponds.
- Renewal of pond mixers.
- Installation of electrically power recirculation and seeding pumps.
- Improved scum removal.
- Improved flow distribution system.
- Increase pipework capacity to allow distribution of storm flows to all three ponds.
- Investigation of suspended solids removal options, including small onsite trials of different options.

8.4 Effluent disposal

8.4.1 To Waimea Inlet

Treated wastewater is discharged to the Waimea Inlet on the first three hours of an outgoing tide. The outfall system consists of a 1200 mm diameter concrete pipeline (498 m long) with two HDPE diffuser strings (119 m long and 95 m long) and outlet riser pipes (100 mm diameter) spaced 1.7 m apart along the diffuser. This pipeline is attached to a tidal storage basin at the WWTP. As per the resource consent (RM171238) the average daily discharge of treated wastewater to the inlet shall not exceed 20,000 m^3/day, while the maximum volume of treated wastewater over any 24-hour period shall not exceed 25,000 m^3. Figure 8-3 displays the average inflow into the WWTP compared to the discharge rate. The differences in inflow and discharge are due to evaporation from the ponds and removal of biosolids volume. It is likely that the volume of wastewater entering the WWTP will continue to increase in the future.

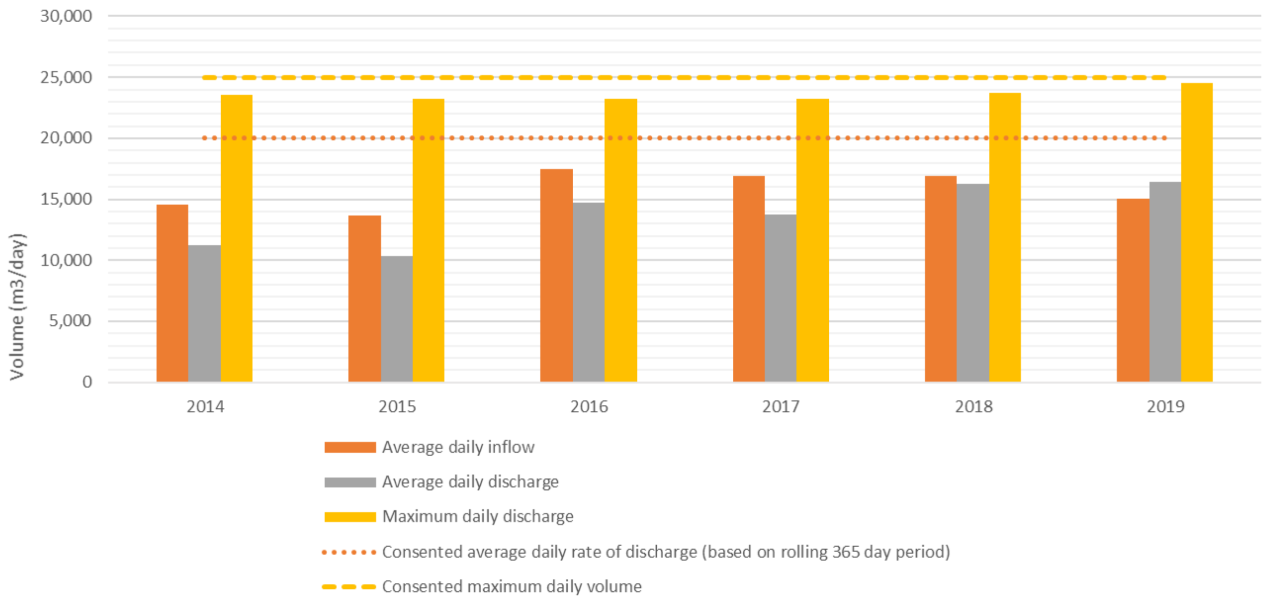


Figure 8-3: Bell Island WWTP inflow and outflow per year

Extended wet weather flows can result in very high flow into the WWTP; therefore the ponds are important in providing storage during wet weather events to ensure that we do not exceed our daily discharge consent conditions. An assessment of the ponds volume at certain water levels has not been completed and is required to provide an understanding of the necessary storage volume to comply with consent conditions. Additionally, during lower summer flow rates there have been non-compliances of BOD and TSS concentrations. Options under consideration to address meeting our consent requirements include ‘do nothing’ (not a viable option), reduce peak wet weather flows, increase the pond storage volume, and/or reduce the proportion of effluent discharged to the estuary, as well as increasing the suspended solids treatment of effluent. The preferred option is to develop an upgrade plan and implement partial treatment to meet consent requirements while developing land disposal systems to reduce the amount of effluent discharged to the estuary.

8.4.2 To land

NRSBU has a resource consent (RM171256) to discharge treated wastewater onto land via irrigation. Up to 1,040 m^3/day may be irrigated to an area of approximately 20.5 ha. This provides NRSBU with an alternative discharge to the Waimea Inlet. Further, NRSBU purchased a 64-hectare block of farmland on Best Island (adjacent to Bell Island) in December 2019. This land was purchased with the strategic goal of exploring alternatives to discharging to the Waimea inlet. Although still in the feasibility stage, it is intended that this land will provide an additional land disposal area for wastewater.

As NRSBU moves away from discharging treated wastewater into the estuary, further land purchase will be required. Alternatively, treatment to a higher standard may be required to provide non-potable water for use by water-intensive industries and/or for use to irrigate land not owned by NRSBU.

8.5 Biosolids treatment and disposal

8.5.1 Overview

Biosolids is sewage sludge, which has been treated and/or stabilised. Biosolids disposal is via spray irrigation over 850 ha of plantation forestry on Moturoa/Rabbit Island. The land is administered by TDC. NRSBU holds a permit for discharge of biosolids to land (NN940379V3), which expires in November 2020. An application for renewal of the consent has been lodged and NRSBU is able to continue to operate while the new resource consent is obtained. Ongoing research into the biosolids application on the Pinus Radiata plantation has shown increased tree growth (due to the plantation growing on low fertility sandy soil) of approximately 30% and increased economic return from the forest (by approximately $480/hectare). The application of biosolids on Moturoa/Rabbit Island is a beneficial reuse of an end-product and enables NRSBU to have an economically sustainable wastewater system.

8.5.2 Biosolids Application Facility (BAF)

The Biosolids Application Facility (BAF) on the island consists of a compound covering approximately 2,000 m^2 and containing four biosolids holding tanks (combined capacity of 1.04 million litres). On site there are also two portacoms and an equipment shed, which are owned by the biosolids application contractor (Figure 8-4). Proposed improvement works for the site include:

- Covers on the holding tanks to minimise odour (2021/22).
- Collection and reuse of stormwater for cleaning holding tanks (2020/21).
- Dedicated washdown area where washdown water is collected and pumped to holding tanks (2020/21).
- Improved communications and data connections with other NRSBU assets

Figure 8-4: Biosolids Application Facility on Moturoa/Rabbit Island (March 2020)

8.5.3 Disposal effects

The Moturoa/Rabbit Island facility has been researched extensively and monitoring has shown less than minor adverse effects on soil, groundwater, coastal environment and water quality. The only adverse effect currently known over 24 years of operation is occasional nuisance odour issues. We believe that a 'do-nothing' approach is not a viable option to reduce odour complaints and meet our levels of service. Therefore, our preferred option is to develop a system to increase the quality of biosolids produced and improve identification and management of conditions where odour complaints are likely in order to avoid discharge in vulnerable areas during these conditions.

Currently, an application (app) that assists the biosolids operations staff to select an effective site is being developed. This app is intended to not only assist with selecting the best site each day, but will also record the decision so that a clear track record is available electronically.

8.5.4 Natural hazards

Moturoa/Rabbit Island is a plantation forest and is therefore at risk of forest fires. At present there is no other alternative biosolids disposal method. By doing nothing we are at risk of being unable to dispose of biosolids, which would have consequential issues for the operation of the Bell Island WWTP. Furthermore, Moturoa/Rabbit Island is vulnerable to sea level rise. The continued use of a 50m buffer from mean high water springs (MHWS), as per the consent conditions, is likely to impact the amount of land available for disposal of biosolids due to any future sea level rise. Ultimately, there is a risk that the disposal area will be insufficient and/or unavailable in the future. Options to mitigate these risks include:

- carry out hazard assessment to understand risk and timeframes,
- purchase additional land for biosolids disposal,
- change treatment process and identify way to create a product from biosolids sold and/or used in different application.

9 Financial projections

9.1 Capital budgets

The forecast capital expenditure over the next 30 years have been provided in Figure 9-1. These works have been categorised by strategic objective to make clear the budgets required to achieve our vision.

The capital budgets beyond the decade (from 2031/32-2050/51) have been averaged over 5-year timeframes. A large amount of spending in the five-year period 2036-41 is for projects which will increase conveyance capacity to cater for future growth. This includes upgrading the Beach Road Pump Station and the design and construction of a pipeline from Beach Road clockwise to the WWTP, including a new pump station partway.

It should be noted that no money has been allocated for the purchase and designation of land for a future WWTP. The relocation of the WWTP is likely to be required within the next century due to discharge requirements and sea level rise. Finding and designating an appropriate site in the future may be more difficult and expensive if not purchased now.

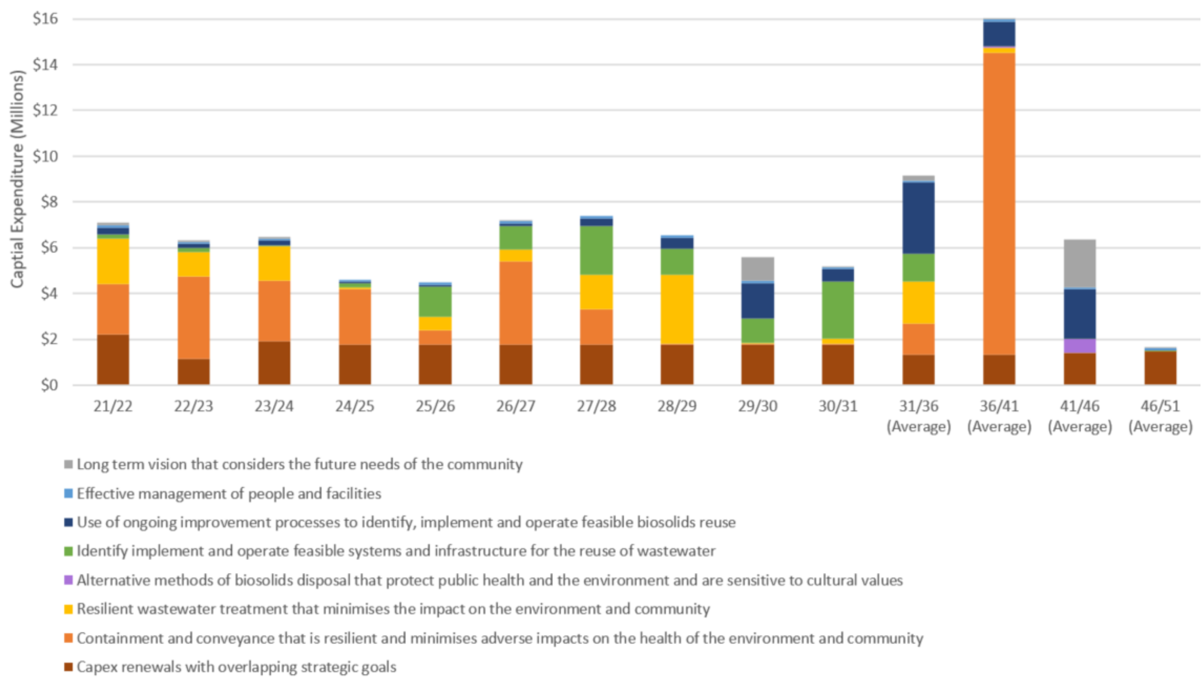


Figure 9-1: Capital budget forecast for the next 30 years

The capital expenditure has also been categorised by renewals, level of service and growth and is provided in Appendix D. Over the next 10 years our spending is driven by meeting our level of service, while infrastructure driven by growth becomes significant after 2030.

9.2 Operating budgets

NRSBU's operational expenditure forecast (excluding inflation, depreciation and interest) over the next 30 years is shown in Figure 9-3. Activities have been split into management, financial costs and depreciation, power, new processes, maintenance, monitoring and general. Over the next 10-year period the operational costs are approximately $105 million, with the split between these categories shown in Figure 9-2.

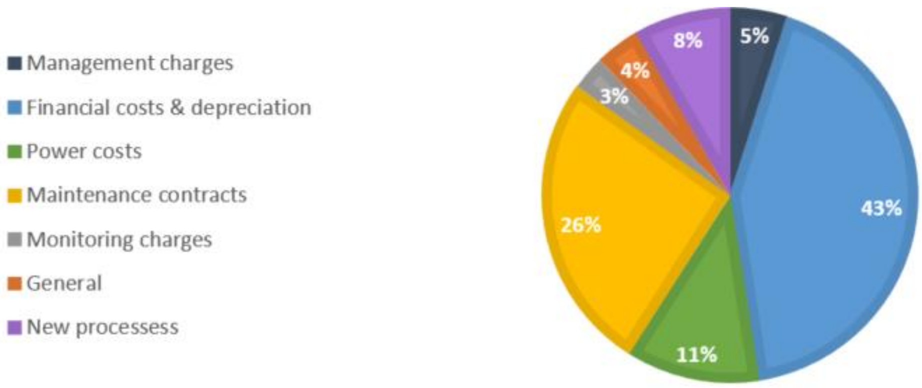


Figure 9-2: Operational budget for the next 10 years per category

Operational costs are relatively consistent over the next four years as they are largely fixed by contractual and staff commitments. Operational costs begin to increase with the implementation of duplicate infrastructure at the WWTP and higher quality treatment processes to enable the reuse of wastewater (UV disinfection, ultrafiltration and nutrient removal). An increase in power costs driven by an increase in flows is also expected to occur.

Constant general, management, maintenance and monitoring costs have been assumed in the operating budget, however in reality these are likely to increase.

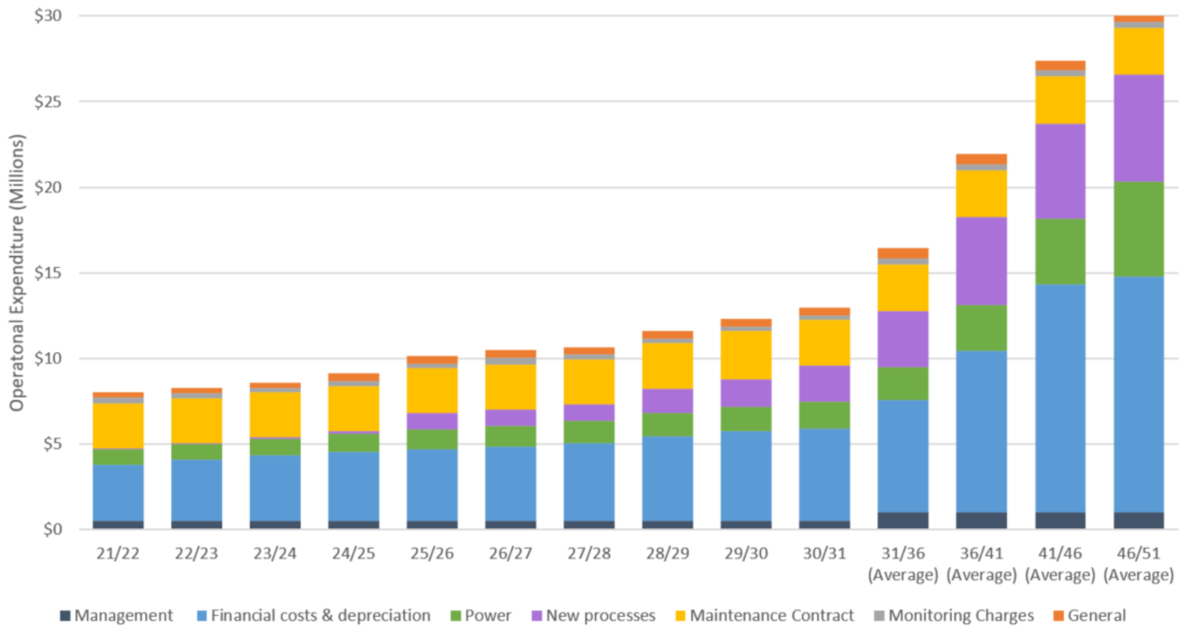


Figure 9-3: Operational budget forecast for the next 30 years

9.3 Funding sources

NRSBU has Trade Waste Agreements with its five major contributors and recoups its expenditure through fixed and variable charges as follows:

- Fixed charges based on flows and loads quota, which account for return on investment and depreciation.
- Variable charges for operational expenditure. This is an interim charge based on the previous month's recorded flows and loads and unit prices. The unit prices are determined from NSRBU's current year's budget and last year's flows and loads. At the end of the financial year there is a calculation to reconcile costs based on the current year's flows and loads and the actual expenditure.

