Nelson Regional Sewerage Business Unit

WASTEWATER ASSET MANAGEMENT PLAN 2017

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SECTION 1 AMP FRAMEWORK

ASSET MANAGEMENT PLAN FRAMEWORK

Section 1 Layout of the Wastewater Asset Management Plan (AMP)

Section 2 Executive Summary

Section 3 Plan Details

1. Introduction: sets out the philosophy for the ongoing operation and development of the NRSBU and the scope of the plan.
2. Levels of Service: outlines goals of the NRSBU in providing the recommended levels of service that the NRSBU wish to achieve. Assess the current levels of service and actions required to achieve the recommended levels.
3. Future Demand: outlines existing demand, demand forecasts, growth and contributors expectations.
4. Emergency and Risk Management: Risk Management, process and treatment overview along with emergency management carried out by the NRSBU.
5. Lifecycle Management Plan: provides detail on planning to monitor the performance of the AMP, to improve asset management systems that will improve the level of confidence in the AMP, asset details (including capacity, performance condition and valuations).
6. Financials: operations, maintenance, renewal and capital programmes.
7. Asset Management System: contains details of the information systems, asset details, and maintenance strategy.
8. AMP Improvement and Monitoring: outlines areas for improvement.
9. Action Plan: A summary of the action points identified in this AMP and the long term programme for capital, renewals and asset management.

Section 4 Bibliography and NRSBU Strategic Plan

SECTION 2 EXECUTIVE SUMMARY

INTRODUCTION

This is the summary of the Nelson Regional Sewerage Business Unit (NRSBU) Wastewater Asset Management Plan 2017. It is also aimed as a stand-alone document giving an overview of the purpose of asset management, some key facts, agreed levels of service, the anticipated future demand, risk management, lifecycle management and the financial requirements.

The Nelson Regional Sewerage Business Unit is a joint committee of Tasman District Council (TDC) and Nelson City Council (NCC). It was established to look after the owners' (the two councils) interests in the Regional Sewerage Scheme. A Memorandum of Understanding that was signed by the two Mayors and CEO's in September 2015 (replacing the previous MOU signed in December 2000) governs the operation of the NRSBU.

PURPOSE OF THIS ASSET MANAGEMENT PLAN

In terms of NRSBU planning processes, the Wastewater Asset Management Plan (AMP) is set at a tactical level between the NRSBU Strategic Plan and numerous process plans (operational documents). The AMP is a management tool that guides and influences decision-making.

The purpose of this AMP is to outline and summarise, in a coordinated manner, the NRSBU's long-term management approach for the provision and maintenance of the Regional Sewerage Scheme. Financial projections from the AMP will support and justify the financial forecasts in Business Plans. Similarly the AMP provides the basis for preparation of Annual Reports.

EMPHASIS FOR NRSBU

The emphasis for the NRSBU will be:

- Continuation of NCC and TDC's work on Inflow and Infiltration, as this will significantly reduce the need for future capital expenditure
- Optimisation of processes
- Mitigation of management, process and external risks to the continued operation of the assets.

KEY FACTS OF THE NRSBU SERVICES

The Nelson Regional Sewerage Scheme (NRSS) was commissioned in 1983 and upgraded in 1996, 2006, 2009 and 2012. NRSS includes 17.73km of rising mains, five pump stations, the Sewage Treatment Plant (STP) and the biosolids application facility. The replacement value (31 March 2017) of the assets managed by NRSBU is $84.8M with an operating budget in 2017/18 of $5.6M.

The NRSBU treats municipal wastes (mainly domestic sewage) from the following contributor:

- Nelson City - Stoke and Tahuna areas
- Tasman District - Richmond, Wakefield, Brightwater (the Waimea Basin) and Mapua
- Industrial wastewater from:
    - Alliance Group Ltd (Nelson)
    - ENZA (T&G Global Ltd)
    - Nelson Pine Industries
    - Minor customers (Liquid waste operators).

Before disposal the wastewater is treated to standards that comply with conditions of individual resource consents held by the NRSBU. Biosolids disposal is via spray irrigation over a 750Ha forest area situated on Rabbit and Bell Island. Treated wastewater from the Wastewater Treatment Plant is discharged into the Waimea Inlet during the first three hours following high tide.

The cost to replace the current NRSBU wastewater assets with modern equivalents (Optimised Replacement Cost) and value movement since the previous plan is detailed below and does not include the value of land.

Gross replacement cost 30 June 2014	Gross replacement cost 31 March 2017	Percentage movement	Capital expenditure 2014-2017	Percentage revaluation movement per annum
$72,839,542	$84,832,436	16.5%	$578,445	15.5%

LEVELS OF SERVICE

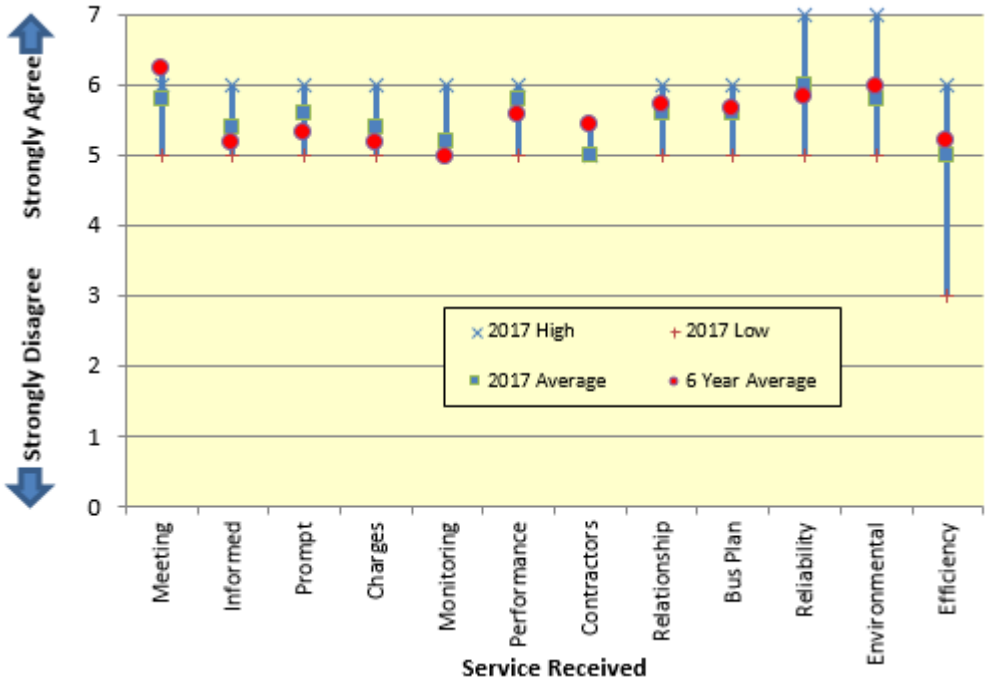
Levels of service are set in consultation with contributors and are ultimately used to measure how well NRSBU delivers a service to the contributors.

A summary of the Levels of Service and the achievements for the three year period of 2014/15 to 2016/17 is detailed on the following page. This indicates that the Level of Service compliance has been very good.

Level of Service	Function	Category	Technical Level of Service	LoS Compliance		
				14/15	15/16	16/17
Environmental Impacts	Treatment & Disposal	RMA Consent - Wastewater Discharge to Coastal Marine Area	100% compliance with consent conditions	Yes	Yes	Yes
		RMA Consent – Discharge of Contaminants to Air	100% compliance with consent conditions	Yes	Yes	Yes
		RMA Consent - Discharge of Contaminants to Land	100% compliance with consent conditions	Yes	Yes	Yes
		Equipment Failure of critical components within the treatment and disposal system	No equipment failures that impact on compliance with resource consent conditions	Yes	Yes	Yes
	Pump Stations (including septage facility)	Odour complaints from pump stations	No odour complaints originating from pump stations	Yes	Yes	Yes
		Pump station wet weather overflows	No overflow events occurring for the contracted contributor flows	Yes	No 3 events	Yes
		Pump station overflows resulting from power failure	No overflow events occurring	Yes	Yes	Yes
		Pump station overflows resulting from mechanical failure	No overflow events occurring	No 3 event	No 1 event	Yes
	Pipelines	Reticulation Breaks	No reticulation breaks	No	Yes	No 1event
		Air valve malfunctions	No air valve malfunction that result in wastewater overflows	Yes	Yes	Yes
Capacity	Treatment & Disposal	Overloading system capacity	Treatment and disposal up to all contracted loads and flow	Yes	Yes	Yes
	Pump Stations	Overloading system capacity	No overflows for pump stations for contracted flows	Yes	Yes	Yes
Reliability	Treatment & Disposal, Pump Stations Pipelines	Equipment failure of critical components	No equipment failures that could lead to non-compliance with resource consent conditions	Yes	Yes	Yes
Responsiveness	Treatment & Disposal Pump Stations Pipelines	Speed of response for emergency and urgent maintenance works	Achievement of Response times specified in Maintenance Contract	Yes	Yes	Yes
		Speed of response for routine and programmable maintenance works	Achievement of Response times specified in Maintenance Contract	Yes	Yes	Yes
Key Contributor Relationships	Treatment & Disposal, Pump Stations Pipelines	Overall satisfaction	Agreed levels of service provided to all Contributors.	Yes	Yes	Yes
			Robust charging structure is put in place	Yes	Yes	Yes
			Contributors are Satisfied with Sewerage Scheme	Yes	Yes	Yes

SURVEY OF NRSBU CONTRIBUTORS

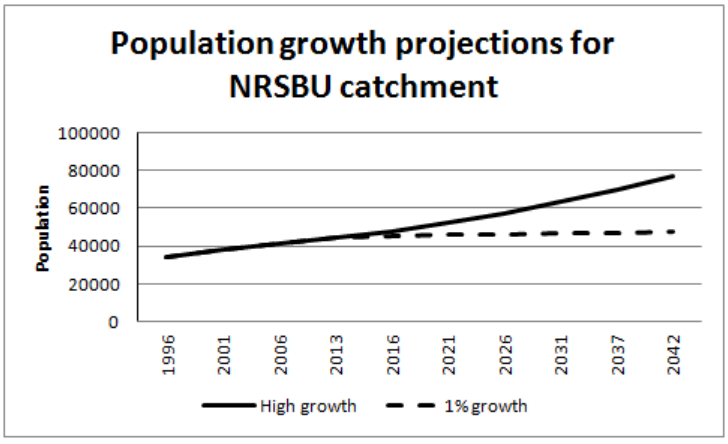
The NRSBU has undertaken an annual customer satisfaction survey of the contributors since 2005. In 2008 the survey was amended with the Expectation/Perception methodology modified and additional survey areas included. The following figure compares the survey results for 2008 to 2017.



The results indicate a general satisfaction with the service provided by the NRSBU.

FUTURE DEMAND

Population for the areas that the NRSBU serves are detailed below (Statistics New Zealand projections) beginning from 1996 and extending out to projections for 2042. Population growth is merely one of a complex mix of conditions that have an effect on the growth in demand for services provided by the NRSBU and include changing patterns in industrial wastewater generation, strategic planning by Council customers and their response to demand management initiatives implemented by the NRSBU through customer supply agreements.



Demand is primarily managed through the Disposal of Tradewaste Agreements.

SIZING OF THE BELL ISLAND WASTEWATER TREATMENT PLANT (STP)

Currently the sizing of the STP is controlled by quota based charging of its five major contributors. Quota based charging caps quantity and quality of discharges and allows NRSBU to control the timing of asset upgrades. Should a particular contributor wish to increase its quota with significant downstream effects then they would be responsible for the costs of upgrading downstream assets.

The STP now has sufficient flexibility and capacity to process existing average and peak flows, and loads being delivered to the plant with the existing sewerage and pumping system.

UPGRADE PLAN - CAPITAL COSTS

Capital costs of upgrading the plant as detailed in the report "NRSBU Long Term Plan 2017" is detailed below.

Year	Description of Projects	Estimated Costs
2017/18	Desludging oxidation ponds	100,000
	Modification pond M5	140,000
	Modification pond M1	140,000
	Generator at Inlet/Outlet	143,000
	Sludge management (Sludge Storage Tank)	200,000
	Regional pipeline upgrade (Review strategy)	40,000
2018/19	Treatment Plant Upgrade (Consent dependent)	2,500,000
	Desludging oxidation ponds	1,520,000
2019/20	Modification Facultative Ponds (Consent dependent)	420,000
	Treatment Plant Upgrade (Consent dependent)	2,500,000
	Richmond Regional Pipeline (Demand dependent)	1,000,000
	Resource consent: Rabbit Island Biosolids application to land	240,000
2020/21	Richmond Regional Pipeline (Demand dependent)	6,500,000
2021/22	Richmond Regional Pipeline (Demand dependent)	6,500,000
2024/25	Disposal of dried sludge to landfill	700,000
2025/26	Songer street upgrade (Demand dependent)	100,000
	Disposal of dried sludge to landfill	700,000
2026/27	Disposal of dried sludge to landfill	700,000
2030/31	Activated sludge management (2nd Secondary clarifier)	2,800,000
Total		$26,983,000

RISK MANAGEMENT

Risks can arise from many areas of the NRSBU, both in terms of the physical assets and business risks.

RISK ASSESSMENT

The risk assessment review identifies risks associated with the on-going management, funding, planning, development and operation of the NRSBU and also identifies risks associated with natural causes and operational aspects of assets owned by NRSBU. The risk assessment review indicated that the previous extreme and high risks identified have been mitigated through the upgrading of treatment facilities, duplication of rising mains, and installation of standby generators at the four major pump stations.

INSURANCE

The NRSBU assets are insured as part of the insurance package for Nelson City Council who uses Aon Plc (NYZE:AON) as the brokerage firm to manage the Nelson City Council insurance portfolio. The Nelson City Council and NRSBU assets are managed as part of a larger package of South Island Territorial Authorities.

SIGNIFICANT NEGATIVE EFFECTS

The significant negative effects that the NRSBU wastewater scheme (wastewater treatment plant, pump stations and rising mains) may have on the social, economic, environmental or cultural well-being of the community were considered. The effects range from nil to moderate but all had existing mitigation that was considered appropriate.

LIFECYCLE MANAGEMENT

Lifecycle management has a direct impact on the provision of wastewater services to the contributors. Lifecycle management will allow the NRSBU to clearly identify both the short and long term requirements of the wastewater system ensuring that a cost effective service is delivered to contributors.

CONDITION AND PERFORMANCE

Rising Mains

The rising main component varies from 150mm to 800mm diameter mains that link the five pump stations and the treatment plant, the outfall main and the biosolids pipeline. The residual life for the two main pipe materials (Polyethylene and Concrete) is more than 30 years.

The regional pipeline has undergone a significant amount of upgrading and has the capacity to accept all but the worst storm flows reaching the system.

Pump Stations

All pump stations are maintained to a high level. The NRSBU strategy is that the four main pump stations do not require emergency storage, as pumps (duty and storm) maintain flows and each pump station has a standby generator capable of operating all the pumps at duty flow levels. Wakatu pump station is operated on a duty/standby basis and has more than six hours of storage capacity.

The airport pump station is the only pump station that does not have redundancy in the event of failure of the storm pump during heavy rain events.

Treatment Plant

As detailed below:

Facility	Performance Comment	Install Date	Condition
Inlet area & screening	The system functions essentially as designed. The installation of backup power supply is being considered. The screening facility has 100% redundancy in all but the heaviest of rain events.	2008 - 2017	Very Good
Primary clarifier	The primary clarifier removes a significant amount of the suspended solids from the influent wastewater, with the suspended solids leaving the primary clarifier being reduced to generally slightly below 200 mg/l, whereas the concentration of the material entering the system is generally above 500 mg/l. (Effectiveness: 35% COD removal and 65% SS removal)	2008 - 2010	Very Good
Aeration Basin	At full aeration, the aeration basin has a capacity of around 7,950 kg/day BOD. The capacity of the system is sufficient for current needs. While the aerators require constant maintenance to keep them in service, operational monitoring has shown that there is redundancy built into the system when the aeration basin operation is integrated with the primary clarifier and all components are operational.	2003	Good
Clarifier	Design guidelines suggest that the usual peak TSS load allowed should not be more than 8,350 kg/hr. In the case of peak flow conditions, the peak load can reach 9,153 kg/hr, but this normally only occurs for a short period. At present during average flow periods the solids loading is around 3,000 to 4,000 kg/hr, and occasionally increases to 5,000 kg/hr depending on the aeration basin operation.	1996	Good
Sludge thickening	The DAF plant provides effective separation and thickening of secondary sludge. The gravity belt thicker introduced in 2010 to thicken primary sludge has only been used very intermittently.		Moderate to good
ATAD	Operational monitoring has demonstrated that the current sludge load can be accommodated through any two of the three ATAD trains without compromising the quality of biosolids produced. There has not been a need to use the heat exchanger at any time since 2009. The heat exchanger is on continuous standby.	1996	Good
Ponds	The algal and other pond parameter monitoring has shown that the ponds are resilient. Operational observations suggest that the ponds are generally under loaded and have significant capacity to treat additional load. Further improvement in pond management has the potential to improve the quality of effluent. Sludge surveys carried out over the last few years have indicated that the build up of sludge is moderate and that an integrated sludge removal process could provide beneficial outcomes for the NRSBU in maintaining the hydraulic capacity of the ponds at more desirable levels. The results from sludge surveys suggest that desludging of ponds will be required within the next two to eight years. The introduction of wind generated mixers has demonstrated that pond conditions are maintained. Further evaluation is programmed for late 2017.	1982 & 1992 & 2017	Good
Outfall	The consent conditions limit the discharge flow and load to the estuary in both quantity and time of discharge. The integration of the outfall pump has improved the management of the ponds significantly. The evaluation of high flow events has demonstrated enhanced flexibility in managing pond levels.	1982 & 2011	Good

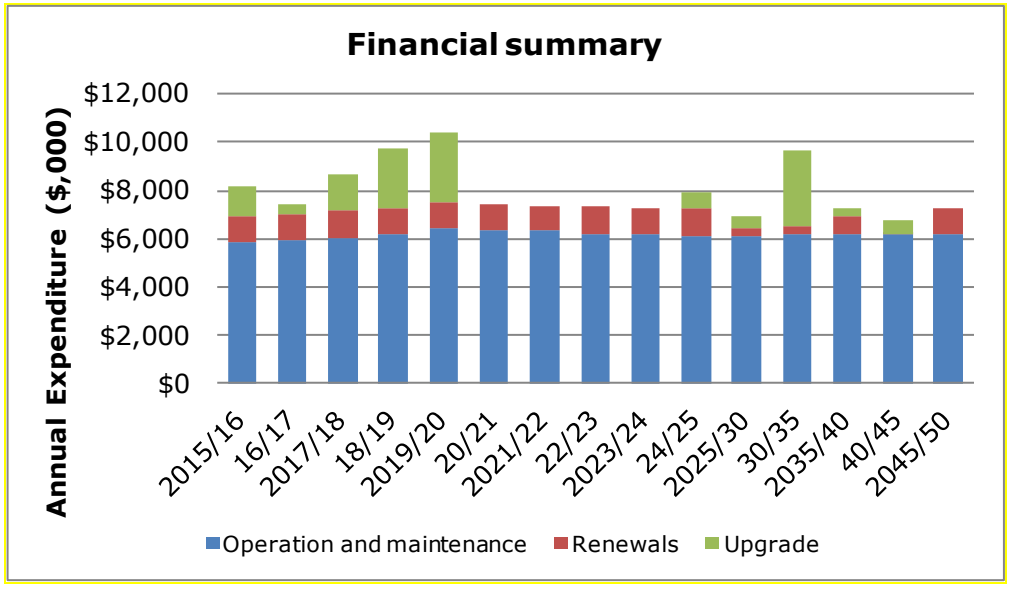
FINANCIAL

Background

No maintenance funding provision is carried over to the following year. Financial estimates are submitted to the Board and the contributors each year following inspections of the assets and the recorded maintenance history during the previous year. The contributor's agreement details the methodology of charging.

Projected Costs

In September each year the NRSBU supplies the contributors with the operating costs of the previous year. The differences between the charges assessed at the commencement of the year and the final actual costs are either reimbursed to the contributors if in credit or paid by the contributors if in debit.



AMP IMPROVEMENTS AND MONITORING

An important component of this Asset Management Plan is the recognition that it is a "live" document in need of monitoring, change and improvement over time. The NRSBU AMP is a regularly revised and evolving document. It is reviewed annually and updated at least every three years.

The effectiveness of the Asset Management Plan will be monitored by the following procedures:

- Levels of Service performance reporting to the NRSBU Board on a quarterly basis
- Quarterly reporting on the improvement plan and action plan to the NRSBU Board
- Operations reports on a daily, weekly and monthly basis to staff
- Environmental reporting on a monthly basis to the consenting authority.

ACTION PLAN

The following table indicates the possible time lines for the individual improvement to general business processes that are referred to within the AMP.

	2018				2019				2020			
	1	2	3	4	1	2	3	4	1	2	3	4
Annual customer survey.		■				■				■		
Business Continuity Plan review.	■				■				■			
Consider benefits of succession planning and how it might be implemented with be considered once governance issues (TDC and NCC) have been resolved.	■											
A programme of regular pipe inspections of risk areas to be developed.			■				■				■	
The existing maintenance schedules and procedures, quality/procedure, decision making process, contingency and operation and maintenance manuals are to be formalised, updated where required.			■				■				■	
Review of security required at all facilities.		■				■				■		
Monitor sludge levels in ponds and ascertain long term removal and disposal requirements.	■											
Consolidate all known natural disaster events information for consideration by the board.				■				■				■
All condition and performance data shown in Hansen.					■			■				■
Biosolid application permits renewal.			■	■	■	■	■	■	■	■	■	

1.0 INTRODUCTION

This section sets out the purpose of this Asset Management Plan (AMP), shows the plan framework, indicates the key stakeholders involved, and describes the asset management progress.

1.1 Background

1.1.1 Nelson Regional Sewerage Business Unit

The Nelson Regional Sewerage Business Unit (NRSBU) is a joint committee of Tasman District Council (TDC) and Nelson City Council (NCC). It was instigated to look after the owners' (the two councils) interests in the Regional Sewerage Scheme. It was set up as a business unit in October 2000 and previously operated as the Nelson Regional Sewerage Authority. A Memorandum of Understanding, signed by the two Mayors and CEO's in September 2015, governs the operation of the NRSBU.

1.1.2 Conception of the 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. The NRSBU 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. 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.

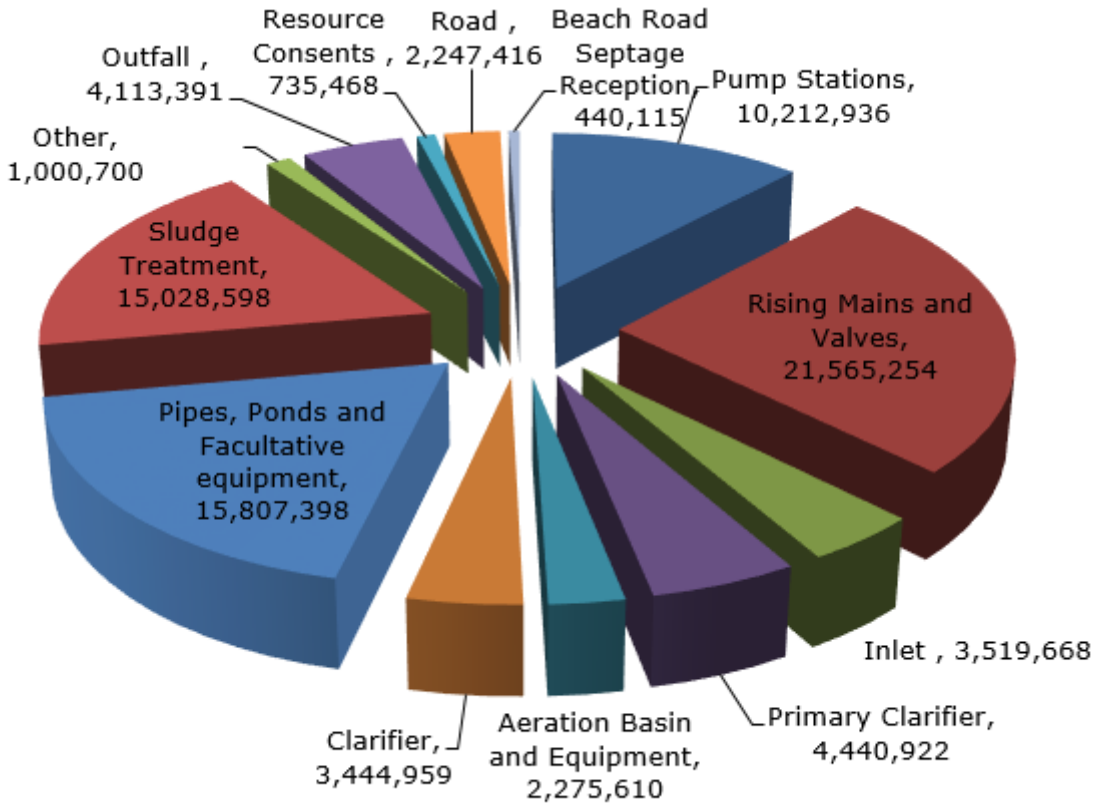
Over time the rising mains from Beach Road to Bell Island have been renewed to PE material. The renewal and upgrade of the rising mains and pump stations completed in 2013 have created capacity in the network for at least the next eight to 10 years. Additional security has been built into the rising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

1.1.3 Value of Assets Managed by NRSBU

The replacement value (31 March 2017) of the assets managed by NRSBU is $84.83m with an operating budget in 2017/18 of $5.621m. Details of the replacement cost of the component grouping are shown below.

Figure 1.1: Optimised Replacement Cost of NRSBU Components



1.1.4 Contributing Councils

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.

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.

1.1.5 Purpose of the Plan

In terms of NRSBU planning processes, the AMP is set at a tactical level between the NRSBU Strategic Plan and numerous process plans (operational documents). The AMP informs the long term plans of the owners. It is the NRSBU's intention that the AMP,

once adopted by the Board, will be a significant management tool that will guide and influence decision-making.
The purpose of this AMP is to outline and summarise, in a coordinated manner, the NRSBU's long-term management approach for the operation and maintenance of the Regional Sewerage Scheme.

The objectives of this AMP are to demonstrate that the NRSBU:

- Understands what asset capacity will be required in the future, and what issues drive this capacity requirement.
- Will proactively and continually improve knowledge of its assets.
- Has robust and transparent processes in place for managing, operating, maintaining, renewing and extending assets in ways that optimise the value of services delivered to contributors.
- Has adequately considered the class of risks its activities face, and has systematic processes in place to mitigate identified risks.
- Has made adequate provision for funding asset operations, maintenance, renewals and upgrades.
- Outcomes delivered by the assets are increasingly aligned to the requirements of the five contributors and to other internally and externally imposed standards.

1.1.6 Previous AMPs

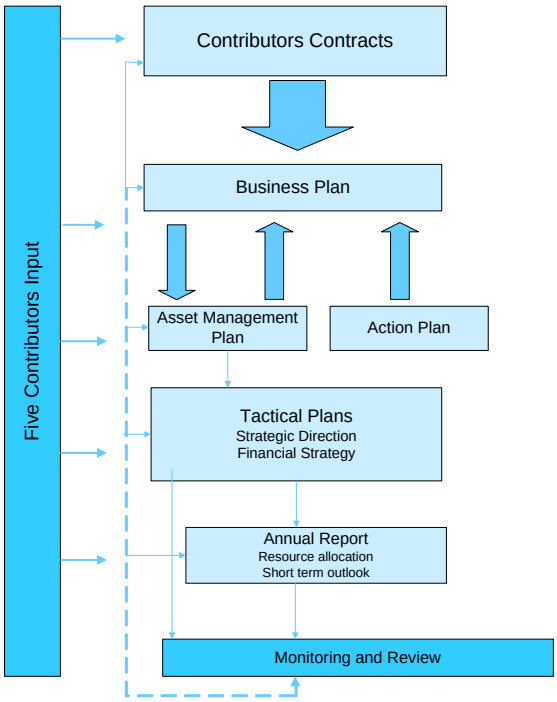
The first AMP was completed in June 1999 and further refined in 2003, 2007, 2012 and 2014 to meet minimum requirements. The Asset Management changes between 1999 and 2014 include:

- 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 Richmond pump stations
- Construction of Songer Street regional pump station
- 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 the NRSBU to optimise the buffer capacity of the ponds to manage wet weather flows
- Development of a long term strategy for pipeline routes
- 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.

1.1.7 Relationship with Other Documents

The AMP is a key component of the NRSBU's strategic planning function. Financial projections from the AMP will support and justify the financial forecasts in the Business Plan and provides the basis for preparation of each Annual Report.

Figure 1.2: Corporate Links to the Asset Plan



1.1.8 Area Covered

The NRSBU treats municipal wastes from the following contributors (refer Figure 1.3):

- Nelson City - Stoke and Tahuna areas
- Tasman District - Richmond, Wakefield, Brightwater (the Waimea Basin) and Mapua
- Industrial wastewater from the Alliance, Turners and Growers Ltd (ENZA), Nelson Pine Industries and minor customers (liquid waste operators).

Figure 1.3: Indicative Annual Cost for Individual Contributors

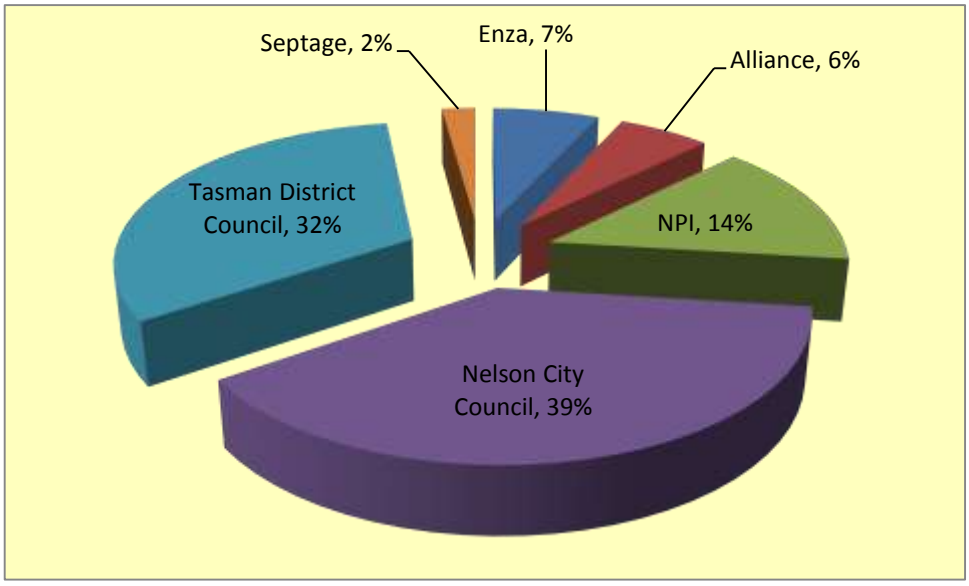
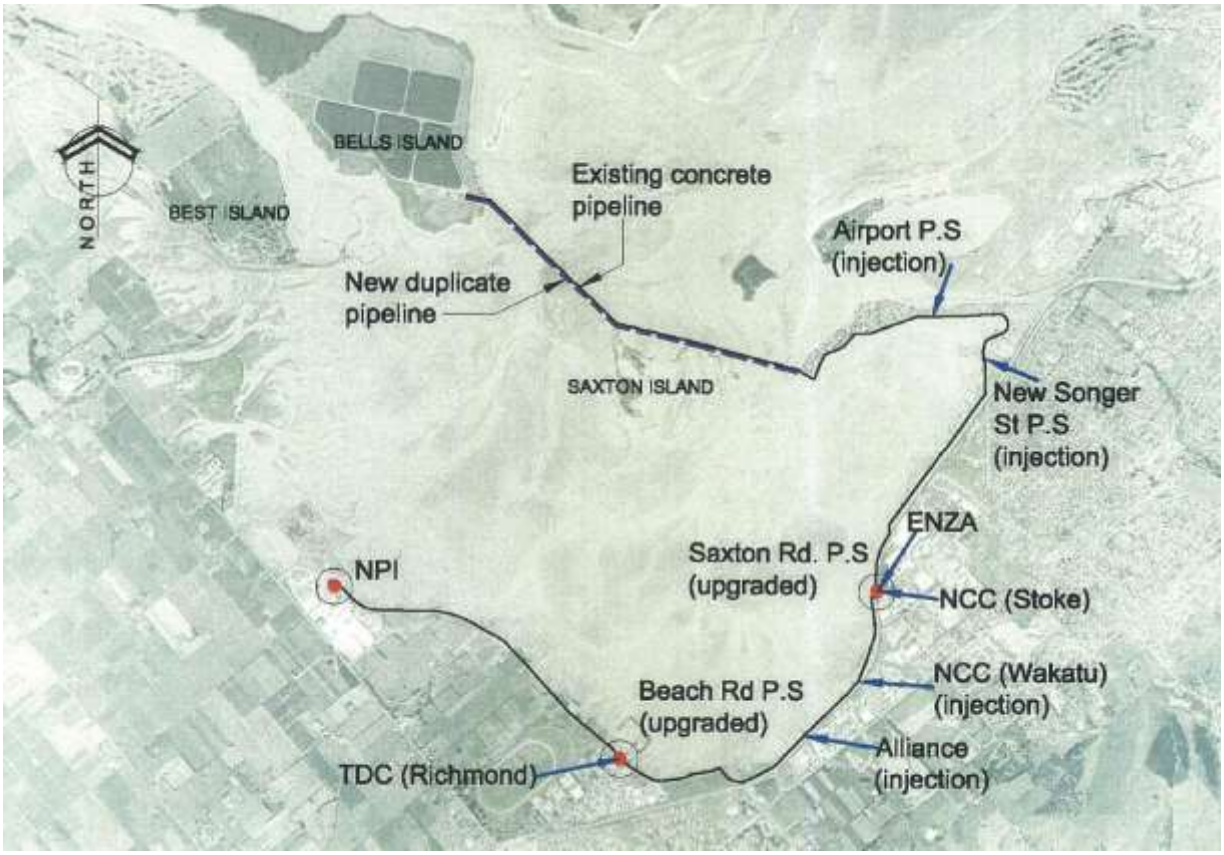


Figure 1.4: Extent of Area Covered by NRSBU



1.1.9 Asset Description

The Nelson Regional Sewerage Scheme (NRSS) was commissioned in 1983 and upgraded in 1996, 2006 and 2009. NRSS includes 16.81km of rising mains, 5 pump stations, the Sewage Treatment Plant (STP) and the biosolids application facility. The layout of the Scheme, showing the location of the STP, contributors, pump stations and pipes is shown in Figure 1.4.

