Asset Management Plan – Municipal Wastewater Treatment and Disposal

March 2015

Contents

Quality assurance information

Plan Version and Control		
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Approved for release		
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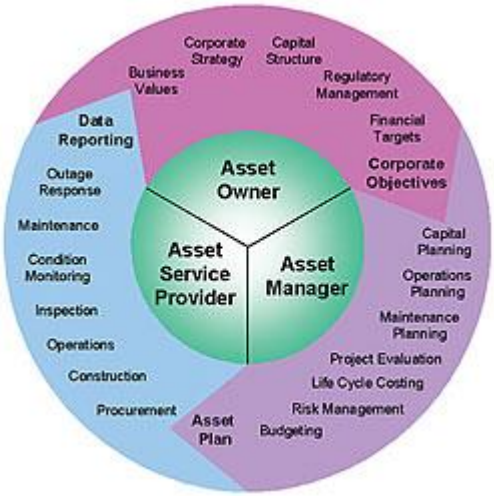
Executive Summary

The purpose of the wastewater disposal activity is to provide a safe and reliable disposal of wastewater from residential, industrial and commercial properties. The activity is also linked to the water supply management, as water conservancy influences the wastewater system capacity. Disposal or re-use of the treated effluent from the wastewater process is governed by consents from Greater Wellington Regional Council.

The primary purpose of the Carterton District Council (CDC) wastewater system is to service the Carterton urban community. There are approximately 2,400 properties connected to the municipal wastewater system.
The network is comprised of approximately 38km of gravity reticulation mains, augmented by pumps and pump stations. Flows gravitate into the Dalefield Road wastewater treatment plant, and treated wastewater effluent is discharged to both land and water.

Historically Council asset records have grouped pipe assets by material. This (2015) AMP has given each pipe stretch (between manholes) a unique identifier in addition to condition rating, age and material. Thus it is now possible to more accurately identify pipe stretches nearing the end of their life, and to obtain a broader knowledge of how the reticulation system is functioning. At present condition rating information is scarce, and an improvement action is to revitalise the recording system for asset condition, repair, and renewal.



A policy framework has been developed for identifying measures by which routine maintenance operations can be used to extend the working life of the asset.

Other improvements include repeating the asset inventory identification process for all wastewater assets, and to develop a formal asset management policy.

CDC's structure is such that traditional roles of Asset Manager and Asset Service provider (fig. 1) overlap. Whilst the exact division of duties is not critical, a starting point for the asset management policy is to review asset management duties relevant to the specific Council structure, and assign tasks to suit staff competencies. Development of a Council specific asset diagram as per figure 1 would make clear and communicate each party's responsibilities.

Figure 1 The three aspects of asset management (source http://www.electricenergyonline.com/show_article.php?mag=&article=179)

The construction of the land irrigation system in 2014 signifies a significant increase in level of service: by re-using the wastewater for crop irrigation and avoiding a discharge to water for the summer and autumn periods, there is a significant reduction in the environmental effects caused by Carterton's wastewater system.

Whilst currently of no legal effect, Wellington Regional Council's Draft Natural Resources Plan is indicative of the likely policy direction and what that might mean for the level of service requirements for wastewater. It is closely aligned with Carterton District Council's wastewater strategy in preference for discharges to land, and it is anticipated that infrastructure investment and an increased level of service will be required over the period of this plan (in the form of improved treatment level and irrigation of treated wastewater to land).

1 Introduction

The purpose of this *basic* Asset Management Plan is to outline and summarise the Council's long-term asset management approach for the provision and intergenerational management of CDC's municipal wastewater system. Since the 2012 AMP, work has been carried out on assigning unique identifiers for wastewater assets, and these have been incorporated into the asset register, allowing greater ability to record and analyse asset condition and renewals.

The plan describes the strategies and programmes for the Carterton municipal wastewater adopted to meet the required level of service to existing and future users in the most sustainable and cost effective way.

The plan informs the Council's Infrastructure Strategy and Long Term Plan (LTP) and contributes to meeting the identified community outcomes. It is intended that this plan will be a living document, and that through its life it will be modified to include information and policies that improve or enhance the Council's ability to effectively manage assets on behalf of the community.