There are ten cost centres in the model for recovery of costs, with an agreed allocation of flows or loads for sharing the costs across each of the centres. There are penalty provisions for breaching the flow or load quotas. The cost centres are:

- Pumps, pipes and biofilters
- Septage receiving facility
- Screens
- Primary clarifier
- Aeration basin
- Secondary clarifier
- Ponds and outfall
- Biosolids
- Nutrient removal
- General

As shown in Figure 9-4, the charges for the main contributors have remained similar over the last five years. Changes to the funding model may be required to ensure that the programme of works can be achieved in a cost-sustainable way.

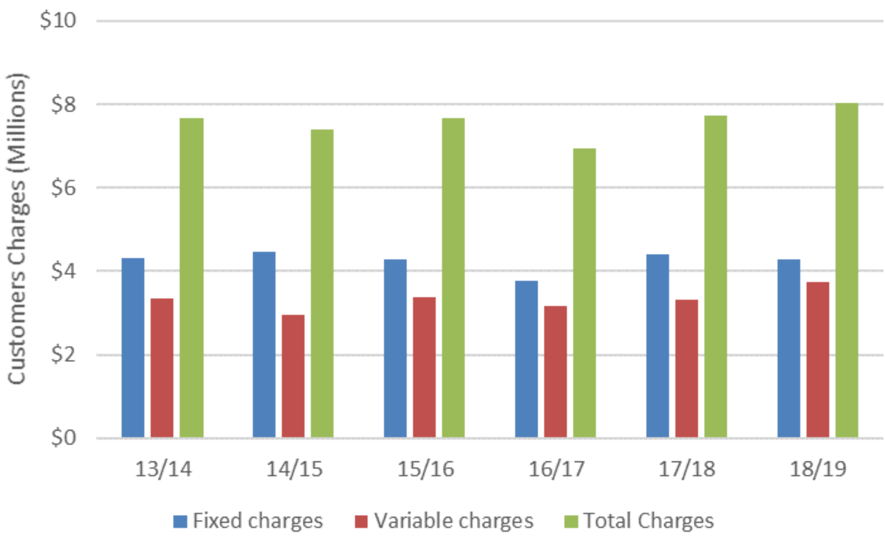


Figure 9-4: Total charges for the five main contributors

9.4 Debt forecasts

Debt and depreciation forecasts are provided in Figure 9-5 and Figure 9-6 respectively. After 30 years, interest and depreciation (as operating costs) are estimated at approximately $14M pa. As depreciation is currently the only payment against principal, there could be options in the future to increase the principal repayment to reduce the amount of interest.

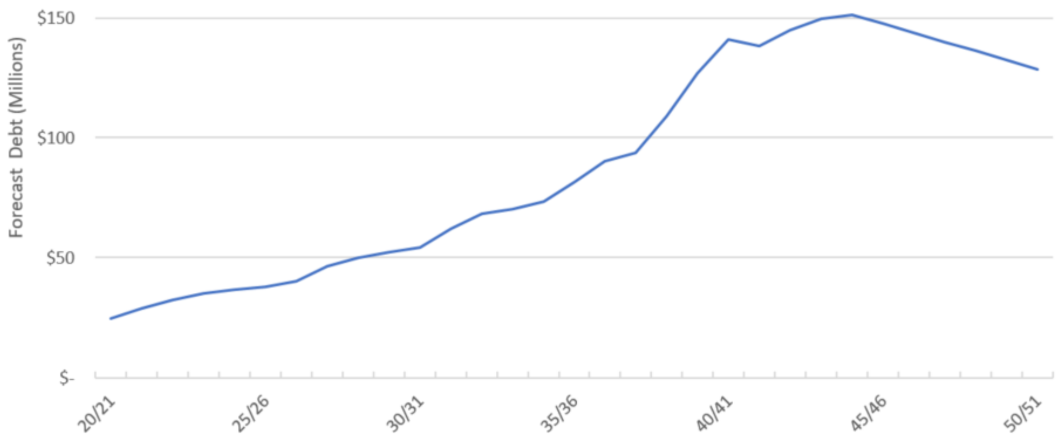


Figure 9-5: Forecast debt over the next 30-year period

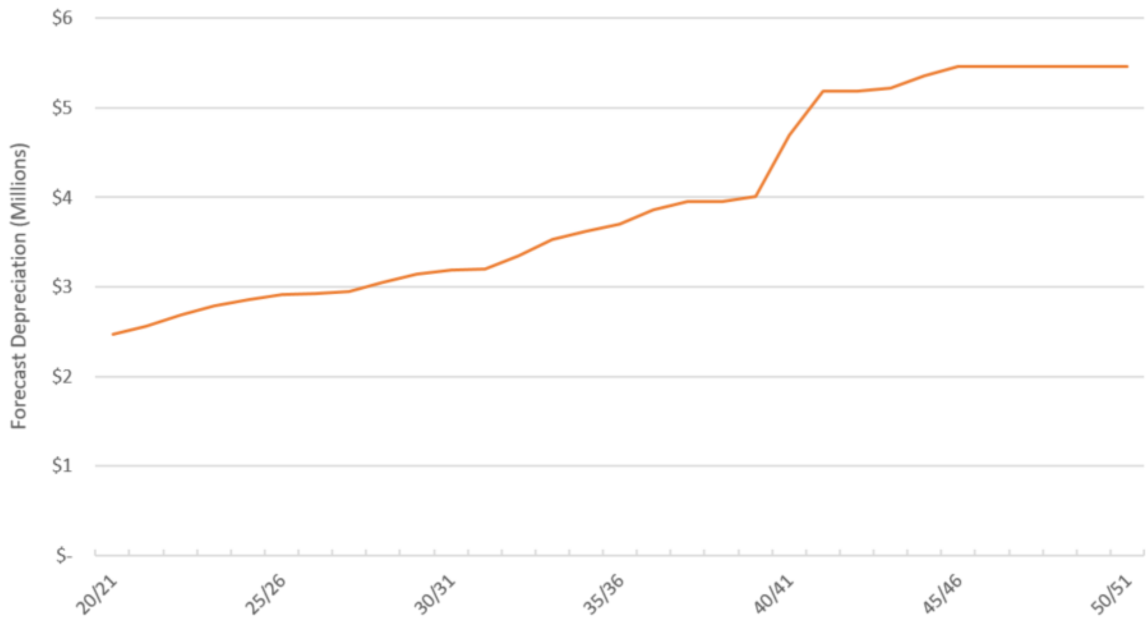


Figure 9-6: Forecast depreciation over the next 30-year period

9.5 Assumptions and confidence in the forecasts

Key assumptions with these forecasts and the associated risks are provided in Table 9-1. These expenditure forecasts are based on very high-level cost estimates and significant assumptions about future contracted flows, therefore there is high uncertainty about the accuracy of these estimates. The confidence level of these forecasts will be improved once full business cases for the proposed projects have been completed.

Table 9-1: Key assumptions and risks

Assumption	Risk
All contributors remain	One or more contributors leave, and any shortfall is not made up by others.
Growth will occur at the rates and in the areas predicted	If growth occurs faster and is more than predicted there is a risk that the programme of works will have to be fast tracked and will be difficult to deliver on time. If growth is less than predicted, infrastructure may not be required.
Renewals are like for like and do not change the replacement cost of the asset portfolio	Significant changes in cost will result in budget constraints and difficulties in delivering the programme of works.
No significant emergency event occurs	Unable to deliver programme of works due to disruptions and costs from an emergency event.
Assets will be replaced at the end of their predicted life	Overestimation of remaining asset lives and underestimation of renewal budgets.
Interest rates will be similar to the predicted rates used in these forecasts	A significant increase would impact our delivery of the programme of works within the forecasted budgets.

Part C: How we manage what we have

10 Our people

10.1 Governance structure

NRSBU is a joint committee of NCC and TDC and is comprised of:

- Two NCC representatives (one must be an elected member of council);
- Two TDC representatives (one must be an elected member of council);
- One Independent Member appointed by the two councils;
- One Iwi Representative; and
- One Industrial Contributor' representative appointed by the Major Industrial Contributors (does not have voting privileges).

Appointment of both the independent member and iwi member is timed to provide continuity across changes from local government elections.

10.2 Organisational structure

NRSBU's organisational structure is detailed below in Figure 10-1 and is considered appropriate for the scale of the operation.

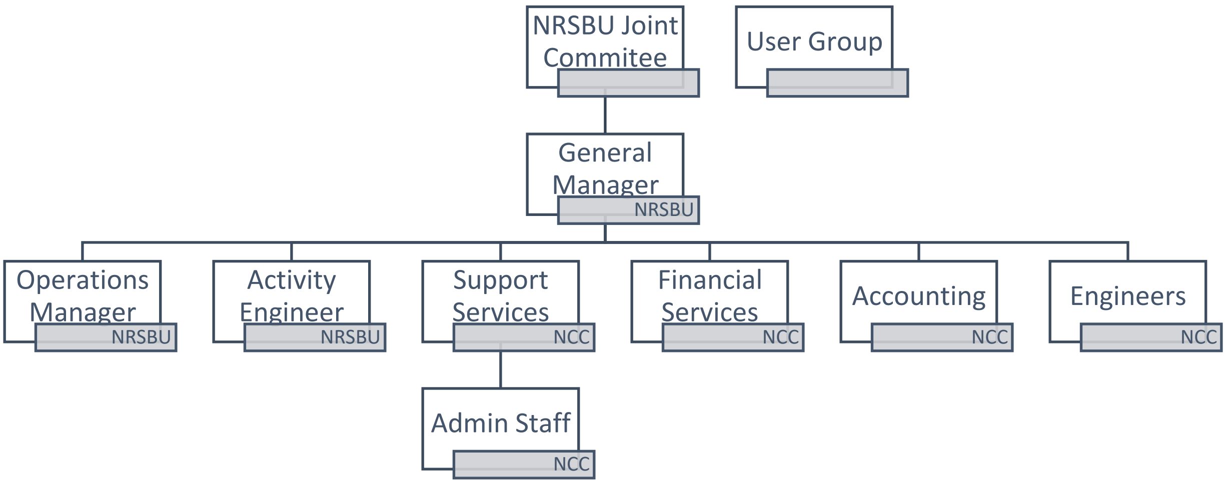


Figure 10-1: NRSBU's organisational structure

NRSBU employs a minimum number of staff required to manage the business, via NCC as the administering authority. The number of employees is kept small, as NRSBU continues to use NCC's HR and administration support to facilitate operational efficiencies.

The remainder of the staff required to operate the assets are procured using a long-term operations contract, currently held by Nelmac. The operations contractor's staff have multiple points of contact with NRSBU staff. Additional specialist maintenance and consulting services are procured as required.

Staffing capacity for NRSBU is reviewed annually and it is anticipated that additional NRSBU staffing capacity will be required to support the delivery of the significant capital and renewal works programme contained within this AMP.

10.3 Employees

Our objective is to effectively manage our people so that we can undertake our activities to a high-quality standard and in a timely manner. NRSBU will have the appropriate staff to undertake its organisational, asset and operational management activities internally.

Currently, we do not have a formal skill register or a resourcing plan for our staff. This creates a risk that we do not proactively fill any gaps within our business as they arise. Additionally, as we rely largely on external contractors, there is a risk that we do not have control over their resourcing and training.

To manage staffing capabilities and levels more effectively, our intention is to have:

- People with the required skills and knowledge.
- A skill register which details the gaps in our business, and knowledge.
- A forward works programme with an estimate of the staffing capacity required by NRSBU to deliver the programme of works.
- A training and development plan.
- A succession plan.
- An internal training programme.

10.4 Health and safety

NRSBU is committed to ensuring that everyone gets home safely and that there is ongoing improvement in our current practices. NRSBU H&S functional activities are managed using NCC's systems and policies and NRBSU fully subscribes to the vision for a Zero Harm Culture.

Day to day health and safety is primarily managed by the operations and maintenance contractors. Monthly meetings are held between NRSBU and the two main contractors: Nelmac and Nelson Marlborough Waste where health and safety is the first item on the meeting agendas. NRSBU undertakes six-monthly health and safety site audits and periodically commissions external health and safety audits. Issues that are identified by these audits become improvement projects. Additionally, there is an active health and safety improvement register, which is frequently revised and updated.

NRSBU's intention is to maintain the current system for managing health and safety. It is considered appropriate as it utilizes the expertise of the operational staff at each of the sites while enabling independent audits and continuous improvement.

11 Our community

A successful approach to working with our community is one which creates engaging and meaningful conversations, so we understand the needs and wants of our community.

Currently we manage our relationship with iwi by having an iwi representative on the board. We consult the community during consent applications. Members of the public can find information about our activities and future projects on our website.

The gaps with our current approach mean that we have not had ongoing dialogue with iwi and have relied on the resource consent process to initiate these conversations which makes it difficult to address their concerns on an ongoing level. From 2020 an annual Hui will be hosted in November each year by NRSBU to encourage dialogue between NRSBU and Iwi.

We do not actively promote our activities and achievements to the general public (we have a website which is intermittently updated) and therefore there is a risk that the public are only exposed to negative activities such as odour complaints and sewage overflows that are reported in the media and do not understand our mitigation practices. Additionally, as we have not engaged proactively with iwi and the wider community there is a risk that our vision and strategic goals do not reflect the communities' wants and values.

To effectively manage our relationship with our community we must be transparent and increase the public's knowledge of our day to day activities and future goals. To achieve this, we will:

- Hold an annual Hui and public open days.
- Have a current and informative website, which NRSBU staff can update.
- Publish articles in council publications.
- Develop a regional infrastructure plan for wastewater services.
- Hold two monthly management meetings with council asset managers.
- Have an NRSBU staff member sit within NCC and TDC offices at least one day per week to facilitate regional conversations and foster ongoing communication.
- Hold quarterly meetings with our contributor in advance of the quarterly board meetings.

One of the challenges to achieving the above tasks is the lack of appropriate facilities to host meetings. Our programme of works includes the development of the house on Bell Island (part of the 2019 land purchase) so it is suitable to hold meetings and the NRSBU annual Hui.

12 Assets

This section outlines how we manage our assets – how we monitor their current state, how we approach operating them, how we maintain them and how we plan to replace and upgrade them.

12.1 Understanding our assets

This section outlines the systems we have in place to understand our assets. Having an accurate understanding of the state of our assets is the foundation to managing them into the future.

12.1.1 Asset performance

Successful performance monitoring will provide an accurate and detailed understanding of the performance of the system and inform maintenance and renewal programmes. The preferred system would involve integrated systems, which notify us of any issues and enable us to visually see trends in monitoring data.

Our key performance areas for our trunk mains and pump stations are detailed in Table 12-1 while the performance measurements for our treatment and disposal facilities are detailed in Table 12-2.

Table 12-1: Reticulation and pump station performance

Key performance area	Performance measurement (for all PS)
Overflow occurrence	High level alarms alert the duty operator immediately if wet well levels are nearing overflow. Level sensors indicate if overflow levels were reached.
Pump failure	Pump failure alarms alert duty operator immediately.
Meter accuracy/trunk main integrity	Flow mass balances calculated in spreadsheets.
Pump efficiency	Manually logged on maintenance sheets: • daily check of instantaneous flow and power consumptions • weekly pump run test

Key performance area	Performance measurement (for all PS)
Average and peak flow handling	Flow meters on all inlet pipes and PS discharge.
Trunk main blockage	The Bell Island to Moturoa/Rabbit Island biosolids transfer pipe is monitored daily for pressure, to indicate when pigging is required. Pigging is undertaken three times per week. The primary sludge lines at the WWTP are monitored daily and pigged. Other pipes not monitored specifically.

Table 12-2: Treatment and disposal performance

Key performance area	Performance measurement
Quality of discharged effluent and biosolids	Weekly sampling.
Flow handling	Flow meters on outlet pipe. Daily outflow graphs calculating annual rolling mean.
Aerator efficiency	Dissolved Oxygen monitoring. Current draw by the motor.
Odour	Odour complaints monitoring.