The rising mains range in size from 150mm to 800mm diameter. Of this, 12.3km consists of high-density polyethylene pipe (HDPE) following replacement of the asbestos cement pipe (2001 to 2005) and the duplication of the estuary main (2.7km - 2012), and the remainder is mainly the old rising main from Monaco to Bell Island with concrete pipes in the intertidal zone and PE through the channel sections.

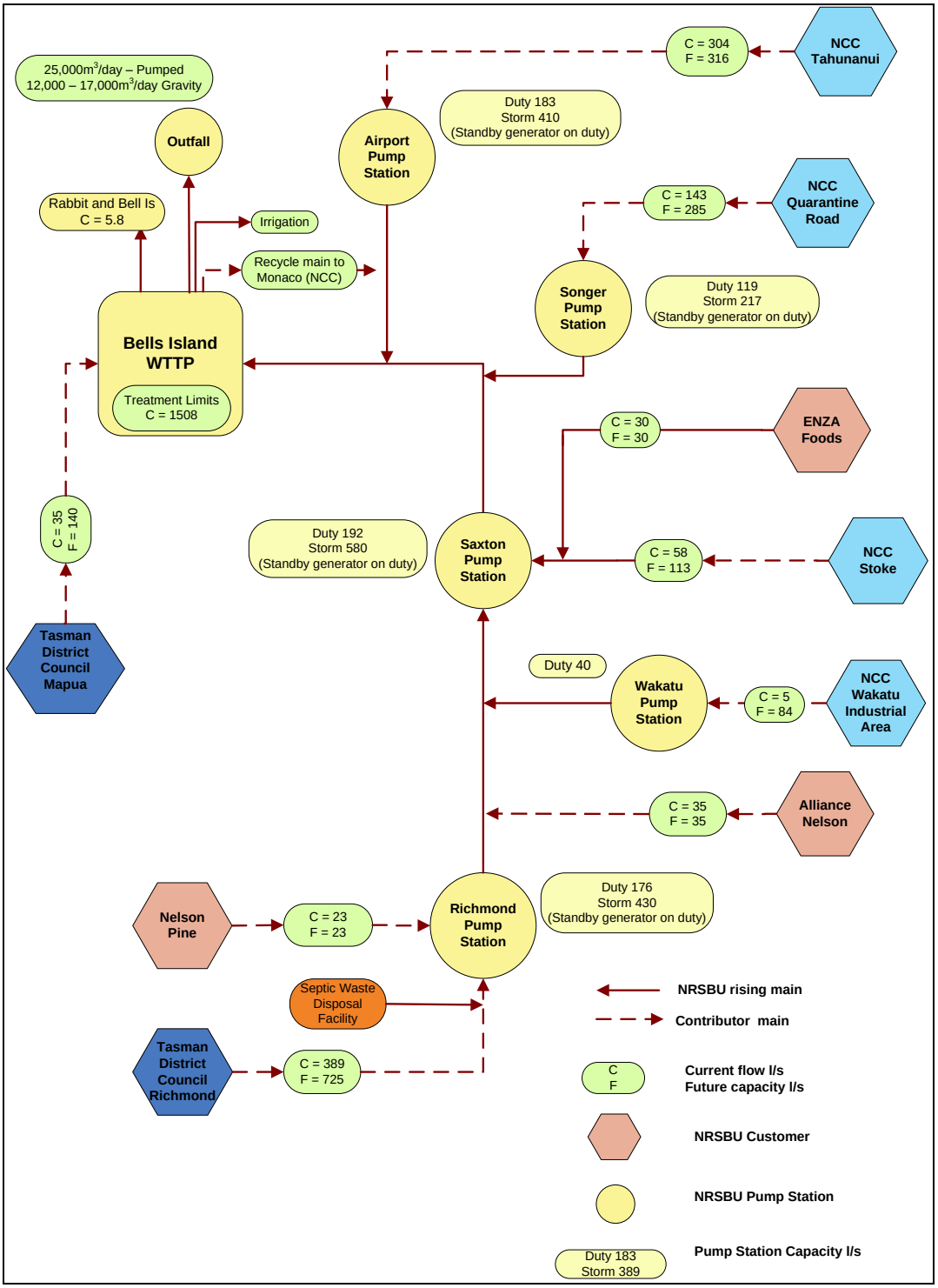
There are five regional pump stations. Beach Road, Saxton Road and Songer Street are equipped with a duty pump and two variable speed drive storm pumps for storm flows that can operate in parallel. The Airport pump station consists of two duty pumps and a storm pump. These four pump stations have standby generators sized for duty operation and all storm pumps can act as standby pumps for the duty pumps. A fifth, smaller pump station is located at the Wakatu Industrial site and consists of a duty/standby pump arrangement. The operation and maintenance contractor is required to provide a mobile generator within 2 hours of a power failure that affects this pump station.

The STP is located on Bell Island, in the Waimea Inlet. Treated effluent is discharged into the inlet on the outgoing tide. Stabilised sludge (biosolids) is beneficially applied to forests on Rabbit and Bell Island. The treatment plant consists of an inlet equipped with two milliscreens, a grit removal facility, a primary clarifier, an aeration basin, a secondary clarifier, a dissolved air flotation system (DAF), a sludge treatment facility

(ATAD) that treats captured solids to produce biosolids, oxidation ponds and an outfall pipeline.

A system of pumps and pipework transfers biosolids to Rabbit Island for storage and application to the pine plantations on Rabbit and Bell Island. The oxidation pond system at Bell Island consists of three facultative ponds in parallel and two maturation ponds in series. Effluent from the last maturation pond is discharged into the Waimea Inlet via a 1.20 metre diameter concrete outfall pipeline and two HDPE diffusers. A booster pump has been installed on the outfall line to improve outfall capacity.

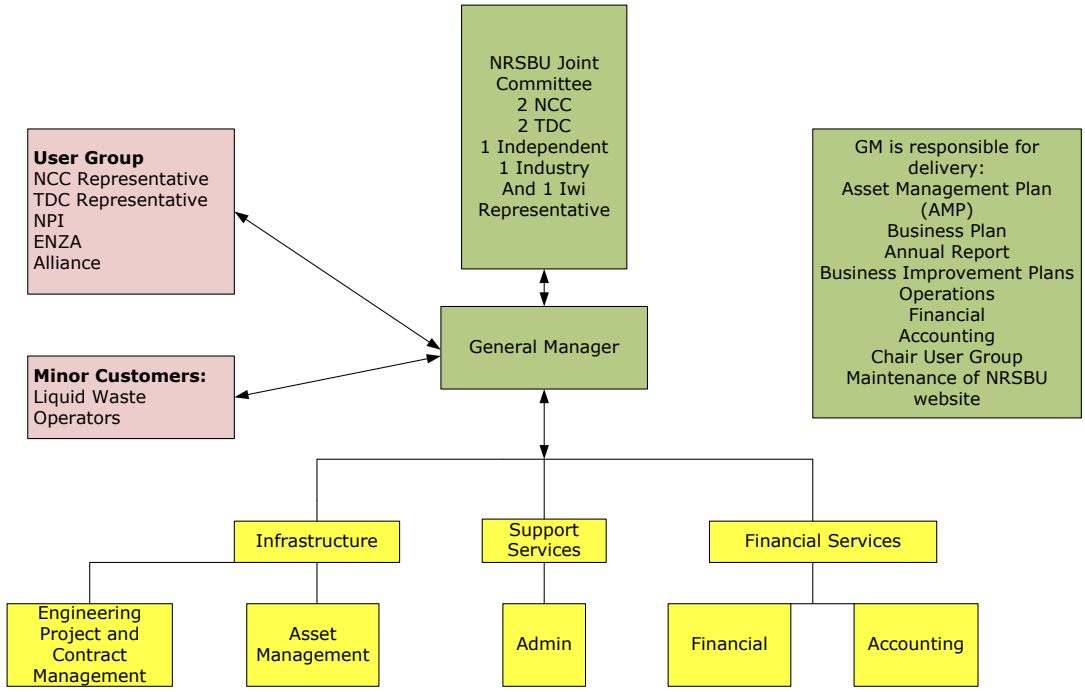
Figure 1.5: Schematic of System



1.1.10 Organisation Structure

The NRSBU is managed by a Joint Committee. The Joint Committee comprises two representatives from each of the councils, one of whom has to be a Councillor, and an optional independent member who is appointed by the two councils. The Joint Committee also has a member who represents the three major industrial customers and an Iwi representative; these members do not have voting privileges. The NRSBU organisation structure is detailed below.

Figure 1.6: NRSBU Organisation Structure



1.1.11 Key Stakeholders

This plan recognises the key external and internal stakeholders. Key stakeholders are those who have significant specific involvement with the assets and/or the service facilitated by the assets and describes their particular main interests. It is limited to the main issues for key stakeholder groups.

Table 1.1: Key Stakeholders

	Stakeholder	Desired Stakeholder Outcome(s)
External	Nelson City Council (NCC) and Tasman District Council (TDC) as customers	Long Term Strategy and Business Plan, and operations which provide an excellent service at optimised cost.
	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).
	Government departments and agencies, including Ministry for the Environment, Ministry of Health, Audit NZ	Water quality is suitable, consistently assured, does not spread diseases. Enhance conservation value of natural waterways.
	Tangata Whenua comprising of 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	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.

Stakeholder		Desired Stakeholder Outcome(s)
	Toa Rangatira.	
	Major industrial contributors (Nelson Pine Industries, ENZA Foods and Alliance Nelson)	Ability to dispose of effluent in a sustainable manner.
	Minor consumers	Ability to dispose of effluent in a sustainable manner.
	Contractors and Consultants	Fair contracts, good relationships and efficient and reliable service.
	Wider Community	Enhance landscape and aesthetic values of farmland and dispose of waste at least cost.
Internal	NCC and TDC as service providers	Enable democratic decision making and action by, and on behalf of communities by meeting current and future needs of communities for good-quality local infrastructure and local public services in a way that is most cost-effective for households and businesses.
	Infrastructure services	To manage the current treatment facilities and network in a cost efficient and environmentally sustainable manner.
	Finance	Proper accounting for assets and for services consumed by asset management activities and good long term treasury management.
	Customer Services	Systems which minimise and resolve complaints/enquiries about service.
	Information Services	Clarity of technical and budget requirements for systems and support.

1.2 NRSBU Outcomes

1.2.1 Mission Statement

The NRSBU mission statement is:
"To identify the long term wastewater processing and reticulation needs of our customers and to meet current and future needs in the most cost effective and sustainable manner."

1.2.2 Strategic Goals

The strategic objectives as detailed below were redefined in 2013 and take due regard to the Mission Statement and the objectives detailed in the Memorandum of Understanding between NCC and TDC.

- Wastewater reticulation, treatment and disposal services meet customers' long term needs.
- The costs of wastewater reticulation, treatment and disposal services are minimised.
- Risks associated with the services provided are identified and mitigated to a level agreed with customers.
- We engage the right people with the right skills and experience.
- NRSBU operates sustainably and endeavours to remedy or mitigate any identified adverse environmental, social or cultural impact.
- Good relationships are maintained with all stakeholders.
- All statutory obligations are met.

All strategic goals are important and no one goal will be pursued at the expense of another. The NRSBU Strategic Plan 2013/2016 is appended.

1.3 Memorandum of Understanding

The key statements for the memorandum of understanding are:

- The NRSBU is a joint committee of the two councils.
- The councils have agreed that the Nelson Regional Sewerage Business Unit is intended to be a self-funding body.
- The NRSBU shall ensure that all capital assets are appropriately depreciated to enable a fund to be established for the upgrade and replacement of capital assets. It has the sole authority to determine what capital expenditure is made from the depreciation fund.
- Required capital expenditure that exceeds the amount held in any depreciation fund (in the way of expansion or new technology which improves the efficiency of performance of the plant, or any major upgrades required because of the increase in growth and users) requires the approval of the two councils.
- The responsibility for the administration of all capital assets administered by the Nelson Regional Sewerage Authority was transferred to the new Business Unit as at 1 July 2000 and all such capital assets are owned equally by the two councils.

1.4 Significance Policy

Under the LGA 2002, every Council is required to have a Policy of Significance. A Significant Activity is one that has a high degree of significance in terms of its impact on:

- The well-being of the people and environment of the District and/or
- Persons likely to be affected by or with an interest in that activity, and/or
- The capacity of the councils to provide for the well-being of the District.

Wastewater schemes are considered by the Nelson and Tasman councils to be a significant activity.

1.5 Issues

Issues for the NRSBU are:

- Upgrading of the treatment plant: Modification of ponds to maintain and improve the quality of the effluent discharged to the Waimea Inlet.
- NCC and TDC need to continue to work on inflow and infiltration as this will significantly reduce the need for future capital expenditure.
- Compliance with resource consents.
- Review the regional pipeline upgrade strategy.
- Improved monitoring of the accumulation of sludge in the ponds.

1.6 Asset Management Planning

1.6.1 Benefits

The benefits to the NRSBU of asset management planning are:

- Improved governance and accountability
- Enhanced service management and customer satisfaction
- Improved risk management
- Improved financial efficiency
- More sustainable decisions
- Demand management planning.

1.7 Asset Management Plan Evolving

Asset management for the NRSBU will continue to evolve in a continuous cycle of review and improvements so that the quality of outputs matches the changing business and legislative needs. The AMP will act as a vehicle for the development of advanced asset management practices.

The plan provides budget forecasts for inclusion in the Long Term Plans of NCC and TDC. The Wastewater Asset Management Plan will be reviewed three yearly in advance of the LTP development cycle of the owners. Annual amendments or updates will be recorded in the annual business plan.

2.0 LEVELS OF SERVICE

The Levels of Service for the NRSBU are defined in this section, as well as the performance measures by which the service levels will be assessed. The service levels are aimed at meeting the NRSBU strategic objectives.

2.1 Introduction

The Levels of Service determine the amount of funding that is required to maintain, renew and upgrade the wastewater infrastructure in order to provide the contributors with specified Levels of Service. Changes to the Levels of Service may drastically change funding requirements.

Levels of service for the NRSBU wastewater infrastructure are specified for the following:

- Environmental Impacts - Treatment & Disposal Facilities, Pump Stations and pipelines (Section 2.3).
- Capacity - Treatment & Disposal Facilities and Pump Stations (Section 2.4).
- Reliability - Treatment & Disposal Facilities, Pump Stations and Pipelines (Section 2.5).
- Responsiveness - Treatment & Disposal Facilities, Pump Stations and Pipelines (Section 2.6).
- Key Contributor Relationships - Treatment & Disposal Facilities, Pump Stations and Pipelines (Section 2.7).

2.2 Levels of Service Summary and Achievement

A summary of the Levels of Service and the achievements for the three year period of 2013/14 to 2016/17 is detailed below:

Table 2.1: Levels of Service Summary and Achievement

Level of Service	Function	Category	Technical Level of Service	LoS Compliance		
				14/15	15/16	16/17
Environmental Impacts	Treatment & Disposal	RMA Consent - Wastewater Discharge to Coastal Marine Area	100% compliance with consent conditions	Yes	Yes	Yes
		RMA Consent – Discharge of Contaminants to Air	100% compliance with consent conditions	Yes	Yes	Yes
		RMA Consent - Discharge of Contaminants to Land	100% compliance with consent conditions	Yes	Yes	Yes
		Equipment Failure of critical components within the treatment and disposal system	No equipment failures that impact on compliance with resource consent conditions	Yes	Yes	Yes
	Pump Stations (including septage facility)	Odour complaints from pump stations	No odour complaints originating from pump stations	Yes	Yes	Yes
		Pump station wet weather overflows	No overflow events occurring for the contracted contributor flows	Yes	No 1 event	Yes
		Pump station overflows resulting from power failure	No overflow events occurring	Yes	Yes	Yes
		Pump station overflows resulting from mechanical failure	No overflow events occurring	No 3 events	No 1 event	Yes
	Pipelines	Reticulation Breaks	No reticulation breaks	Yes	Yes	No 1 event
		Air valve malfunctions	No air valve malfunction that result in wastewater overflows	Yes	Yes	Yes
Capacity	Treatment & Disposal	Overloading system capacity	Treatment and disposal up to all contracted loads and flow	Yes	Yes	Yes
	Pump Stations	Overloading system capacity	No overflows for pump stations for contracted flows	Yes	Yes	Yes
Reliability	Treatment & Disposal, Pump Stations Pipelines	Equipment failure of critical components	No equipment failures that could lead to non-compliance with resource consent conditions	Yes	Yes	Yes
Responsiveness	Treatment & Disposal Pump Stations Pipelines	Speed of response for emergency and urgent maintenance works	Achievement of Response times specified in Maintenance Contract	Yes	Yes	Yes
		Speed of response for routine and programmable maintenance works	Achievement of Response times specified in Maintenance Contract	Yes	Yes	Yes
Key Contributor Relationships	Treatment & Disposal, Pump Stations Pipelines	Overall satisfaction	Agreed levels of service provided to all Contributors.	Yes	Yes	Yes
			Robust charging structure is put in place	Yes	Yes	Yes
			Contributors are Satisfied with Sewerage Scheme	Yes	Yes	Yes

Over the three year period of 2014/15 to 2016/17 the Level of Service compliance has been very good.

2.3 Customer Research and Expectations

2.3.1 Background

The Levels of Service are determined by the Agreement for Disposal of Trade Waste along with the resource consents for discharge of contaminants. The levels of resident satisfaction of the performance of the NRSBU can be determined by reviewing Nelson and Tasman resident feedback in their respective resident surveys.

2.3.2 Survey of NRSBU Contributors

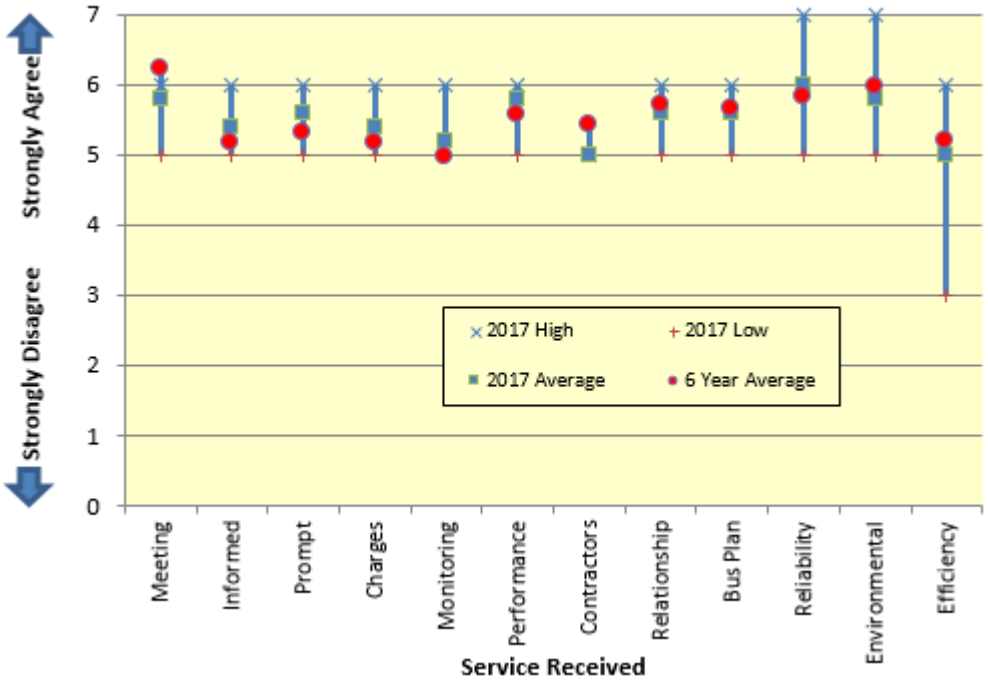
The annual customer satisfaction survey is based on a methodology developed in 2008 and is presented in Table 2.2 below. Presently there are five contributors and one survey form is sent to each organisation.

Table 2.2: Survey Requirements

Survey Requirements	
Meeting	User meetings are a useful forum for the exchange of information between users and staff and for resolving issues.
Informed	Users are kept well informed of issues relating to the Regional Sewerage Scheme, which may affect them.
Prompt	Feedback to users is prompt and timely.
Charges	Data and information on user charges is accurate and provided in a timely fashion.
Monitoring	Data and information on monitoring is accurate and provided in a timely fashion.
Performance	Users are provided with timely and accurate advice on reticulation and treatment plant performances.
Contractors	On-site services, advice and follow up provided by the contractors are excellent.
Relationship	The NRSBU has an excellent working relationship with user representatives.
Business Plan	The NRSBU business plan provides clear direction for the operation of the scheme and is relevant.
Reliability	The NRSBU provides a reliable system to ensure continuity of service to its customers.
Environmental	The NRSBU's record of environmental compliance is good.
Efficiency	The NRSBU runs a cost effective and efficient operation.

Figure 2.1 on the following page compares the survey results for 2008 to 2017.

Figure 2.1: Customer Survey Results 2008 to 2017



The 2017 customer survey results indicate that:

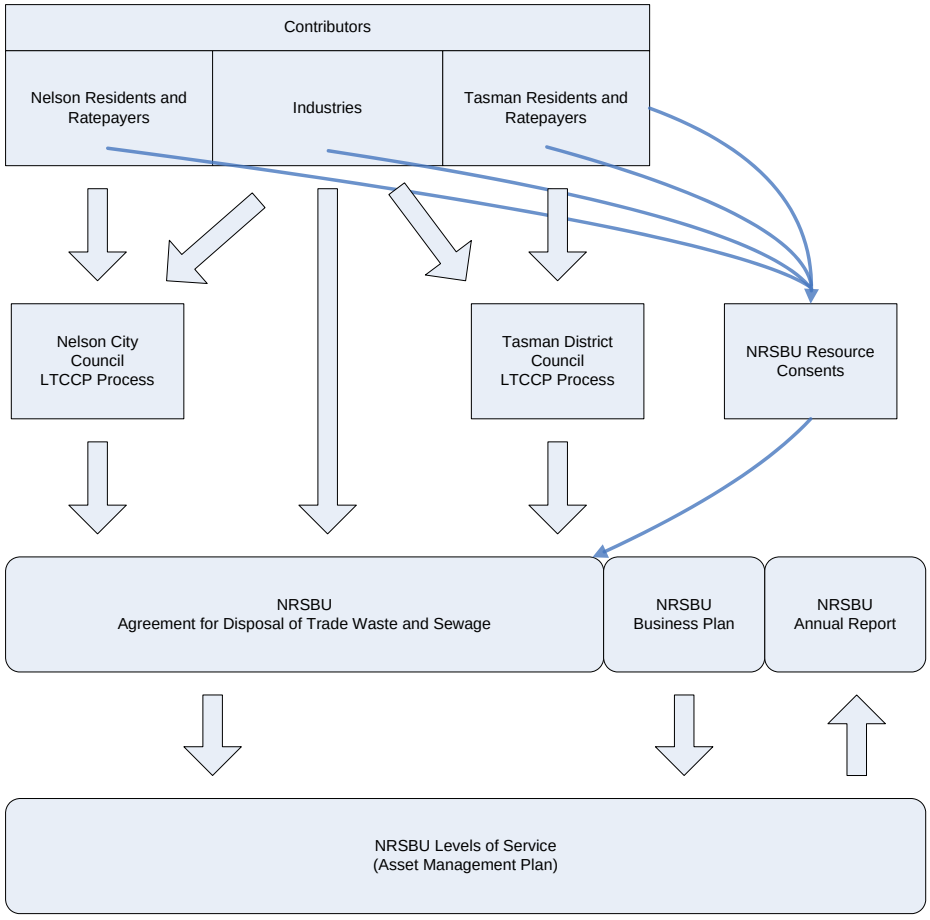
- The groupings for the majority of the individual survey questions were very close (survey using 1 to 7)
- The results indicate a general satisfaction with the service provided by the NRSBU
- An average result greater than five has been achieved.

2.3.3 Consultation

The wider community has contributed to the Levels of Service adopted through the Nelson City and Tasman District Long Term Council Community Plans (Local Government Act consultation process) as well as the resource consent applications for the NRSBU (Resource Management Act consultation process).

The lines of community and contributor input are described in Figure 2.2 on the following page.

Figure 2.2: Community Consultation



Levels of Service for wastewater have been developed by Nelson City Council and Tasman District Council through their Long Term Council Community Plans. These are summarised and compared with the NRSBU Levels of Service in Table 2.3.

Table 2.3: Service Criteria and Levels of Service

NRSBU	NRSBU – Contributors Agreement	NRSBU – Business Plan Function	NRSBU – Business Plan Level of Service	NCC	TDC
Environmental (Treatment & Disposal)		RMA Consent - Wastewater Discharge to Coastal Marine Area.	Compliance with consent conditions.	Environmental protection.	Our wastewater systems do not adversely affect the receiving environment.
		RMA Consent – Discharge of Contaminants to Air.	Compliance with consent conditions.		
		RMA Consent - Discharge of Contaminants to Land.	Compliance with consent conditions.		
		Equipment failure of critical components within the treatment and disposal system.	No equipment failures that impact on compliance with resource consent conditions.		
(Pump Stations)		Odour complaints from pump stations.	The NRSBU wastewater systems reliably receive wastewater from contributors with a minimum of odours, overflows or disturbances to the public.	Appropriate response to reported network issues.	Our wastewater systems reliably take our wastewater with a minimum of odours, overflows or disturbance to the public.
		Pump station overflows resulting from power failure.	No overflow events occur during dry weather conditions and wet weather overflows are minimised.		
		Pump station overflows resulting from mechanical failure.	No overflow events occur during dry weather conditions. All pump stations have at least one storm pump operational at all times.		
(Pipelines)		Reticulation Breaks.	The NRSBU wastewater systems reliably receive wastewater from contributors and breakages are minimised.		
		Air valve malfunctions.	No air valve malfunction that results in wastewater overflows.		

Capacity (Treatment & Disposal)	Receives waste (characteristics within specified limits). Monitoring to confirm limits are not exceeded.	Overloading system capacity.	Treatment and disposal up to all contracted loads and flows.	Environmental protection.	Our wastewater activities are managed at a level that satisfies the community.
Pump stations		Overloading system capacity.	No dry weather overflows for all pump stations.		
Reliability (Treatment, Disposal, Pump Stations & pipelines	Prudently manage the system.	Equipment failure of critical components within the treatment and disposal system.	No equipment failures that impact on compliance with resource consent conditions.	Environmental protection.	Our wastewater systems reliably take our wastewater with a minimum of odours, overflows or disturbance to the public.
Responsiveness	Establish and maintain an Emergency Management Plan.	Speed of response for emergency and urgent maintenance works.	Compliance with times specified in the maintenance contract.	Appropriate response to reported network issues.	Our systems are built, operated and maintained so that failures can be managed and responded to quickly.
		Speed of response for routine and programmable maintenance works.	Compliance with times specified in the maintenance contract.		
Key Contributor Relationships/Customer Satisfaction	Keep the users informed of resource consent variations or associated procedures and processes.	Customer. Key contributor relationships.	Agreed levels of service provided to all contributors. Robust charging structure is in place. Contributors are satisfied with sewerage scheme.	Appropriate response to reported network issues.	Our wastewater activities are managed at a level that satisfies the community (Results from residents' survey).

From this comparison, it can be concluded that it is reasonable for the level of service for the NRSBU wastewater infrastructure to be specified as follows:

- Responsive to customer needs
- Cost effective services
- Risk mitigated to a level agreed with customers
- Mitigate all identified adverse environmental effects
- Maintain good relationships with all stakeholders
- Meet all statutory obligations.

2.4 Statutory Obligations and Non-Statutory Standards

2.4.1 Statutory Obligations

The NRSBU has the responsibility to comply with the following legislative requirements:

- The Local Government Act 2002 sets out the requirements of a long-term community plan that is to include the intended levels of service and how the maintenance, renewal and replacement of assets will be met to maintain the levels of service.
- The Resource Management Act 1991 prohibits the discharge of contaminants into water, air and land unless expressly allowed by a rule, consent or regulation.

2.4.2 Non-Statutory Standards

The NRSBU has the responsibility to comply with the following requirements:

Table 2.4: Non-Statutory Standards

Requirement	Nelson City Council Reference	Tasman District Council Reference
Regional Policy Statements	Nelson City Council Regional Policy Statement.	Tasman District Council Regional Policy Statement.
Resource Management Plans	Nelson City Council Resource Management Plan 2004.	Tasman District Council Resource Management Plan 1996.
Engineering Standards	Nelson City Council Land Development Manual 2010.	Tasman District Council Engineering Standards.
Resource Consents (Refer to Table 5.5 of comprehensive list)		Tasman District Council Wastewater Discharge to Coastal Marine Area (NN00539).
		Tasman District Council Discharge of Contaminants to Air (NN000541).
		Tasman District Council Discharge of Contaminants to Land (NN940379).

The following commitments have been made in the **Regional Policy Statements** relating to the provision of sewerage facilities:

NCC Policy DH1.3.4: To ensure that any proposals for urban subdivision or development include adequate and appropriate provision of services including waste disposal.
TDC Section 5.4, Policy 5.1 (ii): The Council will develop service provision plans and will provide for private contributions to services in the District Plan, to

manage the rate and location extent of utility services including roads, water supply, sewerage and stormwater extensions.

The **Nelson Resource Management Plan** (NRMP) and **Tasman Resource Management Plan** (TRMP) impose restrictions on the maximum quantities of trade waste that may be discharged from industrial zoned land.

The **NCC Wastewater Bylaw** (No. 224) **2014** and **TDC Wastewater Bylaw 2015** require that a consent be obtained before trade waste may be discharged to the sewer system. Control may be exercised over quality and quantity.