Table 1 Purpose of Plan

Items	Detail
Introduction	
Description	Description of assets and level of service
Strategic Alignment: Linkage between agreed community outcomes and Levels of Service	Translates higher level aspirations into meaningful service level items
Risk Management – assessment and mitigation against failure to deliver levels of service, with mitigation measures provided e.g. projects	Funding and associated justification. Clearly presented funding requirements, linked directly to delivering levels of service
Knowledge improvement	Improvement in data collection & application, clear lines of responsibility, and creation of a practical working document.
Activity management: Prudent acquisition, operation, maintenance, renewal and disposal of assets	Optimisation of asset use in delivering a service to the community throughout its lifecycle
Financial forecasts	Existing data is used to estimate the financial implications of the asset management
Assumptions	To communicate the assumptions used in producing this plan and therefore its limitations.

Plan format

The plan format is summarised in figure 1.

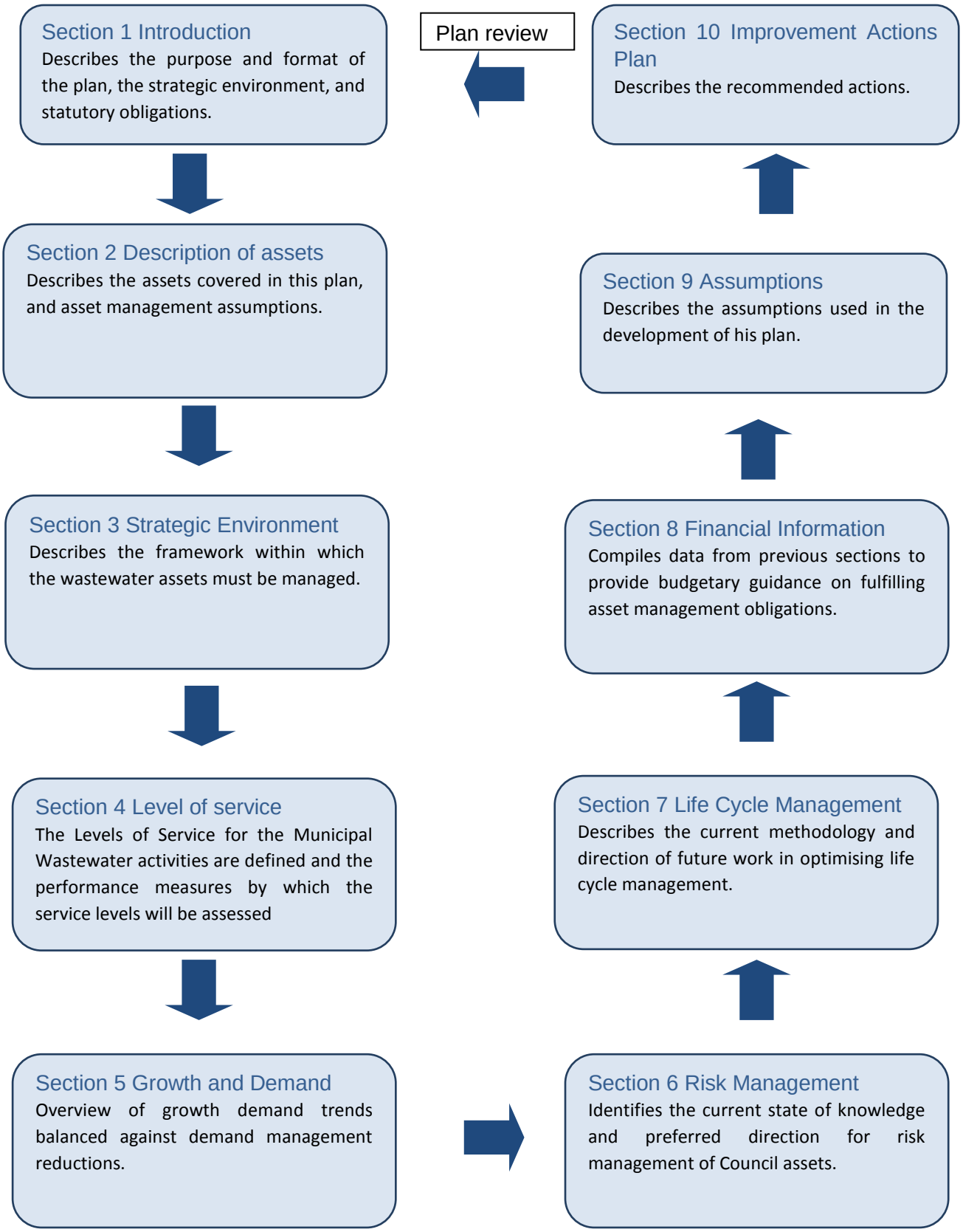


Figure 2 Plan Format

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The AMP aims to put in place systems and processes that will improve the transparency and efficiency of the way that Council assets are created, maintained, and funded to meet the level of service desired by the community. This asset plan will be reviewed and revised every three years. It is recognised that enhancement of the Asset Management Plan is required over time.