The challenge with our current performance monitoring is that the data collected is not held by NRSBU in a single system, which makes it challenging to visually see trends in the data and create automated reports. Additionally, as the data is generally not inputted into the system on site by the operator, there is a risk that the data has been interpreted incorrectly.

We plan to improve our performance monitoring by implementing the following works:

- Developing our use of Infor and ensuring that data is entered into the system seamlessly and intuitively.
- Creation of dashboards to give visibility to real-time and trending information.

12.1.2 Asset condition

The preferred approach to understanding our asset condition would involve the completion of a detailed asset condition survey of our critical assets and the ongoing management of an asset condition register, which would be updated incrementally by staff during routine visual inspections.

Currently, we take a risk-based approach to condition monitoring as we are unable to conduct CCTV assessments as our assets cannot be easily drained. NRSBU considers the recently installed trunk mains (i.e. HDPE) to be in a good condition whereas, the condition of the concrete pipeline from Monaco to Bell Island and Bell Island to Moturoa/Rabbit Island is unknown. Additionally, where possible, visual assessment of the assets is conducted including:

- Routine visual assessments of the pump station chambers conducted by Nelmac staff.
- Visual assessment of the storage tanks at Moturoa/Rabbit Island when they are emptied and washed down by Nelson Marlborough Waste Management.
- Visual assessment of the assets at the WWTP during day to day operations.
- Annual emptying of the primary clarifier and aeration basin and secondary clarifier to inspect the condition of the structure and to allow visual inspection of the aerators and mixers, and scraper mechanisms.

The risks with this approach to condition monitoring mean that we do not have an accurate baseline condition of our assets and must be prepared to replace the assets quickly if they no longer perform as required.

Our intention is to continue to with a risk-based approach to condition assessment and complete CCTV assessments of only the critical assets where the condition is unknown. The programme of works for the next 30-year timeframe will increase redundancy, which should enable assets to be replaced with less impact on the system.

12.2 Operating our assets

NRSBU's intention is to operate our assets in a way that is sustainable with minimal social and environmental impact. We strive to have the right people and operation systems in place so that our processes are always compliant with resource consents and continuously improve to ensure optimisation.

NRSBU has two main operational contracts; one for biosolids disposal and another for the remaining activities. Table 12-3~~Table 12-3~~ summarises the NRSBU maintenance and renewal contracts and the contractors' responsibilities.

Nelmac has a maintenance and operations contract with NRSBU. The contract (Contract No. 3458) outlines the activities required by the contractor and includes operations of both the treatment plant and the pump stations and a range of minor maintenance activities. Nelmac provides five staff on Bell Island, comprising three operational staff and two maintenance staff. The staff who operate the pump stations are part of a separate team provided by Nelmac. The maintenance and operations contractor must also nominate a wastewater treatment plant specialist to provide expertise in process management (supplied by Stantec). The specialist also oversees the data collected by the contractor and must inspect and approve any outliers. The specialist will therefore confirm the accuracy and quality of data used to operate and manage the NRSBU assets. It should be noted there is no contractual relationship between the wastewater specialist and NRSBU.

The risks with the current way we operate our assets is that there can be resourcing conflicts in large storm events as staff are also part of other Nelmac contracts with NCC and TDC as the current operation contract does not specify the number of staff that must be required exclusively for NRSBU operations. There are unique processes at the Bell Island and Moturoa/Rabbit Island facility and as this knowledge of the plant is developed over time; there is a risk that this expertise is lost with a change of staff and/or contractor. Additionally, as the wastewater specialist is engaged by the operations contractor the advice received from the specialist cannot be considered unbiased and NRSBU need to be careful relying on it.

NRSBU intends to address these risks when the Operations and Maintenance contract comes up for review. Possible changes to the contract are as followed:

- Specified minimum number of staff on site.
- Specified staff structure and responsibilities to ensure no boundary between conveyance and treatment operations.
- Ensure operations teams have a holistic understanding of the scheme.
- Technical expert will be engaged directly by NRSBU.
- Contract framework that focuses on outcomes and more effective share of responsibility.
- Collaborative approach to budgets and work programmes with the contractor.
- Adaptive approach to delivering the service using a pain-share/gain-share approach.

Contract No. 3458 has been extended to June 2021.Nelson Marlborough Waste has the current biosolids disposal contract (Contract No. 3619) and has been operating the Moturoa/Rabbit Island disposal since 1996 (previous contract was held by Astro Environmental, which is now part of Nelson Marlborough Waste). As the process is a niche skill, it is normally the sole tenderer when the contract is up for renewal. The contractor owns the mobile operations equipment and is responsible for its maintenance. The major risk with this contract is the loss of skills and expertise that could result in a change of contractor; however, we do not believe any significant changes are required to this contract. This contract is also subject to a s17A(1) review.

Table 12-3: Maintenance and renewal contracts

Service Area	Contractor	Expiry Date	Contract Number	Responsibilities
Reticulation (truck mains and outfalls) **Pump Stations** **Treatment Plant**	Nelmac	30 September 2020 (extended to June 2021)	3458	Operation and maintenance of all equipment and facilities at the WWTP. Disposal of all wastes generated including screening residuals. Disposal of treated biosolids to holding tanks on Moturoa/Rabbit Island. Operation, maintenance and management of all equipment and facilities upstream of WWTP including: • NRSBU pump stations • NRSBU pipelines.
Biosolids Disposal	Nelson Marlborough Waste	30 June 2020 (extended to June 2021)	3619	Spraying of biosolids Operation of biosolids storage tanks

12.3 Maintaining our assets

A risk profile approach to maintaining assets is preferred. Having a prioritised maintenance schedule, which is based on the condition (age), repair time and criticality of the asset results in a maintenance programme, which is cost effective. Ideally maintenance contracts will be structured in a way, which encourages staff to be proactive in maintaining assets to the required quality.

The current contract has a requirement to maintain assets. However, the contract is prescriptive and there are gaps in the scheduled requirements. For the most part, maintenance is reactive and occurs when issues are spotted. The maintenance and operation contractor is responsible for the maintenance of the rising mains, pump stations and treatment plant, however NRSBU is responsible for the cost of reactive maintenance and larger programmed maintenance items.

NRSBU does not currently have a defined maintenance programme and/or a schedule of minimum spares. However, there are a small number of asset classes that have preventive maintenance schedules including the air compressors, backflow preventers and aerators at the treatment plant and ongoing pigging of the biosolids pipeline. Spares (stored at Bell Island Treatment plant) are carried to support reactive response to failures for certain items at the treatment plant and large pumps. The operation and maintenance contractor is responsible for maintaining the inventory, however, this may not be up to date.

There is the potential for large costs to be incurred with reactive maintenance and loss of plant efficiency. As there is a reliance on the expertise of the contractors to spot issues there is a risk that some issues are not spotted during routine operational inspections. With the current approach to maintenance, critical assets are not prioritised and there is a risk that if an asset requires major work and is not able to be repaired/replaced in an appropriate timeframe it could impact our contributors. Additionally, as the inventory of spare assets is not maintained there is a risk of replacement spare not being ordered to maintain the inventory.

We plan to accept the risk of unplanned failures occurring as we believe this is an efficient approach for the system. However, we will minimise the impact of these failures by ensuring that critical assets have N+1 redundancy. The general approach to maintenance will remain reactive, however we will take a criticality approach and identity preventative maintenance schedules for critical assets.

As we currently lack formal maintenance systems and documentation, we plan to address this risk by ensure that maintenance scheduling and reporting is done in Infor and is able to be updated by the field staff in real time in the form of a mobile app. Our intention is to have these systems and programmes established before the new maintenance contract. The new contract will take a general approach using time and disbursement funding and provide incentives for efficiently maintaining assets.

Recently NRSBU has started to order new large pumps with vibration sensors built in, to support proactive maintenance. Work has yet to be undertaken to establish the processes and systems for analysing the vibration data, defining the intervention specification, and seeing that implemented.

12.4 Replacing our assets

A good approach to asset renewal is one which is risk based and considers the likelihood and consequence of failure, the asset condition and performance and the overall life cycle costs of the asset. As discussed in the previous operations and maintenance section, the criticality of assets will inform renewals.

Currently, renewals occur on an ad-hoc basis. The identification of assets that require replacement is generally triggered by the failure of the assets or an issue that is likely to result in imminent failure. With the current arrangement, inspections generally only occur for operational purposes. There is a risk that as the intention for these inspections is not for renewal planning the performance and condition of the system is not considered as a whole and issues may be missed. Therefore, with the current approach for renewal planning there is a risk of avoidable maintenance expenditure, unforeseen budget surprises, premature failure and reliability impacts where not covered by N+1 (e.g. screening chamber).

Our intention is to have a three-tiered approach to renewal planning which could be as shown in Figure 12-1.

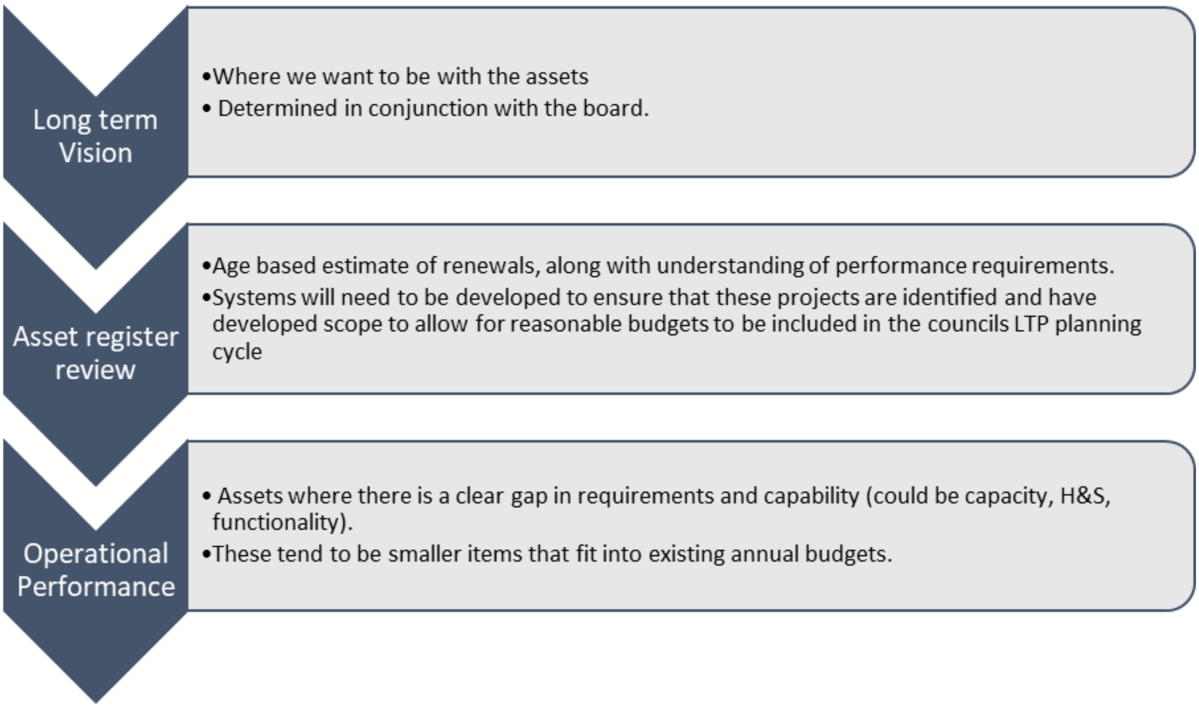


Figure 12-1: Three-tiered approach to renewal planning

To effectively manage our assets, there is a need to develop a dashboard and/or use Infor to inform asset renewals, which will be the responsibility of the Activity Engineer. Maintenance inspections reports and condition assessment schedules (which are yet to be developed) will also be incorporated into one system so that a lack of inspection will also alert a risk of failure. A traffic light system will be developed to visually see which assets are at risk of failure including intentional and unplanned deferred replacement and pending replacements.

Renewals projects may be constrained by budgets as historically annual renewals have been low. NRSBU can modify project timeframes to smooth expenditure within this budget cap and ensure that prioritised projects have adequate budgets. NRSBU will continue to focus on a planning process that identifies projects and develops scope sufficiently to allow reasonable budgets to be developed, covering at least the three-yearly council LTP planning cycle.

12.5 Upgrading our assets

The preferred approach to upgrading our assets is one which identifies and prioritises projects that align with our strategic goals. Upgrades to ensure that levels of service continue to be met and those required to accommodate growth need to be clearly identified.

Historically upgrades are driven by either the customer requiring more capacity or changes in consent conditions. The strategic approach informing upgrades is usually discussed with the board in advance and these projects generally require a higher level of justification. Large projects (e.g. Best Island land purchase) must be signed off by the councillors of each council. Any changes in capital and operational costs are handled through the cost allocation model.

The risk with the current approach is projects, due to the cost allocation model are driven by the contributors' capacity requirements and/or achieving compliance. There is a risk that if our contributors are not on board with our strategic goals and where we want to be in the future, projects will not be approved and funded. We intend to address this risk by ensuring that the board is behind our vision and level of services and it is clear which projects are required to achieve them. Additionally, we will have a staged approach that develops concepts and engineering estimates to inform budgets with adequate lead time.

13 Risks

13.1 Our key risks

We have a number of key risks that we do not have an appetite to accept at their current level. We are actively managing these risks through projects that are either underway or proposed. These projects are expected to reduce the risk to an acceptable level, although for some risks this may take a long time to achieve. These key risks are summarised in Table 13-1 below. Our overall approach to managing risk is discussed in the following section.

Table 13-1: Key NRSBU Risks

Risk	Cause	Current Mitigation	Future Mitigation
Disruption to treatment processes in the ponds, creating odour issues.	Concurrent excess load from industries	Contributor contracts with penalty clauses Online monitoring and regular contributor sampling	
Break/leak in network Making an incorrect assumption about the presence or absence of an asset, based on faulty data. Significant inefficiencies for operations and maintenance staff finding information.	Unreliable asset attribute information in Infor Poor asset information in GIS	Operations manual hardcopy with information, staff/contractors experience Flow meters at pump station, mass balance (5%)	As-built plans of high quality and all asset locations known. Plan to improve the GIS system. Use of Infor and other asset management tools, to streamline the use of asset data.
Unable to treat wastewater due to ageing and under capacity power supply	Lack of resilient power supply to Bell Island.	Bell Island can cope a few hours without power. Generator at inlet (3 x emergency generators for resource consent)	Install larger generators that could power the plant. Look at alternative power supply options, including alternative alignment to the current estuary location.
Breaks in the network causing overflows Increased maintenance cost, increased "down time" Compliance liabilities, due to avoidable non-compliance event	Deteriorating condition of aging infrastructure.	Weekly flowmeter mass balance checks by contract supervisor and asset engineer to show signs of leaks	New duplicate rising main installed across estuary to Bell Island. Additional duplication of pipelines proposed to allow improved ability operate system while inspecting and maintaining assets. A programme developed for risk-based condition assessments of the pipeline, especially the old line from Monaco to Bell Island (currently planned for July 2021).
Overflows Decrease revenue due to drought and lack of flow volume	Extreme weather.	Washup Pump more than contracted flows There are two application vehicles at	Rising main capacity upgrade Redundant storm pumps for all pump stations (work in progress).

Risk	Cause	Current Mitigation	Future Mitigation
Moturoa/Rabbit island closed or restricted discharge due to fire risk Damage to infrastructure		either end of Moturoa/Rabbit Island if one cannot be accessed due to fire risk. These are owned by the contractor by NRSBU covered the costs of setting up the second system. Temp bunds at Beach Rd to seal openings at building	Development of emergency storage on the mainland at the terminal pump station(s), to improve maintainability and attenuate some peak flow. Increased bunding Bell Island. Works at Songer Street and Beach Road to protect from flooding, storm surge and costal inundation.
Overflows from pump stations	Insufficient power generation.	Standby generators for duty pumps	Standby generators to run full storm capacity are planned.
The aeration ponds have to be used for emergency storage of biosolids, with an odour issues and removal costs. Alternate disposal options have to be sourced under duress	Disruption to land disposal sites (both at Rabbit and Bell Island).	Storage tanks at Moturoa/Rabbit Island	Begin process to source other land or alternate acceptable disposal options (including required plant upgrades).
Risk to the public and environment from overflows	Insufficient capacity in the network for actual wet weather flows.	Overflows upstream in the contributor network	The planned improvements to trunk main and pump capacity. Improved communications between NRSBU and contributors.
Avoidable non-compliance through staff inaction or inappropriate action.	Insufficient staff continuity, training, and retention.	Additional resources provided through Secondment and/or external contractors	Engagement of NRSBU direct staff. Revising the operations and maintenance contract to include specific requirements around staffing and to increase collaborative management of the system.