NCC has made the following commitments in the **NCC Regional Policy Statement** relating to sewage disposal:

- Policy WA1.3.3: To control point discharges through the use of resource consents and appropriate conditions in order to ensure that water quality classifications are met and sustained.
- Method WA1.4.19: Council will require that resource consent applications to discharge any sewage to water include:
    - Consultation with Tangata Whenua and the wider community and
    - Adequate consideration of land disposal alternatives in accordance with the 4th Schedule of the Act.
- Policy SO1.3.3: the disposal of industrial, agricultural, domestic and other contaminants onto, or into, soil is carried out in such a way as to where possible avoid and otherwise to minimise contamination of soil and adverse effects on adjoining properties.

TDC has made the following commitments in the **TDC Regional Policy Statement** relating to sewage disposal:

- Issue 10.1: Industrial, Agricultural or Urban Effluent Discharges to Water and Air:
- There is a need to advocate appropriate waste minimisation and treatment processes, and cleaner process or treatment technologies. There is also a need to regulate discharges to avoid, remedy or mitigate adverse contaminant effects.
- Issue 10.2: Agricultural, Forestry and Other Industrial Discharges to Land

As with the discharge of contaminants into water or air, there is a need to advocate appropriate waste minimisation and treatment assessment including the reuse or recycling of bulk organic wastes, use of effluent treatment systems and cleaner process or treatment technology.

The NRMP and TRMP set quality standards for the coastal waters. The Nelson Fresh Water Management Plan forms part of the Nelson Resource Management Plan.

The Nelson City Council Land Development Manual 2010 provides the basis for design and construction of all Nelson City's roads, drains water supply and reserve areas.

2.5 Environmental Impacts

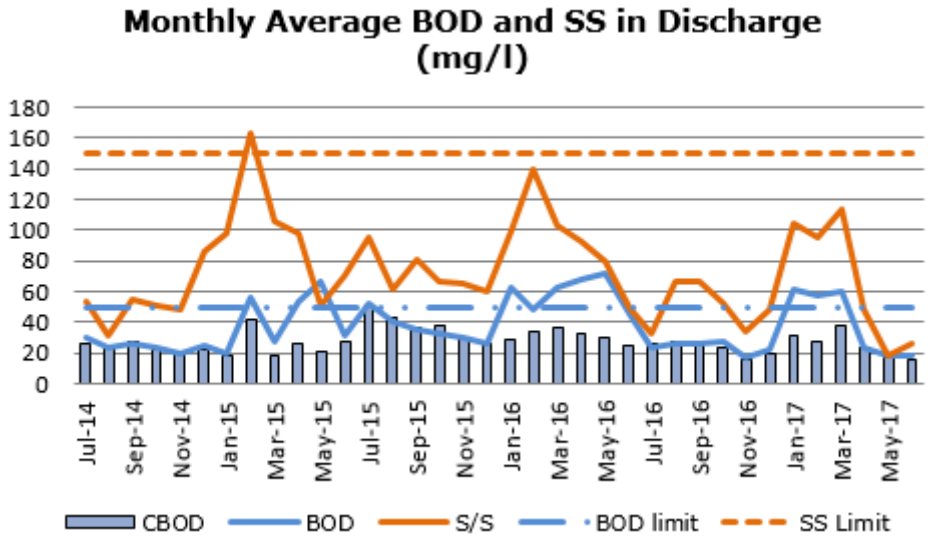
2.5.1 Background

Compliance with resource consents is a key deliverable for the NRSBU.

Wastewater Discharge to Coastal Marine Area

Compliance with coastal permit conditions over the past three years has been good in terms of all the attributes other than Total Biochemical Oxygen Demand (TBOD).

Figure 2.3: Biochemical Oxygen Demand and Suspended Solids

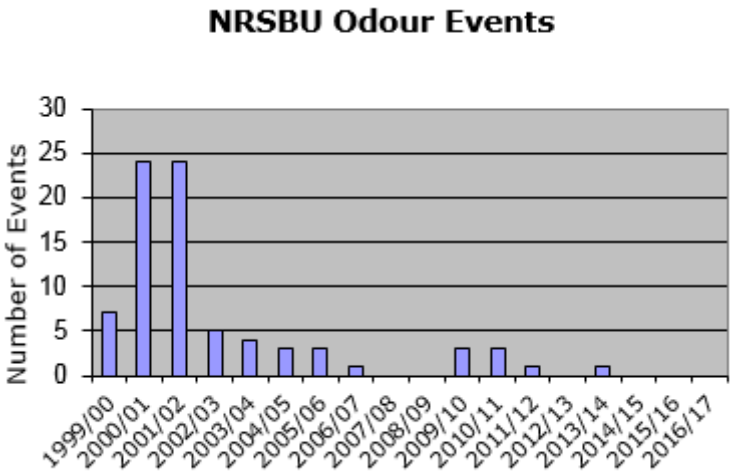


Issues with TBOD concentration in the effluent discharged from Bell Island developed following the commissioning of the treatment plant upgrade in 2010. Investigations into the increase in TBOD demonstrated that the increase is associated with an intermittent increase in nitrifying organisms in samples taken to monitor the quality of the effluent discharged from Bell Island. While the cause of this phenomenon has not been established it is thought to be associated with extended aeration of effluent in the activated sludge area.

Discharge of Contaminants to Air

The discharge to air consent was granted in 2003 and the NRSBU had two years to bring the treatment plant up to standard and comply with all conditions of this consent. The plant is now fully compliant with the consent conditions with no odour events recorded at the treatment plant since 2010.

Odour complaints investigated were mainly associated with biosolids activities.



Over the last 17 years there has been a significant reduction in odour events. This can be directly attributed to improved treatment and operations.

Discharge of Contaminants to Land

Compliance with biosolids consent conditions has been good, except for the levels of nickel in the soil for some stands of forestry, which exceeded the allowable levels before application commenced. This was only discovered in the first round of soil sampling, three years after the commencement of the consent. The high concentrations of Nickel in the soil on Rabbit Island was found to be natural rather than an effect of the application of biosolids.

Outlier results have been recorded for a number of the heavy metals tested for but there does not appear to be any trend confirming deterioration of the soil profile.

2.5.2 Levels of Service for Environmental Impact

The Current Levels of Service are described in Table 2.5 below.

Table 2.5: Current Levels of Service for Environmental Impacts

Level of Service	Function	Category	Technical Level of Service
Environmental Impacts	Treatment & Disposal	RMA Consent - Wastewater Discharge to Coastal Marine Area.	100% compliance with consent conditions.
		RMA Consent – Discharge of Contaminants to Air.	100% compliance with consent conditions.
		RMA Consent - Discharge of Contaminants to Land.	100% compliance with consent conditions.
		Equipment failure of critical components within the treatment and disposal system.	No equipment failures that impact on compliance with resource consent conditions.
	Pump Stations	Odour complaints from pump stations.	No odour complaints originating from pump stations.
		Pump station wet weather overflows.	No overflow events occurring for the contracted contributor flows.
		Pump station overflows resulting from power failure.	No overflow events occurring.

Level of Service	Function	Category	Technical Level of Service
		Pump station overflows resulting from mechanical failure.	No overflow events occurring.
	Pipelines	Reticulation Breaks.	No reticulation breaks.
		Air valve malfunctions.	No air valve malfunction that result in wastewater overflows.

2.5.3 Performance Measurement and Monitoring

Current performance measurement is undertaken in terms of:

- Effects outside the directly affected area (i.e. mixing zone)
- Effluent discharge standard
- Volume and timing of effluent discharge
- Quality of discharge.

Measurement and sampling is undertaken as required by the resource consents and to provide data to support compliance with the resource consents.

2.5.4 Action Plan

- Continue to monitor and record according to consent conditions
- Continue to analyse monitoring data to identify trends and possible areas of improvement.

2.6 Capacity

2.6.1 Background

Volume Overloading of the Treatment and Disposal Components

This service criterion is looking at the capacity of the treatment and disposal system. The capacity of the treatment and disposal process can be broken down into the following components:

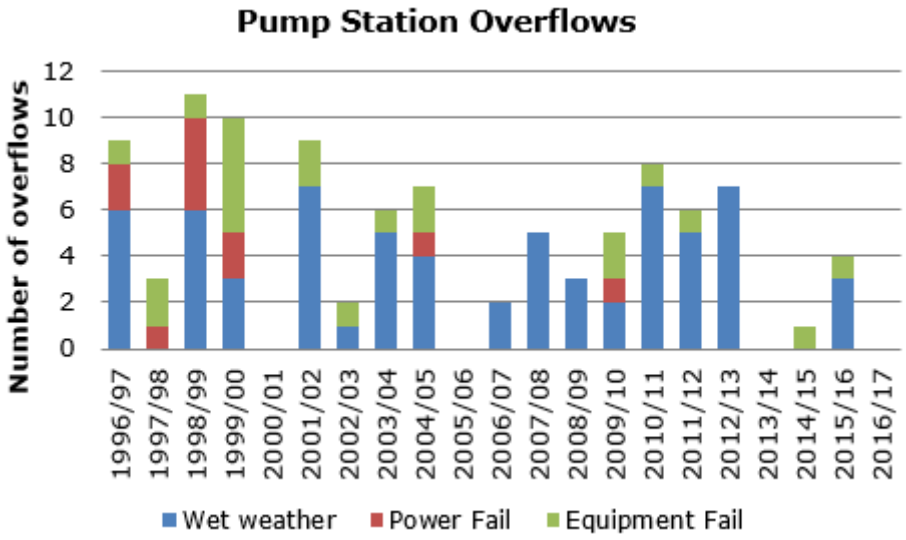
- Reticulation
- Inlet Screen
- Primary clarifier
- Aeration Basin
- Clarifier
- Sludge treatment - ATAD
- Ponds
- Biosolids Application
- Outfall

At present the treatment plant accepts all wastewater discharges from the contributors within the limits of the contributor agreements, and charges the contributors according to volumes and compositions of discharges. The above nine areas make up the contributor's individual agreements.

Pump Station Overflows

Each pump station is fitted with alarms to indicate overflows, pump failures and power outages.

Figure 2.4: Pump Station over flows



A summary of pump station overflows due to wet weather, power failure and equipment failure is shown in Figure 2.4. The three wet weather overflows recorded for 2015/16 occurred during a single rain event.

Overflows Due to Wet Weather

As the regional scheme boundary is at the contributor discharge point to the NRSBU network wet weather overflows result from inflow and infiltration within the contributor system.

The NRSBU will provide wet weather storage only for what the contributor is prepared to pay for and is agreed within their contributor contracts. Any flows above those in the agreements become the responsibility of the contributors.

Overflows Due to Power Failure

The NRSBU regional pump stations have limited emergency storage capacity.

Even though the electricity supply to pump stations is considered reliable, all four major pump stations are equipped with standby generators sized for duty operation.

The Operation and Maintenance contractor is required to deploy a portable generator at the Wakatu pump station within two hours of a power failure affecting this pump station, to back up the emergency storage facility at this pump station.

Overflows Due to Equipment Failure

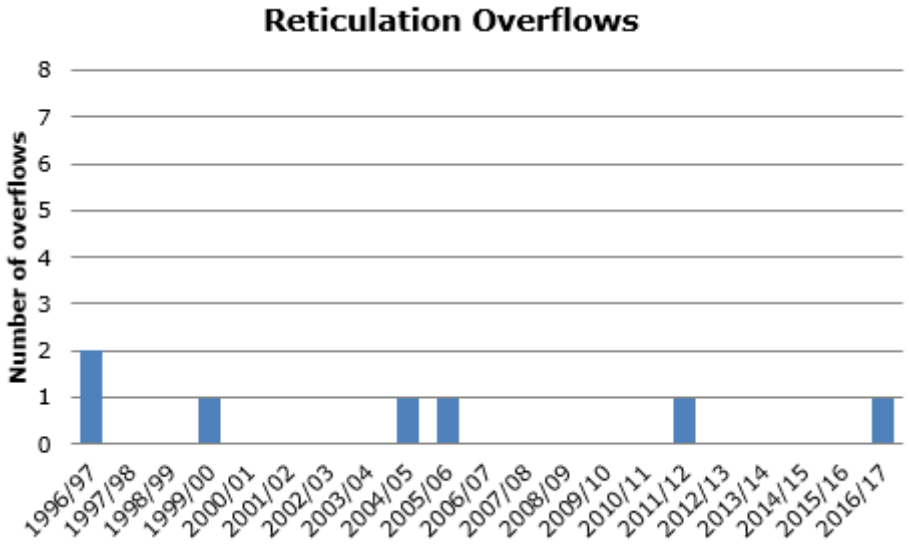
Overflows caused by equipment failure occurred on a regular basis (one to two per year) until 2005/06. Resolution of these equipment failures included:

- Installation of new duty pumps in 2003 and 2004
- The rationalisation of alarm systems (SCADA) for the NRSBU and NCC in 2005
- Electrical and mechanical upgrades of the Beach Road, Saxton Road and Airport pump stations in 2012.

Reticulation Overflows

Three overflows occurred on rising mains since the asbestos cement pipelines were replaced with PE pipes.

Figure 2.5: Reticulation overflows



The 2004/05 overflow was caused by misalignment of the new pipe when it was connected at the completion of a project. The 2005/06 failure was caused by corrosion of bolts holding an air valve. This failure highlighted a deficiency in the maintenance regime operated by the maintenance contractor. Changes in the maintenance process and inspections have been instigated to reduce the risk of this type of failure occurring in future.

A leak was located and fixed in 2012. The leak was located on a joint between two concrete sections of the 600mm rising main.

In July 2016 a leak was located and fixed on the concrete lined ductile iron biosolid transfer pipeline. An investigation into this event showed that the leak resulted from a construction defect at that the remainder of the pipe is in good condition.

2.6.2 Level of Service for Capacity

The Current Levels of Service is described in Table 2.6 below.

Table 2.6: Capacity Current Performance Measurement

Level of Service	Function	Category	Technical Level of Service

Level of Service	Function	Category	Technical Level of Service
Capacity	Treatment & Disposal	Overloading system capacity.	Treatment and disposal up to all contracted loads and flows.
	Pump Stations	Volume overloading system.	No overflow events occurring for the agreed contributor flows.

2.6.3 Performance Measurement and Monitoring

No capacity issues have been identified following the most recent upgrade works. Mass balances are carried out on the rising mains and all treatment plant components. Flows and load trends are tracked through a combination of continuous and programmed monitoring of effluent and component characteristics that will demonstrate anomalies. All anomalies are investigated and dealt with as set out in the maintenance contract. The testing carried out is listed below:

- Contributor monitoring for adherence to agreed limits
- Resource consent recording and monitoring
- Annual review of actual flows and load against design flows/loads
- Weekly flow balance.

There are capacity constraints upstream of all NRSBU pump stations. However, these are associated with contributor assets. (I.e. Tasman District Council has installed a control valve on the Richmond gravity sewer that limits flows into the Beach Road pump station to the contracted flow rate)

2.6.4 Action Plan

Encourage councils to:

- Reduce stormwater infiltration and inflow, and/or provide storage for flows in excess of agreed capacity before significant upgrade of pipes and storage is provided by the NRSBU.
- Continue the development and use of network modelling to optimise the wastewater network
- Operational review processes and controls of assets where issues are observed, followed by amendments to operation and procedure documents through the operation and maintenance contract.

2.7 Reliability

2.7.1 Background

It is recognised that there will be some equipment failure that will affect the treatment process as all components cannot be 100% reliable or have full duplication of all equipment processes.

The aim is to have no critical component of the plant out of action that will impact on the compliance with the resource consents.

2.7.2 Level of Service for Reliability

The Current Levels of Service are described in Table 2.7:

Table 2.7: Level of Service for Reliability

Level of Service	Function	Category	Technical Level of Service
Reliability	Treatment & Disposal Pump Stations Pipelines	Equipment failure of critical components.	No equipment failures that could lead to non-compliance with resource consent conditions.

2.7.3 Performance Measurement and Monitoring

Performance measurement and monitoring will include recording and reporting the number of breakages and malfunctions in monthly reports by the maintenance contractor and use of the Asset Management System to record equipment or asset failure.

2.8 Responsiveness

2.8.1 Background

Responsiveness is a measure of the speed of response for carrying out routine and emergency maintenance work on the system. The NRSBU operation and maintenance contract requires that the contractor responds to calls within specified times depending on the response classification as shown in Table 2.8 below.

Response times for emergency works apply 24 hours per day, every day of the year. Response times for non-urgent works are working days (Monday to Friday) excluding public holidays, during normal working hours. The contractor must respond to, and satisfactorily resolve, responsive maintenance and urgent works within the maximum response times.

Table 2.9 and Table 2.10 below describe the urgent and non-urgent maximum response times, and the response priority classifications.

Table 2.8: System Failure Response Times

Description	Investigation & Appraisal	Complete Repair
Investigations, inspections and reticulation monitoring	By arrangement	N/A
Minor leaks from fittings and connections	2 hours	By agreement
Flow meters	1 working day	By agreement
Other non-urgent works	N/A	By agreement
Burst pipes or major leakages	30 minutes	As soon as practicable
Pump station failure	30 minutes	As soon as practicable
Major sewage overflow that could endanger life or property or have an adverse effect on the environment	30 minutes	As soon as practicable
Other emergency works	30 minutes	As soon as practicable.

Table 2.9: Response Priority Classification

Priority	Description	Definition of Typical Circumstances
1	Emergency	Failure to contain wastewater within the NRSS resulting in risk of flooding to any building, or Risk of loss or damage to assets of Principal or third parties, or Risk of injury to public or employees
2	Urgent	Failure to contain wastewater within the NRSS, or Risk of environmental damage, or Risk of adverse publicity
3	Routine	Malfunction of NRSS which is not sufficiently serious to meet above criteria
4	Programmable	Report, complaint or enquiry which does not reveal any malfunction of NRSS.

Table 2.10: NRSS Response Times

Priority	Description	Attend site	Commence Resolution Works as Required	Complete Resolution
1	Emergency	0.5 hours	0.5 hours	As soon as practicable
2	Urgent	0.5 hours	2 hours*	1 day*
3	Routine	1 day	1 month	1 month
4	Programmable	1 day	By agreement	By agreement

* Or as directed by the NRSBU representative

2.8.2 Level of Service for Responsiveness

The current Levels of Service are described in Table 2.11 as follows.

Table 2.11: Level of Service for Responsiveness

Level of Service	Function	Category	Technical Level of Service
Reliability	Treatment & Disposal, Pump Stations, Pipelines	Speed of response for emergency and urgent maintenance works.	Achievement of response times specified in operation and maintenance contract.
		Speed of response for routine and programmable maintenance works.	Achievement of response times specified in operation and maintenance contract.

2.8.3 Performance Measurement and Monitoring

The approach to performance measurement and monitoring is based around measurement and reporting of the speed of response and issue resolution. This information is collected and managed through the operation and maintenance contract.

2.9 Key Contributor Relationships

2.9.1 Statutory Obligations

Legislation is established by Central Government and must be complied with at Local Government level. The NRSBU must comply with any relevant legislation enacted by Parliament. Commentary related to some of the key legislation is provided below.

Table 2.12: Legislation and Regulation Affecting NRSBU

Legislation & Regulation
Building Act 2004 (and amendments)
Civil Defence Emergency Management Act 2002
Climate Change (Emissions Trading and Renewable Preference) Act 2008
Climate Change Response Act 2002 (and amendments)
Energy Efficiency and Conservation Act 2000
Environmental Protection Authority Act 2011
Epidemic Preparedness Amendment Act 2010
Health Act 1956
Health and Safety at Work Act 2015
Historic Places Act 1993 (and amendments)
Infrastructure (Amendments Relating to Utilities Access) Act 2010
Local Government Act 2002 (and amendments)
Local Government Act 1974 (and amendments)
Local Government Rating Act 2002 (and amendments)
Ngai Tahu Claims Settlement Act 1998
Public Works Act 1981 (and amendments)
Resource Management Act 1991 (and amendments)
Utilities Access Act 2010

2.9.2 Major Legislation Details

More detail about the legislation that has or will have the most effect on the NRSBU is outlined below.

Civil Defence Emergency Management Act 2002 (CDEM)

The expectations under the CDEM is that Council's services will function at the fullest possible extent during and after an emergency, even though this may be at a reduced level. In addition, Council has established planning and operational relationships with regional CDEM groups to deliver emergency management within our boundaries.

Wastewater is regarded as an essential service and is given special consideration within Council emergency management procedures. Every effort will be given to restore services immediately after an event to at least provide adequate water for sanitation and health, albeit supply quantity may be limited.

Health Act 1956

The Health Act 1956 places an obligation on councils to improve, promote and protect public health within the District. The provision of wastewater services conserves public health and helps to protect land and waterways from contamination.

The Health Act requires councils to from time to time provide the Medical Officer of Health with such reports as may be required regarding diseases, drinking water and sanitary conditions within its district.

Local Government Act 2002

The Local Government Act 2002 sets out the requirements of a Long Term Plan that is to include the intended Levels of Service and how the maintenance, renewal and replacement of assets will be met to maintain the Levels of Service.

Resource Management Act 1991

The Resource Management Act 1991 prohibits the discharge of contaminants into water, air and land unless expressly allowed by a rule, consent or regulation.

2.9.3 Non-Statutory Standards

Maintaining good relationships with key contributors as well as other stakeholders is essential in the achievement of the Regional Policy Statements and compliance with resource consents.

2.9.4 Background

The NRSBU has five contributors. The NRSBU is committed to good working relationships with all contributors to enhance and optimise the overall performance of the regional sewerage facilities.

2.9.5 Level of Service for Key Contributor Relationships

The recommended Levels of Service are as listed in Annual Business Plans:

- Agreed levels of service are provided to all contributors;
- A robust charging structure is in place;
- Contributors are satisfied with the management and operation of the sewerage scheme.

2.9.6 Performance Measurement and Monitoring

The approach to performance measurement and monitoring includes measuring and reporting on feedback from the contributors during user group meetings, the contributor survey and other communication with the contributors.

3.0 FUTURE DEMAND AND DEMAND MANAGEMENT

This section provides details of growth forecasts, which affect the management, and utilisation of the NRSBU assets. It also outlines the demand management strategies.

3.1 Existing Situation

3.1.1 Background

The Bell Island Wastewater Treatment Plant (STP) has sufficient flexibility and capacity to process existing average and peak flows, and loads being delivered to the plant with the existing sewerage and pumping system.

Operational experience over the period following the wastewater treatment plant upgrade in 2009, the installation of the outfall discharge pump in 2011 and the network capacity upgrade work in 2012 has demonstrated that the plant has adequate capacity to treat wastewater received, and separated primary sludge received from Nelson North, with considerable ease. The outcomes of process changes necessitated by re-active and programmed maintenance work carried out since these upgrades have demonstrated there are significant opportunities to optimise the Bell Island operations. It has been demonstrated that improved integration of the primary treatment processes, activated sludge processes and ponds has the potential to provide significant improvements in the treatment quality and cost of treatment.

Currently the sizing of the STP is controlled by quota based charging of its five major contributors:

- Nelson City Council;
- Tasman District Council;
- Turners and Growers Ltd;
- Alliance Nelson;
- Nelson Pine Industries.

Quota based charging caps the quantity and quality of discharges and allows the NRSBU to control the timing of asset upgrades. Should a particular contributor wish to increase its quota with significant downstream effects then they would be responsible for the costs of upgrading downstream assets. Contracts exist for all contributors.

3.1.2 Current Non-Asset Solutions

The use of non-asset or alternative solutions to meet future needs or capacity upgrades by NRSBU requires willingness and cooperation from the five contributors. The RMA process for resource consents requires a sustainable approach to wastewater management and forms part of contractual agreements. The expectation for NRSBU to manage all waste is tempered by cost, contractual agreements and discussions at contributor group meetings.

NCC and TDC non-asset strategies regarding inflow and infiltration solutions are further discussed in Section 3.2.2.

3.2 Future Demand

Table 3.1 below details the estimated treatment plant capacity.

Table 3.1: Overall Bell Island WWTP Capacity

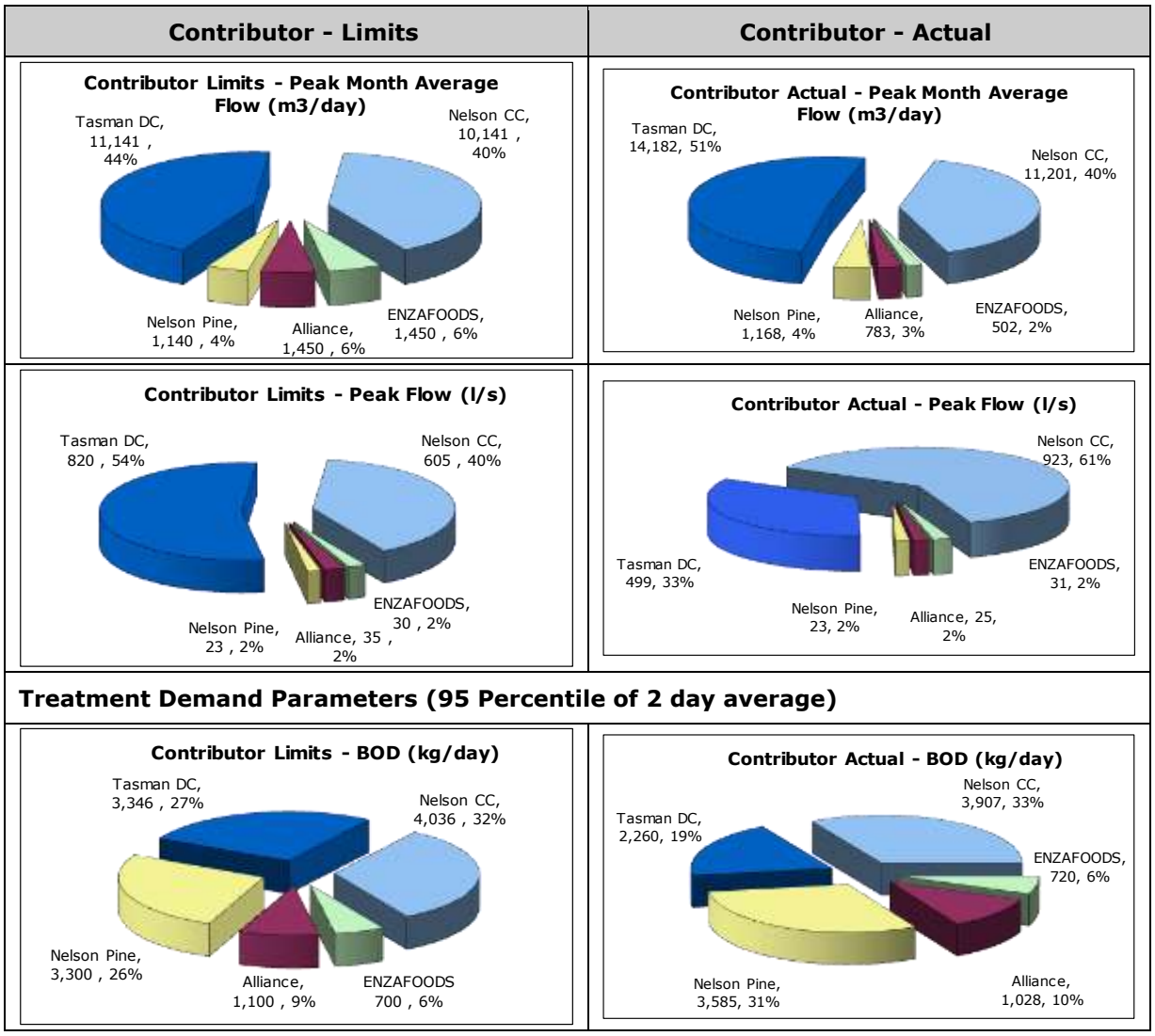
Capacity	Average flow m^3/day	Peak flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Estimated Capacity	25,920	1,508	12,226	28,000	11,000	750	230
Median	13,282		6,441	15,599	6,074		
95 percentile	27,161		10,364	25,771	12,787		
80 percentile	20,039		8,151	18,819	8,937		

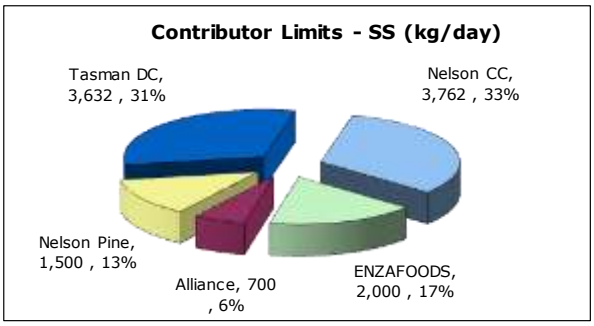
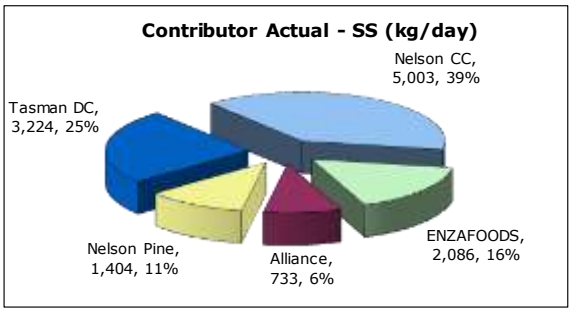
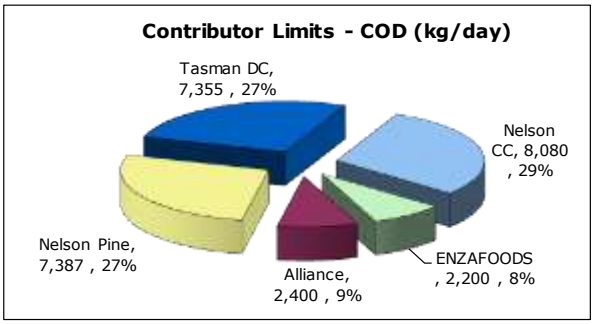
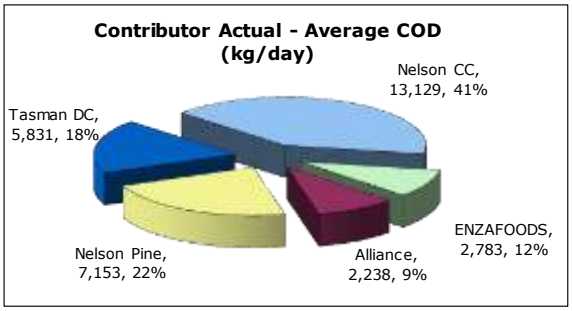
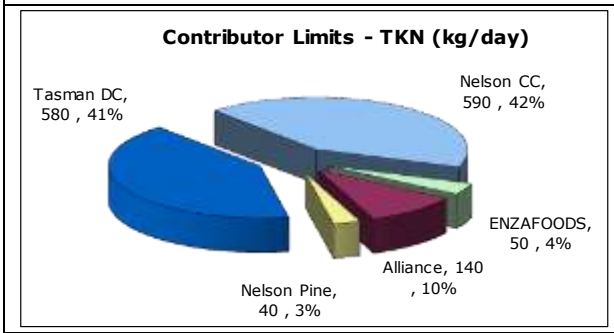
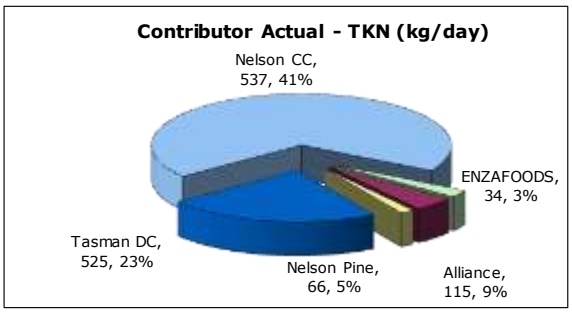
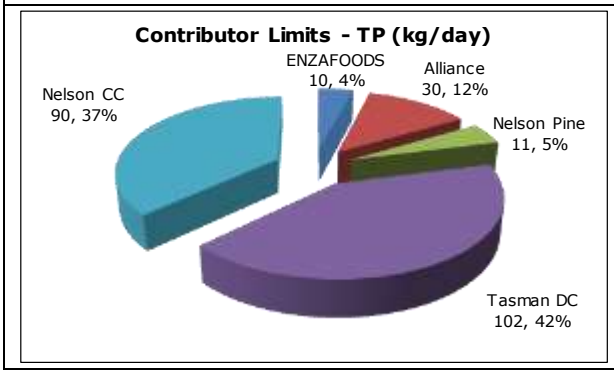
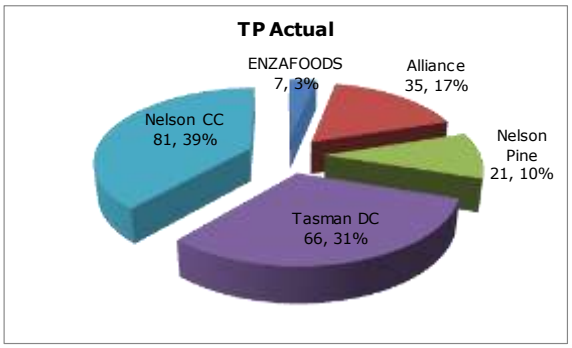
3.2.1 Contributor Demand

Contributors are charged on the limits that they contract with the NRSBU for and discharges based on average daily flow, peak flow, Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Suspended Solids (SS), Total Kjeldahl Nitrogen (TKN) and Total Phosphorous (TP). As can be seen in Figure 3.1 there is some disparity between contributor quotas and actual loads.