The 2015 revision is focussed on:

- improving linkages between the physical assets, and the management of those assets. This starts with basic identification of asset location and age, to be refined with condition rating over time.
- defining who is responsible for each aspect of the Asset Management Plan implementation
- Setting the framework for improved asset budgeting in the future by refinement of asset data.

The wastewater AMP is paralleled by AMP's for stormwater, water supply, and has relationships to the Combined District Plan.

2 Description of Assets

Reticulation

The reticulation system (fig. 2) consists of

- domestic pipes on private land – approximately 2,300 connections,
- the pipes and manholes of the municipal system; pipes range in diameter from 80mm to 380mm and the network consists of 38 km of underground piping.
- There are 15 pump stations (Appendix 3) at strategic locations throughout the town to lift sewerage from low lying areas up into the gravity network.

When entering the treatment plant, the process is;

- Grit removal by contra-shear
- Measurement at the inlet flume
- Collection and transfer by inlet pumps to
- A primary clarifier
- Flows then gravitate to two oxidation ponds in parallel, and then to
- A secondary pond, and from there through
- Constructed wetlands to

- An Ultra Violet disinfection unit (2014)
- Flows then either discharge via a flow measurement device to an unnamed stream, or are irrigated to land via a centre pivot irrigator (2014). There are a number of measurement and control units that assist in monitoring and management of the system.

The age of the reticulation ranges from some 70 years old to current and hence condition varies throughout the network (fig. 4). Older pipeline and lateral types include earthenware, concrete and asbestos cement. Newer pipelines and connection laterals are of UPVC materials.