13.2 Our risk management approach

NRSBU aspires to manage risks in a rationale, systematic way that ensures the right effort is put against the right risks. An appropriate risk management approach should provide:

- A way for people to have visibility of the risks that are relevant to them.
- Identification of risks that are deemed unacceptably high and progress against reducing those risks to an acceptable level.
- Visibility of those risks that will not be mitigated further but are still significant.
- A scalable process that works at the project, operational, and organisational levels.
- A live process that remains up to date.
- An iterative approach that supports continuous improvement.

- Communication and consultation with people from different areas of expertise to define and evaluate risks.
- Consideration of emerging risks, the limitations of information and the biases of those involved.

Aligning to the ISO risk standard (31000) is a means of achieving this.

NRSBU has a Risk Management Plan (RMP), which includes a very comprehensive risk register. The plan is based on ISO 31000 principles, but it exists as a static document that is not incorporated into the operation of the business. For example, the register states that risks, which are scored as extreme or high should be reported to the board, however currently this is not captured in a structured way. NRSBU plans to update the RMP and incorporate it formally into reporting procedures.

The current approaches for communicating risk within the organisation include:

- Management conversations with the board when discussing strategic projects.
- Informal conversations with the board regarding meeting agenda items such as health and safety, quality, environmental performance and operational issues and constraints.
- Monthly management conversations with the operations and maintenance contractor.

The risk conversations that happen in the board and operational meetings become part of the meeting minutes under their relevant headings. These are then tracked until they have been addressed.

NRSBU has identified the following risks from its current approach:

- That an important risk item could fall through the cracks if it is not covered by an existing agenda heading.
- That without linkages between the risk register and an improvement programme, work items may struggle for planning or budget and not be resolved in a timely manner.
- That projects that address an important risk for a moderate budget may not be given the attention they deserve compared to higher profile risks, as structured risk workshops are not currently held.

These risks will be addressed by developing a new risk management plan that is aligned to ISO and integrating that into the business. In the interim a draft risk management plan has been developed, based on the legacy risk register from the previous AMP. This will become part of the risk management plan once developed.

As well as the overall risk management plan, detailed risk management plans for specific aspects of the business will be developed, including:

- Business risk management plan – this to consider income variability and the influence on overall budgets particularly from industrial clients.
- Odour risk management plan – existing but needs to be developed further.
- Sea level rise and climate change risk management plan – consider the implications from sea level rise and change in weather patterns on operations and site viability.

13.3 Critical assets

Understanding asset criticality is foundational to a risk-based approach for managing assets. The preferred approach for asset criticality provides a clear framework for describing the consequence of asset failure, from low to extremely high and applies that framework at an appropriate level of detail. This framework would give balanced weighting to different kinds of consequences such as environmental, public health, and financial. It would also scale to describe whole sites down to individual assets and components within those sites, as required. The critically of a site and its assets would then be incorporated into operation, maintenance and renewals planning.

Currently, our approach to determining the critically of our assets is based on staff experience about the consequences of failure. The assets identified as most critical are:

- Trunk mains.
- Pump stations.
- Power supplies (both onsite generation capacity and supply from the mainland).

NRSBU's planning for resilience, described in the following sections, is focused on these critical assets.

The main gap between our current approach and the preferred approach is the lack of documentation. This makes it difficult to take a systematic approach to anticipating failure, especially in critical control and electrical systems. Additionally, the lack of documentation and a consistent approach in assessing critically makes it harder to communicate critically across our maintenance and operation contractors and members of the board.

There is a risk that critically is not incorporated in our decision making for prioritising maintenance work and capital projects.

Our intention is to develop our approach to criticality as part of improving our risk management processes. We plan to reduce the critically of certain assets by ensuring redundancy in the system though duplication and bypass facilities. We accept that though some of our assets will remain at a high level of critically (e.g. civil infrastructure) the overall risk of failure of these assets is low.

13.4 Resilience

Resilience has increasingly become a focus at all levels of governance. Resilience requires consideration to be given to how infrastructure, natural systems or social fabric will respond to both incremental change and infrequent shocks in a manner, which enables disruption to be minimised. This is becoming increasingly important as communities respond to climate change and we become more aware of our vulnerability to natural disasters such as extreme storms, earthquakes and volcanic eruptions.

From IIMM 2015, resilience is defined as follows (New Zealand Treasury, National Infrastructure Unit, 2011):

"the concept of resilience is wider than natural disasters and covers the capacity of public, private and civic sectors to withstand disruption, absorb disturbance, act effectively in a crisis, adapting to changing conditions, including climate change, and grow over time."

Resilience of a system can be defined as the:

"the ability of systems (including infrastructure, government, business and communities to proactively resist, absorb, recover from, or adapt to, disruption within a timeframe, which is tolerable from a social, economic, cultural and environmental perspective." (Money et al, 2017).

The NRSBU aspires to a risk-based approach for resilience. This involves assessing the hazards the scheme is exposed to and how vulnerable the scheme is to them, along with the criticality of the assets involved. Improving resilience goes hand in hand with detailed risk assessments, which evolve over time.

A cornerstone philosophy of our approach to resilience is to ensure that all highly critical assets have appropriate redundancy or alternate backup. Future projects to support this include duplication of our rising mains and ensuring N+1 redundancy for pump station storm pumps and WWTP headworks assets.

The perceived critically of an asset is incorporated into our operations and maintenance planning informally, and into the design of our major capital upgrades, however this is not documented. Resilience considerations were also built into the design of the treatment plant at the time of construction, but these have not been subject to review since.

Even after these projects, some parts of the process will still have a degree of exposure and vulnerability. A criticality review with the board of NRSBU on a bi-annual basis is advised to determine if any of these risks are unacceptable. Improvements in our approach to risk management will support this.

We currently have an existing business continuity plan, which describes how to respond to an emergency event that presents immediate threats to life, critical physical assets or a sewage spill into the environment. It also details how to restore services to normal operations following an emergency event or disruption of services. This plan was last updated in July 2016.

As described above, the main gap in the current practice is the informal consideration of resilience rather than through a structured approach. Sources for progressing this include the 2015 guidance on developing levels of service for wastewater seismic resilience, the Building Importance Levels defined in the Building Regulations 1992 and recent work for NCC on natural hazard infrastructure loss modelling by Aon/Tonkin and Taylor.

This would facilitate discussion of moderately (but not highly) critical assets such as the large diameter concrete pipes used within the WWTP site, which have not been considered for seismic or other resilience issues so far.

13.5 Lifelines

NRSBU provides a lifeline utility service, as defined under the Civil Defence Emergency Management Act 2002.

NRSBU relies on the relevant NCC staff to make it aware of any civil defence or lifelines planning requirements over and above its current approach.

13.6 Covid 19

The new coronavirus Covid-19, which has led to the declaration of a worldwide pandemic, could impact on the programme for reform of three waters management and the capital works programmes. NSRBU is unable to factor in the risks of three waters management reform until more is known, but capital works programmes shall be reviewed against councils' intentions to limit rates rises.

14 Systems

14.1 Asset management systems

Asset Management Information Systems provide an understanding of assets to optimise lifecycle costs, identify required work, record completed work and cost of work. It benefits general management, long-term planning and data analysis. NCC has a number of information systems that the Business Unit uses including Infor IPS, GIS and SCADA. The systems are described in more detail below.

14.1.1 Current system

NCC has the Infor IPS Asset Management System (formally known as Hansen), to which NSRBU has access. Similar to the GIS system, the IPS system is used to store data on all infrastructural assets (with the exception of land transport) but in a non-spatial manner. All asset information is stored in Infor and linked with GIS.

It provides a single platform for the optimization of assets and has been implemented to improve the efficiency, flexibility, and accuracy with which we currently plan for our assets. IPS is an SQL driven web-based product capable of integrating with most of Council's existing information systems.

The IPS system assists to:

- conduct asset condition analysis,
- carry-out replacement cost valuations and calculate changes in asset book values,
- carry-out optimized decision making on renewal programmes and
- plan and schedule effective maintenance programmes.

The asset database in IPS gets updated from various activities:

- Operations & Maintenance works.
- CCTV inspections.
- Capital projects.

NSRBU has failed to regularly update the information in Infor as assets are rehabilitated, renewed/replaced or new assets are constructed. This issue is being addressed by the appointment of the Activity Engineer, who will assume management of the database.

The use of the Infor system has enabled the following:

- Customer enquiries being logged directly and sent immediately to the contractor for action.
- Contractor directly enters resolution confirmation at completion of job.
- Tracking of expenditure on assets to allow assets that have a disproportionately high maintenance cost to be identified - upgrade or renewal can then be prioritised.

NSRBU's contractor Nelmac has a live interface with Infor. Any work associated with unscheduled maintenance is entered into Infor work order by the contractor. Completed work orders forms the basis of the contractor's payment.

14.1.2 Preferred asset management system

The main gap between our current approach and the preferred approach are the multiple different management systems and lack of processes. Currently, data collected from our operational and maintenance contractors is held separately to our system so there is risk regarding ownership of collected data. There are limited specifications regarding which data should be collected and processes to audit this information resulting in uncertainty of the completeness and reliability of this data.

To address these issues and risks NRSBU plans to work through a stepped process which includes:

1. Fix the GIS system to show NRSBU assets irrespective of their location (inside NCC or TDC Territories). Add dummy nodes for all sites, with index numbers for as-built plans.

2 Improve dashboarding for operations and maintenance data and asset condition and renewal data (read-only visualisation).

3 Define integration requirements for asset management system.

4 Develop 3D model of the site(s) and assets into a BIM model.

5 Implement real time data entry from field.

14.2 Environmental management systems

The preferred environmental management system (EMS) for our business would:

- Connect the existing processes and tools we use to track progress towards our strategic goals and manage compliance with our statutory and voluntary obligations.
- Enable us to better identify and track opportunities for us to continually improve our performance as well as opportunities to make positive environmental impacts.
- Ensure the environmental concerns or expectations of our stakeholder (employees, contributors, iwi, communities, and shareholders) are considered in our decision-making processes.
- Help us to be better prepared for environmental incidents by ensuring we know the environmental context of each of our assets and all of the environmental receptors at risk in the event of an incident.
- Increase awareness of environmental obligations and opportunities within our organisation and ensure we have the right resources and competent people to manage these.
- Improve how we communicate our environmental performance both within and outside of our organisation.

Currently, our environmental system is the framework created by our resource consents. The process to get the consents considered the environmental impacts we have that are covered by the RMA, set some limitations on our activities, put in place a monitoring programme and provides feedback on performance. As an environmental system, this approach provides some basic safeguards but does not encourage continuous improvement beyond compliance minimums. In addition, our current approach only captures some of our regulatory compliance obligations (not those in permitted activity rules, or legislation other than the RMA) and it does not assist us in managing our other compliance obligations (e.g. expectations of our contributors, neighbours, local iwi and wider community, or voluntary commitments). It is ineffective in identifying environmental, social or legislative changes that may impact our business in the future.

The risks of the gaps between our current and preferred approach are that we are currently only managing some of our regulatory compliance obligations, however, failing to meet voluntary or community commitments may also represent a significant risk for us in terms of reputation or a social licence to operate. Our preferred approach would allow us to capitalise on opportunities and be better prepared for abnormal operating conditions, planned operational changes, or legislative shifts that may impact how we mange on environmental impacts (e.g. changes affecting or increasing our ability to reuse treated wastewater).

We plan to undertake the EMS improvement projects detailed in Section 9 that will address the following risks:

- Follow the principles of ISO14001:2015 Environmental Management Systems and ISO14064-1:2018 Specification with guidance at the organisation level for quantification and reporting of greenhouse gas emissions and removals.
- Undertake an audit of the current emissions and have systems in place for the ongoing monitoring and reporting of emissions (20/21).

- Formally include emissions and energy consumption as criteria in all NRSBU decision making and set reduction targets (21/22).

At this stage, we plan to accept the remainder of the risks outlined above.

14.3 Quality systems

NRSBU aspires to a quality system that over time, delivers improved efficiency and less mistakes, and an improved client experience. This quality system will:

- Follow the principles of ISO9001:2015 Quality Management Systems.
- Provides the tools, systems and processes we need to deliver a great job to our clients.
- Ensures our documentation is properly controlled so that our procedures, policies, etc. are the "one source of truth", and that this can be readily accessible for all users (such as on the intranet or a central server).
- Allows for the review of new processes and content before they are added into our source of truth.
- Uses the Plan-Do-Check-Act cycle (the tool used in ISO9001:2015- Quality Management Systems, shown in Figure 14-1 below) to foster continuous improvement and lift our business performance over time.
- Includes a risk-based approach, to avoid us over-documenting our low risk processes.
- Over time, delivers improved efficiency and less mistakes, and an improved client experience.

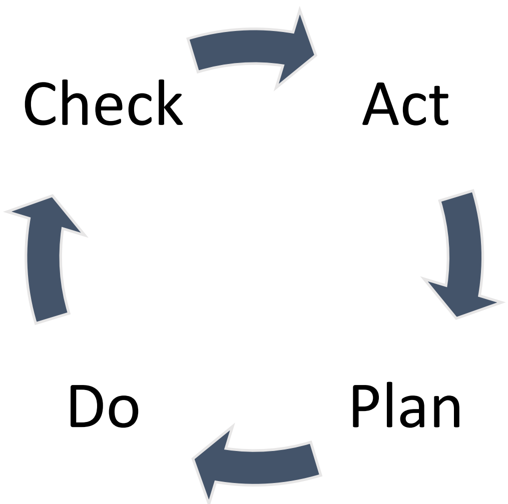


Figure 14-1: The Plan-Do-Check-Act Cycle

Currently, NRSBU has the following systems that provide quality control:

- An O&M plan that includes operator checklists.
- A near miss system for operational misses as part of the operational contract with Nelmac. This involves a monthly agenda item on the operational meeting, covering quality (reporting/admin etc.), environmental, and health and safety. Once raised, these become agreed action items in the meeting minutes, and this is then tracked via the actions list until it is resolved. A significant event will trigger a specific review meeting and detailed follow-up reporting.
- The works order system which is used to record improvement opportunities that are agreed for actioning at the Operations Management meeting.

- The NCC document management system, which is used for storing some information, while other datasets are stored locally.

The biggest risk from the gaps between our current and preferred system is the intellectual property staying with the operational contractor because there is no consolidated place for saving all process and operational information (e.g. an intranet) that works for all parties. These risks will be addressed with the development of an integrated asset management system with maintenance checklists and operating procedures linked to each assets and process.

14.4 Financial systems

This section describes NRSBU's financial systems under the headings of treasury and budgeting, valuation, insurance, and procurement.

14.4.1 Treasury and budgeting

Important background to the treasury and budgeting approach is NRSBU's financial strategy, which can be summarised as:

- Contributors should be charged to recover the operational costs that they generate.
- Contributors should be charged the funding costs of the Capital employed to support their quota.
- Asset renewals should be primarily funded through annual depreciation charges.
- Capital costs for new assets, and any renewals costs that exceed depreciation charges, are funded through debt.
- Loans are repaid through depreciation funds.
- The long-term capital debt forecast is taken as the indicator of financial sustainability, as the cumulative balance of operational costs does not need to be considered.

In addition to supporting the strategy above, NRSBU has the following requirements for its treasury and budgeting approach:

- Financial reporting requirements of relevant legislation and standards are met.
- Actual income and expenditure for the current financial year can be managed easily.
- Predictable charging can be provided to contributors.
- Budget planning for the short to mid-term future (1-10 years) is supported.
- Financial sustainability of the activity (at least 30 years) can be assessed through long term forecasting.

The treasury and budgeting systems that NRSBU has in place to meet these requirements are outlined below.

14.4.1.1 Financial reporting and actuals

Accounting is carried out to generally Accepted Accounting Principles to comply with the Local Government Act 2002 and Public Benefit Entity International Public Sector Accounting Standards (PBE IPSAS).

NRSBU uses NCC's financial systems to manage actual income and expenses, undertake invoicing and to track financial performance against current year budgets. Utilising these existing services is more efficient than maintaining separate financial systems and allows for easy integration with NCC's financial auditing. NCC uses integrated computer software supplied by MagiQ. The General Ledger is linked to packages that run Debtors, Creditors, Banking, Rates, Fixed Assets, Invoicing, Water Billing, Job Costing and Payroll. Internal monthly financial reports are generated by Council significant activity and sub-activity categories although real time data is available at any time. External financial reports by significant activity are published in the annual report.