The small disparity between the limits and the actual is a function of the customer contract and the risk that customers are prepared to take. In accordance with the customer agreements, customers must annually advise NRSBU of their limits.

Figure 3.1: Indicative Reticulation Demand Parameters



Contributor - Limits	Contributor - Actual
	
	
	
	

Demand therefore requires careful management to achieve consent compliance, cost efficiency and meet contributor expectations.

3.2.2 Inflow and Infiltration (I/I)

The local authority demands are the most influential on the overall system. Both local authorities accept domestic, commercial and industrial wastewater. They control commercial and industry discharges through their respective trade waste agreements and domestic waste by imposed standards.

Monitoring of flows during rain events has shown peak flows from both local authorities exceeding agreed peak discharge levels. As a result, overflows due to wet weather have occurred as identified in Section 2.6.1.

The ingress of stormwater into the sewer system through direct inflow and infiltration, known as I/I, requires proactive intervention to control. It is extremely hard to control and has significant operational impacts, as well as impacts on consent compliance and major negative effects on NCC and TDC customers (ratepayers). While the NRSBU can constrain flows at the point of discharge from its contributors as per individual agreement this is neither constructive nor helpful.

Controlling I/I is a long term commitment and reductions that would reduce wet weather flows are likely to be gradual. There is a need to control I/I, as ingress of stormwater can exceed system capacity very quickly and the "do nothing" option is not appropriate. Commitment to I/I reduction can be inferred through financial commitment reflected in:

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

The current I/I reduction strategies for Nelson City and Tasman District are indicated below.

Table 3.2: NCC & TDC I/I Reduction Strategies Status

Reduction Strategies	Nelson City Council	Tasman District Council
Inflow/Infiltration Programme	Staged investigations, implementing staged work plan with supporting budget.	Focus is now moving towards reducing high wet weather flows by renewing reticulation mains.
I/I Monitoring Programme	Investigations started with supporting budget.	Investigations and inspections initiated.
Modelling of wastewater system	Used to ascertain areas of high infiltration.	Modelling of network.
Stormwater Upgrades	Staged investigations, implementing staged work plan with supporting budget.	Staged investigations, implementing staged work plan with supporting budget.
Sewer Renewals (on Target)		
Demand management		Require engineering solutions in new developments that will provide on-site storage capacity. Pressurised sewage systems in new developments.
Trade Waste Bylaw	Yes.	Yes.

The NRSBU strategy will be to provide information on the effects of the stormwater infiltration on the cost of wastewater treatment to the owners.

3.3 Growth Demand Forecast

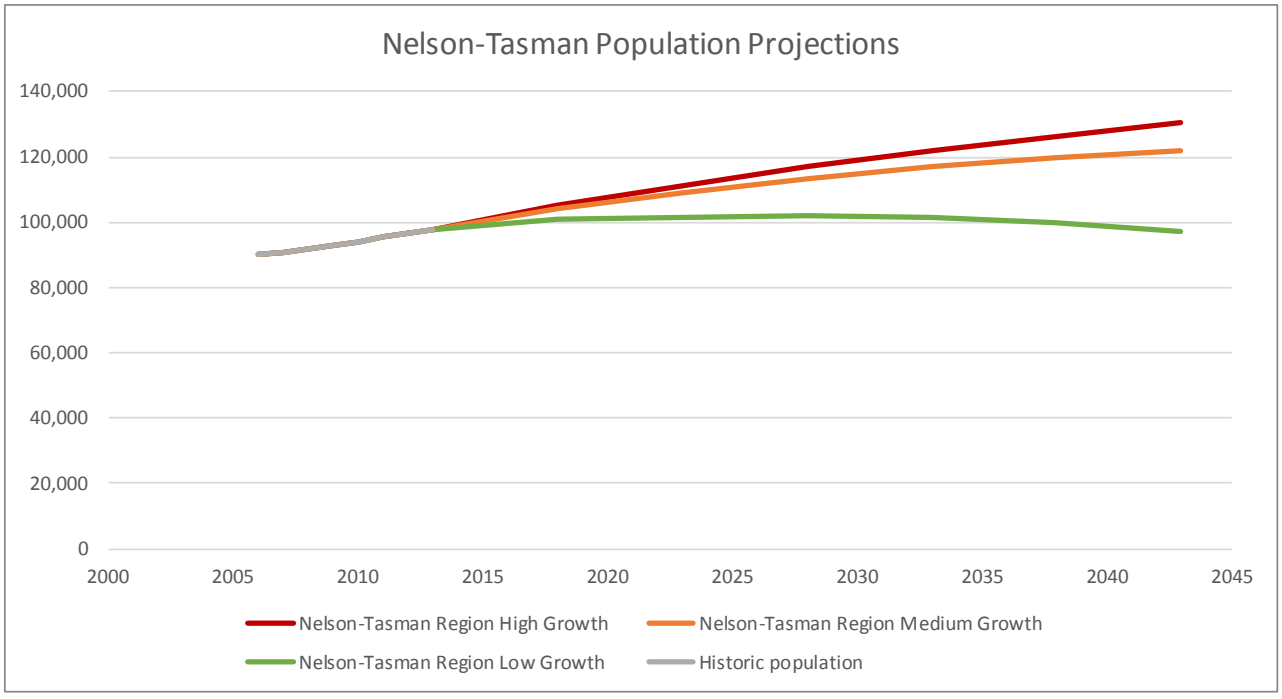
Growth forecasts are based on a critical analysis of historic flow and load patterns and through consultation with the five contributors. Planning policies of the two Councils are considered to determine their probable impact on future demand and changes in the demographics, but there is significant reliance on the requirements of the Disposal of Tradewaste Agreements, where it is required that contributors must consider their load and flow demand on an annual basis. While the industrial contributors have decreased demand in recent years and the two councils have contracted for with the NRSBU for the capacity that became available, no contributor has to date requested additional capacity.

3.3.1 Population Trends

Populations for the areas that the NRSBU serves are detailed in Figure 3.3 below (Statistic NZ projections), beginning from 1996 and extending out to projections for 2031.

Experience has shown that growth is only part of a complex set of circumstances that influence demand at the wastewater treatment plant.

Figure 3.3: Population Trend



3.3.2 Nelson City Council

Table 3.3: NCC Wastewater Profile

Nelson City Council 2015/16	Flow m3/day	Peak Flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Maximum	13866		3611	12535	7263	460	62
95 percentile	8639	783	2760	7959	4603	447	62
Peak 4 day average	9243	592	4454	11664	10429	506	104
4 Day Average	7342	378	2269	6036	4155	334	50
Limit	10419	605	4707	8413	4627	590	90
Variation average/limit	-30%	-38%	-52%	-28%	-10%	-43%	-44%
Variation 95%/limit	-17%	29%	-41%	-5%	-1%	-24%	-31%

Table 3.3. reflects a normal, predominantly domestic based wastewater system. It is anticipated that Nelson can create additional capacity by continuing renewal programmes and improvements in infiltration and inflow management. NCC plan to implement the following management strategies that will affect demand at Bell Island:

- NCC discourages the use of garbage disposal units in their Wastewater Bylaw.
- NCC plan to place more emphasis on trade waste controls in order to charge significant polluters appropriately.
- NCC continues to improve asset condition assessments in order to target renewals in areas where asset condition warrants renewals.

- All new properties are developed with boundary inspections that can be accessed to inspect private property flows during rain events.

3.3.3 Tasman District Council

Table 3.4: TDC Wastewater Profile

Tasman District Council 2015/16	Flow m3/day	Peak Flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Maximum	29788		2273	6128	4062	478	65
95 percentile	11236	500	1848	4842	2799	405	63
Peak 4 day average	11141	382	1858	4349	2337	414	119
4 Day Average	8158	294	1257	3218	1919	301	47
Limit	11419	820	4017	7688	4497	580	102
Variation average/limit	-29%	-64%	-69%	-58%	-57%	-48%	-54%
Variation 95%/limit	-2%	-39%	-54%	-37%	-38%	-30%	-38%

Table 3.4 indicates that the TDC is well positioned for future growth in terms of wastewater treatment. However, it also indicates that storm water inflow (Maximum inflow is 2.6 times the contracted flow limit) needs consideration.

TDC plans to implement the following management strategies that will affect demand at Bell Island:

- Focus on installing pumped systems for internal property services in future development areas to limit inflow and infiltration, while providing up to 24 hour detention capacity on individual properties. This work is intended to ease peak wet weather flows discharged to the NRSBU network.
- TDC plans to place more emphasis on trade waste controls to identify and target significant polluters. Through this initiative one can expect that there will ultimately be an increase in pre-treatment and a decrease in loads and/or load concentrations discharged to the NRSBU network.
- TDC base renewal works on asset condition, performance and age. The successful implementation of this work will decrease inflow and infiltration.
- TDC is in the process of developing flow models for their networks that will allow improved renewal planning. This work will allow TDC to prioritise renewals and should result in improved demand management.
- All new properties and locations where public services are renewed are developed with boundary inspections that can be accessed to inspect private property flows during rain events. This inspection work will show where drainage systems are connected to sewage networks and ultimately result in decreases in peak flows discharged to the NRSBU network through improved management of illegal storm water connections.

3.3.4 Industrial contributor (NPI, ENZA and Alliance)

The following table presents the combined industrial contributor flows and loads.

Table 3.4: TDC Wastewater Profile

Industrial contributors 2015/16	Flow m3/day	Peak Flow l/s	BOD kg/day	COD kg/day	SS kg/day	TKN kg/day	TP kg/day
Maximum	2733	110	5613	12525	2942	129	48
95 percentile	2452	110	4257	10312	2657	124	43
Peak 4 day average	2242	98	4615	10478	2206	143	56
4 Day Average	1832	80	3160	7692	1602	87	32
Limit	3040	83	3600	11000	2550	190	51
Variation average/limit	-40%	-4%	-12%	-30%	-37%	-54%	-37%
Variation 95%/limit	-19%	33%	18%	-6%	4%	-35%	-16%

- When the industrial contributor discharges are considered as one block it becomes clear that their collective demand is lower than their combined quota.
- Industry representatives have indicated that when growth takes place that they are likely to improve on site pre-treatment and they do not consider that they will require additional quota allocations from the NRSBU.
- The industries are more likely to reconsider their load allocations with a view to adjusting their loads downward as savings can be made by the industrial contributors.
- The fact that two of the industrial contributors recently invested in further improvements at their on-site treatment facilities indicate that the Agreement for the Disposal of Tradewaste continue to provide incentives to industrial contributors to improve the quality of their effluent.

3.3.5 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 process 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 and NPI. This minimises requirements for land-fill disposal. The treated water is then pumped to the Bell Island treatment plant for further biological treatment prior to discharge.

Nelson Pine demands on STP 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.

3.3.6 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.

3.3.7 Turners and Growers Ltd (ENZAFOODS)

ENZAFOODS was established in 1962, with the first processing plant built in Nelson.

Turners and Growers Ltd manufactures and exports fruit and vegetable juice concentrates, and also has a fruit and vegetable products factory located in Nelson.

Turners and Growers Ltd factories are strategically located close to international ports in the two key pipfruit growing regions of Hawkes Bay and Nelson.

Turners and Growers Ltd discharges generally match their quotas. Incidents where they exceed their quota can be mitigated by the ability to offset their flows and load against the other industrial contributors.

3.3.8 Septage Users

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.

3.3.9 NRSBU Regional Pipeline Long Term Strategy

In June 2008 the NRSBU considered the Regional Pipeline Strategic Issues and Options Report. That report considered the needs of the region for the next 80 years and identified a number of upgrade options to meet these needs. The main findings of the study were:

- Immediate action needed to be taken to duplicate the pipeline between Monaco Peninsula and Bell Island. This was necessary because of the risk of pipeline failure, which could result in serious environmental impacts and associated social, economic and cultural consequences.

- In the longer term, major system-wide upgrades will be required to provide the capacity for future flows of waste water. There are a number of options for the provision of this capacity and work is not required immediately.

The NRSBU upgraded the rising main system that included the duplication of the rising main across the Waimea Estuary from Monaco to Bell Island, the construction of a new pump station at Songer Street and the upgrade of pump stations at Saxton Road and Beach Road so that all the NRSBU pump stations can be reconfigured to pump in either direction.

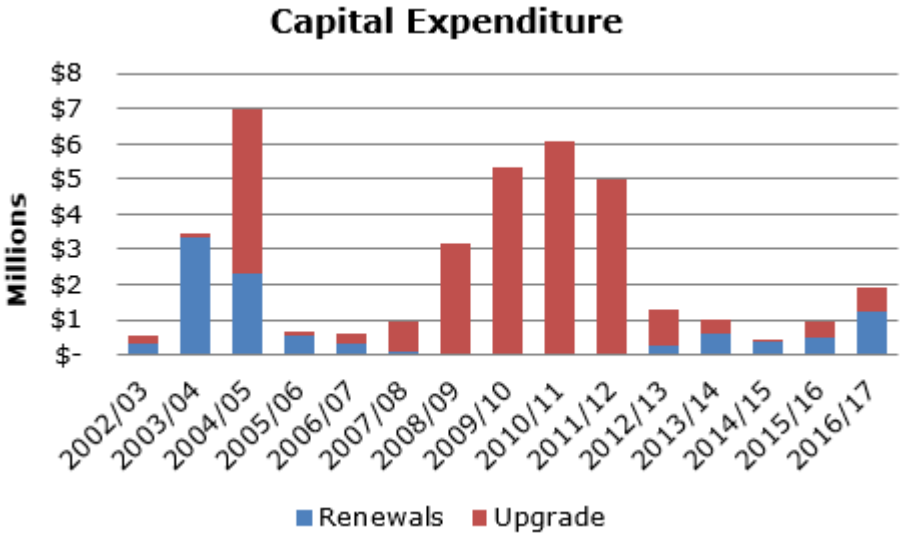
A new rising mains from Richmond to Bell Island that is tentatively programmed for 2019 to 2022 and will be contingent to increased flow demand in Nelson and Tasman.

3.4 Asset Upgrades

3.4.1 Historic Upgrades

The major upgrades over the last twelve years have been the Aeration basin upgrade, the Primary Clarifier upgrade, outfall pipeline upgrade, the duplication of the pipeline from Monaco to Bell Island and the upgrade of the pump stations. The total capital expenditure over this period has been $35m. The annual expenditure and accumulated total is shown below.

Figure 3.4: Historical Upgrade Expenditure - 2002 to 2017



The expenditure on renewals over the last 3 years averaged $689,000 (37% of annual depreciation) per annum compared to the 15 year average of $645,274. The value of renewals in 2016/17 was $1.2mil or 66% of annual depreciation.

3.4.2 Future Upgrades

Monitoring since the completion of the 2010 Treatment plant upgrade and Regional Pipeline upgrade completed in 2013 has not shown any capacity issues.

Upgrade work programmed for the next 10 years is focused on the improvement of the quality of the effluent discharged to the Waimea Inlet, the duplication of critical treatment components and the upgrade of pipelines to provide additional capacity for growth in Nelson and Tasman.

Improvements in the control of storm water inflow into the council controlled reticulation networks can potentially delay the implementation of these projects.

3.5 Upgrade Plan - Capital Costs

Capital costs of upgrading the plant as detailed in the report "NRSBU Long Term Plan 2017" is detailed in Table 3.10 below.

Table 3.10: Upgrade Costs

Year	Description of Projects	Estimated Costs
2017/18	Desludging oxidation ponds	100,000
	Modification pond M5	140,000
	Modification pond M1	140,000
	Generator at Inlet/Outlet	143,000
	Sludge management (Sludge Storage Tank)	200,000
	Regional pipeline upgrade (Review strategy)	40,000
2018/19	Treatment Plant Upgrade (Consent dependent)	2,500,000
2019/20	Desludging oxidation ponds	1,520,000
	Modification Facultative Ponds (Consent dependent)	420,000
	Treatment Plant Upgrade (Consent dependent)	2,500,000
	Richmond Regional Pipeline (Demand dependent)	1,000,000
	Resource consent: Rabbit Island Biosolids application to land	240,000
2020/21	Richmond Regional Pipeline (Demand dependent)	6,500,000
2021/22	Richmond Regional Pipeline (Demand dependent)	6,500,000
2024/25	Disposal of dried sludge to landfill	700,000
2025/26	Songer street upgrade (Demand dependent)	100,000
	Disposal of dried sludge to landfill	700,000
2026/27	Disposal of dried sludge to landfill	700,000
2030/31	Activated sludge management (2nd Secondary clarifier)	2,800,000
Total		$26,983,000

4.0 EMERGENCY AND RISK MANAGEMENT

This section looks at the Risk Management Processes utilised by NRSBU for assessing and managing risk within the NRSBU. Risk assessment is used as a strategic decision-making tool assisting with developing and prioritising strategies and work programmes.

4.1 Risk Management

4.1.1 Background

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 the NRSBU to do things more innovatively, sustainably and effectively.

4.1.2 Potential Risks

Risks can be seen to arise from many areas of the NRSBU, both in the physical aspect for assets and business risks. Table 4.3 identifies risks associated with the on-going management, funding, planning, development and operation of the NRSBU and Table 4.4 identifies risks associated with natural causes and operational aspects of assets owned by NRSBU.

The mitigation strategies are detailed and the residual risk is then determined. The Business and Asset Risk Control Schedules will be updated on a regular basis, to ensure that risks are relevant and understood. Where required, the mitigation strategies have been noted in the improvement programme.

4.1.3 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 4.1 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 4.2 below.

Table 4.1: Semi-Quantitative Measures of Consequence and Areas of Impact

		Descriptor				
	Areas of Impact	**Negligible**	**Minor**	**Moderate**	**Major**	**Catastrophic**
Area of impact	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 4.2: 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

Where issues are identified as a High or Extreme risk this issue will be mitigated by future action as reported in the Improvement Plan.
Additional work has also been identified for issues that did not gain high scores based on the risk analysis.

Table 4.3: Business Risk Schedule

No	Issue	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.	Extreme			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
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 in-operable	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 in-operable	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

No	Issue	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan		Residual Risk
					(IP) Ref		
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 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
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 spiraling 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

No	Issue	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
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
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

No	Issue	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
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
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

No	Issue	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan		Residual Risk
					(IP) Ref		
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 modeling 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
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	Asset Management System in place and updated as required.	Low			Low

No	Issue	Consequence or Outcome	Mitigation Strategies	Gross Risk	Improvement Plan (IP) Ref		Residual Risk
		management system not operational.					
7.7	Sea level rise.	Asset not functional due to intermittent flooding.	Most of the STP 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
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

Table 4.4: Asset Risk Schedule

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. Asset 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
9	Treatment Plant	Equipment/	Failure to meet	Processes within treatment plant that have	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
		component failure.	consent conditions.	contingencies for failure (duplication of pumps) and alarm systems (SCADA).				
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 STP 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 waste water 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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
18	Treatment Plant	Vandalism	Cost of repairs.	Intrusion alarms are installed.	Low			Low
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 STP 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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
25	Grit removal "HAZOP 8"	Mitigation	Grit retention in C11.	Increase monitoring of grit levels. Daily inspection by operators.	Low			Low
Primary clarifier								
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 6 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 STP 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	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
				oxygen levels and performance indicators in electronic portal.				
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
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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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
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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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 - 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.	Low			Low
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 place 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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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 biosolids to environment.	Regular pigging of the pipeline. Include a report in monthly biosolids contract minutes reporting the number of pigs received at the Rabbit Island biosolids storage facility. Supervisor to check pressure and flow performance of pipeline daily.	Mod			Low
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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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 - 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.	Mod			Low
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								

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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
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 fire fighting equipment. Other areas outside the 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.	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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
74	Biosolids Facility	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			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 discharges to the environment having an impact on environmental and cultural values.	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. Weekly mass balance check by contract supervisor and asset engineer.	Mod			Low
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

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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
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 the 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 Wakatu (standby generator available from NCC).	Low			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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
88	Pump Stations Wakatu	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 Wakatu	Control failure.	Overflows.	Alarm system, emergency storage and contractor response as required in terms of O&M contract.	Mod			Low

Item	Risk Location	Risk Event	Consequence or Outcome	Mitigation Strategy	Gross Risk	Action Plan Description	(IP) Ref	Residual Risk
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
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

4.2 Risk Summary

The risk assessment review in August 2017 indicates that other than natural disaster generated incidents that human error is the most significant cause for non-compliance of non-performance.

4.3 Insurance

4.3.1 General

The NRSBU assets are insured as part of the insurance package for Nelson City Council who uses Aon Plc (NYZE:AON) as the brokerage form to manage the Nelson City Council insurance portfolio. The Nelson City Council and NRSBU assets are managed a larger package of South Island Territorial Authorities.

In July 1991 Government introduced a Disaster Recovery Plan which places specific responsibilities on local authorities. In order for them to be eligible for a Government contribution of up to 60% of the restoration costs of infrastructural damage from a catastrophe, local authorities have to demonstrate they can meet the remaining 40% of costs through:

- Proper maintenance
- The provision of reserve funds
- Effective insurance.

4.3.2 How Risks to Assets are Insured

The valuation data is presently used for insurance valuation purposes. The recent seismic activity around New Zealand has prompted a consideration as to how risks to assets are insured. It is considered important that NRSBU be able to provide an insurance valuation that considers all possible risks.

4.4 Emergency Management

4.4.1 Civil Defence and Emergency Response Plans

The following documents are available for guidance in the Civil Defence and Emergency Management area:

- Civil Defence Emergency Management Plan
- NCC emergency procedures manual - exercises are carried out on a six monthly basis to ensure all staff are familiar with the procedures. The NRSBU is a party to the procedures manual and any exercises carried out.

4.4.2 Local CDEM Arrangements

The Nelson-Tasman Civil Defence Emergency Management Group (CDEM) is a joint committee of both NCC and TDC.

The Nelson Tasman Civil Defence Emergency Management Group Plan provides for an 'all hazards' approach to emergency management planning and activity within the CDEM Group area for Nelson City and Tasman District. The CDEM Group Plan sets out the civil defence emergency management structure and systems necessary to manage those hazards, including the arrangements for declaring a state of emergency in the Group's area. The Group Plan is the primary instrument whereby the community identifies and assesses its hazards and risks, and decides on the acceptable level of risk to be managed and how it is to be managed.

4.4.3 Lifelines Responsibility

The Civil Defence Emergency Management (CDEM) Act 2002 requires Local Authorities to coordinate plans, programmes and activities related to CDEM across the areas of Risk Reduction, Readiness, Response and Recovery. It also encourages co-operation and joint action within regional groups.

NCC (and by extension the NRSBU) and TDC participate in the Nelson-Tasman Engineering Lifelines project.

The following indicates the status of the wastewater schemes in the areas of Risk Reduction, Readiness, Response and Recovery.

Table 4.6: Risk Reduction, Readiness, Response and Recovery Status

Activities required	Description	Wastewater Status
Risk Reduction	Identifying hazards, describing risks, and taking actions to reduce the probability or consequences of potential events.	AMP Risk Treatment Schedule and Plan.
Readiness	Planning and preparation required to equip agencies and communities to respond and recover.	Wastewater Mutual Aid Plan Emergency procedures manual and exercises.
Response	Addressing immediate problems after an emergency	Wastewater Mutual Aid Plan
Recovery	Addressing the long term rehabilitation of the community.	Nelson-Tasman Civil Defence Emergency Management Group.

4.4.4 NRSBU Mutual Aid Plan

Nelson City Council (and therefore the NRSBU) is a signatory to the Wastewater Mutual Aid Plan administered by the Water Services Managers Group of the Water New Zealand.

4.4.5 Electricity Supply

The electricity lines supply is via Network Tasman Ltd and the electricity network is detailed in Table 4.7 below.

Table 4.71: Electricity Network Supply to Facilities

Facility	Supply
Saxton	Ring fed network with dedicated transformers
Wakatu	Ring fed network with single transformer
Songer	Ring fed network with dedicated transformers
Airport	Ring fed network with dedicated transformers
Richmond	Ring network with dedicated cable spur and transformers
Bell Island	Ring network with 1500m overhead and 1500m cable spur to multiple dedicated transformers

Electricity Supply Summary

- All the facilities are supplied by a single transformer. Nelson Tasman Ltd monitor demand on these units and none are overloaded.
- Nelson Tasman Ltd's 11kV network is operated as a series of radial supplies with a number of switchable ring feeds between these radials.
- The transformers supplying the Wakatu site is the most secure being located within one of these switchable rings.
- The Saxton, Airport and Richmond transformers are all similar in that they are connected via a single 11kV cable to the switchable ring network.
- The Bell Island transformers are connected to the switchable ring network via a section of underground cable and an overhead line.

- The failure rates of transformers, cables and overhead lines are all low but typical emergency replacement times can be between 3-12 hours, depending on the asset.

Energy supply is via two separate Nelson City Council contracts with Trustpower.

Four of the five pump stations have standby generators and the operation and maintenance contractor is required to provide a generator to operate the Wakatu pump station at two hours notice.

4.4.6 Interconnectivity Effects

Interconnectivity or interdependence between different utilities during and after a disaster is of utmost importance. In the event of failure, access is necessary to visit a site and provide power for recovery or removal of debris. To enable effective and efficient recovery of lifelines from an event which disrupts their service, dependencies on other lifelines must be understood and where necessary, mitigated against.

Table 4.8: Interdependency – NRSBU and other Utility Providers following a Disaster

Wastewater System Components	Electricity	Communications	Roading	Water	Stormwater	Cell phone network	Fire Fighting
Treatment Plant	2	2	3	1	-	1	1
Bio-Solids Facility	3	1	3	-	-		-
Pump Stations	1	1	2	-	-	2	1
SCADA	2	3	1	-	-	-	-
Rising Mains	1	1	2	-	-	1	-
Total	9	7	11	1	-	4	2

Note: 3 = High dependence, 2 = Moderate dependence, 1 = Low dependence, - = No dependence

Table 4.8 shows the NRSBU's high dependence on roading, electricity and communications following a disaster.

4.4.7 Business Continuity

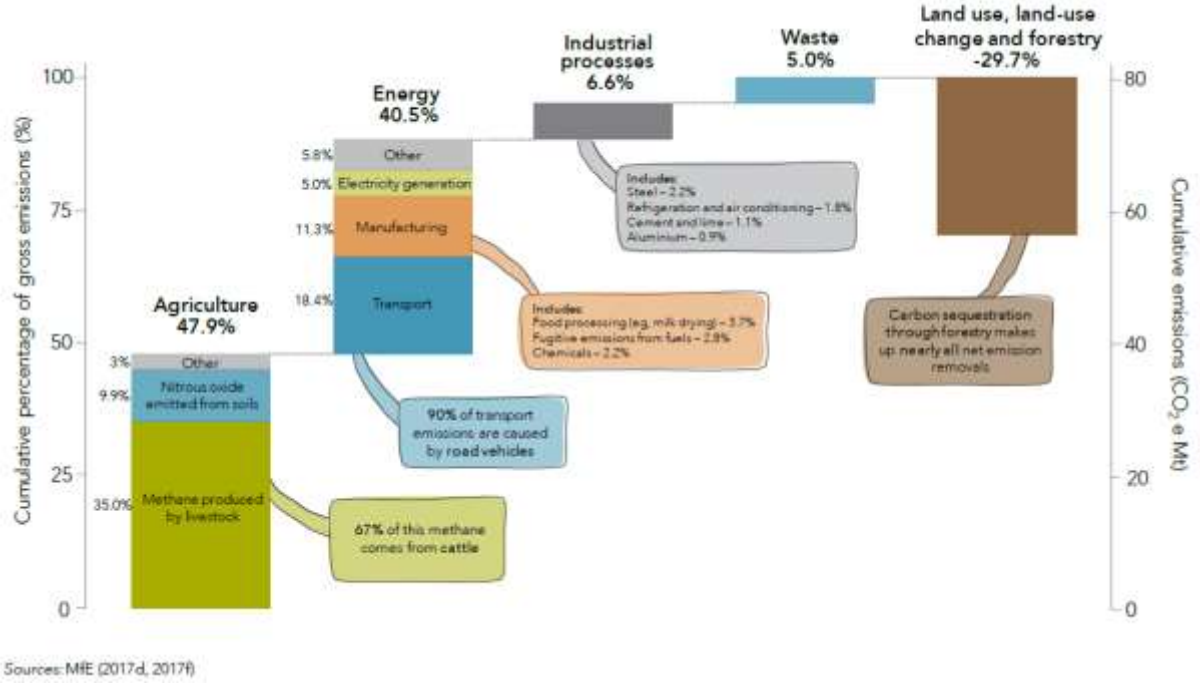
A business continuity plan was developed and implemented in 2014 and reviewed in 2016. (A1584805)

4.4.8 Climate Change

There has been considerable work undertaken at a national level on the possible effects of climate change and sea level rise. NRSBU is aware that increases in average sea level could have significant effects on the foreshore areas. This may lead to the need for:

- The development of policies to take into account climate change/sea level rise;
- Additional infrastructure requirements.

Figure 4.4.8 Greenhouse Gas emissions and removals by source, 2015



Sources: MfE (2017d, 2017f)

It should be noted that the largest contributor of wate emission is associated with solid waste disposal. While it is apparent that the NRSBU can at best make a very small contribution towards mittigating the effects of climate change, addopting a low emissions strategy for treatment of sewage and disposal of biosolids appears to be a practical response.

The NCC and TDC design standards take into consideration the effects of climate change in the designs for rising mains, pump stations, treatment plant and biosolids disposal. (The Ministry for the Environment recommends that authorities consider the consequences of a sea level rise of 0.8m for infrastructure assessment for the timeframe up to 2099 and to add 10mm per annum beyond that.)

The discharge channel at Bell Island is 0.95m above the highest recorded datum and the other assets on Bell Island are located higher than this.

4.5 Health and Safety

Health and safety has a very high profile and procedures within NRSBU relating to health and safety are:

- Monthly meeting with the two main contractors (NELMAC and Nelson Marlborough Waste) to discuss any safety concerns;
- Six monthly audits are carried out by NCC.

4.6 Significant Natural Events

Recent earthquake events in New Zealand and the subsequent effects on infrastructure has shown that while the risk of an event of the magnitude that struck Canterbury in 2011 within the Nelson area might be considered low, the consequences of such an event could be catastrophic.

The NRSBU assets are located in one of the most seismically active regions of New Zealand. Moderate to severe earthquakes (larger than Modified Mercalli intensity VIII or larger than magnitude 6.5 on the Richter scale) have occurred on at least five occasions

since 1840. (According to NZS 4203:1992, Code of Practice for General Structural Design and Design Loadings for Buildings Bell Island lies in the 1.2 seismic zone, the highest zone in New Zealand.) The Nelson/Tasman area has active faults within the region with the Alpine Fault the most prominent geological fault. There are no known faults underlying Bell Island and the nearest known fault is the Waimea Fault, approximately 6km to the south east of Bell Island. All the assets of the NRSBU are at risk from seismic hazards, including liquefaction, tsunami and ground surface rupture.

It is assessed that the probability of a significant earthquake of intensity VIII (Modified Mercalli scale) from any source affecting the region is approximately 40% over the next 50 years or 65% over the next 100 years. A national study on tsunami risk by the Institute for Geological and Nuclear Sciences indicates that a tsunami is a risk with wave heights up to approximately 3.5m expected in a 1 in 500 year event. With pond bunds only 2.4m above the high tide level (MHWS) it is apparent that the Bell Island infrastructure is potentially at risk during a large tsunami.