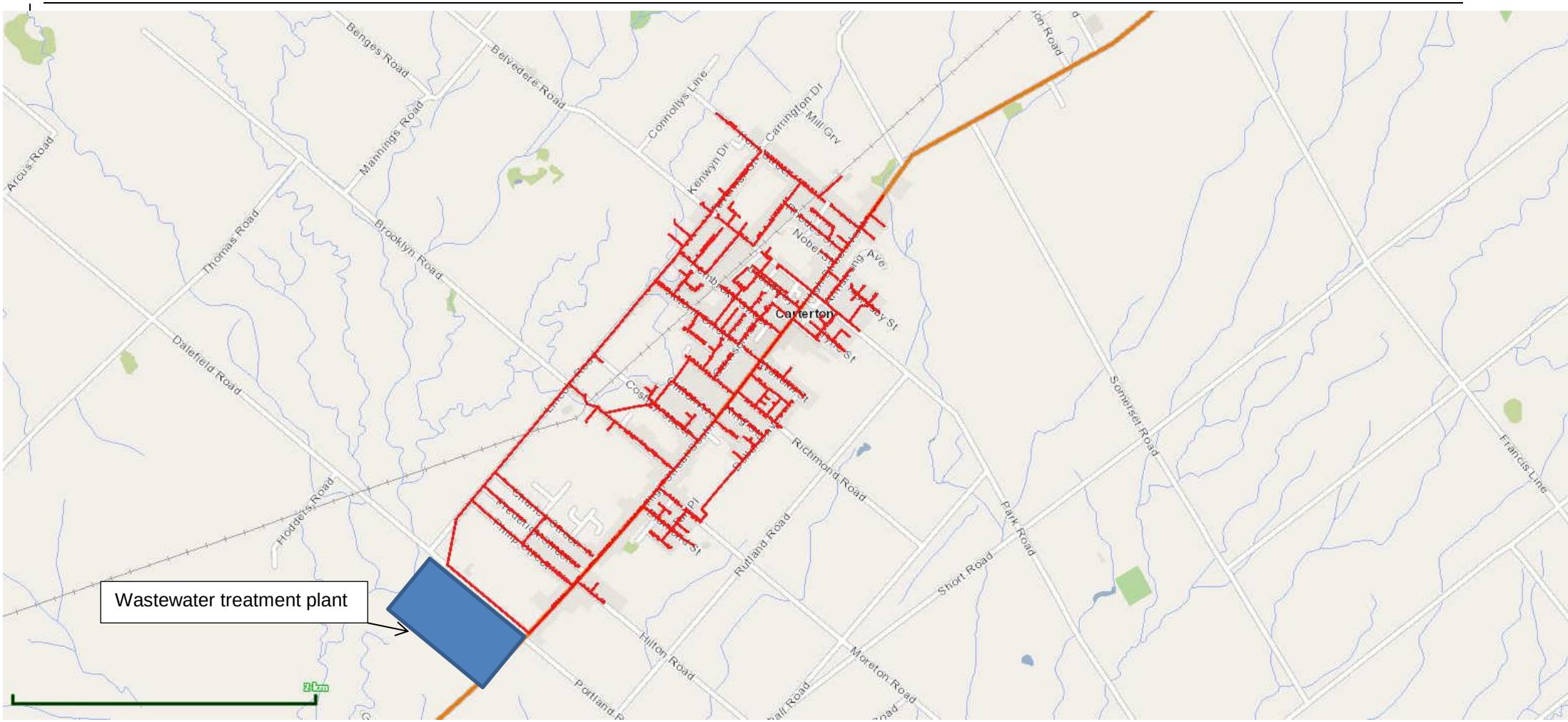


Figure 3 Sewer network

The pipes in the municipal portion of the system are also of varying diameter, with the predominant sizes being 150mm and 225mm.