14.4.1.2 Predictable charging for contributors

NRSBU has a comprehensive charging model that relates the components of the contributors' flows and loads to the actual costs incurred by the business. This model is documented in the contract and provides transparency to the contributors.

Each contributor is advised of its capital charge for its committed quota and the operational unit charges estimated from their historic loads and the forecast budget. The actual annual operational charge will vary based on flows and loads observed. The primary cause of large variations between estimated and actual are changes to flows and loads by the contributors. Where large variations in flows and loads occur, the charging agreement provides for an annual washup based on actual loads and flows and the actual operational costs.

Forecasting of changes to client charges in light of the long-term budget is not carried out.

14.4.1.3 Short term budget planning

NRSBU annually updates a detailed rolling three-year budget as part of its business plan process. The plan is developed by NRSBU management and then approved by the board. The two owning councils then each adopt the plan.

The three-year budget sits inside a high level 10-year budget that is developed as part of the AMP preparation. The 10-year budget is updated every three years.

14.4.1.4 Financial sustainability

NRSBU primarily evaluates its long-term financial sustainability by modelling its future debt levels. Debt is used as the metric because operational costs are balanced annually and do not have a cumulative financial impact.

NRSBU is reliant on NCC to develop the long-term debt forecasts, which are updated every three years after the AMP budget is submitted to the NCC finance team. This forecast consolidates debt from improvement, growth and renewals capex into a single account.

NRSBU's overall debt position is split evenly between TDC and NCC, with each council incorporating that debt within its organisational debt caps. The limitation imposed from these debt caps is considered as part of NRSBU planning, being understood qualitatively through the Councils' representatives on the board and informal discussions between NRSBU and council staff.

One of the challenges with incorporating financial sustainability into the long-term budgeting is that the long-term debt forecasts are not available until some months after the AMP budget has been prepared and adopted. Due to this limitation, the AMP budgets are tested for sustainability based on staff experience to judge how the last forecast would be impacted by changes in the new budget.

NRSBU management discusses the debt forecasts with the board when they come available.

14.4.2 Valuation

NRSBU requires that its asset valuation system provides the following:

- replacement costs to inform insurance amounts and planning for renewals project budgets;
- annual depreciation calculations to support allocation of intergenerational equity and appropriate funding for renewals projects; and

- depreciated asset values as an indication of asset value/life consumed.

Currently, the results of the valuation process are not updated into the asset register.

NRSBU's current valuation approach is:

- NCC maintains a fixed asset register.
- An independent valuer uses the fixed asset register to prepare a new valuation every two years.

Part of the existing valuation methodology includes consideration of recent contract costs and this will be considered again in the next valuation.

The risks from the gaps between our current and preferred system are:

- NRSBU has not undertaken a first principles valuation for some time and therefore, there is a risk that the valuation is not as accurate as it could be. The consequence is that we may have under-insured out assets, which would increase our financial risk.
- We may have under-forecast the cost of our renewals programme (only if the asset register is being used to forecast costs though), resulting in inadequate budgets for planned renewal projects.
- We may not be charging the right amount for depreciation, which risks requiring additional loan funding for works.
- We may not have the timing of our renewals programme right, resulting in projects being required sooner than was budgeted or reduced system reliability from deferred renewals.

We plan to make the following improvements to our valuation process:

- Improve the integration between the valuation process, the financial asset register and Infor.
- Review the confidence in the historic valuation information, particularly for large value assets where legacy values have been incremented because there have not been relevant capital projects to benchmark the values against and get an independent valuation developed based on the as-built plans.

14.4.3 Insurance

NCC purchases insurance on behalf of NRSBU. NCC and NRSBU assets are managed as a larger package of South Island Territorial Authorities for catastrophe insurance and the Top of the South Collective for material damage and liability insurance.

NRSBU also has liability insurance level of fire cover for Moturoa/Rabbit Island forest that is specified by TDC because it is the forest owner. This currently sits at $1,000,000, as this is amount required under the contract.

The insurance purchase to cover the loss or damage of assets provides for the following:

- Additional increased cost of working (e.g. additional staff to support emergency response);
- Consents for new alignments or other matters arising;
- Additional operational costs during recovery (e.g. to cover alternate disposal solutions if Rabbit/Bell Islands forests catch lost to fire; and
- Post event cost surcharging.

With the current insurance cover there is a risk that there is a lack of reserves for covering "excess" and that that the implications of not being able to use the Moturoa/Rabbit Island forest for biosolids disposal is not adequately covered.

A review is needed of the amount and types of cover held, in relation to the third part liability (e.g. Moturoa/Rabbit Island forest), and the operational impacts (e.g. additional disposal costs if Moturoa/Rabbit Island is not available).

14.4.4 Procurement

NRSBU operates under NCC's procurement policy and uses its purchasing systems.

NRSBU directly procures capital projects and professional consulting. Plant consumables (chemical, power) and specialist maintenance services (e.g. electricians) are generally procured through the operations contract.

The way the current operations contract is structured creates some potential risks:

- The contractor is not required to have dedicated staff, which could result in periods of understaffing.
- The contract does not emphasise having the right people responsible for delivering the required outcomes.
- The contract may not be cost efficient as a large amount of contract administration is required.
- The current focus on performing a fixed schedule of works may not foster innovation and efficacy.
- The current contractual arrangements with subcontractors may mean that guarantees between equipment suppliers and installation contractors may not pass through to the NRSBU.
- It is difficult to audit the contract performance at the interface between different disciplines.

We intend to address these risks by ensuring that any new operations and maintenance contracts are structured in a way to promote a collaborate approach to ensure that staff are fully focused on NRBSU objectives.

Appendices

Appendix A: History of NRSBU

A1 Inception of NRSBU

In the early 1970's poor water quality in the Waimea Inlet meant there was a need to move towards better treatment of the waste streams in the area. Several of the major industries, along with the Councils, discharged partially treated effluent direct to the Waimea Inlet.

After five years of investigation Bell Island was chosen as the best site for a regional treatment facility and the Nelson Regional Sewerage Authority was set up to administer the Joint committee. The NRSA sewerage system, comprising pump stations, rising mains, aeration basin and oxidation ponds, was commissioned in 1983. The treatment plant was upgraded in 1996, 2006 and 2009/10.

In the early 1990's the plant exhibited sludge treatment capacity constraints resulting in the construction of a secondary clarifier and ATADs to take the sludge loads off the facultative ponds.

In 1998 a review of the structure and operating principles was undertaken on the NRSA, and it was renamed NRSBU.

Following severe odour issues a new aeration basin was constructed in 2004.

In 2006 several components of the plant began to exhibit capacity constraints at peak flows and loads and a review of the treatment capacity in November 2006 highlighted the need to further upgrade the plant. The plant was upgraded in 2009/10 to increase the plant capacity by pre-treating the peak loads at the front end of the plant and installing flow bypass facilities, which allow the flows and loads going through the plant to be treated within the existing capacity of the downstream components.

The 2009/10 upgrade was designed to increase the capacity in terms of flow, Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS), and included:

- Installation of a new inlet chamber system and screen.
- A primary clarifier for pre-treatment of the load prior to the existing facilities.
- Installation of a thickening system for primary sludge.

Since the completion of the upgrade in July 2010 it has been demonstrated that the treatment plant has significant capacity to cater for future growth.

Over time the rising mains from Beach Road to Bell Island have been renewed to PE material. The renewal and upgrade of the rising mains and pump stations completed in 2013 have created capacity in the network for at least the next eight to 10 years. Additional security has been built into the rising main network with the completion of a second pipeline crossing from Monaco to Bell Island in 2012.

Effluent quality has decreased over time and is associated with the build-up of sludge in the facultative and maturation ponds. Future initiatives are programmed to improve the management of sludge in the ponds, and to improve the quality of effluent through the modification of the ponds.

A2 Contributing councils

A2.1 Nelson City Council

Nelson City Council and its forebears have been responsible for sewage disposal in the city since the first piped disposal system was put in place in approximately 1907. The city has expanded by amalgamation of adjoining areas. Tahuna Town Board joined the city in 1953 and Stoke was transferred from Waimea County Council in 1960.

A2.2 Tasman District Council

Tasman District Council and its forebears have been responsible for sewage disposal in the area since the first piped disposal system was put in place in the late 1940’s and early 1950’s. Tasman District was formed by the amalgamation of adjoining Boroughs and Districts in 1989. Before amalgamation Richmond Borough and Waimea County, along with Nelson City Council, were the major stakeholders in the Regional Scheme.

A3 Previous AMPs

The first AMP was completed in June 1999 and further refined in 2003, 2007, 2012, 2014 and 2017 to meet minimum requirements. The Asset Management changes between 1999 and 2020 include:

- NRSBU established
- Significant Asset Management awareness at governance level
- Increased understanding and implementation of risk management
- Asset register implemented
- Upgrade of the treatment plant
- Rising main upgrade through the Waimea Estuary from Monaco to Bell Island
- Dedicated website for NRSBU
- Upgrade of Saxton and Beach Road pump stations
- Construction of Songer Street regional pump station
- Moturoa/Rabbit Island biosolids resource consent – and amendments to resource consent
- Centre pivot irrigation joint venture with Julian Raine on Bell Island for the irrigation of pastoral land
- Installation of booster pump on outfall. This improves the capacity to achieve consented discharge flows and allows NRSBU to optimise the buffer capacity of the ponds to manage wet weather flows
- Development of a long-term strategy for pipeline routes
- Review sludge treatment at Bell Island
- Construction of an irrigation supply pipeline from Bell Island to Monaco with Nelson City Council. (Irrigation pipeline is owned by Nelson City Council)
- Installation of wind generated mixers on one of the facultative ponds
- Desludging facultative ponds
- Modifications to maturation ponds (baffle curtains)
- Improvements to inlet works
- Bunding/flood protection at Bell Island WWTP and Songer PS
- Overflow screens at Airport, Beach Road, Songer and Whakatū pump stations
- Emergency generation at Airport, Beach Road, Saxton and Songer pump stations
- Commencement of physical works on regional pipeline upgrades
- Increase capacity of biosolids storage tanks at the Biosolids Application Facility.

A4 Bell Island Wastewater Treatment Plant

A4.1 History

1983: The Bell Island Wastewater Treatment Plant (WWTP) was commissioned in 1983. The original design population for the WWTP was 33,000 and the plant consisted of a fully mixed aeration basin, three facultative oxidation ponds (in parallel), two maturation ponds (in series) and a tidal discharge. The original concept allowed for expansion by the addition of one extra aeration basin (alongside the original aeration basin), and extra maturation ponds as required. (BOD design capacity of ponds = 4,257kg per day = 149kg per Ha per day and a minimum of 30 days retention.)

The WWTP operated successfully until overloading of the facultative oxidation ponds (FOPs) was noticed in the late 1980s. The overloading caused malodour. Investigations into the issues concluded that the cause of the overloading was a combination of stratification and organic load build-up in the ponds in excess of treatment capacities. Because of the high organic load the available oxygen in the ponds were quickly assimilated, causing anaerobic and putrefactive conditions and noticeable malodour production. Mechanical mixers and aerators were installed in the facultative ponds to address these issues.

1992: A review of the WWTP in 1992 confirmed that sludge build-up was a primary factor causing the overloading and it was recommended that desludging of the oxidation ponds should be commenced and also recommended the installation of a clarifier and sludge processing plant (Autothermal Thermophilic Aerobic Digestion - ATAD) to improve the management of loads to the oxidation ponds.

These upgrades were completed in 1996. Over time further issues were observed and investigated:

- Overloading of the aeration basin caused malodours
- A fungal parasite infected the ponds, reducing the algal population for short periods with consequential generation of malodours
- Improved solids capture through recycling of sludge was desirable in the clarifiers to reduce load on the FOPs
- High nitrogen levels in the biosolids processed by the ATAD plant led to a requirement for additional land to maintain biosolids application rates within consent limits for nitrogen
- The operation of the ATAD and sludge processing plant needed improvements to the aeration and mixing equipment
- There were reported high hydrogen sulphide levels around the inlet basin which needed to be addressed.

2003: In 2003 NRSBU tendered the design, construction and operation of a retrofit at the WWTP that included the installation of a Dissolved Air Flotation System (DAF). This upgrade was implemented during 2004 and 2005.

After the acceptance of the tender, but prior to the construction, it became apparent that the influent parameters to the Bell Island facility could, at times, exceed the design parameters used for the upgrade. However, NRSBU decided to continue with the tender and to review the situation after the installation of the 2004-2005 upgrade.

2006: In 2006 several components of the plant began to exhibit capacity constraints at peak flows and loads, and a review of the treatment capacity in November 2006 highlighted the need to further upgrade the plant. It was agreed that the upgrade would increase the plant capacity by pre-treating the peak loads at the front of the plant and installing flow bypass facilities, which would then allow the flows and loads going through the plant to be treated within the existing capacity of the downstream components.

This strategy optimised the use of the existing assets and allowed the components to be better matched than previously in terms of treatment capacity. The main issues to be addressed in the upgrade were:

- The existing inlet screen which was undersized for future loads
- Screening was not sufficient to protect downstream equipment
- The existing treatment systems did not have the capacity to treat future loads
- Moturoa/Rabbit Island was running out of capacity to dispose of sludge with high levels of nitrogen.

2007 – 2010: The 2007-2010 upgrades were designed to increase the capacity in terms of flow, COD and TSS, and included:

- Installation of a new inlet chamber system and screen
- A new primary clarifier for pre-treatment of the load prior to the existing facilities
- Installation of a thickening system for primary sludge
- Installation of a pump at the outfall to maximise the discharge rate.

Although the design of the biosolids thickening/dewatering process was completed, the actual construction of the facility did not proceed because NRSBU had applied for, and was subsequently granted, a revised consent which allowed application of higher nitrogen levels at Moturoa/Rabbit Island. This removed the need for the capital investment. The physical works of the upgrade were completed in July 2010.

NRSBU agreed that it would be uneconomic to treat peak flows through the clarifier and aeration basin, and a series of flow splits were included in the design of the upgrade.

The bypass philosophy used for the upgrade provides for the efficient use of assets and reduced the capital costs of the upgrade, but at the same time it carries a slight increase in operational risk. This is because the performance of the overall plant could be affected during high rainfall periods due to the large amount of bypass flow that would pass to the facultative ponds.

During the development of the upgrade methodology, it was identified that the loading profile was not expected to change significantly over time due to the contractual agreements in place, and therefore while flows would increase as a result of proposed pumping increases, it was unlikely that the average daily flows would increase to above 300 l/s in the next 10 years. Therefore, the risks of the bypasses will be confined to heavy rainfall events. (Daily average 2016/17 = 198l/s)

In the worst-case scenario, there may be periods where plant performance might deteriorate due to long-term high flow periods.

2011: The 2011 sludge management review included a tour of facilities in the North Island where sludge was treated anaerobically. It was found that all the treatment plants visited struggled to use the methane to generate electricity. NRSBU's study concluded that maximising the useful life and optimising the ATAD processes currently used at Bell Island to treat sewage sludge provides the best economic outcomes for the Bell Island treatment plant. It is acknowledged that if NRSBU loses access to Moturoa/Rabbit Island and need to dewater sludge that investing in an anaerobic sludge treatment process will need to be considered.

2012-2020: An energy audit conducted in 2012 concluded that the treatment plant was operating highly efficiently with respect to power consumption. Overflows at pump stations from storm events and power failures continued to be an issue, leading to breaches of resource consents. Improved flexibility was built into the network through the duplication of pumps at the stations and commissioning of components upgraded under the Regional Pipeline Upgrade Project and in 2013 a second pipeline was installed below the estuary thus increasing flows through the treatment plant.

In June 2013, the Operations and Maintenance Contract with Downer expired and was extended through to September to allow for the contract to be retendered, which included a complete review of management practices at the plant as well as improved management reporting and benchmarking. In October 2013, Nelmac was awarded the contract. A review of sludge treatment processes during 2012/13 concluded it was feasible to refurbish the facilities enabling implementation of increased sludge treatment to be deferred by up to 10 years. Desludging of the ponds was also deferred. However, a sludge survey conducted during 2013/14 confirmed further sludge build-up in the facultative ponds so desludging was programmed for 2015-17.