Mapping of liquefaction prone sediment in Nelson was undertaken by the Institute for Geological and Nuclear Sciences. The Waimea Estuary islands are all considered susceptible to liquefaction. A study by Coote & Downes has divided Tasman District into four zones based on likely shaking amplification response and placed Bell Island in the greatest likely shaking amplification response zone.

Consideration and planning for these types of events by consolidating all known natural disaster events information and reporting to the joint committee, is considered necessary.

4.7 Significant Negative Effects

The following table identifies any significant negative effects the NRSBU wastewater scheme may have on the social, economic, environmental or cultural well-being of the community, and states how the effects will be measured and reported against in future.

Table 4.9: Negative Effects – The Wastewater Activity

Effect	Status of Effect		Type of Effect (existing situation)		Impact on Well-Being (existing situation)				Existing Approach or Proposed Action to Address
	Existing	Potential	Negative	Significantly Negative	Social	Economic	Environmental	Cultural	
Wastewater Treatment Plants									
Discharge of treated wastewater to Waimea estuary (outside the mixing zone)	Static	Static	√		Moderate	Minor	Minor	Moderate	Compliance with resource consent.
Biosolids disposed to land	Static	Static			Minor	Benefit	Minor	Minor	Positive impact.
Discharge of odour	Static	Reducing	√		Minor	Nil	Minor	Minor	High degree of odour control.
Pump Stations									
Discharge of odour	Static	Static	√		Minor	Nil	Minor	Minor	Reported and resolved within a short space of time.
Overflows	Static	Static		√	Moderate	Nil	Minor	Moderate	Pump station overflows are reported and resolved within a short space of time.
Noise	Static	Static	√		Minor	Nil	Minor	Nil	High degree of noise mitigation in residential areas.
Rising Mains									
Overflows	Static	Static		√	Moderate	Nil	Minor	Moderate	High level of inspections carried out.
Discharge of odour	Static	Static	√		Minor	Nil	Minor	Minor	Reported and resolved within a short space of time.

5.0 LIFECYCLE MANAGEMENT

This section outlines the strategies and specific work programmes required to achieve the NRSBU's strategic objectives. It presents the lifecycle management plan and includes:

- A description of the trends and issues
- Detailed management, operations, maintenance, renewal and development strategies
- Work programmes and associated financial forecasts.

5.1 Overview

Lifecycle management has a direct impact on the provision of wastewater services to the contributors. Section 2 identifies the Levels of Service that the NRSBU are committed to delivering for the contributors. This section identifies the measures that need to be implemented to achieve these levels of service. Lifecycle Management will allow the NRSBU to clearly identify both the short and long term requirements of the wastewater system, ensuring that a cost effective service is delivered to the contributors.

5.1.1 Asset Lifecycle

Assets have a lifecycle as they move through from the initial concept to final disposal. Depending on the type of asset, its lifecycle may vary from 10 years to over 100 years. Key stages in the asset lifecycle are:

Asset planning	When the new asset is designed - decisions made at this time influence the cost of operating the asset and the lifespan of the asset. Alternative, non-asset solutions, must also be considered.
Asset creation or acquisition	When the asset is purchased, constructed or vested in the NRSBU. Capital cost, design and construction standards, commissioning the asset, and guarantees by suppliers influence the cost of operating the asset and the lifespan of the asset.
Asset operations and maintenance	When the asset is operated and maintained. Operation relates to elements including efficiency, power costs and throughput. Maintenance relates to preventative maintenance where minor work is carried out to prevent more expensive work in the future and reactive maintenance where a failure is fixed.
Asset condition and performance monitoring	When the asset is examined and checked to ascertain the remaining life of the asset what corrective action is required, including maintenance, rehabilitation or renewal and within what timescale.
Asset rehabilitation and renewal	When the asset is restored or replaced to ensure that the required level of service can continue to be delivered.
Asset disposal and rationalisation	Where a failed or redundant asset is sold off, put to another use, or abandoned.

5.1.2 Asset Failure Modes

Generally it is assumed that physical failure is the critical failure mode for many assets. However, the asset management process recognises that other modes of failure exist. The range of failure modes includes:

Structural	Where the physical condition of the asset is the measure of deterioration, service potential and remaining life.
Capacity	Where the level of under or over capacity of the asset is measured against the required level of service to establish the remaining life.
Level of Service Failure	Where reliability of the asset or performance targets are not achieved.
Obsolescence	Where technical change or lack of replacement parts can render assets uneconomic to operate or maintain.
Cost or Economic Impact	Where the cost to maintain or operate an asset is greater than the economic return.
Operator Error	Where the available skill level to operate an asset could impact on asset performance and service delivery.

5.2 Summary of Assets

5.2.1 General

NRSBU is responsible for 16.81km of rising mains, 688m outfall, five pump stations, the Sewage Treatment Plant (STP) and the biosolids application facility with a replacement cost of $84.83M. The replacement costs as at 31 March 2017 are shown in Table 5.1 below.

Table 5.1: NRSBU Summary Asset Replacement Costs

Asset Description	Gross replacement Value
Rising Mains	$21,495,847
Pipes and Ponds	$15,359,632
ATAD Plant	$8,944,280
Outfall	$4,113,391
Primary Clarifier	$4,440,922
Inlet	$3,529,668
Clarifier	$3,444,959
Saxton P/S	$2,962,959
Beach Road Reception Facility	$440,115
Thickening	$1,628,708
Beach Road P/S	$2,393,350
Songer Street P/S	$1,993,710
Road	$2,247,416
Airport P/S	$2,433,402
Aeration Equipment	$1,418,086
Dissolved Air Flotation Plant	$1,761,658
Biosolids Pipeline	$899,685
Resource Consents	$735,468
Rabbit Island Facility	$983,087
Aeration Basin Civil Works	$857,524
Buildings	$582,644
Wakatu P/S	$429,515

Asset Description	Gross replacement Value
Facultative Equipment	$447,766
Sludge Storage Tank	$288,170
Biosolids Storage Tanks	$143,363
Equipment	$332,804
Biosolids Transfer Pumps	$71,214
Valves	$69,407
Biofilter- ATAD	$230,817
Washwater	$85,252
Supermatent Sump Pumps	$77,616
	$84,832,436

5.2.2 Rising Mains

General

The rising main component varies from 150mm to 800mm diameter mains that link the five pump stations, and the treatment plant plus the outfall main and the biosolids pipeline.

Main Type	Length km	Base Service Life (years)	Residual Life (years) at 2017
PE	12.29	80	46 - 72
Concrete	2.55	80	46
Steel	1.97	80	46 - 59

Condition

An investigation of the condition of all the pipelines was conducted in 1997 following several failures. Due to the lack of storage or bypass facilities it is not possible to conduct a CCTV inspection or remove sections of pipe for detailed inspection without risking an overflow of effluent into the estuary. The inspection was therefore limited to a core sampling exercise. This inspection resulted in the replacement of all AC mains with PE mains, a process that was completed in 2005.

The concrete pumping main that services the STP has had two core samples taken. The samples were located at valves and showed no deterioration on the concrete pipes tested. With the duplicate pipeline in place further work will be carried to assess the condition of the concrete sections of the old rising main.

Performance

The regional pipeline has the capacity to accept all but the worst storm flows reaching the system.

5.2.3 Pump Stations

Background

The NRSBU operates five pump stations. Flows are received from the five contributors:
The Beach Road (Richmond) pump station receives flows from the Tasman District sewage networks and NPI.

- Wastewater is pumped from the Beach Road (Richmond) pump station into the Saxton Road pump station.
- Wastewater is injected from the Wakatu and Alliance pump stations into the rising main linking the Beach Road Pump Station to the Saxton Road Pump Station.

- The Saxton Road pump station also receives gravity discharges from Nelson City Council and form the ENZA pump station.
- Wastewater is then pumped from the Saxton Road pump station to Bell Island along the rising main.
- Wastewater received at the Songer and Airport pump stations from Nelson City Council is injected into the rising main linking the Saxton pump station to Bell Island.

Standby generators that allow pump stations to operate at duty level are installed at the Airport, Songer, Saxton and Richmond pump stations. Pump station operations are monitoring remotely.

Table 5.2: Pump Station Details

Name	Location	Pump Capacity - l/s *	
		Duty Pumps	Storm pump
Richmond	Beach Rd	176	430
Saxton	Saxton Rd	192	580
Songer	Songer St	119	217
Airport	Nelson Airport	183	410
Wakatu	Wakatu Industrial estate	40	40

Condition

All pump stations are maintained to a high level as required by the operation and maintenance contract.

Performance

The NRSBU strategy is that the four main pump stations do not require storage as pumps (duty and storm) maintain flows and each pump station has a standby generator. Wakatu pump station has more than six hours emergency capacity.

5.2.4 Treatment Plant

History

1983: The Bell Island Sewage Treatment Plant (STP) was commissioned in 1983. The original design population for the STP 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 STP 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. As a consequence 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 STP 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 STP 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
- 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 the NRSBU had applied for, and was subsequently granted, a revised consent which allowed application of higher

nitrogen levels at 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.

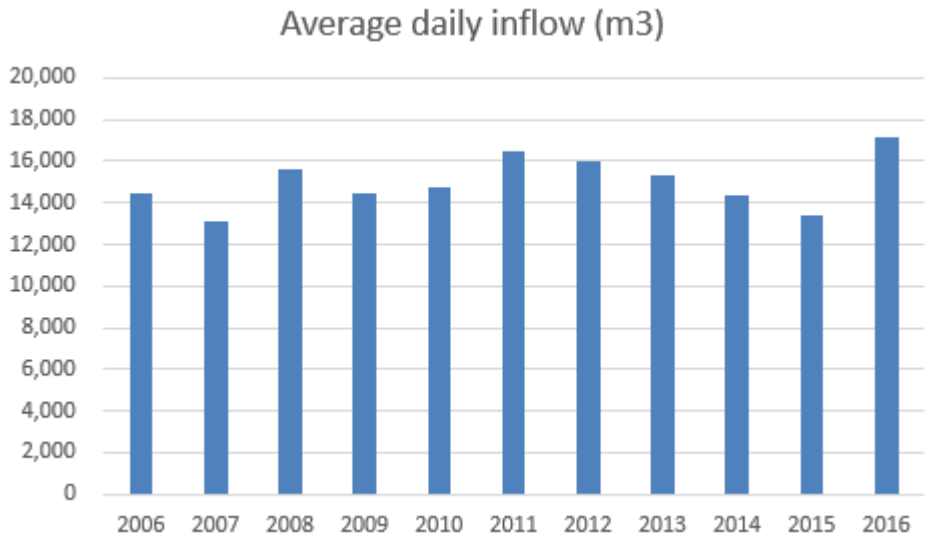
An on-going review of the system will be undertaken to assess the amount of bypass occurring.

Capacity

The treatment plant treats sewage equivalent to that generated by a domestic population of between 109,000 and 125,000 people. Peak flows and loads are highly variable due to the combined effects of stormwater infiltration and the seasonal nature of industrial food processing activities.

The municipal inputs are characterised by high wet weather flows. These peak wet weather flows govern the sizing of the pump stations and rising mains of the NRSBU. An indication of flows received from the five contributors is detailed in Figure 5.1 below.

Figure 5.1: 2005 - 2016 Average Daily Flows



The daily average BOD, COD, SS, TN and TP (As depicted in Figures 5.2 through 5.6) at the inlet is indicative of the success of demand management policies in place. Incentives in the Disposal of Tradewaste Agreements continue to present opportunities for industrial contributors to improve effluent quality. All inlet loads, other than flows, have trended downward since the signing of Disposal of Tradewaste Agreements in 2007.

Figure 5.2: 2005 - 2017 Daily Average BOD at Inlet

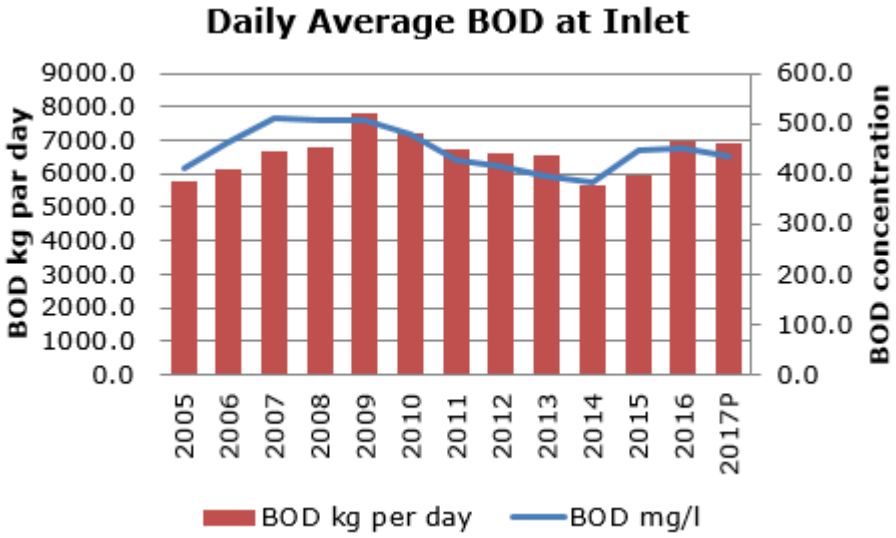


Figure 5.3: 2005 - 2017 Suspended Solids at Inlet

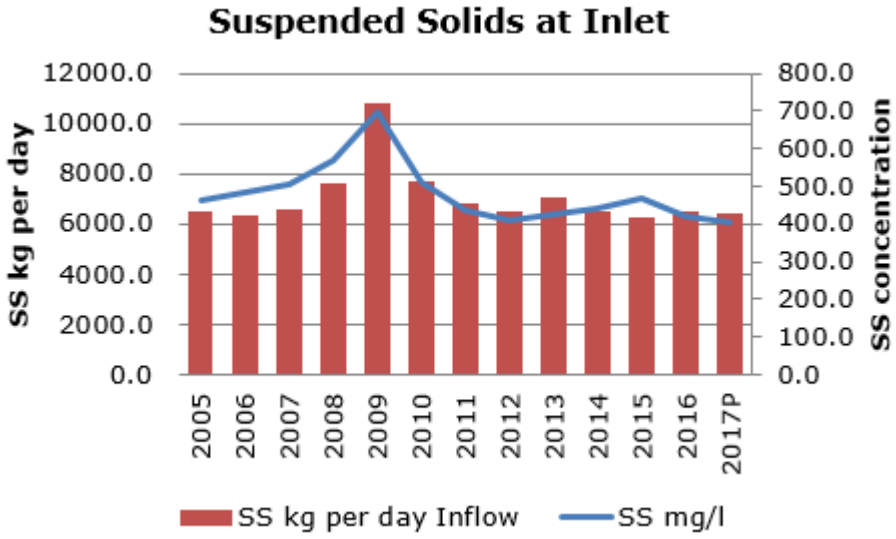


Figure 5.4: 2005 - 2017 Daily Average COD at Inlet

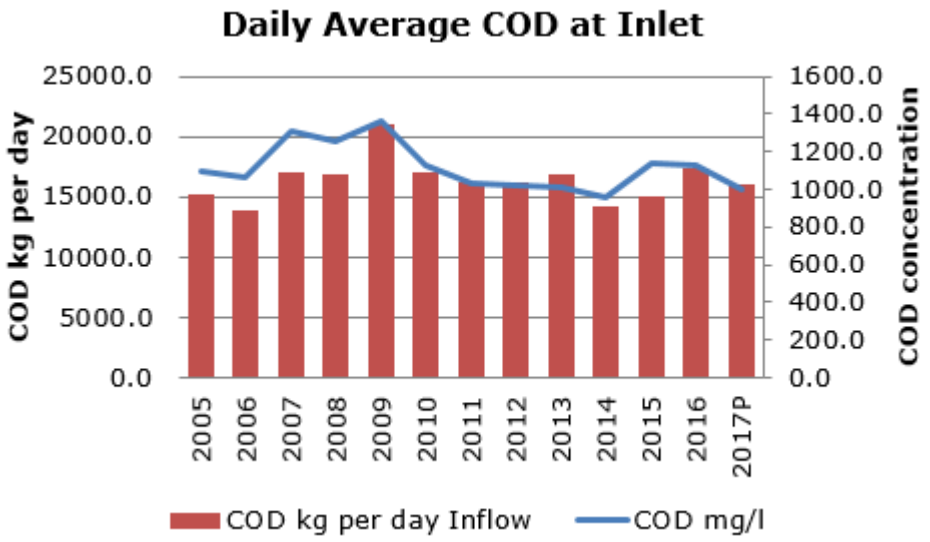


Figure 5.5: 2005 - 2017 Total Nitrogen at Inlet

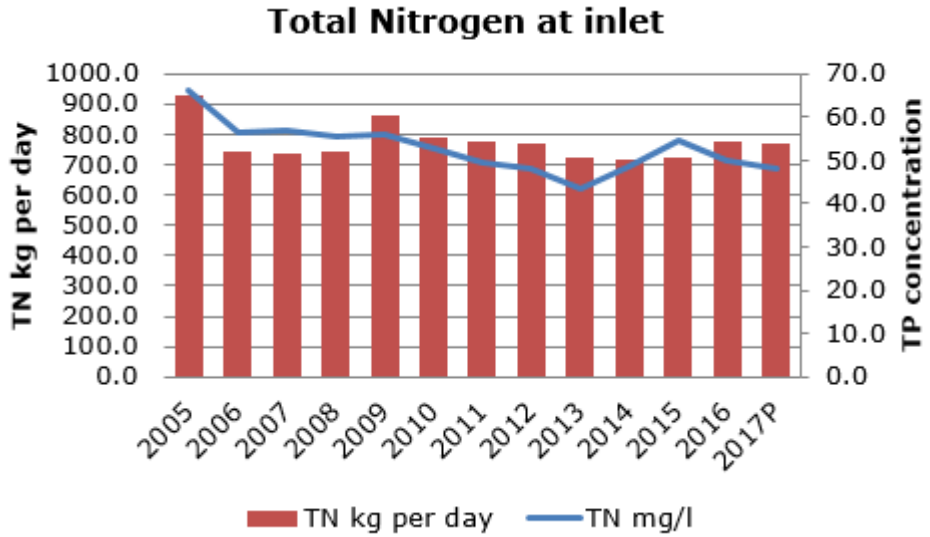
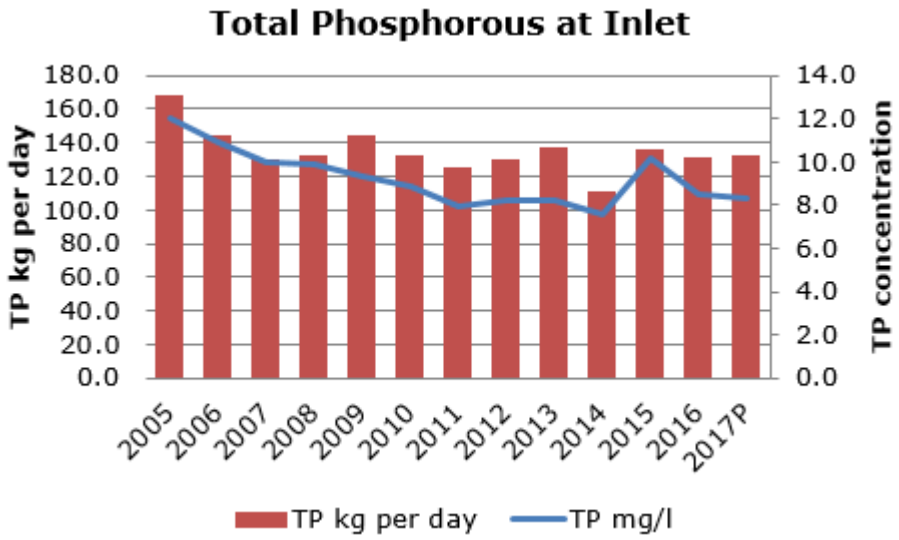


Figure 5.6: 2005 - 2017 Total Phosphorous at Inlet



Wastewater Treatment Process and Flows

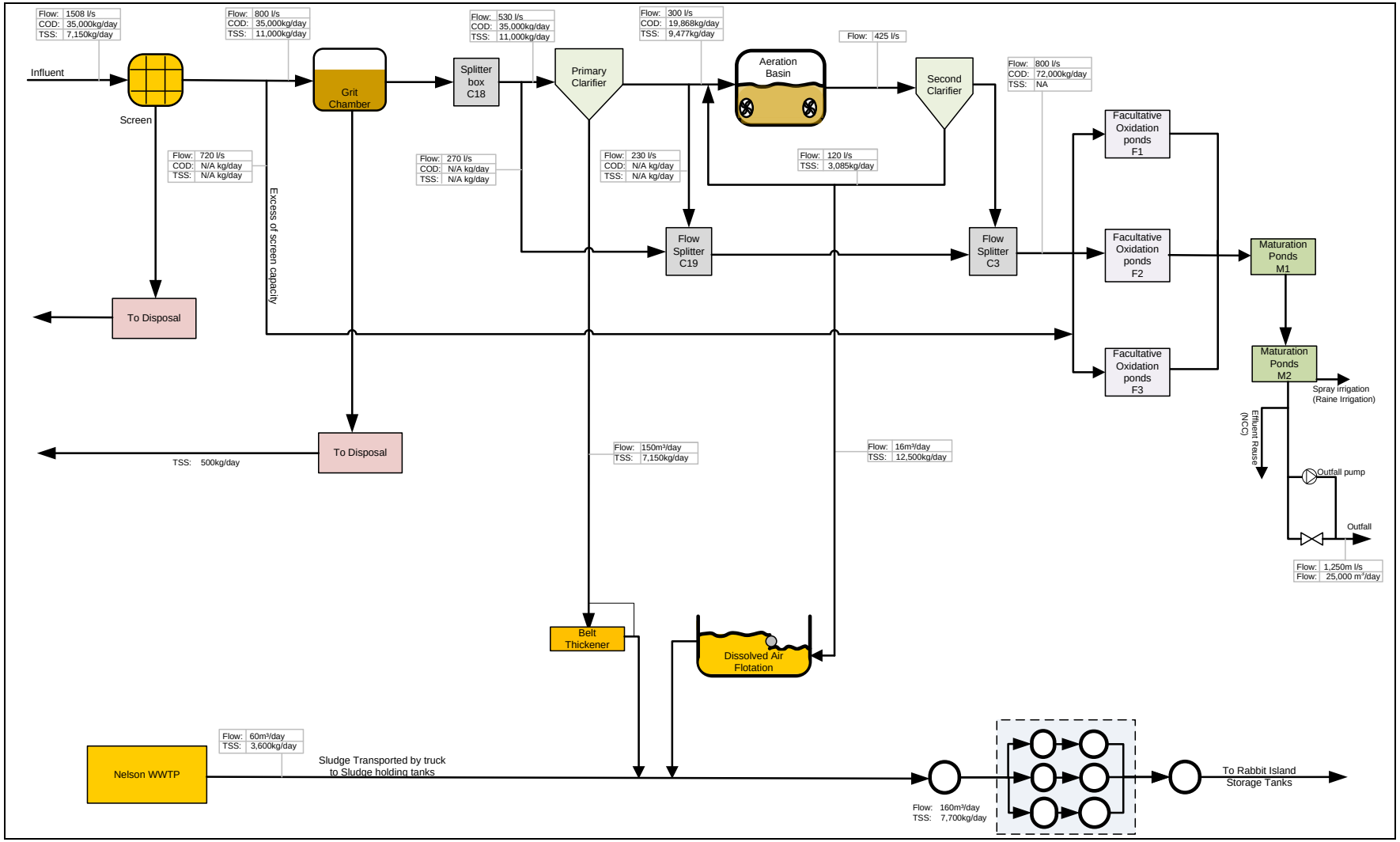
The treatment plant process is shown schematically in Figure 5.3.1 with the essential treatment plant components detailed below:

Table 5.3: Treatment Plant Units Flow Capacities Details

Unit Operation	Flow Capacities
Inlet works	1508 l/s (estimated)
Grit removal	800 l/s estimated)
Primary Clarifier	530 l/s (demonstrated)
Aeration basin	300 l/s (demonstrated)
Clarifier	425 l/s (dependant on aeration basin performance)
Outfall	Greater than 25,000 m3/day (demonstrated)
ATAD	7,200kg/day (demonstrated)
Overall Plant capacity 2 day peak	1508 l/s ~30,000 m3/day

The information in the table above is from the Bell Island Wastewater Treatment Plant Treatment Capacity and Commissioning Report, July 2011.

Figure 5.7: NRSBU Wastewater Treatment Process and Flows - Schematic



Treatment Facilities – Performance and Condition

The following table details the performance and condition of process facilities at Bell Island.

Table 5.4: Treatment Facilities – Performance and Condition

Facility	Performance Comment	Install Date	Condition
Inlet area & screening	The system functions essentially as designed. The installation of backup power supply is being considered. The screening facility has 100% redundancy in all but the heaviest of rain events.	2008 - 2017	Very Good
Primary clarifier	The primary clarifier removes a significant amount of the suspended solids from the influent wastewater, with the suspended solids leaving the primary clarifier being reduced to generally slightly below 200 mg/l, whereas the concentration of the material entering the system is generally above 500 mg/l. (Effectiveness: 35% COD removal and 65% SS removal)	2008 - 2010	Very Good
Aeration Basin	At full aeration, the aeration basin has a capacity of around 7,950 kg/day BOD. The capacity of the system is sufficient for current needs. While the aerators require constant maintenance to keep them in service, operational monitoring has shown that there is redundancy built into the system when the aeration basin operation is integrated with the primary clarifier and all components are operational.	2003	Good
Clarifier	Design guidelines suggest that the usual peak TSS load allowed should not be more than 8,350 kg/hr. In the case of peak flow conditions, the peak load can reach 9,153 kg/hr, but this normally only occurs for a short period. At present during average flow periods the solids loading is around 3,000 to 4,000 kg/hr, and occasionally increases to 5,000 kg/hr depending on the aeration basin operation.	1996	Good
Sludge thickening	The DAF plant provides effective separation and thickening of secondary sludge. The gravity belt thicker introduced in 2010 to thicken primary sludge has only been used intermittently.		Moderate to good
ATAD	Operational monitoring has demonstrated that the current sludge load can be accommodated through any two of the three ATAD trains without compromising the quality of biosolids produced. There has not been a need to use the heat exchanger at any time since 2009. The heat exchanger is on continuous standby.	1996	Good
Ponds	The algal and other pond parameter monitoring has shown that the ponds are resilient. Operational observations suggest that the ponds are generally under loaded and have significant capacity to treat additional load. Further improvement in pond management has the potential to improve the quality of effluent. Sludge surveys carried out over the last few years have indicated that the build up of sludge is moderate and that an integrated sludge removal process could provide beneficial outcomes for the NRSBU in maintaining the hydraulic capacity of the ponds at more desirable levels. The results from sludge surveys suggest that desludging of ponds will be required within the next two to eight years. The introduction of wind generated mixers has demonstrated that pond conditions are maintained. Further evaluation is programmed for late 2017. An evaluation of these mixers on the sludge in the ponds is programmed for late 2017.	1982 & 1992 & 2017	Good
Outfall	The consent conditions limit the discharge flow and load to the estuary in both quantity and time of discharge. The integration of the outfall pump has improved the management of the ponds significantly. The discharge pump was used for more than 50% of the discharges during the last 12 months.	1982 & 2011	Good

Inlet Chamber System and Screen

The Inlet Chamber System and Screen was commissioned in 2010. Functionally, the new inlet works will accept up to 1,508 l/s into the system and then pass this through the screens and then to the grit removal system. A flow splitter is used so that all flows under 800 l/s pass through the grit chamber, while flows over 800 l/s pass directly to facultative pond F1.

Primary Clarifier

The primary clarifier commissioned in 2010 has demonstrated capacity to remove TSS (65% - demonstrated), BOD (>30% estimated) and COD (>35% - demonstrated) prior to further treatment of the wastewater in the aeration basin.

The primary settlement process is used to remove sufficient of these contaminant loads so that the downstream liquid processing units can operate within their design capacities. The primary clarifier system is designed to accept 530 l/s from the grit removal system, the remainder (up to 270 l/s) bypassing around the primary clarifier and aeration basin directly to chamber C3 for distribution to the facultative pond.

Gravity Belt Thickener

The plant is running without the thickener operating, as the primary sludge concentration is sufficiently concentrated that it can be fed to the ATAD system without additional thickening.

Clarifier

The clarifier was installed in 1996 and removes the settleable solids from the wastewater. The waste activated sludge is pumped to the Dissolved Air Flotation System (DAF) where the sludge is separated from the waste stream and pumped to the sludge digesters. Effluent from the top of the clarifier is decanted into the facultative ponds.

Aeration Basin

A new aeration basin was introduced in 2004 to improve the activated sludge process.

Dissolved Air Flotation System (DAF)

In 2005 the DAF process was added as a gravity separation system that uses air bubbles in the wastewater holding tank to help float insoluble materials to the surface, so the sludge can be removed. The matter that is in suspension is removed by dosing with polyelectrolytes. The resulting flocculants cause these materials to join together in clusters that are lighter than water and therefore float. The secondary sludge is then pumped to the sludge storage tank before being fed into the sludge treatment tanks.

Autothermal Thermophilic Aerobic Digestion (ATAD)

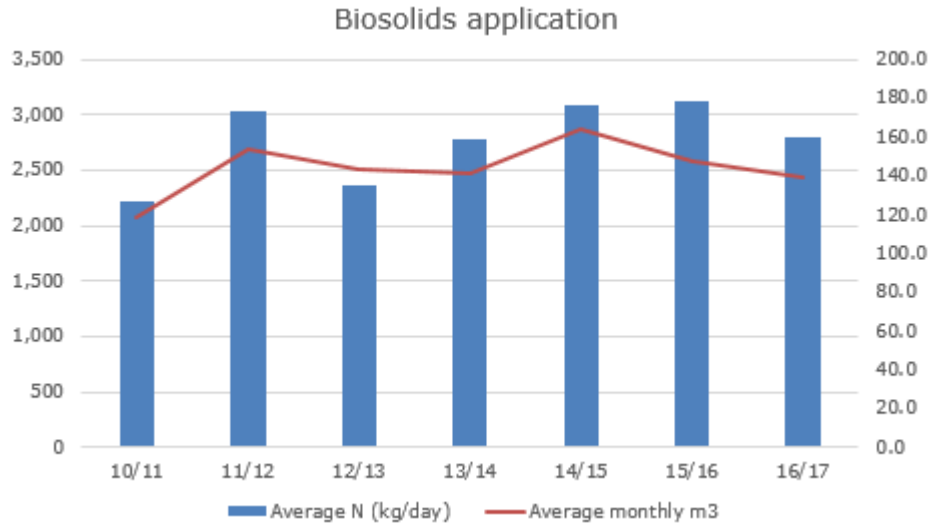
The ATAD process, added in 1996, uses microbial activity to reduce volatile solids in the waste sludge and the heat generated by the microbial activity sterilises the biosolids.

The resultant "biosolids" are transferred to a storage tank before being pumped across the Waimea Inlet to holding tanks on Rabbit Island. Tankers transport biosolids to the forest where it is sprayed under the trees as fertiliser.

A peak monthly production of 3,780m^3, was achieved while B-train was off line for refurbishment. The quality of the biosolids produced during this time achieved the required volatile solids reduction and temperatures to qualify as a class A biosolid. This was achieved without the introduction of the heat exchanger.

Figure 5.8 below details the volume of biosolids that was produced from the ATADs over the last few years. The decrease in volume and nitrogen load indicates that further optimisation of the processes employed could possibly be achieved. The processes involved are complex and requires intensive oversight.

Figure 5.8: Biosolids application



The ATAD plant was refurbished in 2004-05 and included replacement of the roofs for the B and C trains and the refurbishment of the walls. Similar roofs were installed on the A-train tanks in 2013. The internal walls of all the tanks have been refurbished between 2013 and 2016. The condition assessment of the internal walls demonstrated that the walls continue to be structurally sound. The surface coatings applied are expected to extend the useful life of the tanks beyond 10 years.

Facultative Oxidation Ponds (FOPs)

Effluent from the clarifiers is split between the three 10ha FOPs. Bacteria and nutrients in the waste promote vigorous growth of algae. During the day, near the surface, the algae generate oxygen by photosynthesis, further stabilising the wastes. The remaining solids settle to the bottom of the ponds and are treated by anaerobic processes.