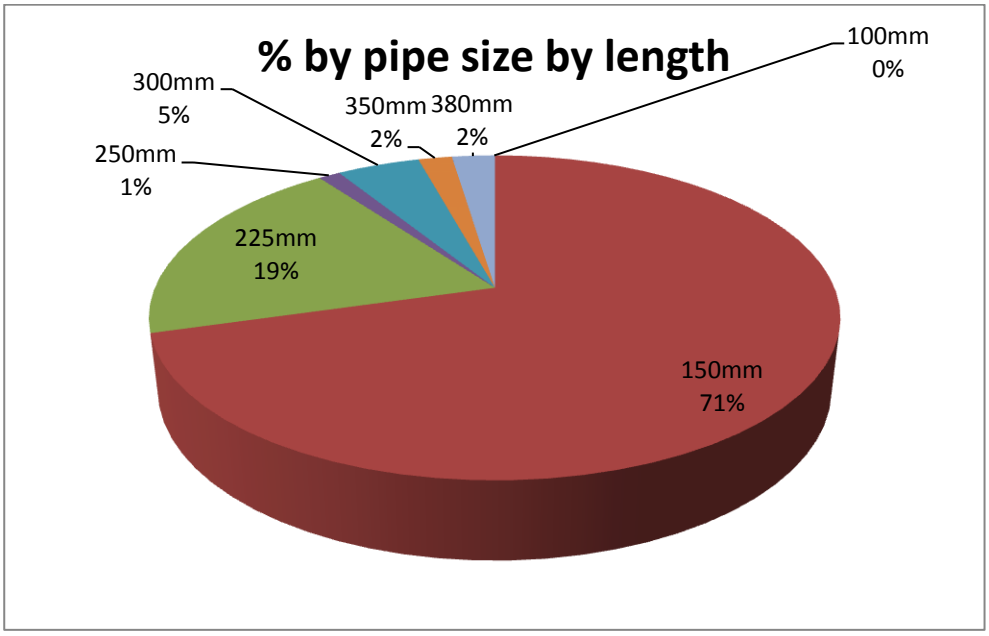


Figure 4 Pipe Size Distribution

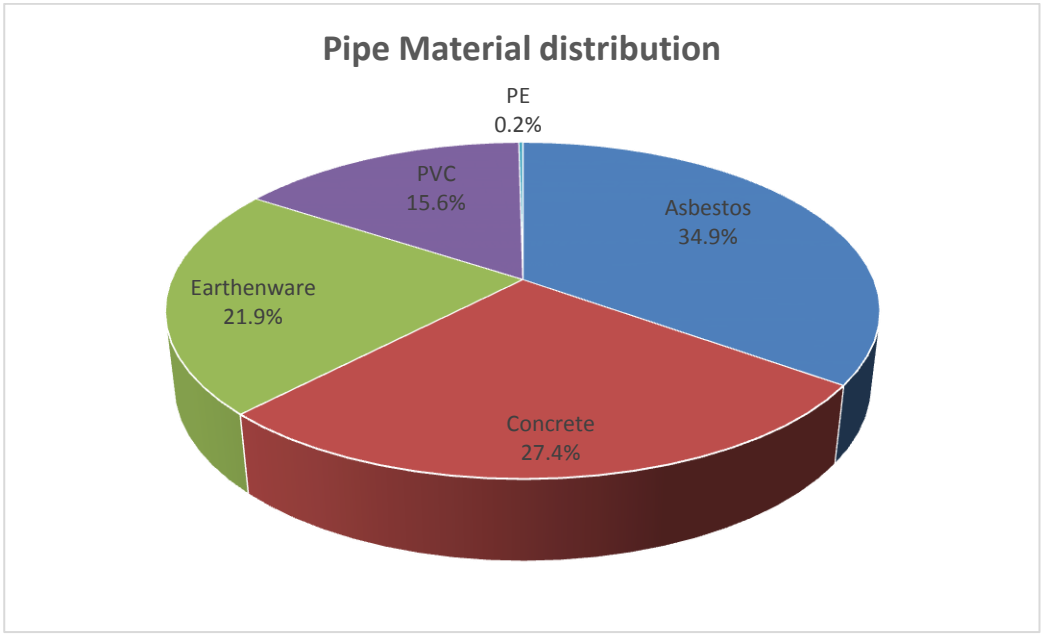


Figure 5 Pipe material distribution

Wastewater treatment plant

The Carterton Wastewater Treatment Plant (WWTP) is located off Dalefield Road, South Carterton and is owned and operated by CDC. The WWTP provides treatment of wastewater collected by Carterton's reticulated sewerage system as per the figure below.

Figure 6. Carterton Wastewater Treatment Plant, wetlands, receiving stream and monitoring bores.

The wastewater treatment plant occupies a lot of approximately 16ha of land area, which also includes the (now closed) Carterton Landfill.

The valuation reference for the site is 1814055100, and the legal description is Lots 1 and 2, DP 24549, and Lots 1 and 2 DP 30724, Block X, Tiffin Survey District. The NZMS 260 grid reference is S26 205 154. In 2012, Council purchased an area of land for use in wastewater treatment and disposal/reuse.

The site is located at the south end of Carterton on Daleton Farm, Lot 2 DP89642. The proposed current irrigation is on land immediately adjacent to the designated wastewater treatment plant where the existing consented wastewater activities occur. The grid coordinates are:

Easting: 1810315.70 / Northing: 5453154.13, BP34:1031-5315.