In 2015/16, savings in electricity usage continued to be made from improved utilisation of the capacity of the ponds by Nelmac. Investigations into the installation of mixers in the ponds to increase their hydraulic capacity by decreasing sludge levels were underway and the first online spectrolyser (S::can) was installed at the inlet to the treatment plant, providing real-time information about influent characteristics, which would allow NRSBU/Nelmac to optimise treatment plant performance. In 2016/17 lower energy costs were achieved by the installation of wind generated mixers in one of the three facultative ponds.

In 2017/18 failure to manage the odour management infrastructure resulted in a spate of complaints from neighbours. This led to remedial works, which mitigated the situation and resulted in a cessation of complaints. Further upgrades to odour management were programmed. In 2018/19 odour management improved following a variety of maintenance and remedial works. In March 2020, an issue with the ponds resulted in a number of odour complaints and chemical dosing of the ponds was frequently implemented to mitigate the issue. High loads were experienced through the plant as a result of Covid-19. Similarly, this was experienced in other facilities throughout New Zealand. Odour control upgrades at the inlet area, including construction of a biofilter commenced in the last quarter of financial year 2019/20. Odour patrols by an independent contractor were implemented during this period. Desludging of Facultative Pond F2 is underway in 2020/21, with ponds F1 and F3 programmed for 2021/22. Land at Best Island was purchased in June 2020, with a view to utilising for irrigation of treated effluent at some time in the future. Fulton Hogan have been extracting sand and gravel for a number of years within the area purchased and an agreement with NRSBU has been entered into to allow operations to continue. This realises an annual return for NRSBU of $45,000.

Appendix B: Industrial Contributors' Background

B1 Nelson Pine Industries (NPI)

The Nelson Pine Industries medium density fibre board (MDF) factory, near Richmond, opened in October 1986, for manufacturing products comprising of specially engineered wood fibre bonded with synthetic resin adhesive under heat and pressure. The plant has capacity to process 1,000,000 cubic metres annually, making it one of the largest single site MDF producers in the world.

Nelson Pine Industries is a wholly owned subsidiary of the Sumitomo Forestry Company Ltd of Tokyo, Japan.

NPI uses water for washing chips and other processes. Wash water is treated to remove solids before it leaves the site. A flotation clarifier uses tiny dispersed air bubbles to float coagulated solids to the surface of the clarifier where they are skimmed off. The solids are then thickened up in a big screw press. These solids are then burned with other wood waste in the furnaces at NPI. This minimises requirements for landfill disposal. The treated water is then pumped to the Bell Island WWTP for further biological treatment prior to discharge.

Nelson Pine demands on the WWTP can be affected by:

- Importing additional logs into the district (to make up shortfall or increase production);
- Harvesting peaks due to planting sequences (fluctuating production);
- No further land available for planting (cannot increase production);
- Competing land uses (reduction in land for forestry unless owned by NPI);
- Securing logs for processing into MDF (unable to buy logs for processing);
- World prices (influence demand);
- NPI Plant capacity and room for further expansion (influence demand);
- Undertake their own on-site treatment.

The above factors will be considered to validate the future requirements requested or not requested by NPI as part of the continued discussions with all contributors about their future requirements.

NPI has continued to make improvements to their on-site treatment facility. With little growth in production projected, the improvements to the on-site treatment facility are likely to release capacity for the use of other contributors in future.

B2 ENZAFOODS

ENZAFOODS was established in 1962, with the first processing plant built in Nelson. T&G Global Limited (T&G) manufactures and exports fruit and vegetable juice concentrates, and also has a fruit and vegetable products factory located in Nelson. In 2018 ENZAFoods (subsidiary of T&G) was purchased by Cedenco Foods New Zealand Limited (Cedenco). Cedenco factories are strategically located close to international ports in the two key pipfruit growing regions of Hawkes Bay and Nelson. The contributor contract for this site is held by Turners and Growers Ltd not by Cedenco, despite Cedenco being the largest discharger. It was announced in March 2020 that Cendenco will relocate its apple processing from Nelson to its existing Hasting site by the end of the 2020 season. It ceased operations in September 2020. It is unclear at this time what the future of the site will be. Turners and Growers Ltd has not indicated to NRSBU that it wishes to terminate its contract at this time.

B3 Alliance

The Alliance Group Ltd replaced the 1909 plant with a new plant in 2000. It is a comparatively small and efficient, single chain sheep and lamb operation, which also processes bobby calves in the spring.

The plant operates on a shift basis, employing a staff of about 160 over two shifts, one starting in August operating almost all year round with the second shift commencing early November going through to May. The plant is able to add value to a lamb carcass.

Alliance does not present a major risk for Bell Island given the total flow contribution.

B4 Septage Disposers

The additional loading requirements from septage disposal (from non-reticulated rural areas septic tanks) have been resolved by the installation of a separate septic disposal facility adjacent to the Richmond pump station. Individual permitted users have limits and are charged accordingly. The main uses are:

- Fish/Mussel Waste
- Chicken Waste
- Trade Waste
- Stock Effluent
- Septage

Appendix C: Risk Management Plan

C1 Background

Risk assessment is used as a strategic decision-making tool assisting with developing and prioritising strategies and work programmes. Risk management is the systematic application of management policies, procedures, and practices to the tasks of:

- Identifying
- Analysing
- Evaluating
- Treating
- Monitoring

It is important to note that risk management is not simply about the downside of events such as financial loss or legal proceedings. It also refers to the upside and opportunities that exist for NRSBU to do things more innovatively, sustainably, and effectively.

C2 Analysis of risks

The risk management framework is consistent with the joint Australian New Zealand Standard AS/NZIS4360:2004 Risk Management and the associated Risk Management Guidelines (SAA/SNZ HB 436:2004), to ensure risks are managed on a consistent basis.

Risk, likelihood and consequence are defined as follows:

- Risk is the combination of the likelihood and consequence of an event occurring.
- Likelihood is a description of the probability or frequency of an event occurring.
- The consequence is the outcome of an event being a loss, injury, disadvantage or gain.

For each event the likelihood score is multiplied by the consequence score for each area of impact (there will be only one likelihood but several consequences for each event) as shown in Table 14.1 below. These multiples are then totalled to produce the risk score for the event.

The risk priority ratings and the risk response of the mitigation strategies are detailed in Table 14.2 below.

Table 14-1: Semi-quantitative measures of consequence and areas of impact

Area of Impact	Descriptor				
	Negligible	Minor	Moderate	Major	Catastrophic
Health and Safety	10	30	50	70	100
Public Health	10	30	50	70	100
Asset Performance	10	30	50	70	100
Environment and Legal Compliance	10	30	50	70	100
Historical or Cultural	10	30	50	70	100
Financial	10	30	50	70	100
Public Perception	10	30	50	70	100

Table 14-2: Risk priority rating

Risk Score	Level of Risk	Risk Response
>200	**Extreme**	Awareness of the event to be highlighted to the Board and shareholders
150 - 200	High	Risk mitigation project to be reported to the Board with resolution on management/elimination of risk
100 - 150	Moderate	Risk mitigation reported to Board quarterly
0 - 100	Low	Managed by routine procedures

C3 Asset Risk Register

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
1	Operations	Supervisory failure.	Failure to ensure compliance by contractor, resulting in equipment failure, odour generation, or not achieving consent compliance.	Weekly site visits, daily supervision through SCADA.	Mod			Low
2	Operations "HAZOP 2"	Documentation.	Skewed maintenance costs on specific asset.	Maintenance cost to capture work separately on all individual assets in the Asset Management System. E.g. each aerator - not all combined. Responsibility of contractor. Contract Supervisor to check monthly. Asset Manager to check annually.	Mod			Low
3	Operations "HAZOP 3"	Start up and shut down.	Power failure - safe shut down.	Fail safe valve positions to be reviewed. Contractor responsible. Contract Supervisor to follow progress during monthly meetings. Operations Manager to follow up in annual report by contractor.	Mod			Low
4	Operations "HAZOP 5"	Documentation.	Potential nuisance alarms.	Rationalise alarms vs events logging. Contractor responsibility. Contract Supervisor to monitor changes.	Low			Low
5	Operations "HAZOP 13"	Maintenance.	Blockages.	Water blast sludge lines clarifier to storage tank (Annually). Contractor responsibility. Contract Supervisor to include this in six monthly performance audit.	Mod			Low
6	Operations "HAZOP 17"	Quality assurance.	General site aesthetics.	Improve housekeeping. Contractor responsibility.	Low			Low
7	Operations "HAZOP 29"	Quality assurance.	Flow balances incorrect.	Annual calibration of flow devices by NRSBU. Monitor sludge levels in pond and ascertain long term removal and disposal.	Low			Low
8	Treatment Plant	Toxic Discharge to Plant.	Failure of biological process resulting in the treatment plants discharges failing to meet consent conditions.	Current trade waste by-laws for NCC and TDC prohibit certain toxic discharges to the plant. Trade waste sampling and monitoring programme has been implemented. Contributor contracts to fix characteristics of discharge from contributors in place. Automated monitoring equipment.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
9	Treatment Plant	Equipment/ component failure.	Failure to meet consent conditions.	Processes within treatment plant that have contingencies for failure (duplication of pumps) and alarm systems (SCADA).	Low			Low
10	Treatment Plant	Asset register not linked to design standard.	Replacement by lower level of asset, thereby increasing risk of not performing to peak requirements.	Asset replacement reviewed at time of replacement.	Low			Low
11	Treatment Plant	Power Failure.	Odours and non-compliance with consents.	Fixed generator is available to provide power to inlet area and discharge pump. Ability of ponds to take increased loadings for short periods when WWTP not operating.	Low			Low
12	Treatment Plant "HAZOP 12"	Failure of railings and fencing. Corrosion hazards.	Injury.	Condition assessment of railings and fences. Controlled public access. Responsibility for health and safety lies with the Operation and Maintenance contractor. Part of six monthly performance audit schedule.	Mod			Low
13	Treatment Plant	Fire/buildings.	Failure to comply with resource consent conditions. Loss of data.	Fire and smoke alarms in buildings that are linked to the SCADA system. Daily back up of data to secondary off site facility. Responsibility of contractor. Part of six monthly performance audit schedule.	Low			Low
14	Treatment Plant "HAZOP 14 and 32"	Documentation of procedures.	Blockages.	Establish trending trigger levels for pigging/water blasting on all sludge lines. Contractor responsibility. Monitor pressure trends. Advise NRSBU if trending is not adequate/useful. Supplement with site visits, inspection and run-up testing. Record results. Contractor responsibility.	Mod			Low
15	Treatment Plant "HAZOP 15"	Management of sludge levels in clarifiers.	Optimisation.	Specialist advice on optimisation to be captured in operations manual. Contractor responsibility. Daily check of pressure trends by project supervisor.	Low			Low
16	Treatment Plant	Operator Error.	Failure to achieve consent conditions.	All operators are suitably qualified. Supervision by full time wastewater treatment plant manager on daily basis. 24/7 operation monitoring. Nominal staff resourcing as contracted. Review contractor controls monthly to ensure procedures are followed and resources are available.	High			Mod
17	Treatment Plant	SCADA Failure.	No alarm available.	Backup systems in place and manual operation of facilities.	Low			Low
18	Treatment Plant	Vandalism.	Cost of repairs.	Intrusion alarms are installed.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
19	Treatment Plant	Movement failure caused by earthquake, landslide or settlement.	The consequence for these events is so high that separate planning is required.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan.	Low	Consolidate natural disaster information and review.	IP-1	Low
20	Treatment Plant	Tidal Wave.	The consequence for these events is so high that separate planning is required.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan.	Low	Consolidate natural disaster information and review.	IP-1	Low
21	Treatment Plant delegation process	Insufficient documentation of escalating process decision making.	Failure to meet consent conditions.	Currently the WWTP is operated and maintained in a manner that employs best practicable options that includes: - Operating parameters for all major items and facilities - Operations and Maintenance contract is in place and the risk for achieving consent conditions are the contractor responsibility.	Low			Low
Inlet								
22	Inlet	Failure of screens.	Down-stream equipment failure and increased renewal and operation cost.	Duty standby screens.	Mod			Low
23	Inlet	Power failure causing disruption of screening process.	Down-stream equipment failure and increased renewal and operation cost.	Dedicated power generator to ensure continuous operation.	Low			Low
Grit removal								
24	Grit removal	Failure of grit classifier.	Down-stream equipment failure and increased renewal and operation cost.	Daily inspections and reactive maintenance.	Low			Low
25	Grit removal "HAZOP 8"	Mitigation.	Grit retention in C11.	Increase monitoring of grit levels. Daily inspection by operators.	Low			Low
Primary clarifier								