Maturation Ponds

The two 10ha maturation ponds, in series, complete the stabilisation process and reduce pathogens. They also provide storage capacity for intermittent release of the treated effluent.

Outfall to Waimea Inlet

After an average retention time of no less than 30 days, the treated wastewater is discharged through gravity or pumped outfall, into the waters of the Waimea Inlet, during the first three hours of outgoing tides.

5.2.5 Biosolids Application Facility

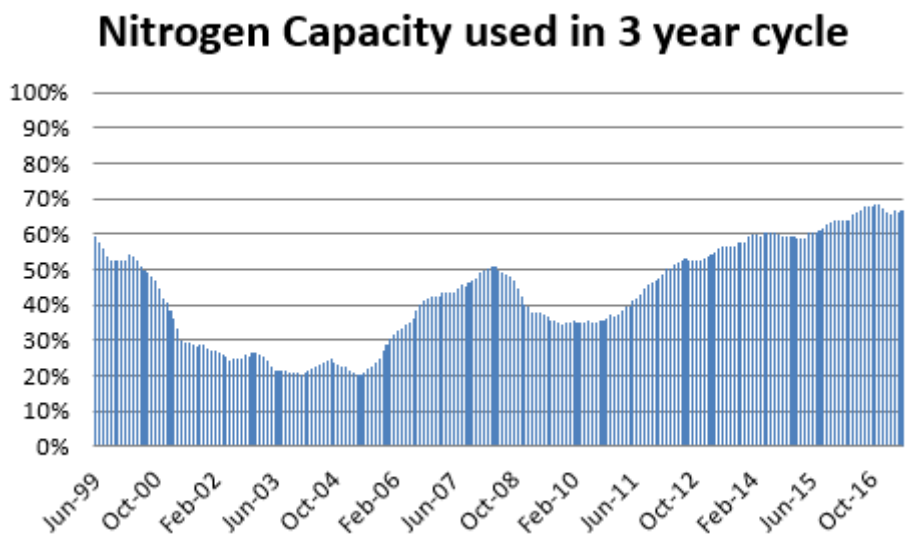
Total afforested area available for biosolids disposal is approximately 750ha. The land is owned by TDC and a licence to dispose of biosolids is held by NRSBU. Biosolids are pumped to Rabbit Island and stored in holding tanks. Biosolids are subsequently transported by trucks to the appropriate forestry block and then discharged via a travelling spray irrigator.

Biosolid Application Rates

Following harvest and completion of replanting biosolids application can resume at an average rate of no more than 150 kilograms of nitrogen per hectare per year, calculated using a three year rolling average, and no single discharge exceeding 450 kilograms per hectare per year until the trees are 12 years in age. From this point until harvest the average maximum rate of discharge is reduced to 100 kilograms of nitrogen per year

(calculated using a three year rolling average, and no single application being greater than 300 kilograms).
Figure 5.9 below details the daily nitrogen application and indicates that the rate of application is well within the capacity of the Bell and Rabbit Island forests to receive biosolids. (Capacity = 258 kg per day.)

Figure 5.9: Biosolids Daily Nitrogen Application



Long-Term Research Trial

A long-term research trial was established in 1997 to investigate the sustainability of the biosolids application. Biosolids were applied to the trial site (Rabbit Island) in 1997, 2000, 2003, 2006, 2009, 2012 and 2015 at three application rates: 0 (control), 300 (standard, equivalent to 100 kg Nitrogen/ha/year over 3 years, used in the full scale operation) and 600 kg Nitrogen/ha/year (high). Tree growth response and nutrition were measured along with a number of other environmental variables such as soil and groundwater quality. The biosolids application significantly increased tree growth since the trial was established.

The economic conclusions are that repeated application of biosolids to a Pinus Radiata plantation growing on low fertility sandy soil on Rabbit Island have significantly improved tree nutrition and consequently increased tree growth.

The increased productivity has had some negative effects on wood quality attributes, with larger branches, and reduced wood density and wood stiffness of the tree crop. However, the increased stem volume and greater average log diameter in the biosolids treatment areas are predicted to outweigh any negative effects on log value due to the reduced stiffness. The high and standard biosolids treatments are predicted to increase the net stumpage value of logs by 41% and 32% respectively at harvesting, providing a large positive impact on the forest owner's economic return.

Biosolids Pipeline and Facility Capacity

The biosolids pipe appears to have sufficient capacity to pump 25m^3/hr which is significantly more flow than would ever be required on a daily basis (Daily average biosolids produced is less than 115m^3).

In reality the pipeline from Bell Island to Rabbit Island will be constrained not by its capacity, but by the maintenance (pigging frequency) and by the disposal capacity of the Rabbit Island contractor, and the acceptance capacity of the land onto which the biosolids are disposed.

5.3 Resource Management Consents and Permits Held

NRSBU hold a number of resource consents that have been discussed in previous sections and are applicable to:

- Treatment and disposal of effluent and biosolids
- The regional pipeline upgrade project.

Table 5.5: Resource Management Consents and Permits

	Consent Number	Issue Date	Expiry Date
Regional pipeline upgrade	TDC • RM090563: Coastal permit • RM090885: Coastal permit • RM090887: Coastal permit (maintenance on existing and new mains) • NCC • RM095331: Coastal permit to construct duplicate pipeline • RM095332: coastal permit (maintenance on existing and new mains) • RM095333: Coastal permit (deposition of material) • RM0995334: Coastal permit (disturbance of foreshore) • RM095335: land use (earthworks).	September 2010	2060
Discharge of effluent into the coastal environment	NN000539: Discharge of 25,000m^3 of treated effluent to Waimea Inlet.	February 2003	2018
Air Discharge	NN000541: Bell Island Treatment Plan	February 2003	2018
To discharge treated wastewater to land	RM071151: Discharge of 1,040m^3 per day at Bell Island by way of irrigation.	Mar 2008	2019
Discharge of biosolids to forestry block at Rabbit Island	RMNN940379V3: The main biosolids disposal.	December 2008	2020
Discharge of biosolids to land Bell Island	NN980122D: 18 ha of forestry land and 4 ha of 2 metre thick waste bark infill.	Oct 1998	2020
Air discharge	NN980123D: Biosolids application Bell Island	6 April 1998	2020

5.4 Plant Upgrades

The Bell Island Sewage Treatment Plant has been substantially upgraded since March 1995. The upgrades, the reasons for them, and their approximate costs are summarised in Table 5.6 below.

Table 5.6: NRSBU Treatment Plant Recent Upgrades

STP Upgrade	Date	Reason	Approximate Capital Cost
Installation of Clarifier.	1996	To reduce loading on oxidation ponds and hence potential for odours.	$5,800,000
Installation of ATAD.	1996	To treat solids from clarifier to a standard appropriate for beneficial disposal of biosolids.	
Additional ATAD aeration.	1998	Reduction in biosolids odour by better mixing and increased oxygen.	$500,000
Installation of biofilters.	1998	Reduction in odours from ATAD.	$120,000
Installation of flow meters and pond monitoring equipment.	2001	Better information and management control.	$100,000
Cleaning of outfall pipeline and diffuser ports; installation of "red valves".	2001	Increase capacity of outfall.	$56,000
Treatment plant inlet.	2005	Upgrade to install grit removal , installation of biofilter for odour control and bypass pipe to Pond F1 for peak flows.	$ 422,000
Aeration basin equipment - electromechanical services and 11 aerators.	2005	Increased aeration to reduce risk of odours.	$ 1,586,000
Aeration basin - civil works and recirculation pipe.	2005	Increased aeration and to improve treatment capacity with an appropriate level of aeration and recycling of activated sludge.	$ 697,000
Clarifier - mechanical services.	2005	To pump sludge from clarifier to DAF.	$132,000
Dissolved air flotation plant.	2005	To thicken sludge to the required level for ATAD treatment.	$1,122,000
Sludge storage tank- electromechanical services.	2005	Replace tanks walls which had corroded and mixer.	$85,000
ATAD plant - structures and electromechanical services.	2005	C Train tank roof replacement - extreme corrosion of beam and roof panels.	$432,000
	2005	B Train tank roof replacement - extreme corrosion of beam and roof panels.	$430,000
Rabbit Island facility - biosolids storage tank (1&2).	2005	Tanks walls corroded and required replacement.	$44,000
Septage reception facility.	2009	Co-ordinate septage reception.	$487,000
Upgrade primary clarifier.	2010	Upgrade capacity and improve efficiency of aeration basin and secondary clarifier.	$8,365,000
Outfall upgrade.	2011	Discharge capacity less than allowed under resource consent conditions and outlet resulting in periodic pond overflows.	$560,000
Rabbit Island facility – biosolids storage tank.	2012	Tank corroded and required replacement.	$35,000
Regional pipeline (includes pump station upgrades).	2012	Capacity upgrade and improve redundancy on rising main.	$11,960,000
Treatment plant road upgrade.		Seal access road inside treatment plant.	$111,000
A-train wall refurbishment and replace roofs.	2013	A Train tank roof replacement - extreme corrosion of beam and roof panels and wall refurbishment.	$841,000
Airport pump station.	2013	Replace storm pump and refurbish spare storm pump.	$220,000
Continuous wastewater monitoring	2015	S::can installation at inlet	$104,000
Continuous wastewater monitoring		S::can roving unit	$103,000
Accel-o-Fac mixers in Facultative Pond F2	2017	Replace mechanical mixers with wind generated mixers	$100,000
Install duplicate milliscreen	2017	Replace the step screen and improve screening	$270,000

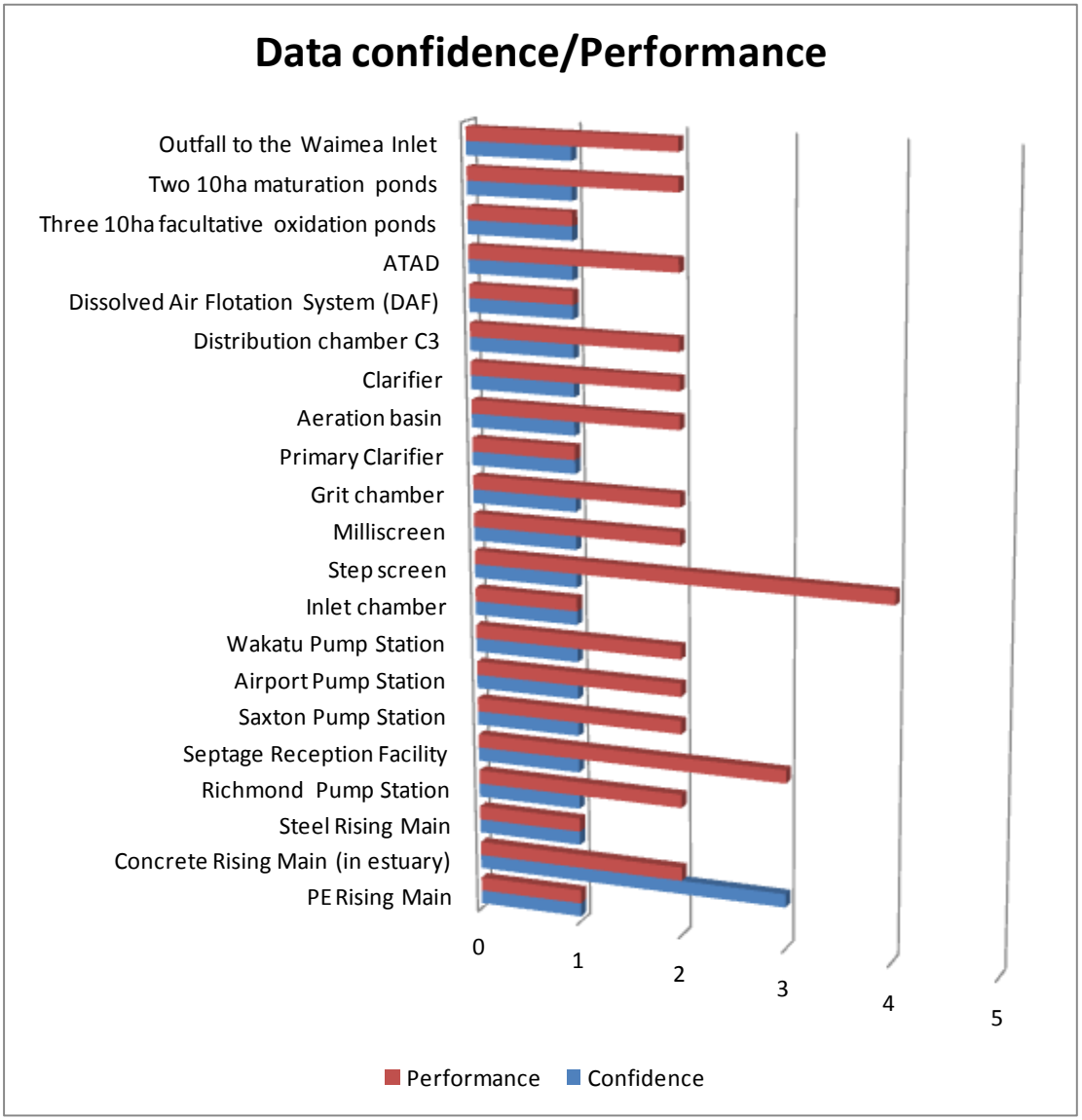
5.5 Critical Assets

Due to the nature of the NRSBU, all assets are considered critical and the operation and maintenance schedule takes this into consideration.

5.6 Knowledge of Assets – Condition Confidence

The confidence in the condition data for rising mains, pump stations and treatment plant is detailed in Table 5.7. This confidence rating is from NRSBU staff knowledge, data from the asset management system and is based on the "New Zealand Infrastructure Assets Grading Guidelines" 1999.

Table 5.7: Condition Confidence



5.7 Management, Operations, Renewal and Development Plans

5.7.1 Background

Lifecycle asset management focuses on management options and strategies, considering all relevant economic and physical consequences, from initial planning through to disposal. The effective application of asset management principles will ensure the

reliable delivery of service and reduce the long-term cost of ownership - and in this way reduce service costs. A well-structured lifecycle management plan will reduce the long term costs of ownership and in so doing reduce the service cost to the contributors.

The Lifecycle Management Programmes cover the four key categories of work necessary to achieve the required outcomes from the NRSBU. These key categories are:

Management Plan:

To carry out the management functions required to support the other programmes.

Operations and Maintenance Plan:

To ensure efficient operation and serviceability of the assets so that they achieve their service potential over their useful lives. This includes the day-to-day work to keep the assets operating.

Renewal Plan:

To provide for the progressive replacement of individual assets that have reached the end of their useful lives (restores the original capacity).

Maintaining the service potential of the assets and ensuring that the assets achieve that potential.

Development Plan:

To improve parts of the system currently performing below target service standards and to allow development to meet future contributors requirements.

Closing service gaps.
Meeting the future demand.

The fifth category is the disposal programme (sale, disposal or relocation); while not as critical as the other four areas it still plays a role in lifecycle management.

5.7.2 Management Plan

Management and monitoring strategies set out the activities required to support the maintenance, and operations cyclic renewal and asset development programmes. These activities include:

- Strategic planning
- Data management and evaluation
- Business processes
- Monitoring
- Financial management.

Strategic planning and a focus on meeting the needs of contributors drives the design of management processes which in turn are reflected in the level of performance achieved. Collection of data necessary to manage the service effectively, and processes for the analysis and interpretation of this data support all management activities.

The management strategies that are used for each of the five categories shown above are detailed on the following page, along with NRSBU practices and processes.

Table 5.8: Management Strategies

Strategy	Objective	NRSBU Processes and Practices
Strategic Planning		
Service Levels	A clear statement of NRSBU services to be provided and standards to be achieved.	Contributor service standards have been developed over a number of years.
Sustainable Management	Ensure all planning for the management, operation, maintenance, renewal and development of the NRSBU is compatible with sustainable management principles.	Planning for the management, operation, maintenance, renewal and development of the NRSBU activity is consistent with sustainable management principles.
Data Management and Evaluation		
Asset Management Systems (AMS)	Optimise the application of Asset Management Systems over the short to medium term and develop functionality in line with business needs.	Refinement of asset data requirements has occurred as staff identify management applications for data and refine reporting capacity.
Data Collection	Data collection programmes (condition, performance, asset registers) closely aligned with business needs, and implemented in accordance with documented quality processes.	Have systematic processes for the collection and upgrading of essential/critical data including: Asset attribute information, Asset performance data and Asset condition data. Implementation of internal bench marking (using historical data) of all of the NRSBU network, pump stations, treatment and disposal facilities is required.
AMS Data Quality Assurance	AMS data subject of defined quality assurance processes.	NCC (as provider of this service) has quality processes intended to ensure that all data entered to the AMS meets defined quality standards.
Business Processes		
Asset Management Plan Updates	This AMP remains a strategic and living document.	AMP is updated and reviewed at three yearly intervals to incorporate significant improvements to asset management practices.
Risk Management	Risk Management is an essential part of Asset Management. The NRSBU activity risks are managed by the Risk Management Plan and the implementation of risk mitigation measures to maintain risk exposure at acceptable levels.	Risk mitigation measures include maintaining emergency response planning, condition monitoring of assets, preventative maintenance and the use of telemetry.
Quality Assurance	Document, review and implement quality processes for all key business activities in accordance with good business practices.	Quality processes cover activities such as reporting, data collection and management, contract monitoring, risk management, economic analysis, performance monitoring, strategic planning, customer contact, asset valuation and asset operation.
Monitoring		
Contributor Service Standards	Have established Contributor Service Standards as part of a performance framework for the activity.	Monitor and report on the achievement of these standards.
Asset Performance	Maintain a framework to enable the performance of the NRSBU assets to be monitored.	Monitoring includes: Asset Maintenance and failure records Compliance with Resource Consents Asset audits.
Financial Management		
Budgeting and Financial management.	All expenditure programmes for the activity in accordance with the NRSBU business plan.	This currently involves: Economic appraisal of all capital expenditure Annual review of financial programmes Continuous monitoring of expenditure.

5.7.3 Operations and Maintenance Plan

The maintenance strategies for the NRSBU are based around the development and implementation of practices that minimise the risks of asset failure and ensure that failed assets are restored, with minimal disruption to levels of service and compliance. There are two categories of maintenance:

- Unplanned Maintenance - All reactive maintenance such as repairs and modifications
- Planned Maintenance - Preventative Maintenance, Servicing and Condition Monitoring. Planned Maintenance is usually carried out at a given frequency or at fixed intervals to preserve the required levels of service at a minimum cost.

The operations and maintenance strategies that are used for each of the categories shown above are detailed below along with NRSBU practices and processes.

Table 5.9: Operation and Maintenance Plan

Strategy	Objective	NRSBU Processes and Practices
Maintenance		
Routine Maintenance	Routine maintenance will be carried out in terms of defined routine maintenance items and triggers for these activities to be carried out.	Maintenance contractor is responsible for the determination and optimisation of work methods and the maintenance scheduling to achieve the target service standards.
Performance outcomes	Measurement of actual performance against LoS indicators.	Measurement of actual performance against KPI in the maintenance contract, which is linked to Levels of Service.
24/7 Operation	Response to service problems and operation of the infrastructure 24 hours a day, seven days a week is required.	The maintenance contract requires operation of the infrastructure 24 hours a day, seven days a week.
Unplanned Maintenance	Reactive maintenance requirements are detailed.	Reactive maintenance requirements are detailed within the maintenance contract and undertaken in a reasonable period to restore an asset to a satisfactory condition.
Redesign and Modification	Redesign may be necessary if an asset or system does not meet its operational objective. Similarly, modifications may be necessary to improve the operating characteristics.	Redesign and modifications are undertaken in a methodical manner to ensure alternative options are considered and optimum decisions made.
Operations		
Physical Works	Audits carried out on sample of works.	Audit work carried out by contract supervisor to verify compliance with standards.
Health and Safety Audits	Audits undertaken.	Audits undertaken randomly to ensure all work completed by Council and Contractor staff complies with regulations.
Energy Efficiency	Energy savings and management is carried out in a logical and planned manner.	Energy savings and management is carried out in a logical and planned manner for the facilities, at a time when energy costs and availability are of high priority.
System Control and Monitoring	Appropriate level of surveillance for networks and facilities.	NCC SCADA system provides surveillance of facilities (excluding biosolids application) and provides: - Alarms when equipment fails or when operating parameters are exceeded - Increase in the knowledge of the asset operation therefore enabling efficiencies to be introduced - For all essential data to be retained for trending.
Customer Service		
Complaints monitoring	Compliance with the appropriate response and timing.	Monitoring all tasks on a continuous basis via asset management system to show non-compliance and trending.

5.7.4 Renewal Plan

This section describes the processes that the NRSBU uses to identify and optimise renewals. Renewal is defined as an activity which renews, restores, rehabilitates or replaces an existing asset to extend its economic life or service potential. Renewal does not increase the capacity of the asset.

Cyclic renewal strategies are intended to provide for the progressive replacement of individual assets that have reached the end of their useful life. The rate of asset renewal is intended to maintain the overall condition of the asset system at a standard which reflects its age profile, and ensures that the NRSBU investment in the infrastructure is maintained.

The level of expenditure on cyclic asset replacement varies from year to year, reflecting:

- The age profile of the system
- The condition profile of the system
- The ongoing maintenance demand
- Contributors' service issues
- The differing economic lives of individual assets comprising the overall asset system.

The renewal strategies that are used by the NRSBU along with practices and processes are detailed below.

Table 5.10: Renewal Plan

Strategy	Objective	NRSBU Processes and Practices
Identification of renewal needs	Renewal forecasts are based on analysing a number of factors that include but not limited to: • Remaining asset lives • Performance • Asset faults • LoS achievement • Condition. The short-term asset renewal programmes are prepared from specific renewal needs identified from the above information. Long-term asset renewal programmes are prepared from the remaining life profiles for the assets.	Condition reports, maintenance records (customer complaints, asset failure and expenditure history), observations of staff and contractors. Long-term asset renewal programmes are prepared from the remaining life profiles for the assets.
Prioritisation of renewal projects	Renewal projects are justified and prioritised using a risk based process.	Decisions on renewal works consider the short and long-term effects on the operation and structural integrity of the system. Short-term renewal priorities are reassessed annually taking account of additional information that becomes available.
On-going condition assessment	Key asset attributes identified during normal operations.	Maintenance contract requires the identification of key asset attributes at the time of any maintenance.
Deferred Renewals	The quantity and impact of deferred renewals (if any) is tracked.	The NRSBU recognises that although the deferral of some items on cyclic renewal programmes will not impede the operation of many assets in the short term, repeated deferral will create a future liability.

5.7.5 Development Plan

Asset development provides for a planned increase in the service capability of the NRSBU system to:

- Close gaps between the current capability of the system and target service standards
- Accommodate agreed contributor growth.

Asset development and asset renewal can occur simultaneously. The purpose of asset renewal is to prevent a decline in the service potential of the assets whereas asset development is concerned with the service improvements.

The development strategies that are used by NRSBU along with practices and process are detailed below.

Table 5.11: Development Strategies

Strategy	Objective/ Description
Identification of development needs	Asset development needs are identified from analysis of contributors' requirements and the capacity of the system (reticulation, treatment and disposal). A provisional forward capital works development programme is maintained and updated at least annually.
Prioritisation of development projects	Development projects are justified and prioritised using a risk based process. In determining the requirement for capital or asset development works the short and long-term effects on the operating and structural integrity of the system are considered, together with any forecast increase in loading upon the system. All feasible options, including non-asset demand management options are considered.
Project approval	A long-term development programme is prepared from projects meeting the assessment criteria, and all projects are approved through the annual NRSBU Business Plan process.
Project design	All asset development works will be designed and constructed in accordance with current adopted industry standards (or known future standards) and system design loading. The system will be designed to minimise supply disruptions as far as practically possible by building in an appropriate level of redundancy.

5.7.6 Disposal Plan

The Disposal Plan recognises that there can be activities and costs associated with the decommissioning and disposal of assets which are no longer required as part of the NRSBU systems. In some situations there can be revenue resulting from asset disposal.

Table 5.12: Disposal Strategies

Strategy	Objective/ Description
Asset Disposal	Assess each proposal to dispose of surplus or redundant assets on an individual basis, subject to the requirements of the relevant legislation. Asset disposal will comply with the requirements of the Local Government Act 2002
Residual Value	The residual value (if any) of assets, which are planned to be disposed of, will be identified and provided for in financial projections.

5.8 Service Delivery

5.8.1 Maintenance Contract

An Operation and Maintenance contract that includes the operation and maintenance of the pump stations, rising mains and treatment plant was let on 1 October 2013 with a three year contract period that may be extended by up to two periods of 24 months subject to good performance.

The biosolids spraying contract commenced on 1 July 2014 with a three year contract period that may be extended for a period of three years subject to good performance.

The following table details a summary of all NRSBU maintenance and renewal contracts that are presently operable.

Table 5.13: Maintenance and Renewal Contracts

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

5.8.2 Maintenance Standards

The work performed and material used complies with the NCC Standards and all relevant New Zealand Standards, in particular those listed in the Maintenance Contract.

6.0 FINANCIALS

This Section sets out financial statements, funding strategy, valuation process, depreciation forecast and charges for the NRSBU.

6.1 Background

The works proposed in the previous sections on Levels of Service, Future Demand, Emergency and Risk Management and Lifecycle Management all impact on expenditure. There are cost implications that affect the Operations and Maintenance Renewal and Capital Plans that include:

- Meeting levels of service
- Meeting future demand
- Managing risk
- Maintaining and improving asset condition
- Maintaining and improving asset performance
- Operating assets.

6.2 Asset Valuation and Depreciation

6.2.1 Definition

The basic value of an asset reduces in accordance with the wearing out over the asset's life arising from use, the passage of time, or obsolescence. This reduced value is called the depreciated replacement cost. It is accounted for by the allocation of the cost (replacement cost) of the asset less its residual value over its useful life.

6.2.2 Valuation Method

The NRSBU policy is that assets are valued annually with base line (prime) valuations carried out at a maximum interval of five years.

Re-valued Assets

An independent prime valuation of all NRSBU assets was completed by OPUS up to 31 March 2017. The next prime valuation is due for 30 June 2022.

Asset Replacement Cost Escalation Update

Optimised replacement values (ORV) have been estimated from an assessment of the size and functionality required from an asset at optimisation of the replacement value included providing replacement values based on materials that would be used for construction, assuming current construction methods and not necessarily the form of construction used in the existing structures. The only significant optimisation of replacement values for this valuation was the optimisation of the pipeline replacement values where Polyethylene pipe has been assumed to replace the existing concrete pipe sections in the estuary between Martins Point and Bell Island.

6.2.3 Depreciation

The value of the assets has been depreciated on a straight line basis over their nominal working life. Assets in general have been assigned a life as set out in Table 6.2. This is based on the NAMS manual and experience.

The Asset Management System records the number of pump hours with the maintenance history to enable predictive modelling techniques to be used for

maintenance and renewal strategies and determine more accurate life cycles. The assumed asset life of pumping station components are detailed in Table 6.2.

6.2.4 2011 Valuations

Table 6.1 details the NRSBU 31 March 2017 valuations for all assets.

Table 6.1: NRSBU Asset Valuation for 31 March 2017

Asset Description	Gross replacement value	Depreciated replacement cost	Annual depreciation
Rising Mains	$21,495,847	$16,478,124	$311,981
Pipes and Ponds	$15,359,632	$12,325,109	$109,698
ATAD Plant	$8,944,280	$4,981,960	$278,195
Outfall	$4,113,391	$2,582,292	$61,234
Primary Clarifier	$4,440,922	$3,671,994	$117,399
Inlet	$3,519,668	$2,480,537	$116,220
Clarifier	$3,444,959	$1,881,059	$77,612
Saxton P/S	$2,962,959	$1,743,050	$108,432
Beach Road Reception Facility	$440,115	$335,824	$13,104
Thickening	$1,628,708	$1,247,524	$54,455
Beach Road P/S	$2,393,350	$1,390,296	$74,448
Songer Street P/S	$1,993,710	$1,632,710	$56,975
Road	$2,247,416	$1,514,818	$31,344
Airport P/S	$2,433,402	$1,420,021	$86,189
Aeration Equipment	$1,418,086	$822,518	$84,246
Dissolved Air Floation Plant	$1,761,658	$890,856	$73,953
Biosolids Pipeline	$899,685	$668,753	$11,299
Resource Consents	$735,468	$43,434	$42,044
Rabbit Island Facility	$983,087	$620,237	$35,076
Aeration Basin Civil Works	$857,524	$794,395	$5,261
Buildings	$582,644	$305,629	$14,719
Wakatu P/S	$429,515	$309,236	$9,202
Facultative Equipment	$447,766	$118,256	$15,419
Sludge Storage Tank	$288,170	$123,478	$11,591
Biosolids Storage Tanks	$143,363	$36,725	$6,303
Equipment	$332,804	$227,884	$24,033
Biosolids Transfer Pumps	$71,214	$48,256	$3,382
Valves	$69,407	$36,981	$2,114
Biofilter- ATAD	$230,817	$138,614	$5,997
Washwater	$85,252	$36,194	$3,386
Supernatent Sump Pumps	$77,616	$44,479	$1,870
Total	**$84,832,436**	**$58,951,242**	**$1,847,183**

Table 6.2: Asset Lives

Asset		Lives
Buildings		50 years
Ponds and Channels	earthworks	999 years
	electromechanical	25 years
	wave bands	90 years
	pipelines, chambers, aeration basin outfall	50-60 years
Aerators		25 years
Power Supply		25 years
Clarifier	earthworks	999 years
	civil works	50 years
	pipes	50 – 60 years
	pumps	15 years
	other	10 – 25 years
Odour Control Unit		10-50 years
Pump Stations	pumps	15 years
	variable speed drive units	10 years
	pipes and civil works	50 years
	other	25 years
Pipelines	pipes	45 – 80 years
	air valves	25 years

6.2.5 Future Valuations

The following valuation programme has been considered as appropriate for NRSBU:

- 30 June 2018, 2019, 2020, 2021 - Desktop Update for escalation
- 31 March 2022 - Prime valuation.

Valuation programme review - decision based on the scale of additions and deletions since the last prime valuation.

It needs to be noted that the functional assets comprising the wastewater reticulation and treatment facilities are located within a natural environment. The natural environment encompasses living things in all their diversity: wildlife, rivers and streams, lakes and seas, urban green space and open countryside, forests and farmed land. It includes the fundamentals of human survival: our food, fuel, air and water, together with the natural systems that cycle our water, clean out pollutants, produce healthy soil, protect us from floods and regulate our climate. And it embraces our landscapes and our natural heritage, the many types of contact we have with nature in both town and country. In the Nelson/Tasman Region our natural environment is the result of years of interaction between people and nature. It continues to be shaped through the care and attention invested by the individuals and organisations who actively manage it. Although this wastewater AMP has not attempted to quantify the value of this 'natural environment', it recognises that it has significant intrinsic and natural value which must not be forgotten.

6.3 Operations and Maintenance Funding

6.3.1 Background

No maintenance funding provision is carried over to the following year. Financial estimates are approved annually by the Joint Committee and recorded in the

Draft Business Plan. The Draft Business Plan is adopted by the Joint Committee subject to consideration by the owners, TDC and NCC. Charges for services are set in accordance with the Agreement for Disposal of Trade Waste entered into by the five contributors and the NRSBU. The contributor agreements detail the methodology of charging and the terms of trade.

In September each year the NRSBU supplies to the contributors the operating costs of the previous year. The differences between the charges assessed at the commencement of the year and the final actual costs are either reimbursed to the contributors if in credit or paid by the contributors if in debit.

6.3.2 Excess Maximum Discharges Levels

Any user who discharges trade waste and/or sewage to the sewerage scheme in excess of the contributor agreement can be required to pay additional charges that are detailed in clause 8.3 of the contributor agreement.