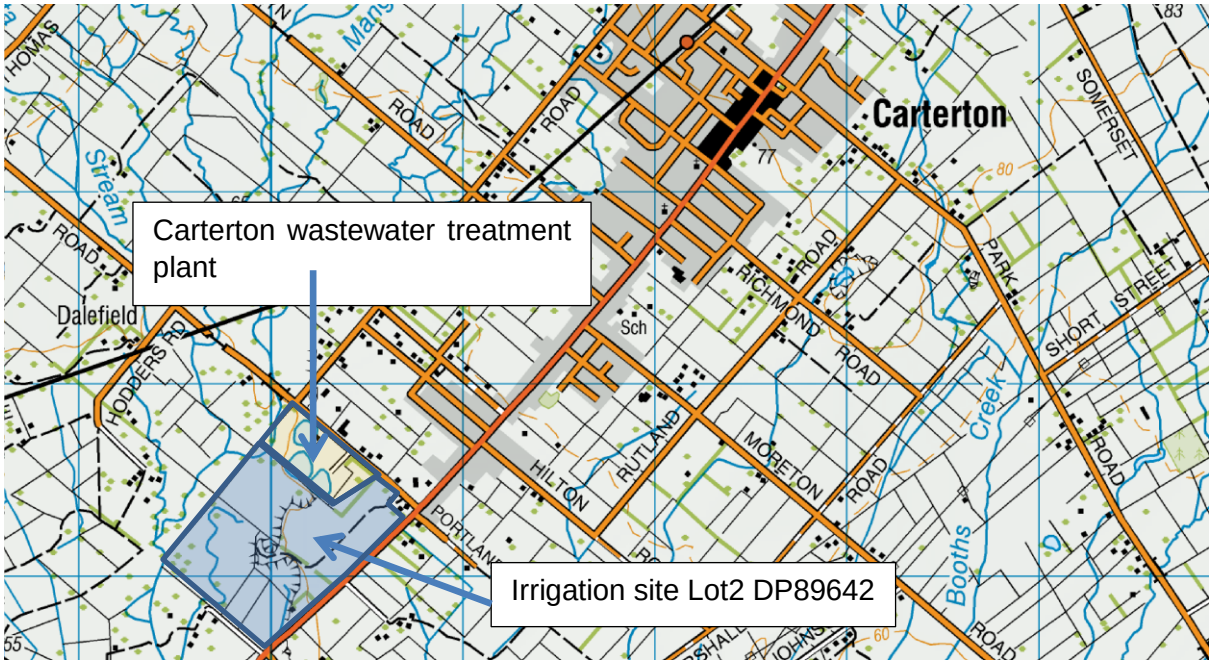


Figure 7 The site is lot 2 DP89642 comprising approximately 65 Hectares located immediately adjacent to the Council's wastewater treatment plant on Dalefield road.

Wastewater from Carterton Township is primarily gravity fed to the treatment plant on the edge of town at Dalefield Road. The treatment plant is located adjacent to farmland and access is via Dalefield Road.

The treatment plant process comprises: fine screen, clarifier, sludge digester, a two-stage oxidation pond system, and 16 wetland plots. The screen removes debris and floatables prior to the pumping chamber. The screenings are deposited into a thick-walled plastic liner at the site. The liner is then sealed and disposed of with solid refuse. Weekly volumes of screenings disposed of are in the order of 0.5 – 0.75 m3.

Oxidation Ponds 1 and 3 act in parallel as secondary treatment ponds, and Pond 2 provides a polishing function as a tertiary pond. Treated effluent from Pond 2 discharges via flow splitters into the 16 wetland plots, then into a common outlet collection channel.

Additions in 2014 include the installation of a screen, a pump well and pumps that pressurise the wastewater and force it through an Ultra Violet reactor. From here it then passes either into a small unnamed drain (at or around map reference S26:201-156) or into a new 300mm medium density polyethylene pipe to the new centre pivot irrigator.

Thus depending on weather conditions the wastewater is either discharged to the Mangatarere River or irrigated to land.

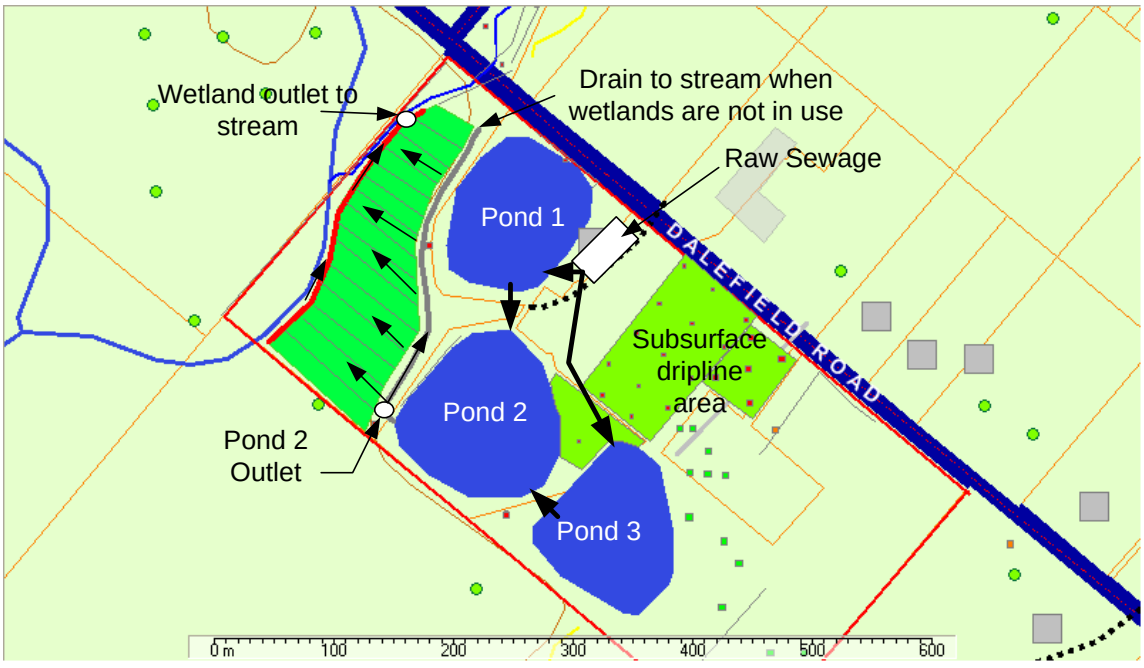


Figure 8. Flow path for Carterton Sewage Treatment Plant (prior to UV installation). Note that this diagram still represents the discharge location when the irrigator is not used (see fig. 8 for irrigation area components)