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
26	Primary clarifier	Concrete corrosion. Contractor fails to clean and assess condition annually.	Remedial cost and loss of functionality.	Duplication/redundancy/daily inspection. Annual clean out and assessment. Ensure regular clean out and assessment as per contract requirements. Form part of six monthly performance review.	Mod			Low
27	Primary clarifier	Scum sumps.	Concrete corrosion and odours.	Duplication/redundancy/daily inspection. Part of six monthly quality audit assessment. Include in six monthly performance audit schedule. Project Supervisor to evaluate remote performance daily.	Mod			Low
28	Primary clarifier	Primary sludge transfer failure.	Increase in cost from loading activated sludge area and increased hydraulic load on sludge treatment and disposal facilities.	Duplication/redundancy/daily inspection/daily check of remote monitoring data. Regular flushing and pigging on lines. Project Supervisor to evaluate remote performance data daily.	Mod			Low
29	Primary clarifier	Odours. Launders not kept clean.	Primary sludge becomes anaerobic. Odours.	Daily inspections. Part of six monthly performance audit schedule. Joint inspection during monthly meetings and report condition in minutes.	Mod			Low
Activated sludge area								
30	Aeration Basin/ Clarifier	Overloading of Components. Treatment Capacity.	Failure to comply with resource consent conditions.	Treatment capacity sufficient. Optimise the integration of primary and secondary treatment. Ensure that all components are operational.	Mod			Low
31	Aeration Basin/ Clarifier	Failure to achieve consent conditions: Air.	Customer complaints, and failure to comply with Discharge of Contaminants to Air resource consent conditions.	Currently the WWTP is operated and maintained in a manner that employs best practicable options that includes: - Operating parameters for all major items and facilities - Odour Management Plan has been implemented - Operations contract is in place and the responsibility for achieving consent conditions are transferred to the contractor. Adequate resourcing by contractor. Weekly inspections by supervisory staff. Daily check of flow splits, dissolved oxygen levels and performance indicators in electronic portal.	Low			Low
32	Aeration Basin/ Clarifier "HAZOP 16"	Optimisation.	Aeration maintenance cost escalating.	Investigate cost/benefit of diagnostics, preventative maintenance, holding spares etc. NRSBU responsibility.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
33	Aeration Basin/ Clarifier "HAZOP 18"	Contractor not adequately resourced and fails to implement strategies in place to mitigate risk.	Drowning.	Railings and work processes to ensure that operators and contractors working in the area are supervised. Install new railing - NRSBU. Contractor resourcing, weekly site inspections by supervisory staff.	Mod			Low
34	Dissolved Air Floatation "HAZOP 19"	Optimisation.	No redundancy for DAF.	Investigate use of gravity belt thickener instead of DAF. Review by NRSBU.	Mod	Review secondary sludge separation.	IP-6	Low
Nelson North primary sludge reception								
35	Nelson North Sludge reception "HAZOP 23"	Pump failure.	Sludge transferred to primary clarifier. Additional load on primary system.	Redundancy. Duty/standby.	Low			Low
36	Nelson North Sludge reception	Transfer failure due to blocking of transfer pipe work or failure of pumps caused by failure to screen primary sludge.	Sludge transferred to primary clarifier. Additional load on primary system. Additional costs.	Screening of primary sludge discharged. Ensure that contractor is using the facility screen material properly and keep gravel out of the tanks. Clean the tanks annually and do condition assessment.	Mod			Low
Secondary clarifier								
37	Secondary sludge	Failure to remove secondary sludge.	Extended aeration, deterioration of secondary effluent quality. Issues with sludge treatment. Mix of primary and secondary sludge not optimal.	Ensure that ponds are maintained in healthy condition so that they have capacity to treat changing loads.	Mod			Low
38	Secondary sludge	WAS pump failure.	Extended aeration, deterioration of secondary effluent quality. Issues with sludge treatment. Mix of primary and secondary sludge not optimal.	Redundancy.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
39	Secondary sludge	RAS pump failure.	Odours and inability to operate activated sludge area effectively managed.	Redundancy.	Low			Low
Sludge Storage								
40	Sludge storage "HAZOP 21"	Sludge storage tank require renewal works.	Cannot process sludge for extended period.	Bypass primary and secondary processes and take raw effluent directly to ponds (Seasonal).	Mod			Low
41	Sludge storage	Sludge transfer pump failure.	Cannot process sludge for extended period.	Redundancy. Weekly supervisory inspection.	Mod			Low
42	Sludge storage	Sludge mixer failure. Spare mixers not serviceable.	Cannot process sludge for extended period.	Spare mixers Readiness check during six monthly audit.	Mod			Low
43	Sludge storage	Heat exchanger not operational.	Less than optimal sludge treatment.	Bypass heat exchanger.	Low			Low
Sludge storage								
44	ATAD	Corrosion and sulphur attack.	Discharge of Biosolids to environment. Failure to comply with resource consents. Customer complaints.	Fibreglass roofs installed/redundancy. Three yearly cleanout and condition assessment.	Low			Low
45	ATAD	Overloading of Components Treatment Capacity.	Discharge of biosolids to environment. Failure to comply with resource consents. Customer complaints.	Currently the ATAD is operated and maintained in a manner that employs best practicable options to comply with the resource consents. It includes: - Bypass to ponds available - Redundancy within the three ATADs - High level of training - Up to date O & M manuals - Calibration of equipment carried out on regular basis	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
				- A regular monitoring and sampling programme in place - Contributors are limited to maximum fixed volumes and overflows above these volumes become the responsibility of the contributor. -Spare aerator.				
46	ATAD	Failure to achieve consent conditions: Air: Failure to keep neighbours informed.	Odour - customer complaint Non-compliance of consent conditions.	High level of operating and testing practiced. Operations contract places responsibility for achieving consent conditions on the contractor. Notification of neighbours when work is performed on ATADs. Weekly inspection by supervisory staff.	Mod			Low
47	ATAD	Sludge transfer pump failure.	Disruption of production.	Redundancy. Weekly inspection by supervisory staff.	Mod			Low
48	ATAD	Aerator failure (B and C train).	Disruption of production.	Spare aerator on site. Interconnection between B and C train.	Low			Low
49	ATAD	Component failure A train.	Disruption of production.	Redundancy.	Low			Low
50	ATAD	Failure to achieve class A biosolids.	Odour and additional cost of disposal or rework of biosolids.	Redundancy.	Low			Low
Biosolids transfer								
51	Biosolids transfer	Biosolids storage tank require remedial work.	No storage for treated biosolids available.	Temporary tank, move load to ponds.	Low			Low
52	Biosolids transfer	Pump failure.	Compromise capacity to treat sludge and dispose of biosolids.	Redundancy.	Low			Low
53	Biosolids transfer	Transfer pipeline blockage. Failure by contractor to pig the line.	Compromise capacity to treat sludge and dispose of biosolids. Pipeline break and discharge of	Regular pigging of the pipeline. Include a report in monthly biosolids contract minutes reporting the number of pigs received at the Moturoa/Rabbit Island biosolids storage facility. Supervisor to check pressure and flow performance of pipeline daily.	Mod			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
			biosolids to environment.					
54	Biosolids transfer	Biosolids storage tank mixer. Spare mixer not operational.	Compromise capacity to treat sludge and dispose of biosolids. Pipeline break and discharge biosolids to environment.	Spare mixer. Include in readiness inspection at six monthly performance audit.	Low			Low
Ponds								
55	Ponds	Chamber C3 penstocks malfunction.	Requires two people to operate.	Exercise penstocks monthly, inspect weekly.	Low			Low
56	Ponds "HAZOP 6"	Documentation.	Uncaptured knowledge regarding stop log operation based pond level control.	Procedures captured in Pond Management Plan. Pond levels inspected daily by operators. Annual review of Pond Management Plan. Critical review of Pond Management Plan following any pond event where response is considered outside the methodology in Pond Management Plan.	Mod			Low
57	Ponds "HAZOP 7"	Optimisation.	Existing manual-stop log based pond level control method could lead to overflows.	Consider automation of F1, F2, F3 and M1 using actuated valves or penstocks and additional controls.	Low			Low
58	Ponds "HAZOP 11"	Odour.	Odour complaints from pond inlet chamber C3.	Investigate covers to C3 and connection to odour control unit at Thickening Building.	Low			Low
59	Ponds	Failure by contactor to implement pond management plan as required under the contract.	Failure to comply with resource consents.	Currently the ponds are operated and maintained in a manner that employs best practicable options that include: - Pond loadings are adjusted for different seasons and conditions - Loading profile of the ponds are known and operated to these limits - A regular pond monitoring and sampling programme is in place	Mod			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
				- Performance based Design Build and Operations contract is in place and the risk for achieving consent conditions lies with the contractor. Monitor sludge levels in pond and ascertain long term removal and disposal. Supervisor to check ponds loadings and DO daily in SCADA and weekly in electronic portal. Check and receive Pond Team meeting report weekly.				
60	Ponds	Overloading of Components. Treatment Capacity	Failure to comply with resource consents. Customer complaints.	Monitor sludge levels in pond and ascertain long term removal and disposal. Supervisor to check ponds loadings and DO daily in SCADA and weekly in electronic portal. Check and receive Pond Team meeting report weekly.	Mod			Low
61	Ponds	Failure to achieve consent conditions: Estuary	Odour - customer complaint Non-compliance with consent.	Monitor sludge levels in pond and ascertain long term removal and disposal. Supervisor to check ponds loadings and DO daily in SCADA and weekly in electronic portal. Check and receive Pond Team Meeting report weekly.	Mod			Low
62	Ponds	Failure by contractor to manage pond levels.	Overflow of ponds.	Set discharge schedule monthly, and signed off by the supervisor. Limit change of outflow to duration of discharge and mode of discharge. Inspect levels in all ponds daily. Include pond level assessment in pond management meeting. Supervisor to check pond levels daily in SCADA. Check and receive Pond Team meeting report weekly. Check pond levels at weekly supervising inspections.	Mod			Low
Outfall								
63	Outfall	Failure of discharge pipeline.	Over flow of ponds.	Maintain ponds at optimal operational level. Ensure discharge pump is operational. Inspect pipeline every second year by CCTV.	Mod			Low
64	Outfall	Failure of discharge flow meter.	Non-compliance with resource consent conditions.	Redundancy.	Low			Low
65	Outfall	Failure of discharge pump.	Over flow of ponds.	Maintain ponds at optimal operational level. Ensure discharge pump is operational. Supervisor check pond levels daily in SCADA. Check and receive Pond Team meeting report weekly. Check pond levels at weekly supervising inspections.	Mod			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
				Biosolids spraying				
66	Biosolids Facility	Odours.	Customer complaints and odours.	The biosolids facility is operated and maintained in a manner that employs best practicable options to comply with the resource consents this includes a high level of training	Low			Low
67	Biosolids Facility	Forest Fire.	Significantly reduced areas for biosolids disposal.	Extensive fire breaks exist (roads). Easy access to site for firefighting equipment. Other areas outside the Moturoa/Rabbit Island area are available for biosolids disposal.	Low			Low
68	Biosolids Facility	High nutrient levels in biosolids.	Over use of land.	High level of testing carried out.	Low			Low
69	Biosolids Facility	Failure to meet consent conditions.	Over use of land.	High level of testing carried out.	Low			Low
70	Biosolids Facility	Excessive heavy metals.	Excessive heavy metals in environment.	High level of testing carried out.	Low			Low
71	Biosolids Facility	Land ownership / Land use change.	Increased costs.	Keep land owner informed of consequences of loss of land to apply biosolids.	Low			Low
72	Biosolids Facility	Vandalism.	Loss of equipment and cost implications.	Responsibility for security fencing is contracted to biosolids spraying contractor.	Low			Low
73	Biosolids Facility	Movement failure caused by, earthquake, landslide or settlement.	Facility becomes in-operable.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan. Redundant until facility is recommissioned.	Low			Low
74	Biosolids Facility	Tidal Wave.	Facility becomes in-operable.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan. Redundant until facility is recommissioned.	Low			Low
				Rising mains				
75	Rising Mains - Concrete	Estuarine environment deterioration and acid attack.	Deterioration and failure of asset resulting in loss of service, health and safety issues and wastewater	New duplicate rising main installed. Operation and maintenance contractor responsible for monthly inspection of pipeline route during spring tide to check for evidence of leakages on pipeline. A programme of regular pipe inspections of risk areas to be developed and condition assessments of the pipeline.	Mod			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
			discharges to the environment having an impact on environmental and cultural values.	Weekly mass balance check by contract supervisor and asset engineer.				
76	Rising mains air valve "HAZOP 31"	Maintenance.	Air valve planning requirements.	Pump out all chambers. Transit traffic management. Saxton owner permission obtained. Confined space entry. Develop procedure to service air release valves and document. Project supervisor to include activity in six monthly performance audit.	Mod			Low
77	Rising Mains	Capacity.	Wastewater discharged to the environment at pump stations having an impact on environmental and cultural values.	Pump stations are designed for the capacity of the rising mains. All pump stations have high level and overflow alarms for advance warning of an overflow event. Contributors are limited to maximum fixed volumes and overflows above these volumes become the responsibility of the contributor.	Low			Low
78	Rising Mains	Inaccurate and/or unknown location of pressure line.	Pipe breakage causing overflows.	As built plans of high quality and all asset locations known.	Low			Low
79	Rising Mains	Estuarine environment deterioration.	Mechanical damage or acid attack on concrete pipes.	High level of resistance to acid and sulphide attack. Buoys showing location of PE diffuser pipes. A programme of regular pipe inspections of risk areas to be developed.	Mod			Mod
80	Rising Mains	Movement failure caused by, earthquake, landslide or settlement.	The consequence for these events is so high that separate planning is required.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan.	Low			Low
81	Rising Mains "HAZOP 30"	Inspection/operate.	Rising main junction valves close in opposite direction.	Add direction indicator. Contractor responsibility.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
82	Pump Stations "HAZOP 27"	Equipment or component failure.	Wastewater discharges to the environment having an impact on environmental and cultural and health issues. Customer complaints.	Processes within pump station that have contingencies for failure (duplication of pumps) and alarm systems (SCADA) installed.	Low			Low
83	Pump Stations "HAZOP 27"	Design/ Documentation.	Inefficient use of pump stations.	Investigate level set points. Contractor responsibility. Progress review by project supervisor during six monthly audit. Critical review of events management.	Mod			Low
84	Pump Stations	Insufficient wet weather storage capacity.	Insufficient storage or capacity resulting in wastewater discharges to the environment having an impact on environmental and cultural values.	All pump stations have high level and overflow alarms for advance warning of an overflow event and high capacity pumps for peak flow conditions. Contributors are limited to maximum fixed volumes/flows/loadings and are subject to excess discharge costs plus other punitive actions by NRSBU.	Low			Low
85	Pump Stations	Power failure.	Pump station over flow and high level of pollution into the estuary.	Standby generators at four pump stations and six hours storage capacity at Whakatū (standby generator available from NCC).	Low			Low
86	Pump Stations	Corrosion and sulphur attack of electrical/control equipment.	Asset failure.	Testing of effluent on regular basis to ascertain sulphur content.	Low			Low
87	Pump Stations Beach	Insufficient operational pump station capacity.	Overflows.	Redundancy. Duty standby. Storm pump: Duty/Standby/Assist. Part of six monthly performance audit. Daily check of pump station operation by Contract Supervisor Tasman District Council gravity discharge is fitted with a control valve that is managed by Tasman District Council to limit discharge flow rate to the quota allocation applicable to the Beach Road pump station.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
88	Pump Stations Whakatū	Insufficient operational pump station capacity.	Overflows.	Redundancy. Duty standby. Emergency storage capacity. Part of six monthly performance audit. Daily check of pump station operation by Contract Supervisor.	Mod			Mod
89	Pump Stations Saxton	Insufficient operational pump station capacity.	Overflows.	Redundancy. Duty standby. Storm pump: Duty/Standby/Assist. Part of six monthly performance audit. Daily check of pump station operation by Contract Supervisor.	Mod			Low
90	Pump Stations Songer	Insufficient operational pump station capacity.	Overflows.	Redundancy. Duty standby. Storm pump: Duty/Standby/Assist. Part of six monthly performance audit. Daily check of pump station operation by Contract Supervisor.	Mod			Low
91	Pump Stations Airport	Insufficient Operational Pump Station Capacity.	Overflows.	Redundancy. Duty standby. Storm pump: Duty. Part of six monthly performance audit. Daily check of pump station operation by Contract Supervisor.	Mod			Mod
92	Pump Stations Beach	Control failure.	Overflows.	Monitoring pump station performance during storm events. Independent review of control systems.	Mod			Low
93	Pump Stations Whakatū	Control failure.	Overflows.	Alarm system, emergency storage and contractor response as required in terms of O&M contract.	Mod			Low
94	Pump Stations Saxton	Control failure.	Overflows.	Monitoring pump station performance during storm events. Independent review of control systems.	Mod			Low
95	Pump Stations Songer	Control failure.	Overflows.	Monitoring pump station performance during storm events. Independent review of control systems.	Mod			Low
96	Pump Stations Airport	Control failure.	Overflows.	Monitoring pump station performance during storm events. Independent review of control systems.	Mod			Low
97	Pump Stations	Vandalism.	Asset failure.	Intrusion alarms are installed.	Low			Low
98	Pump Stations	Odours from pump stations.	Odours.	All pump stations have biological filters.	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
99	Pump Stations	Designs of infrastructure with no innovation and no demand management.	The consequence for these events is so high that separate planning is required.	High level of innovation and demand management incorporated into all design.	Low			Low
100	Pump Stations	Movement failure caused by, earthquake, landslide or settlement.	The consequence for these events is so high that separate planning is required.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan.	Low			Low
101	Pump Stations	Tidal wave inundation.	The consequence for these events is so high that separate planning is required.	Civil Defence Emergency Management Plan. Emergency procedures manual and exercises. Wastewater supply Mutual Aid Plan.	Low			Low

C4 Business Risk Register

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan		Residual Risk
					(IP) Ref		
1	Higher Level Policies, Procedures and Controls						
1.1	Board does not have clearly defined documented strategy to guide long-term delivery of activity.	Ad-hoc decision making, waste and unnecessary financial cost.	Long term strategy integrated into the Business Plan.	Mod			Low
1.2	Operations manuals not up to date.	Failure to supply service or cause adverse health effects or environmental damage due to poor operation of assets.	Operating manuals are substantially complete and reporting requirements are in place to ensure contractors comply with requirements. Annual review of O&M manuals.	Mod			Low
1.3	NRSBU does not have a complete Business Continuity Plan.	Business unable to recover quickly following extreme event.	Annual review of Business Continuity Plan.	Low			Low
1.4	No clear direction on public consultation.	Contributing councils in breach of LGA with respect to public consultation.	High level of public consultation through the five Contributors.	Low			Low

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
1.5	NRSBU does not have an acceptable position on the impact of climate change on service delivery.	Financial loss due to liability for property damage, loss of asset. Not able to provide service.	NRSBU has and implements relevant design parameters on climate change.	Low			Low
1.6	The activity management plan is not fully implemented.	The operational, tactical and strategic objectives of the activity are not integrated into the annual/LTP planning cycle and are not aligned to staff work programmes, resulting in delays and poor decision making.	High level of commitment from NRSBU.	Low			Low
1.7	Inaccurate growth information or growth not considered.	Inappropriate decisions made about development.	Contributors' requirements are known.	Mod			Low
1.8	Natural disaster (Tsunami).	Plant damaged and could be rendered in-operable for a period of time.	While the resilience of the plant is good the consequence for this event is so high that separate planning is required.	Low	IP 1	Consolidate natural disaster information and review.	Low
1.9	Natural disaster (Earthquake).	Plant damaged and could be rendered in-operable for a period of time.	While the resilience of the plant is good the consequence for this event is so high that separate planning is required.	Low	IP-1		Low
2	Financial						
2.1	Lack of long term financial planning.	Higher than necessary financial costs.	Business Plan and associated long term strategy are reviewed on annual basis.	Low			Low
2.2	Service levels versus funding and works not clear.	Lack of connection between the Levels of Service committed to and the funding and services provided.	Performance targets are defined and monitored/report on.	Mod			Low
2.3	True costs and "whole of life" costs of activity not recorded appropriately.	Financial cost for providing both operations and capital works not reflecting true costs. Decision making not based on true costs.	Improve record keeping in Asset Management System.	Low			Low
2.4	Assumptions for financial forecasting not always understood.	Additional costs incurred because assumption/uncertainties not accounted for i.e. asset valuations, depreciation.	Manager is aware of assumptions and uncertainties behind financial forecasting information and it is noted in AMP and other relevant documents.	Low			Low
2.5	Unforeseen additional costs.	Reputation of NRSBU detrimentally affected.	AMPs and asset information at the appropriate level.	Low			Low
2.6	Valuations not accurate for asset facilities.	Fixed Asset Register (FAR) not reconciling with existing assets, causing incorrect valuations and affecting true financial requirements.	Asset Management System and FAR reconciled and revaluation is carried out on an annual basis.	Low			Low