6.3.3 NRSBU Funding Formula Explanation

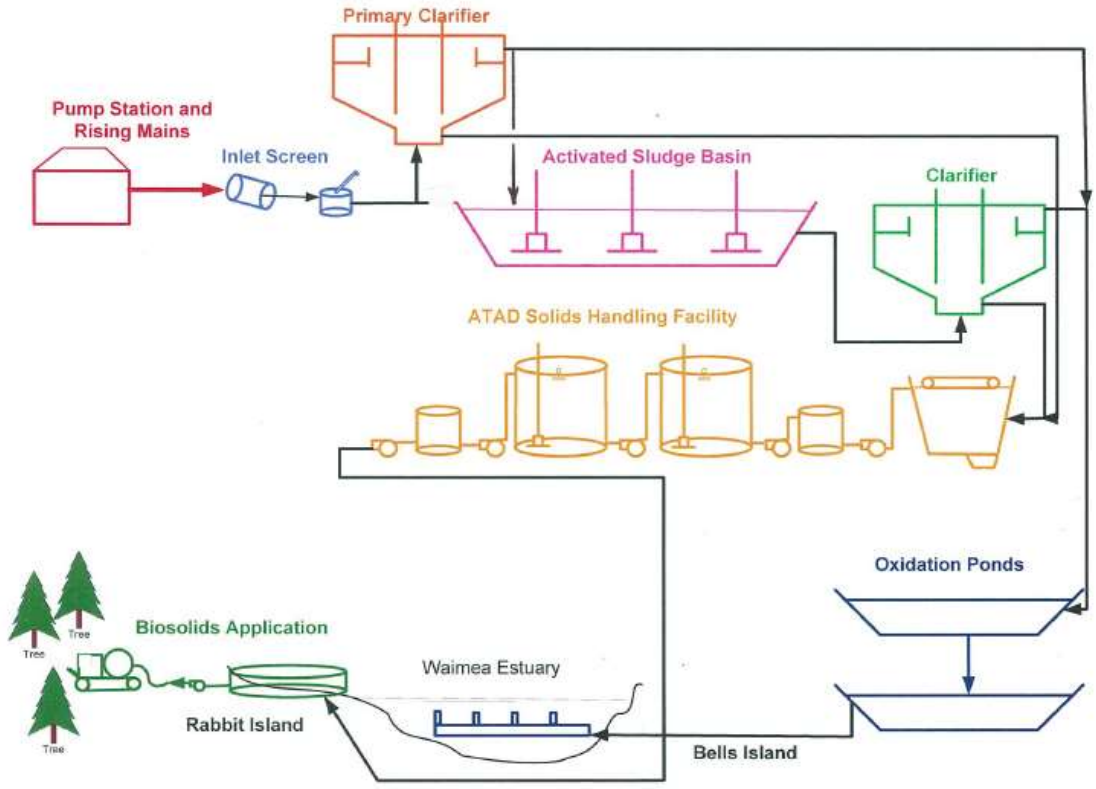
The following details the funding formula for capital and operational costs:

- Apportionment (allocation proportions) of the charging parameters (flow, BOD, SS and COD) is defined based on the impact of these parameter on the capacity and use of the Asset as indicated in Table 6.3 and Figure 6.1 below.
- The Capital and O&M costs are split on the basis of the allocation proportion, e.g. for Pumps and Pipes O&M the total cost is split 80:20 i.e. if the total cost of running this node (a part of the total assets) is $100,000 then $80,000 is the portion to be allocated based on average flow and $20,000 is the portion to be allocated based on peak flow.
- The 80% portion of the total cost is then apportioned to each contributor based on their proportion of the average flow i.e. if the average flow is 1,000, 1,000, 100, 100 and 100m3 for users A, B, C, D and E respectively then User E's cost allocation would be 100/2,300 x $80,000. Similarly the $20,000 would be apportioned based on peak flow i.e. if peak flows are 100, 100, 20, 20 and 20 l/s for users A, B, C, D and E respectively then User E's cost allocation would be 20/260 x $20,000.
- This process is then applied to each of the nodes for the scheme, as identified in the Table 6.3 and Figure 6.1 below.
- When a new asset is added to the scheme, i.e. a capital upgrade, a new node is created. The NRSBU then enters into negotiations with the affected parties, i.e. those requiring additional capacity to determine what parameters impact on the operation of that new node and what the appropriate allocation proportions should be between parameters.
- The capital is apportioned based on peak capacity (for which a quota is purchased) and the O&M is apportioned based on the monthly usage (the discharge is monitored monthly and the load parameters are averaged over 4 days selected randomly each month) of the scheme.
- O&M costs are initially based on projected use for the year ahead and at the end of the financial year the O&M costs are reconciled to reflect actual use.
- An asset is only paid for by the users at the end of the financial year of the year in which it is commissioned.

Table 6.3: Funding Nodes Allocation Proportions

Funding Nodes		Ave Flow	Peak Flow	BOD	COD	SS	TKN	TP
Pumps, Pipes & Biofilters	Capital		1.00					
	O & M	0.80	0.20					
Screens	Capital		1.00					
	O & M	0.80	0.20					
Primary Clarifier	Capital		0.60	0.20		0.20		
	O & M		0.20	0.40		0.40		
Aeration Basin	Capital		0.05	0.55	0.30		0.05	0.05
	O & M			0.60	0.30		0.05	0.05
Clarifier	Capital		0.60	0.20		0.20		
	O & M		0.20	0.40		0.40		
Ponds & Outfall	Capital	0.25	0.25	0.25		0.25		
	O & M	0.10		0.30	0.30	0.30		
Biosolids	Capital			0.45	0.10	0.35	0.10	
	O & M			0.40		0.40	0.20	
Nutrient Removal	Capital						1.00	

Figure 6.1: Funding Nodes



6.3.4 Analysing Total Expenses 2002/03 to 2016/17

The following section is an analysis of the total expenses associated with the NRSBU. This allows long term trends to be indicated. Costs are shown for the seven financial areas of: Management, Financial, Depreciation, Electricity, Maintenance, Monitoring, Biosolids Disposal and General.

Figure 6.2: Total Costs 2002/03 to 2017/18

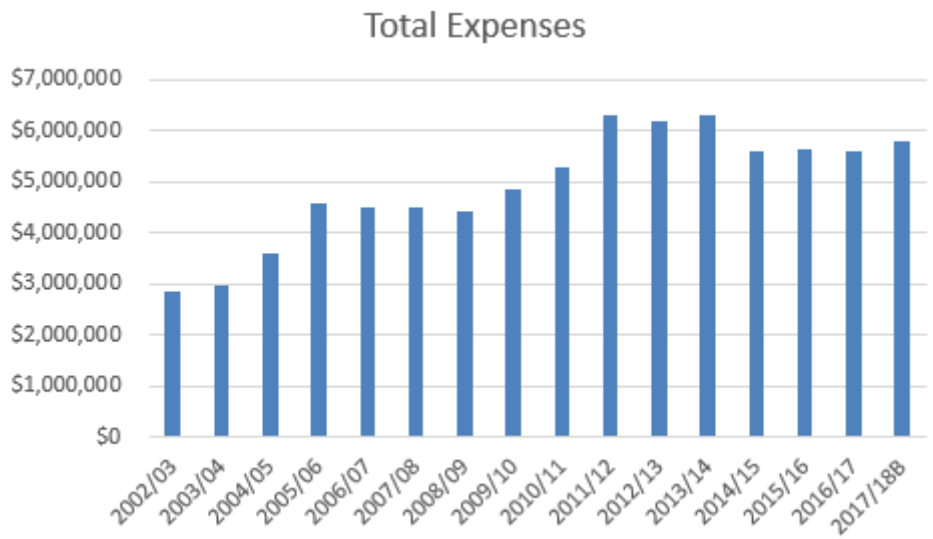


Figure 6.3: Management Costs

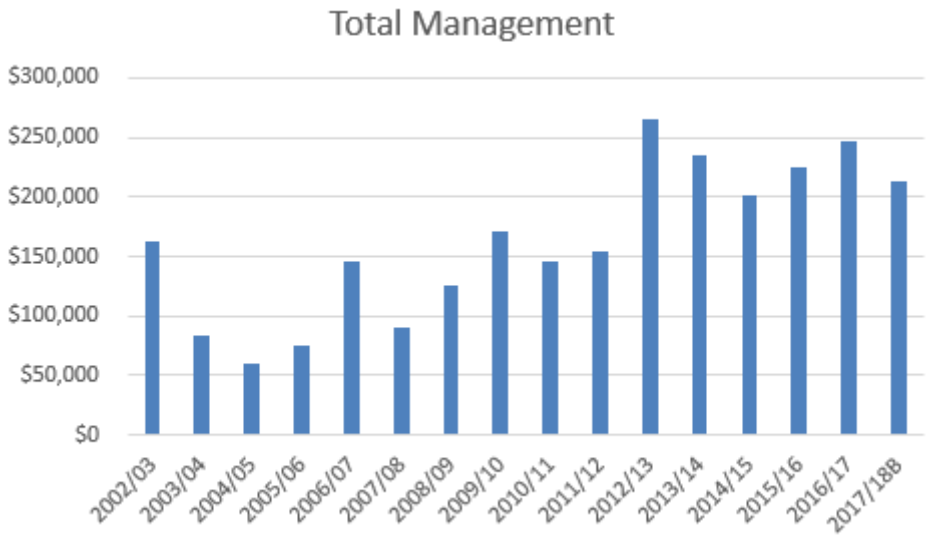


Figure 6.4: Financial Costs

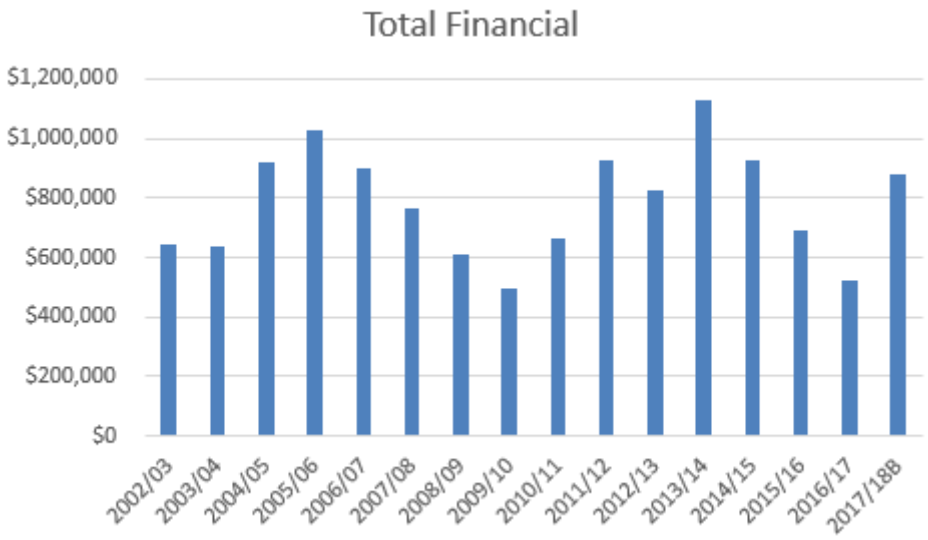


Figure 6.5: Depreciation Costs

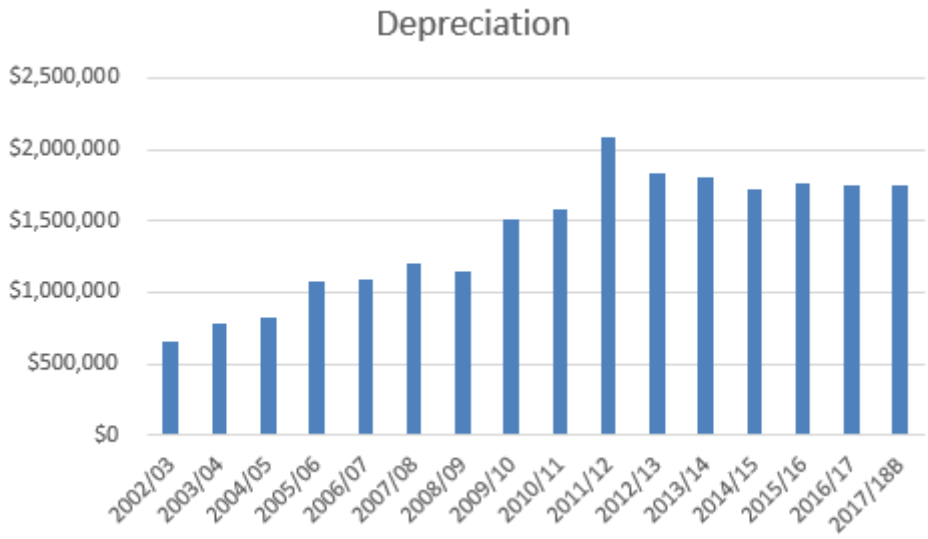
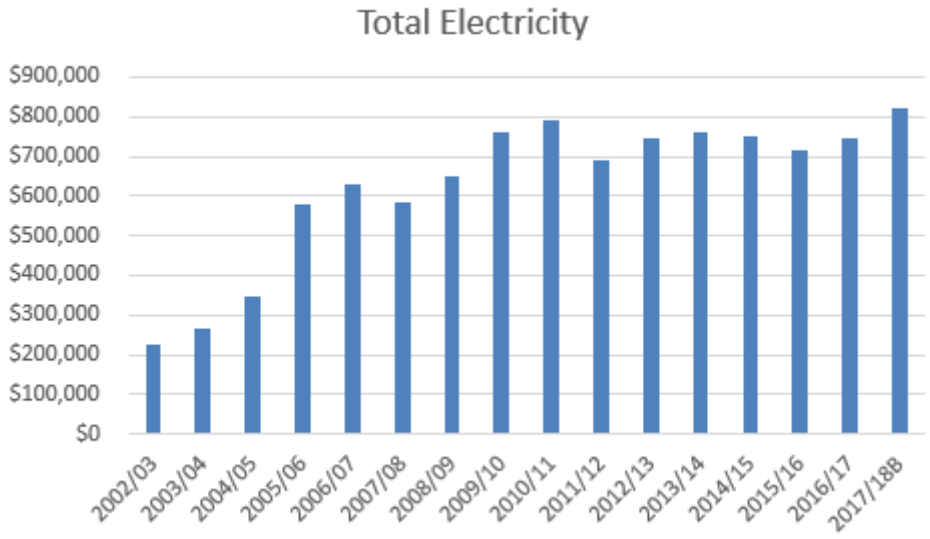
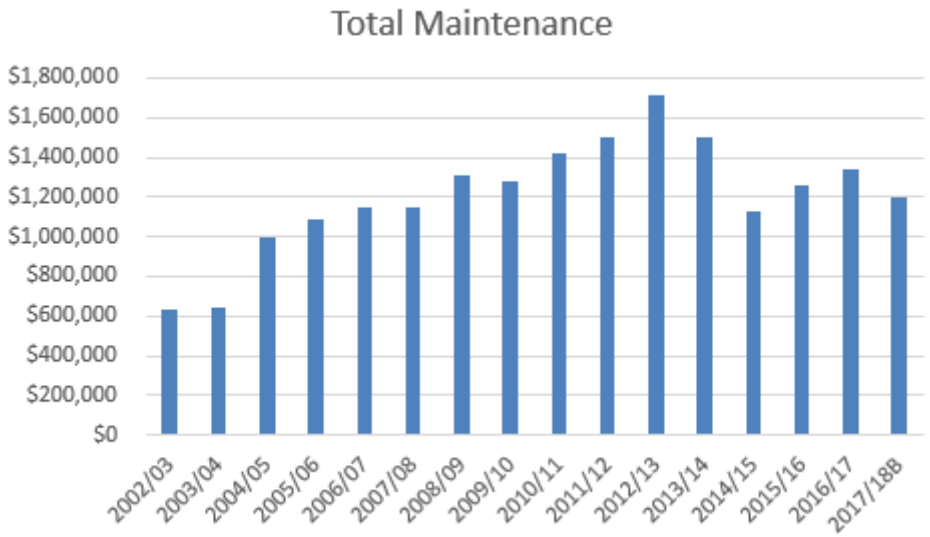


Figure 6.6: Electricity Costs



The decrease in total electricity costs is associated with changes to the process management following the primary clarifier upgrade in 2010. This allowed a rationalisation of the use of the activated sludge area. Further improvements are expected in this area over time.

Figure 6.7: Maintenance Costs



The decrease in maintenance cost is associated with the change in procurement strategy for the operation and maintenance contract and reflects a shift in risk from the contractor back to the NRSBU. The responsibility for the cost of reactive maintenance and larger programmed maintenance items have been transferred from the operation and maintenance contractor to the NRSBU. This was done to remove incentives to the contractor to increase profit through deferred maintenance and to ensure that assets are well maintained and monitoring data is reliable.

Figure 6.8: Monitoring Costs

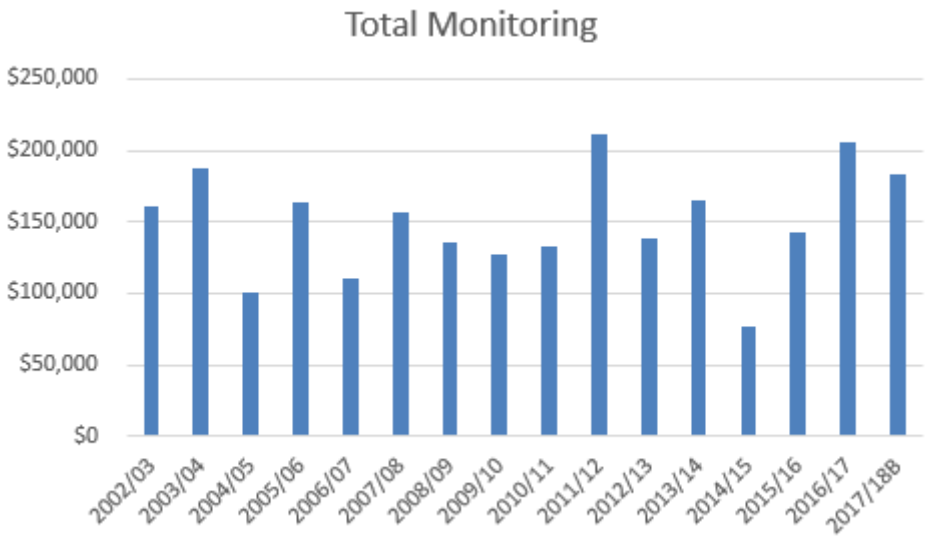
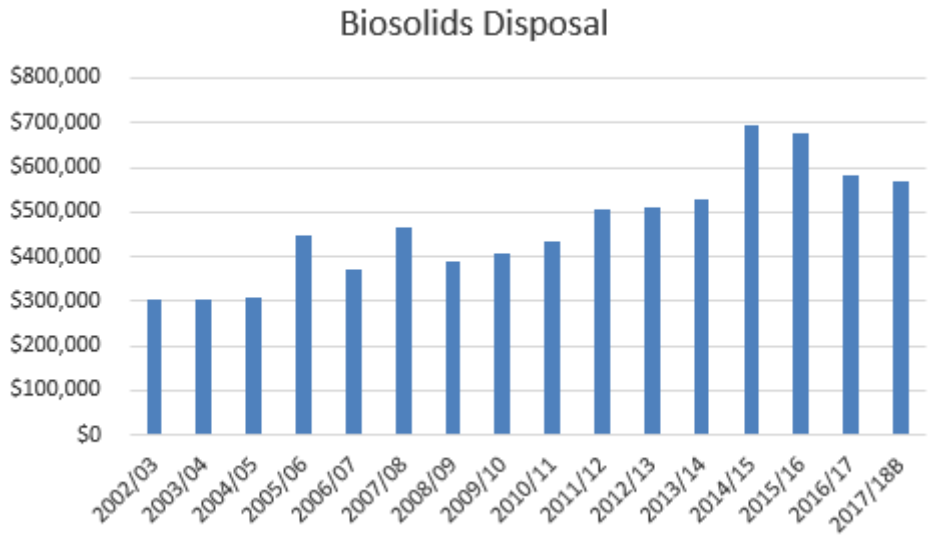
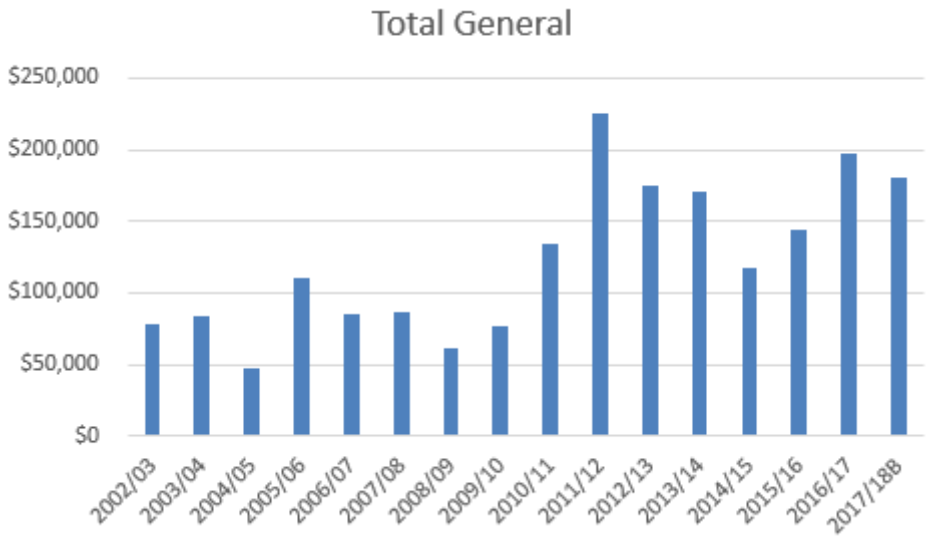


Figure 6.9: Biosolids Disposal Costs



It is anticipated that improved integration of the ponds and sludge treatment facilities at Bell Island will decrease the volume of biosolids produced over time.

Figure 6.10: General Costs



General includes the following cost centres: Consultancy, Rates, Water Charges, Forestry and Telephone/Computers.

6.3.5 Total Cost Projections

The projected costs based on the recommended levels of service of operating the NRSBU over the next 10 years are shown in table 6.4.

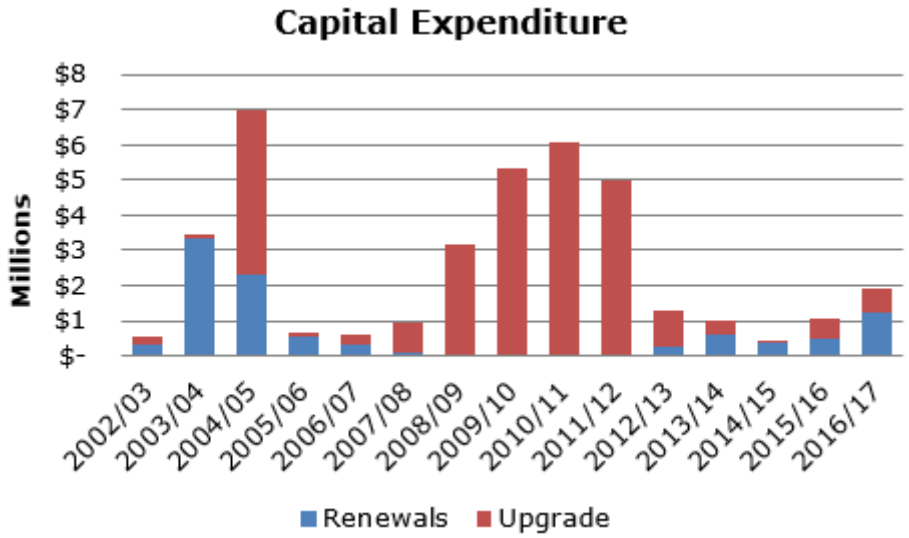
Table 6.4: 10 Year operation and maintenance plan

	1	2	3	4	5	6	7	8	9	10
	17/18	18/19	19/20	20/21	21/22	22/23	23/24	24/25	25/26	26/27
Total Management	230	230	230	230	230	230	230	230	230	230
Total Financial	577	720	839	865	829	790	758	719	701	694
Depreciation	1795	1816	1884	1913	1913	1913	1913	1913	1921	1936
Total Electricity	739	739	739	739	759	759	759	759	759	759
TP Maintenance	1017	1017	996	996	996	996	996	996	996	996
PS & RM Maintenance	243	243	243	243	243	243	243	243	243	243
Total Monitoring	188	176	216	168	226	166	168	166	216	228
Consultancy	75	75	75	75	50	50	50	50	50	50
Insurance	60	60	60	60	60	60	60	60	60	60
Rates & Rental	32	32	32	32	32	32	32	32	32	32
Water Charges	22	22	22	22	22	22	22	22	22	22
Forestry	10	43	13	4	36	13	4	36	13	4
Biosolids Disposal	630	630	630	630	630	630	630	630	630	630
Telephone/Computers	3	3	3	3	3	3	3	3	3	3
Total Expenses	**5621**	**5806**	**5981**	**5979**	**6028**	**5906**	**5867**	**5858**	**5875**	**5886**

6.4 Actual Capital Expenditure

The actual capital expenditure for the period 2001/02 to 2016/17 is detailed below. The expenditure on upgrade work is associated with treatment plant and network upgrades completed to increase capacity.

Figure 6.11: Renewal Expenditure 2001/02 to 2016/17



6.4.1 Deferred Renewals

This plan does not record deferred renewals. Deferred renewals will be reflected in successive Business Plans.

6.4.2 10 Year Renewal Plan

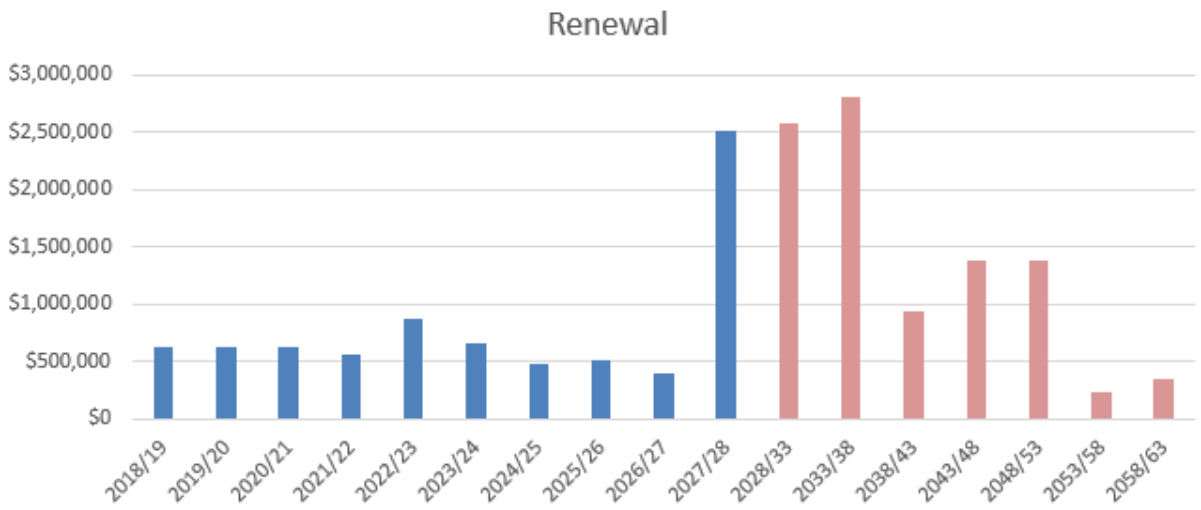
The renewal program for 2017/18 to 2026/27 is detailed in table 6.5

Table 6.5: Long Term Renewals

NRSBU 10 Year Renewal Plan ($,000)

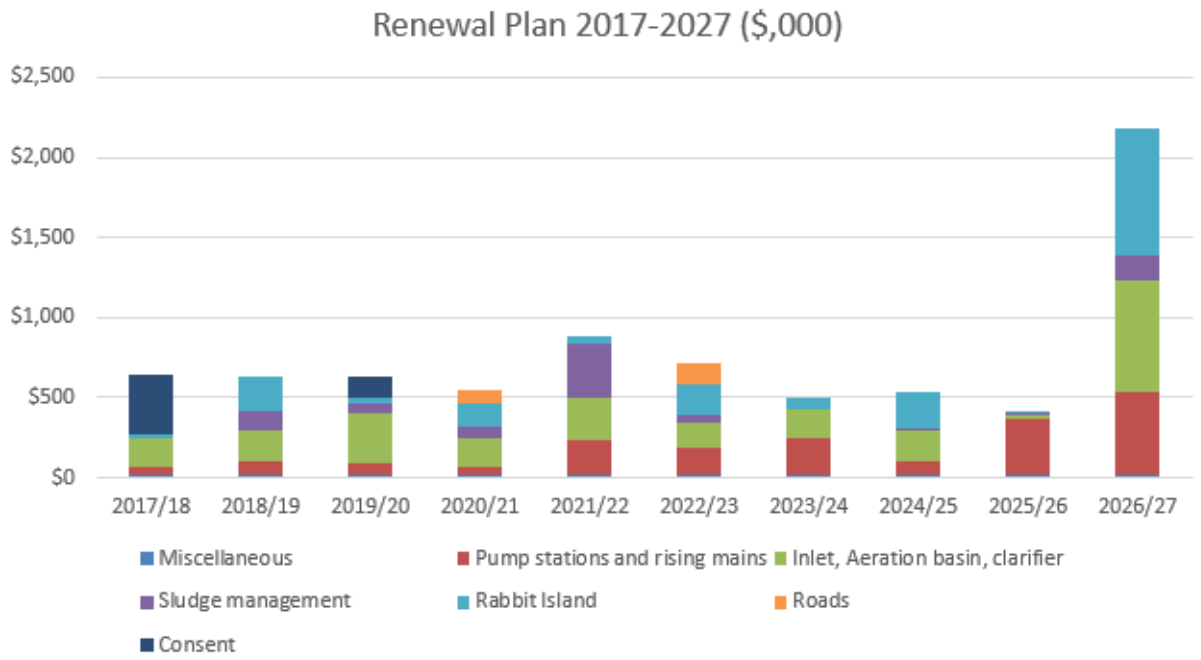
Renewal category	1	2	3	4	5	6	7	8	9	10
	2017/18	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27
Miscellaneous	$20	$20	$20	$20	$20	$20	$20	$20	$20	$20
Pump stations and rising mains	$50	$85	$67	$42	$218	$168	$228	$85	$344	$518
Inlet, Aeration basin, clarifier	$172	$188	$318	$190	$259	$154	$179	$193	$29	$697
Sludge management	$0	$119	$55	$63	$336	$52	$0	$8	$15	$153
Rabbit Island	$24	$223	$38	$154	$47	$186	$67	$233	$7	$798
Roads	$0	$0	$0	$75	$0	$138	$0	$0	$0	$0
Consent	$381	$0	$136	$0	$0	$0	$0	$0	$0	$0
Total	**$647**	**$635**	**$635**	**$543**	**$881**	**$717**	**$494**	**$539**	**$415**	**$2,187**

Figure 6.12: Long Term Renewals



The projected costs shows the lifecycle replacement costs for the NRSBU assets. Figure 6.13 shows an unmodified renewal programme based on lifecycle for the 10 year period starting 1 July 2017. The significant renewal costs associated with sludge management reflects the age of the associated assets.

Figure 6.13: Unmodified renewal programme based on lifecyle



Improved condition assessments could result in significant savings on renewal costs. (A1809096)

6.4.3 Sensitivity on Renewal Plan

The renewals programme is based on a transitional stage as detailed in section 6.5.2 and as this renewal strategy is developed the renewal programme will be reviewed.

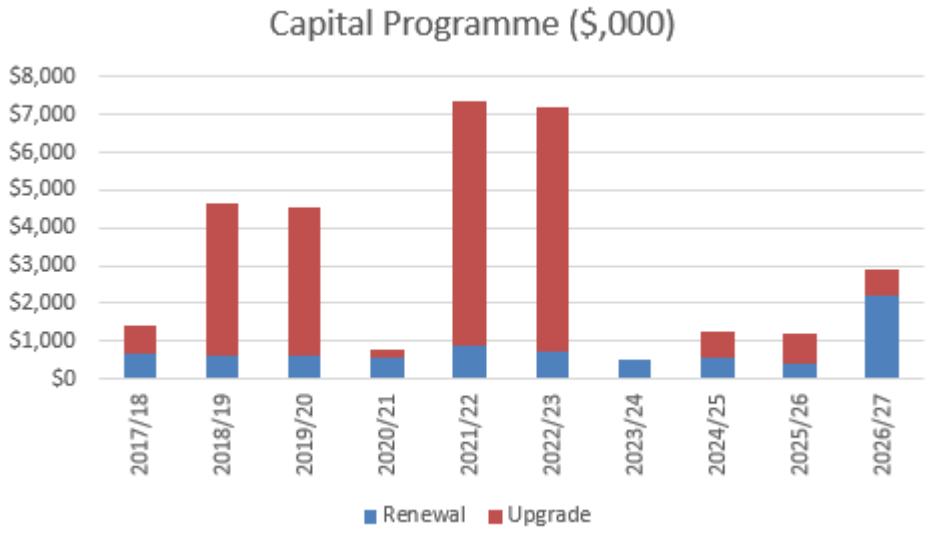
6.5 Capital Programme

6.5.1 Definition

New works are those works that create a new asset that did not previously exist or works which upgrade or improve the capacity. They may result from growth, social or environmental needs. Capital expenditure projects display one or more of the following characteristics:

- Construction works which create a new asset that did not previously exist in any shape or form.
- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrading works which increase the capacity of the asset.
- Construction works designed to produce an improvement in the standard and operation of the asset beyond its present capacity.