Daleton Farm Irrigation - System component locations

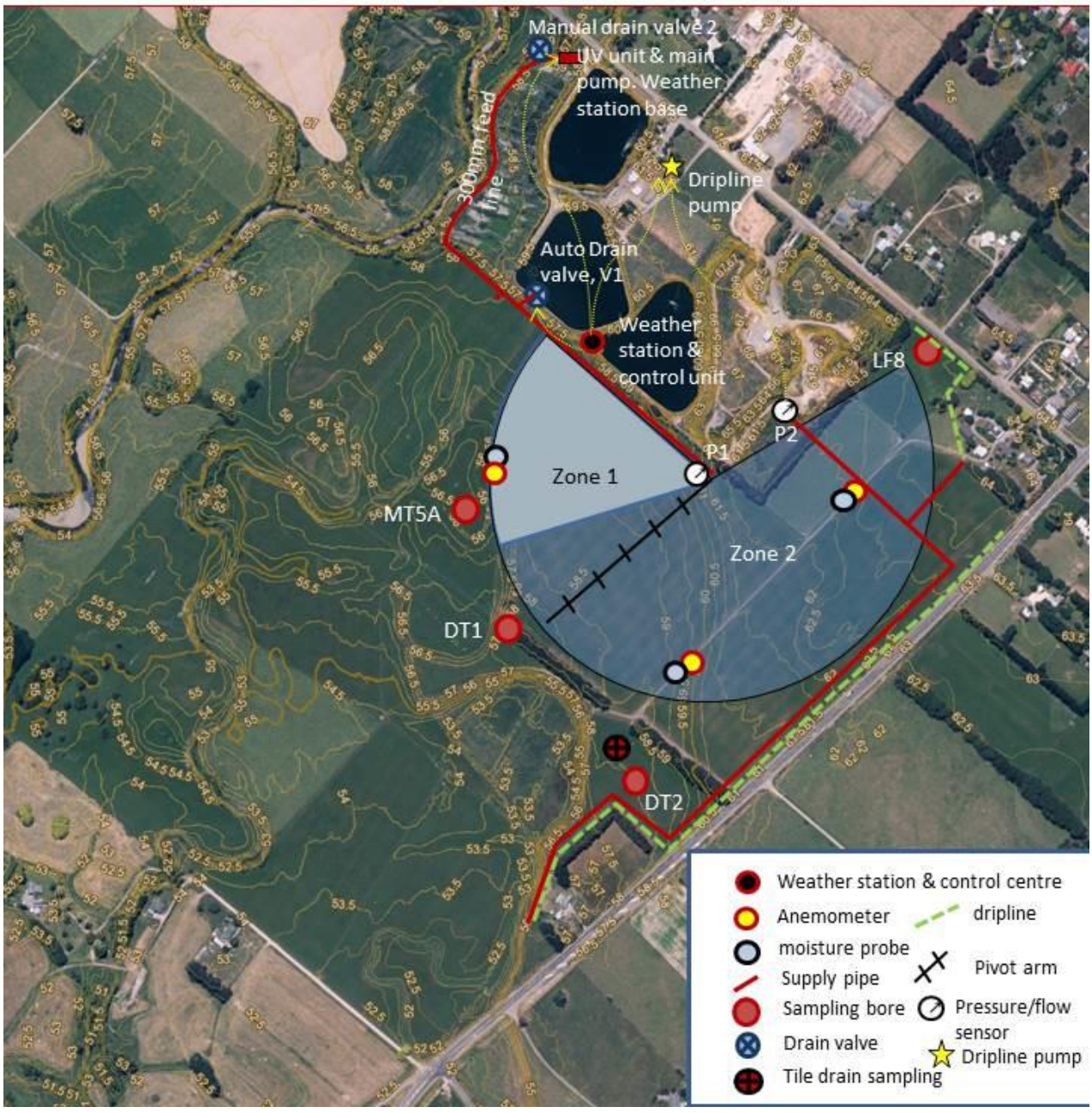


Figure 9 Irrigation components

The treatment process involves a significant number of assets, from pumps to screens, concrete structures, and oxidation ponds. 2014 assets additions include anemometers, centre pivot irrigator, pipeline, valves, UV reactors, pumps, pump well, UV housing, and control gear.