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref	Improvement Plan	Residual Risk
2.7	All potential sources of Government and other external funding (third party funding) not appreciated or obtained.	Higher cost to the councils than there should have been.	Identify potential availability of third party funding and apply / take advantage of it.	Low			Low
2.8	Consultant fees for design works.	Costs exceed expectations due to spiralling fees and re-work.	Robust professional services contracts and good communications exist between officers and consultants.	Mod			Low
2.9	Contributors find an alternative way of treated wastewater and withdraw from the Disposal of Trade Waste Agreements with NRSBU or improve effluent quality significantly so that they can adjust quota requirements.	Increased cost for existing remaining contributors.	A decrease in demand will provide opportunity to reassess capacity requirements. If the demand is affected significantly then it is likely that there will be significant spare capacity. This should be mitigated through optimised replacement and/or abandoning current assets. Cost of procuring a consent and compliance to discharge final treated effluent probably prohibitive.	Low			Low
2.10	Contributors go out of business due to high waste water charges.	Increased cost for existing remaining contributors.	Same as above. Benchmark of operational costs does not appear to support the idea that NRSBU charges are higher than equivalent operations. Owners compensated of risk through payment of 1.5% risk premium by three industrial contributors.	Low			Low
2.11	Insurance cover needs review.	Insurance not adequate and unnecessary costs may be incurred in the future.	Insurance reviewed and appropriate cover taken.	Low			Low
3	Organisational Management						
3.1	Lack of strategic thinking/ long term planning.	Inefficient use of time and money.	Development of long term strategy.	Low			Low
3.2	Failure to act on identified risk.	Possible legal action against the councils if event occur which councils knew about. Public health adversely affected.	Risk schedules updated on a regular basis and improvements carried out as required.	Mod			Low

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan		Residual Risk
					(IP) Ref		
3.3	Lifelines Plan not up to date or implemented.	Large scale asset failure due to a naturally occurring event resulting in prolonged and substantial loss of service to Nelson and Richmond.	Nelson City Council and Tasman District Council responsibility. NRSBU does not control this activity.	Low			Low
3.4	NRSBU does not have internal audit policy.	Financial loss due to lack of robust internal audit process and/or legislative requirements not being met.	Use of Audit NZ auditors.	Low			Low
3.5	Low standard provision of professional and physical services.	Poor quality or delayed projects. Unnecessary financial cost.	Appropriate penalty or exit clauses in contracts.	Low			Low
3.6	Improvement plan from AMP not undertaken.	Future forecasting not accurate. Decision making not optimised.	Reporting on implement improvement plan required on a six monthly basis.	Low			Low
3.7	Opportunity for corruption of data/operational systems.	Interruption to supply of service. Decision making not robust as data missing/damaged.	Security and administration system implemented.	Mod			Low
3.8	Legislative requirements not understood.	The councils face legal action because legal requirements are not met.	High level of understanding by manager of legislative requirements.	Low			Low
4	Human Resources						
4.1	Accountabilities not clear.	Staff not accountable for actions allowing apparent problems to continue.	Performance reporting on a regular basis to NRSBU Board.	Mod			Low
4.2	Information in people's heads or inappropriate recording of information.	Organisational knowledge lost with staff leaving.	Ensure managers and contractors document and appropriately file everything that is relevant. The areas of Risk Demand, Asset Management, Renewals, Capital Expenditure, Environmental and Operations are well documented. Review plans annually.	Mod			Mod
4.3	Inadequate attention to staff succession.	Organisational knowledge lost with staff leaving.	Implement good staff/management succession plan and document procedures. Owners are reviewing governance structure.	Mod			Mod
5	Health and Safety						
5.1	NRSBU does not have a good health and safety culture.	High accident rate.	NRSBU health and safety procedures are implemented and relevant.	Low			Low

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
5.2	Health and safety risks not identified or managed appropriately.	Councils face legal claims for not meeting health and safety obligations.	Health and safety manuals up to date and are effectively managed.	Low			Low
6	Wastewater Asset Management						
6.1	Deferred renewal and maintenance not recorded.	Deferred maintenance not recorded causing unexpected, additional costs from asset failure.	Record all deferred maintenance and renewals when this occurs.	Low			Low
6.2	Not all easements recorded or obtained.	NRSBU faces legal action or cannot carry out its activities because it does not have the legal right to cross a property.	NRSBU has up to date record of easements and has established policy for processes to be followed when easements are required.	Low			Low
6.3	Wastewater not treated to acceptable standards.	Dissatisfaction of customers from odours and not being able to swim at local beaches.	Long term Strategy integrated into the Business Plan with a high level of acceptance by the Board.	Mod			Low
6.4	Performance monitoring of service levels not completed.	Target Service Levels not met, resulting in customer dissatisfaction.	Monitoring programme established and reviewed regularly.	Low			Low
6.5	Security of assets not adequate.	Wastewater assets damaged, causing widespread sickness or environmental damage.	Adequate security systems in place (smoke & intruder).	Low			Low
6.6	Poor standards of constructed assets due to design and/or construction of infrastructure.	Substandard physical works resulting in poor asset performance.	NCC Code of Practice is updated regularly and contractors and consultants are familiar with these. Contractors/Consultants take responsibility for work done.	Low			Low
6.7	Excess discharge from contributors exceeds the capacity of treatment plant.	Discharge from treatment plant exceeds consent conditions.	Excess discharge penalty cost as detailed in the in the individual agreements for disposal are set at a rate that actively discourages excess discharge from contributors.	Low			Low
6.8	Long term viability (20 - 30 years) of the existing plant at the existing site.	Dissatisfaction of customers from odours. Biosolids disposal not sustainable High costs of treatment.	High level of treatment with adequate bio-solids disposal and low environmental impact.	Mod			Low
7	Asset Management						
7.1	Network modelling and condition assessments not undertaken.	Capital works programme not optimised. Renewal works not completed due to lack of knowledge causing failure of assets. Future forecasting not accurate.	Asset management system is maintained, up-to-date and accurate. Continue condition assessments of network. Continue to develop robust renewals programme based on sound knowledge.	Mod			Low

No	Potential Risk	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
7.2	As-built information can be slow or incorrect coming from contractors, and consultants.	Inability to repair assets within reasonable time. Unreliable cost allocation leading to less than optimal decision making.	As-builds are kept up to-date and recorded promptly. Contractor responsible for quality check P&ID against as build plans and asset register.	Mod			Low
7.3	Asset data not provided or incorrect from contractor.	Poor asset management decisions made.	Data provided in the appropriate format and with data having a high degree of confidence.	Mod			Low
7.4	Criticality assessment not undertaken.	Failure of critical assets resulting in environmental damage or not meeting Service Levels.	Criticality assessment of assets has been carried out.	Mod			Low
7.5	Asset Risk Register and Asset Risk Plan not implemented.	The councils face legal action because of asset failure or unnecessary costs incurred due to asset failure.	Maintain Asset Risk Schedules and review annually.	Mod			Low
7.6	Asset management systems not up to date or completed.	Failure of wastewater systems because maintenance works not completed or management system not operational.	Asset Management System in place and updated as required.	Low			Low
7.7	Sea level rise.	Asset not functional due to intermittent flooding.	Most of the WWTP assets are located 2.4m above the 1999 high tide mark. Consider constructing seawalls or bunds around the ATAD area at Bell Island or regional pump stations once a sea level rise of 500mm is confirmed.	Low			Low
New	Storm surge.						
8	Resource Consents and Designations						
8.1	Review of designations required.	NCC or TDC faces legal action because wastewater assets have not been designated in their resource management plans.	Designations are appropriate.	Low			Low
8.2	Resource consents.	Councils face legal action because resource consents not applied for, or conditions not met. Public dissatisfaction with environmental damage being caused.	Consents that are required are well documented and effects understood. Consents continuously monitored and reporting undertaken.	Mod			Low
8.3	Application for resource consents.	Failure to obtain resource consents	Long term consents have been obtained.	Mod	IP-2		Low

Appendix D: Financial Forecasts

Table 14-1: Total capex budgets 2021-2031 ($ thousands)

Form of capex	Total years 1-10	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Level of service	31,105	4,800	4,850	4,325	2,575	2,085	1,200	3,950	1,550	2,570	3,200
Growth	5,000						500	1,500	3,000		
Land	2,500						1,500			1,000	
Renewals	20,209	2,194	1,146	1,924	1,835	2,185	3,785	1,785	1,785	1,785	1,785
Total capex	**58,814**	**6,994**	**5,996**	**6,249**	**4,410**	**4,270**	**6,985**	**7,235**	**6,335**	**5,355**	**4,985**

Table 14-2: Level of service (LoS), growth and land driven capex projects 2021-2031 ($ thousands)

Project	Capex	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Pump station overflow screens and monitoring systems	LoS	300									
Regional pipeline capacity upgrades	LoS	3720	2,470	2,150	2,000						
Pump and discharge pipework upgrades at pump stations	LoS		2,050	350	250						
Strategic review and seismic strengthening of PSs	LoS			50		100		500			
Flood protection of pump stations	LoS										
Storage at pump stations	LoS			50	50	110	100	1,000			
Saxton Road PS- land purchase for storage	Land						1,500				
Additional screening and duplicate grit trap at WWTP	LoS				50	500					
Hydraulic capacity upgrades at WWTP	LoS		80	1,500							
Power supply upgrades at Best Island and WWTP	LoS							500			
Aeration basin and clarifier capacity upgrade	Growth						500	1,500	3,000		
Design of system to remove algae from pond	LoS	20									200

Project	Capex	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Desludging ponds	LoS	400			25						
New technology assessments to meet Consent	LoS	50				50					
Design of sludge processing improvements at WWTP	LoS						50	50	200	500	500
Biosolids drying	LoS		100				50	250	250	1,020	
Odour and equipment upgrades at Rabbit Island	LoS	200		150							
Buffer storage at WWTP	LoS			25	200	1,000					
Ultrafiltration plant and re-use water pipework	LoS							150	100	1,050	2,000
UV disinfection for re-use water	LoS					50	500				
Best Island irrigation	LoS		100	50		250	500	1,500	1,000		
Bell Island irrigation and effluent re-use	LoS	110	50								
Rabbit Island Irrigation	LoS					25					500
Purchase and designate land for future Clockwise PS	Land									1,000	
Total LoS, growth and land driven capex upgrades	**38,605**	**4,800**	**4,850**	**4,325**	**2,575**	**2,085**	**3,200**	**5,450**	**4,550**	**3,570**	**3,200**

Table 14-3: Operational Costs 2021-2031 ($ thousands)

NELSON REGIONAL SEWERAGE BUSINESS UNIT 10 Year Operations and Maintenance Plan ($,000)											
	Budget	1	2	3	4	5	6	7	8	9	10
73.89	20/21	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Total Management	500	500	500	500	500	500	500	500	500	500	500
Total Financial	548	730	901	1,065	1,198	1,318	1,442	1,642	1,928	2,103	2,247
Depreciation	2,469	2,553	2,667	2,775	2,849	2,921	2,954	2,988	3,084	3,176	3,226
Total Electricity	900	900	924	982	1,045	1,112	1,185	1,263	1,348	1,439	1,537
TP Maintenance	1,439	1,574	1,574	1,574	1,684	2,474	2,479	2,484	2,939	3,144	3,654
PS & RM Maintenance	284	309	309	309	309	309	309	309	309	309	309
Total Monitoring	291	358	297	277	279	277	392	279	277	277	279
Consultancy	75	75	75	75	250	250	250	250	250	250	250
Insurance	75	98	98	98	98	98	98	98	98	98	98
Rates & Rental	54	63	63	63	63	63	63	63	63	63	63
Water Charges	70	20	20	20	20	20	20	20	20	20	20
Forestry and spit restoration	12	4	4	4	4	4	4	4	4	4	4
Biosolids Disposal	659	960	960	960	960	960	960	960	960	960	960
Vehicle		10	10	10	10	10	10	10	10	10	10
Telephone/Computers	2	5	5	5	5	5	5	5	5	5	5
Total Expenses	**7,376**	**8,159**	**8,407**	**8,717**	**9,274**	**10,321**	**10,671**	**10,875**	**11,795**	**12,358**	**13,162**

Table 14-4: Cyclic Operational Costs 2021-2031 ($ thousands) (included in totals in Table 14-3: ~~Table 14-5:~~)

	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Forestry	4	4	4	4	4	4	4	4	4	4
Monitoring O&M	174	174	174	174	174	174	174	174	174	174

Coastal Permit 5 yearly Receiving Environment Study	70	15	15	15	15	70	15	15	15	15
Coastal Permit summer and winter survey	18	18	18	18	18	18	18	18	18	18
Rabbit Is Biosolids 6 yearly Benthic and Transect Survey						60				
Bell Island 3 yearly soil samples	2			2			2			2
Odour monitoring	20	20								
Rabbit Island and Bell Island Soil samples	26	26	26	26	26	26	26	26	26	26
S::can Iceberg Analysis	24	24	24	24	24	24	24	24	24	24
Monitoring contingency	20	20	20	20	20	20	20	20	20	20

Table 14-5: Additional Operational and Maintenance Costs from Upgrades 2021-2031 ($ thousands) (included in totals in Table 14-3: ~~Table 14-5:~~)

Upgrades	21/22	22/23	23/24	24/25	25/26	26/27	27/28	28/29	29/30	30/31
Duplicate grit trap					50	50	50	50	50	50
Odour upgrades				110	110	110	110	110	110	110
Additional aeration basin and clarifier								450	450	450
UV disinfection					740	745	750	755	760	765
Ultrafiltration	65	65	65	65	65	65	65	65	65	570
Biosolids processing for sale									200	200
UF and re-use water pipework							30	30	30	30
Subtotal	**65**	**65**	**65**	**175**	**965**	**970**	**1005**	**1,460**	**1,665**	**2,175**

Appendix E: Valuation June 2020

The valuation as of June 2020, which has been independently audited is summarised in Table 14-3~~Table 14-8~~ below:

Table 14-3~~8~~: June 2020 valuation

	Jun-20		
	ORC	**ODRC**	**AD**
Pumps, Pipes, Biofilters	35,065,522.88	24,711,627.10	660,681.20
Septage	469,761.93	315,014.21	14,769.20
Inlet Works	4,643,887.52	3,342,720.70	189,045.05
Primary Clarifier	4,680,801.98	3,407,012.68	134,094.00
Aeration	1,721,716.70	810,804.25	89,297.49
Secondary Clarifier	3,622,023.00	1,617,943.82	87,251.57
Ponds, Outfalls	22,876,040.66	17,311,468.84	336,375.31
Biosolids	16,508,592.12	7,684,570.61	687,041.36
General	6,029,795.27	3,846,732.93	212,084.42
	$95,618,142	**$63,047,895**	**$2,410,640**

The typical useful lives adopted in the valuation of NRSBU assets are derived from industry knowledge and local performance data. These typical useful lives are shown in Table 14-4~~Table 14-9~~ to Table 14-6~~Table 14-11~~ below.

Table 14-4~~9~~: Typical useful lives used in pump station valuation

Component	Life
Structure	50
Steelwork	30
Pump	15
Electrical	15/25
Valves	30
Telemetry	10
Flow Meters	15
Biofilters	20
Biofilter media	5

Table 14-5~~10~~: Typical useful lives used in rising main valuation

Material	Life
Pipelines- plastic/polyethylene	100
Pipelines- steel	50
Pipelines- concrete	80
Pipelines- asbestos cement	50
Valves	25
Flowmeters	15
Manholes/chambers	100

Table 14-6~~11~~: Typical useful lives used in wastewater treatment plant valuation

Asset	Life
Building/Structure	50
Biosolids Tanks	10
Mechanical	15
Aerators	25
Mixers	10
Flowmeters	15
Electrical	15/25
Electronic	10
Instrumentation	10
Office Equipment	10
Pipework- above ground	20/50
Pipework- below ground	100
Valves	25
Manholes/chambers	100