Figure 6.14: Capital programme



6.5.2 Capital works Programme 2018/19 to 2027/28

The capital works programme for the 10 year period as outlined in Table 6.4 below, for this period is dependent on the outcome of the renewal of the discharge permits.

Table 6.6: NRSBU Capital Upgrade Plan ($,000)

Year	Description of Projects	Estimated Costs
2017/18	Desludging oxidation ponds	100,000
	Modification pond M5	140,000
	Modification pond M1	140,000
	Generator at Inlet/Outlet	143,000
	Sludge management (Sludge Storage Tank)	200,000
	Regional pipeline upgrade (Review strategy)	40,000
2018/19	Treatment Plant Upgrade (Consent dependent)	2,500,000
	Desludging oxidation ponds	1,520,000
2019/20	Modification Facultative Ponds (Consent dependent)	420,000

Year	Description of Projects	Estimated Costs
	Treatment Plant Upgrade (Consent dependent)	2,500,000
	Richmond Regional Pipeline (Demand dependent)	1,000,000
	Resource consent: Rabbit Island Biosolids application to land	240,000
2020/21	Richmond Regional Pipeline (Demand dependent)	6,500,000
2021/22	Richmond Regional Pipeline (Demand dependent)	6,500,000
2024/25	Disposal of dried sludge to landfill	700,000
2025/26	Songer street upgrade (Demand dependent)	100,000
	Disposal of dried sludge to landfill	700,000
2026/27	Disposal of dried sludge to landfill	700,000
2030/31	Activated sludge management (2nd Secondary clarifier)	2,800,000
Total		$26,983,000

6.6 Assumptions and Uncertainties

Table 6.9 details possible and actual significant forecasting assumptions and uncertainties relating to the NRSBU wastewater system.

Table 6.9: Significant Forecasting Assumptions and Uncertainties

No	Assumption	Degree of Risk or Uncertainty	Likely Impact if the Assumption is (or is Not) Realised or is Not Acceptable
1	Interest rates for new loans raised, or existing debt refinanced during the years are forecasted (weighted average) as 5.5%.	Low	Level of debt is moderate. Interest costs are not expected to vary significantly.
2	Growth is based on figures provided by the individual contributors.	Low	Any significant increase in the growth may require upgrading of the regional sewerage system to occur at an earlier stage than presently proposed.
3	The actual remaining lives of assets will not deviate significantly from those contained in the asset valuation.	High	Changes in estimated asset lives could lead to significant changes in asset renewal projections, depreciation and renewal budgets.
4	The replacement values are a realistic cost and have taken into consideration engineering fees, resource consents etc.	Low	Replacement values have gone through a review process in 2017.
5	Upgrade/capital estimates are as follows: Concept +/- 25% Initial & Planning +/-10 to +/- 25% Execution +/- 5%.	Medium	Costs of upgrades are estimated only without detailed project planning.
6	Maintenance cost of service for Reticulation and Treatment will be within -5% and +10% of budget.	Low	Historically maintenance costs % variations for treatment have been low.
7	Depreciation based on estimated useful lives not on condition of assets.	Low	If proposed condition assessments indicate that NRSBU assets have decreased useful lives, depreciation presently taken will be less than that required for replacement.
8	Obtaining new resource consents.	Medium	Environmental standards changing.

7.0 ASSET MANAGEMENT PRACTICES

This section outlines the information available on the assets, information systems used and process used to make decisions on how the asset will be managed. It also provides details on planning for monitoring the performance of the AMP.

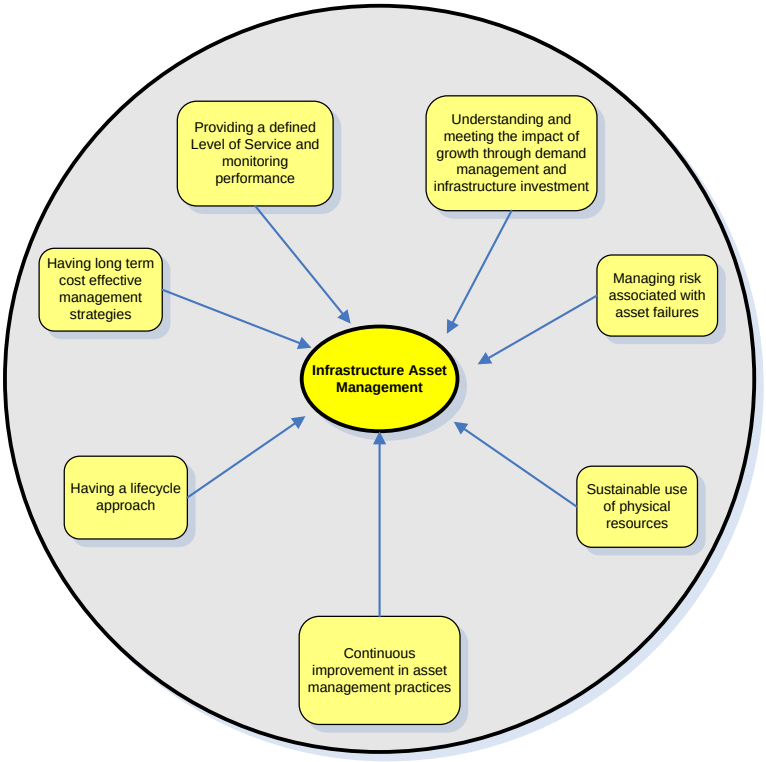
7.1 Introduction

The goal of infrastructure asset management is to: Deliver the required level of service to existing and future customers in a sustainable and cost effective manner.

A formal approach to the management of assets is essentially to provide services in the most cost-effective manner, and to demonstrate this to customers and other stakeholders. The benefits of improved asset management are:

- Improved governance and accountability
- Enhanced service management and contributor satisfaction
- Improved risk management
- Improved financial efficiency
- More sustainable decisions

The key elements of Infrastructure Asset Management are as shown below:



7.2 Advanced Asset Management

The January 2006 assessment indicated that the NRSBU asset management was about 90% of the "advanced" criteria. There is an intention to achieve an increased level of advanced asset management but there is no requirement to achieve advanced asset management in all areas.

NRSBU will investigate a programme to achieve the appropriate level of asset management.

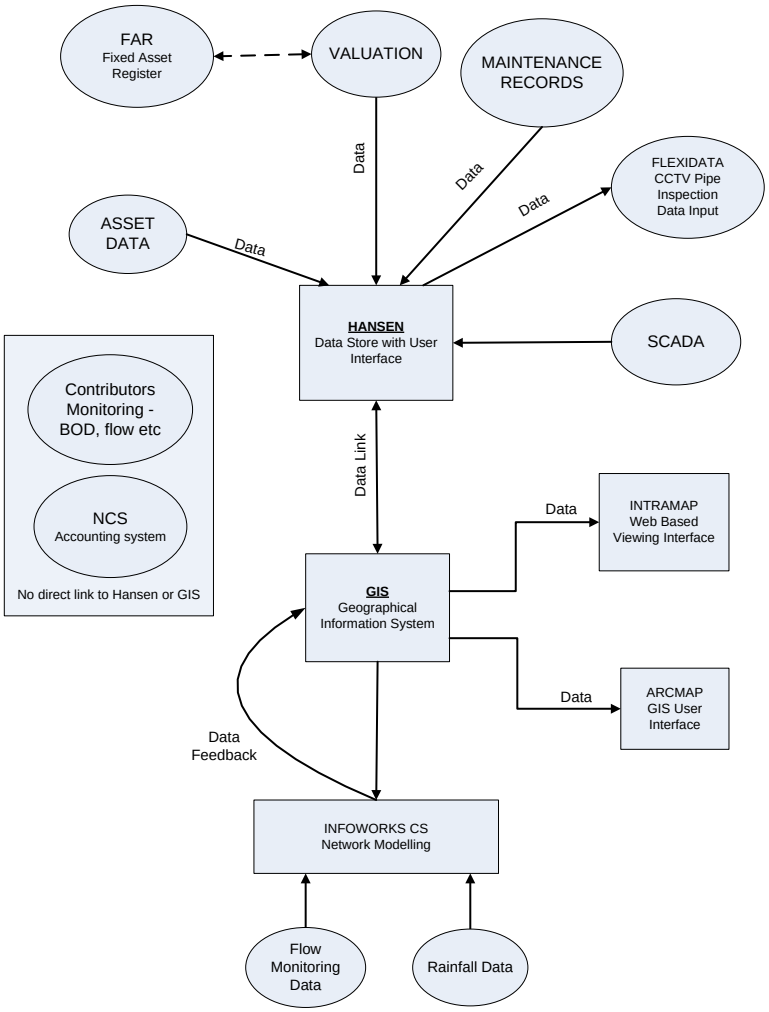
Table 7.1: NRSBU Advanced Asset Management Gap Analysis

	Practice	Gap	Comment
1	A reliable physical inventory of assets at both an individual asset level and at a network level. This would include:		
	• Physical attributes such as location, material, age etc.	No	All such data should be in GIS and asset register.
	• Systematic monitoring and analysis of physical condition for critical assets	Yes	There is no formalised system of monitoring condition, left to contractors to report on issues.
	• Systematic measurement of asset performance (including utilisation/capability) for critical assets.	Yes	In the process of identifying asset load and flow limits to set benchmarks for performance. Performance of contributors is monitored and reported on to the Board.
2	The assumptions underpinning financial forecasts should be disclosed in the organisations strategic plans and AM plans.	No	
3	Have degrees of confidence on the reliability of data as follows:	Yes	
	• Physical Inventory data: Grade 1		All critical assets to be identified and then these confidence levels to be identified for critical assets.
	• Condition data: Grades 2		
	• Performance data: Grades 2.		
4	AM planning will state what needs to be done to improve AM processes and techniques. Improvement programmes will outline:	Yes	
	• The weak areas and how these will be addressed		Continuous improvement.
	• The timeframe over which the improvements will take place		NRSBU will investigate a programme to achieve the appropriate level of asset management.
	• The resources (human and financial) needed, and		
	• Key performance indicators (KPIs) for monitoring AM improvement.		
5	Risk management for critical assets will encompass:	Yes	
	• Identification of strategies		Implemented.
	• Failure mode and effects analysis		Implemented.
	• Integration to disaster recovery plans (e.g. lifelines) and business continuity plans		Need integration with lifelines, etc.
	• The link to optimised decision making on maintenance and replacement strategies.		Addressed in AMP.
6	Identify all critical assets and then apply optimised decision making techniques only to these critical assets.	No	
7	The ability to predict, by applying models and past data, robust and defensible options for asset treatments that assist in achieving optimal costs over the entire life cycle of the asset or network, including:	Yes	
	• Applying appropriate economic evaluation tools (or other Council-endorsed prioritisation systems) in developing short-term project lists		Discounted Cash Flows (or NPV) evaluations done on some capital expenditure decisions, very few other economic tools used.
	• Using predictive modelling techniques to provide defensible long-term financial forecasts.		Rely on projections from Contributors Need to identify what predictive models (economic and capacity) are available and will meet NRSBU requirements.

7.3 Information Systems

All asset information is stored on Arcinfo, a computer based geographical information system (GIS), and Asset Management System (INFOR). The accounting system used is integrated computer software supplied by MagiQ. An overview of the asset information system is shown in Figure 7. below.

Figure 7.1: Asset Information Systems



7.4 Accounting and Financial Systems

7.4.1 Background

Accounting is currently carried out to Generally Accepted Accounting Principles (GAAP) to comply with the Local Government Act 2002. The Nelson City Council 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. External financial reports by significant activity are published in the annual report.

7.4.2 Definition of Expenditure Categories

Expenditure for the wastewater system can be divided into two broad categories:

- Day to day operations and maintenance works, and

- Programmed works that upgrade or renew the asset to maintain a level of service.

All expenditure on infrastructure assets falls into one of three categories:

- Operations and Maintenance Expenditure
- Capital Expenditure – renewals
- Capital Expenditure – new or upgraded assets.

7.4.3 Maintenance Expenditure

Maintenance may be planned or unplanned and is the regular day to day work necessary to keep assets operating, including instances where parts of the asset fail and need immediate repair to make the asset operational. This includes:

- Regular and on-going annual expenditure necessary to keep the assets at their required service potential.
- Day to day and/or general upkeep works designed to keep the assets operating at required levels of service.
- Works which provide for the normal care and attention of the asset including programmed repairs and minor replacements of sub-components (ie asset components not individually listed in asset register).
- Unplanned (reactive) maintenance, i.e. isolated failures requiring immediate repair to make the asset operational again.

7.4.4 Capital Renewal/Replacement Expenditure

Renewal expenditure is major work that does not increase the asset's design capacity but restores, rehabilitates, replaces or renews an existing component to its original capacity. This includes:

- Works that do not increase the capacity of the asset but restores them to their original size, condition capacity, etc.
- Reconstruction or rehabilitation works involving improvements and realignment.
- Renewal and/or renovation of existing assets, restoring the assets to a new or fresh condition consistent with the original asset.

7.4.5 Capital Creation/Upgrading Expenditure

Capital works create a new asset that previously did not exist, or upgrade or improve an existing asset. They may result from growth, social or environmental needs. This includes:

- Expenditure which purchases or creates a new asset (not a replacement) or in any way improves an asset beyond its original design capacity.
- Upgrading works which increase the capacity of the asset.
- Construction works designed to produce an improvement in the standard and operation of the asset beyond its present capacity.

7.4.6 Depreciation and Loss of Service Potential

Depreciation and Loss of Service Potential are calculated via the fixed asset register (FAR) using a spreadsheet. Due to the limited number of assets owned by NRSBU a spreadsheet system is considered the most appropriate and cost effective solution.

7.5 GIS

7.5.1 Background

All information in GIS are based on as-build information.

7.5.2 Accuracy Limitations

The data captured by photogrammetry was required to be accurate to within a tolerance of +/- 0.3m. In streets where surface openings could not be seen from the air (e.g. under verandas or trees) the points were picked up by the contractor's field survey team.

In other less accessible areas, it was not considered economic to search for buried fittings. Instead, the best estimated position was entered and the accuracy limitation flagged.

7.5.3 Maintenance of GIS Data

Nelson City Council's Land Development Manual require that any work on NRSBU assets must be proposed to Council by means of an engineering plan for approval and an "As-built" record submitted at the completion of works.

Procedures are in place to update new data into the GIS system on a monthly basis.

The design/build/operate contract required implementation of the INFOR AM system.

Data on assets associated with renewal and upgrade capital are now updated into the asset register by NCC Engineering and Finance staff. This ensures a high level of reliability.

7.6 Modelling

Modelling has been carried out for all four components of the system (pumping, rising mains, treatment and disposal) and normally been associated with planned upgrades.

The simplicity of the pumping and rising mains associated with the NRSBU means that this modelling can be carried out without sophisticated proprietary systems.

The existing treatment plant has been modelled in association with the Operation and Maintenance contract in 2014.

The modelling for disposal of biosolids to the afforested land on Rabbit Island is based on evidence presented for the resource consent in 1994 and the variation of the consent in 2008.

7.7 Asset Management System

7.7.1 Background

In 2000 the Hansen Asset Management System (INFOR) was selected as best suited to meet the future asset management planning requirements of NCC and was adopted as the system for use by NRSBU.

INFOR (Public Sector v8.4.0) provides the following key features that have enabled:

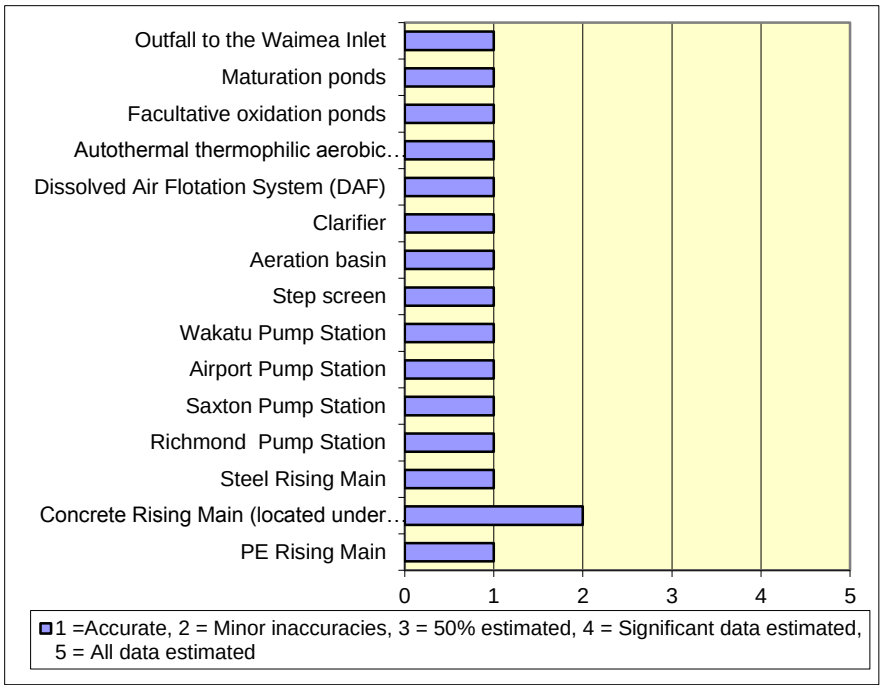
- Customer enquiries being logged directly and sent immediately to the contractor for action.
- Contractor directly enters resolution confirmation at completion of job.
- Tracking of expenditure on assets to allow assets that have a disproportionately high maintenance cost to be identified - upgrade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

7.8 Data Confidence

NRSBU have a high level of confidence in the asset attributes (as shown in Figure 7.) due to:

- The significant renewal and upgrade programmes have been carried out by the NRSBU since the early 2000.
- Requirements of the maintenance contact.

Figure 7.2: Data Confidence



7.9 Asset Management Processes

The table below sets out the current state of NRSBU Asset Management, existing business processes and the desired business processes that Management intend to develop in the next three years.

Table 7.2: Level of Current Business Process

Current Business Process	key	Attention Required by	Response Required
Requires attention		NRSBU Board	Action plans and management responsibility specified
Basic		NRSBU staff	Management responsibility specified
Appropriate best practice		Specific monitoring or response procedures	Management responsibility specified
Comprehensive		Routine procedures	Unlikely to need specific application of resources

Table 7.3: Management Business Practices

Process	Desired Business Processes	Current Business Processes	Competence
Level of Service	Contributor consultation results incorporated into levels of service.	A stated level of service.	Comprehensive
	High level performance measures with associated technical KPI to enable compliance reporting.	High level KPI's defined and processes developed to measure and report on these.	Comprehensive
	Customer feedback surveys.	Customer feedback survey for ascertaining performance levels.	Comprehensive
Organisation issues	Corporate sponsorship and commitment throughout senior management.	High level of corporate sponsorship.	Appropriate
	High level of staff skills and on-going training programmes.	High level of skills	Appropriate
Knowledge of Assets	Comprehensive data collection system for consultants and contractors.	Data capture programme for validation of GIS network database in place.	Appropriate
		Process in place for new as-builts, vested assets to be entered into GIS and IMS database.	
Condition Assessment	Inspection programme cycles based on criticality and condition.	Inspection programme cycles based on criticality and condition.	Appropriate
	Use of industry documents (condition rating manual).	Condition rating manual used in condition assessments.	
Risk Management	Critical assets monitored and failure modes understood.	Risk management is practised informally, based on the knowledge of staff.	Appropriate
Accounting / Economics	Level of deferred maintenance identified through condition rating.	No deferred maintenance identified.	Appropriate
	Valuation optimised by criticality, capacity and system redundancy.	Valuation based on optimised replacement costs assuming the use of modern techniques and pipe materials.	Appropriate
Maintenance	Measurement of actual performance against level of service indicators.	Measurement of actual performance against level of service indicators.	Appropriate

Process	Desired Business Processes	Current Business Processes	Competence
	Performance outcomes included in maintenance agreement.	Performance outcomes included in maintenance agreement.	Appropriate
Performance Monitoring	Range of performance standards developed for service delivery contracts.	Range of performance standards developed for service delivery contracts.	Appropriate
Optimised Life Cycle Strategy	10 year renewal programme with budgets based on predicting failure for critical assets, replacement on failure of non-critical assets.	10 year renewal programme with budgets based on asset age and knowledge of plant operators, staff, extensive consultation and reports from specialist consultants as appropriate.	Appropriate
	Life cycle and risk costs considered in optimisation process.	Life cycle and risk costs informally considered in optimisation process.	Basic
Design, Project Management	Document design and project management procedures.	High level of contract management procedures defined.	Appropriate
	Improved contract management with quality assurance programmes.	High level of contract management with quality assurance procedures.	Basic
QA / Continuous Improvement	System of quality checks on work activity and data collection in place.	Some inspection of work undertaken but no formal process for quality assurance.	Appropriate

8.0 AMP PLAN IMPROVEMENT AND MONITORING

This section details the improvements to asset management within NRSBU that will lead to an increase in confidence in the management of the assets.

8.1 General

An important component of this asset management plan is the recognition that it is a "live" document in need of monitoring, change and improvement over time.

The NRSBU AMP is a regularly revised and evolving document and will be reviewed annually and updated at least every three years. The AMP will be developed throughout its life cycle as further information about the wastewater system assets are collected in terms of condition, performance and service delivery. NRSBU is committed to advanced data collection and management systems that will allow for a greater appreciation of the performance and condition of the NRSBU assets.

The effectiveness of the Wastewater Asset Management Plan will be monitored in various ways and the results used in the updating and revision of the Plan as described in following sections.

8.2 Timetable for Audit and Review

The programme for future asset management reviews of this plan is shown below:

Table 8.1: Timetable for Audit and Review

Activity	Target Date
Improvement Plan reviewed annually by all staff directly involved and focusing on key business issues.	30 June each year.
Report on Improvement Plan.	30 June each year.
Adoption of AMP by Board.	December every 3 years (Next plan review due 2020).
Audit NZ external audit.	As required by Audit NZ.

8.3 Performance Monitoring and Management

The effectiveness of the Asset Management plan will be monitored by the following procedures that will use the dashboard reporting system:

- Levels of Service performance reporting to the NRSBU Board on a quarterly basis.
- Quarterly reporting on the improvement plan and action plan to the NRSBU Board.
- Operations reports on a daily, weekly and monthly basis to staff.
- Environmental reporting on a monthly basis to consenting authority.

The continued monitoring of these performance measures and on-going analysis of results will result in:

- Optimisation of expenditure through the asset lifecycle.
- Service levels actively monitored and reported on.
- Management of risk and control of failures.

8.4 Improvement Programme

The NRSBU Improvement Plan as detailed in Table 8.2 is focused on the following key areas:

- WWTP upgrade requirements;

- Enhanced Maintenance;
- Asset Management.

Table 8.2: Improvement Programme

IP	Description	Resource Requirements	Progress
IP-1	Consolidate all natural disaster information and review 3 yearly.	In-house	On-going.
IP-2	Renewal of effluent discharge permits	In-house	On-going.
IP-3	Develop sludge removal programme.	In-house	On-going.
IP-4	Review Long Term Plan	In-house	2018-2020
IP-5	Review the AMP	In-house	2018-2020
IP-6	Investigate use of gravity belt thickener for use to thicken secondary sludge	In-house and Consultant	2018-2021

8.5 Monitoring and Review Procedures

8.5.1 Asset Management Plan Review

The plan will be reviewed annually and revised every three years to incorporate improved decision making techniques, updated asset information, and NRSBU policy changes that may impact on the levels of service.

8.5.2 Statutory Audit

The Local Government Act requires that an independent, annual, financial audit of the operations of the NRSBU be carried out.

8.5.3 Internal Audit

Annual internal audits will be taken to assess the effectiveness of the plan in achieving its objectives. The internal audit will also assess the adequacy of the asset management processes, systems and data.

9.0 ACTION PLAN

9.1 Explanation

Throughout this Wastewater Asset Management Plan, objectives, targets, capital works, maintenance and improvements to general business processes are referred to.

Table 9.1 details the AMP Action Plan and the existing status of the individual improvements.

Table 9.1: Action Plan Status

AP Number	Description	Status	Comment
1	The annual survey will be sent out in March and the results reported to the Board in June.	On-going	Annually.
2	The business and asset risk control schedules will be updated on a regular basis, to ensure that all risks are relevant and understood.	On-going	Next review due in 2019/20.
3	The existing maintenance schedules and procedures, quality/procedure, decision making process, contingency and operation and maintenance manuals are to be formalised, updated where required.	On-going	Review annually.
4	Annually review Business Continuity Plan.	On-going	Review annually.
5	Ensure Lifelines Plan up to date and identified risks and mitigation works are programmed into capital works programme.	On-going	To be reviewed by NCC and TDC.
6	Review of security required at all facilities.	On-going	Part of maintenance contract requirements.
7	A programme of regular pipe inspections of risk areas to be developed.	On-going	Annually.
8	Internal benchmarking carried out annually.	On-going	Annually.
9	Annual review of contractor performance.	On-going	Annually.
10	Review business continuity plan.	On-going	Annually.

Outstanding actions will be carried forward to this AMP and annual business plans.

9.2 Action Plan Implementation

The following table indicates the possible time lines for the individual improvement items over the following 3 years.

Table 9.2: Action Plan Implementation

	2018				2019				2020			
	1	2	3	4	1	2	3	4	1	2	3	4
Annual customer survey.		■				■				■		
Business Continuity Plan review.	■				■				■			
Consider benefits of succession planning and how it might be implemented with be considered once governance issues (TDC and NCC) have been resolved.	■											
A programme of regular pipe inspections of risk areas to be developed.			■				■				■	
The existing maintenance schedules and procedures, quality/procedure, decision making process, contingency and operation and maintenance manuals are to be formalised, updated where required.			■				■				■	
Review of security required at all facilities.		■				■				■		
Monitor sludge levels in ponds and ascertain long term removal and disposal requirements.	■											
Consolidate all known natural disaster events information for consideration by the board.				■				■				■
All condition and performance data shown in Hansen.					■			■				■
Biosolid application permits renewal.			■	■	■	■	■	■	■	■	■	

SECTION 4 Bibliography and NRSBU Strategic Plan 2013-2016

APPENDIX A BIBLIOGRAPHY

Title	Date	Author
Bell Island Wastewater Treatment Plant Treatment Capacity and Commissioning Report	July 2011	CPG NZ Ltd
Bells Island WWTP Treatment Capacity Report	November 2006	Waste Solutions Ltd
NCC Wastewater Asset Management Plan	2005	Nelson City Council
The Development of Business Process Mapping for Asset Management Systems	June 2000	Opus International Consultants Ltd
New Zealand Infrastructure Assets Grading Guidelines	1999	NZWWA

APPENDIX B NRSBU STRATEGIC PLAN 2013-2016

1. Mission Statement

The NRSBU's mission statement is:
"To identify the long term wastewater processing and reticulation needs of our customers and to meet current and future needs in the most cost effective and sustainable manner."

2. Strategic Goals

- Wastewater reticulation, treatment and disposal services meet customers' long term needs.
- The costs of wastewater reticulation, treatment and disposal services are minimised.
- Risks associated with the services provided are identified and mitigated to a level agreed with customers and owners.
- We engage the right people with the right skills and experience
- NRSBU operates sustainably and endeavours to remedy or mitigate any identified adverse environmental, social and cultural impact.
- Good relationships are maintained with all stakeholders.
- All statutory obligations are met.

All strategic goals are important and no one goal will be pursued at the expense of another.

3. Strategic Objectives and Performance Measures

The objectives below describe the long term aims of the business unit. Performance measure targets and dates (where they are not specified below) will be set annually in the Business Plan along with performance measures for projects identified in the Asset Management Plan. Performance will be reported on quarterly to the NRSBU Joint Committee and annually or six monthly, as appropriate, to the shareholding Councils.

Long Term Objectives	Key Performance Measures
1. Wastewater reticulation, treatment and disposal services meet customers' long term needs	
Sufficient reticulation, treatment and disposal capacity is available for loads received.	Loads do not exceed the capacity of the system components.
Intergenerational equity is maintained.	Loans are repaid over 30 years (the average life of the assets).
Customers are encouraged to engage with the organisation and are satisfied with the service.	All customer representatives attend at least 75% of customer meetings. Customer surveys show an average score of at least 5 out of 7 on satisfaction with services.
Levels of service are defined in all contracts and are met.	100% compliance with service level agreements by all major contractors.
2. The cost of wastewater reticulation, treatment and disposal services are minimised	
The costs of reticulation, treatment and disposal are minimised.	The operational costs of reticulation, treatment and disposal processes are maintained under the cost for these services at 30 June 2013 when adjusted by the Producer Price Index. All capital projects are delivered within budget.

Long Term Objectives	Key Performance Measures
The economic lives of all assets are optimised.	Three yearly independent audit of asset management practices confirms this.
Customers understand the benefits of demand management and the costs, risks and environmental implications of increasing demand.	Demand management policy is developed by June 2014. Customer contracts are reviewed by December 2014 to ensure that charging mechanisms support the demand management policy. NCC and TDC implement their own load management policies, priorities and plans by June 2014. Combined loads do not exceed the capacity of the components of the system. Peak storm water inflows are reduced by 10% per year and that this target is reviewed annually.
New technology choices are well understood and are proven to be reliable, sustainable and cost effective.	All significant technology choices are supported by cost benefit analysis, independent peer review, energy efficiency analysis, risk analysis and, where appropriate, by other users of those technologies.
3. Risks associated with the services provided are identified and mitigated to a level agreed with customers and owners.	
Risk management plans include all significant health and safety, environmental, cultural, social, economic and contractual risks.	No event, which impacts on agreed levels of service, occurs that has not been identified in the NRSBU risk management plans. Customer representatives review and approve the risk management plan annually and following any incidents which require activation of the plan.
Contingency plans adequately address emergency events.	Customer representatives review and approve the plans annually. Effectiveness of plans is reviewed and confirmed following incidents which require activation of the plan.
4. We engage the right people, with the right skills and experience.	
Those engaged with the NRSBU have the right skills, experience, and support to perform well.	Annual staff performance reviews include assessment of the skills and experience required in their role in NRSBU and their development needs are identified and met. Development and succession plans are in place. The Board reviews its performance at least annually. A workshop is conducted at least annually to develop the skills and industry knowledge of Board members and staff.
Operation and maintenance manuals reflect best practice for the management of the plant and reticulation systems and are followed consistently.	An independent audit every three years confirms this.
5. NRSBU operates sustainably and endeavours to remedy or mitigate any identified adverse environmental, social or cultural impact	

Long Term Objectives	Key Performance Measures
NRSBU minimises adverse environmental, social and cultural impacts where this is economically viable.	Targets are set for energy efficiency improvements by June 2014 and are reported on and reviewed annually from that date. Current capacity to utilise beneficial application of biosolids to land is sustained. Beneficial economic and environmental reuse of treated waste water is maintained or increased. Environmental, social and cultural impacts are considered in all decision making.
6. Good relationships are maintained with all stakeholders	
Shareholders are satisfied with the strategic direction and the economic performance of the business unit.	All strategic and business plans are approved by shareholders. All budget projections are met.
Good relationships are maintained with all stakeholders including owners, iwi, customers, contractors, neighbours, and the wider community.	All complaints or objections are addressed promptly. All applications for resource consents are approved. Up to date information on activities and achievements is publically available. Stakeholders are identified and communication targets are set and met by June 2014.
7. All statutory obligations are met	
All statutory obligations are identified and met and are included in contracts with suppliers.	100% compliance with all statutory obligations.
All resource consent requirements are met.	100% compliance with all resource consents.