In general, the civil structures such as ponds and concrete clarifier have long base lives and low maintenance requirements. By contrast, pumps have relatively short lives, and/or relatively high maintenance requirements.

Pump stations

The Council reticulation system currently includes fifteen pump stations. The gravity systems reticulating to the pump stations had, at the time of the 2012 AMP, not been analysed for integrity and level of service provision.

In April 2014 an initial review provided base information on which to make decisions about specific investigation and/or repair work (Appendix 3).

The methodology used will be repeated concurrently with the flow analysis of the main reticulation system to identify critical asset serviceability areas in regard to the pumped catchments.

Improvement Actions:

a) Divide assets into groups in the asset register to facilitate easier reconciliation of additions or alterations – e.g group assets in the wastewater treatment plant as one group, pump stations as another, manholes etc.
b) Carry out an inspection of accessible assets to give a starting condition rating.
c) Continue with establishing linkages between the asset register and the GIS.

Effects of providing wastewater services via wastewater assets

There are positive and potential negative effects of the wastewater assets:

Wellbeing	Potential Positive Effects	Potential Negative Effects
Social	Maintaining / improving health and wellbeing through the provision of an effective sanitary collection, treatment and disposal system	Malodour from pumping stations and treatment plants can impact on quality of life and amenity.
Environmental	Robust wastewater planning and design avoids adverse effects on the environment to efficient use of non-renewable energy resources	Sewage overflows from pumping stations or blocked sewers and impacts of the final effluent quality at the point of discharge have the potential for negative impact on the environment
Economic	Provides efficient means for the disposal of trade wastes from local commercial and industrial sector	Cost of compliance with applicable standards. Cost of sewerage rates and fees can be a significant burden for local industry
Cultural	An effective wastewater system helps to facilitate the safe hosting of traditional community gatherings and events	Discharges from wastewater treatment plants can have a damaging effect on both the physical and cultural attributes of the receiving environment

3 Strategic environment

This section sets out the framework from which wastewater assets are managed in terms of:

- Council's Vision
- Statutory requirements
- Asset Management Plan Strategy
- Future Demand Drivers
- Risk Issues

Statutory Requirements

Key legislation relating to the management of wastewater assets is listed below:

- *Local Government Act 2002*. This act defines the purpose of local authorities as enabling local decision making by and on behalf of the community and allows local authorities the power of general competence. To assist exercising this power of general competence, the Act requires that significant consultation takes place with the community including:

- Council must every six years carry out a process to identify community outcomes for its district
- Council is required to consult with the community on a range of specific issues including changes to service delivery and transfer to or from Councils assets

- Resource Management Act 1991 requires Council to:

- Sustain the potential of natural and physical resources to meet the reasonable foreseeable needs of the next generation
    - Comply with the Combined District and Regional Plans
    - To avoid , remedy or mitigate any adverse effect on the environment
- Comply with resource consents issued by Greater Wellington Regional Council for water quality and land use e.g. water treatment plants and intakes
- Take into account the principles of the Treaty of Waitangi in exercising functions and powers under the act relating to the use, development and protection of natural and physical resources

- *Health Act 1956 and its amendments* which gives Council a general responsibility "to improve, promote and protect public health within its district." This responsibility extends to public wastewater disposal because of the importance of wastewater disposal to public health
- *Building Act 1991*, which requires every local authority to enforce the provisions of the New Zealand Building Code.

- Health and safety in Employment Act 1992
- Construction Contracts Act 2002
- The Local Government Official Information and Meetings Act 1987

In addition the 2005 "Water and Sanitary Services Assessment" as was then required to be undertaken under Part 7 of the Local Government Act 2002. This assessment aimed to assess how the community was being served and more specifically whether any adverse health or environmental impacts require attention.

The assessment identified several generic issues and the role that Council would be required to play. The important issues identified were:

- Monitoring of relevant public health issues. Council to meet the monitoring requirements of current legislation
- Development in the District. Council to monitor/respond to growth in line with the levels of service
- Funding of asset management, investigations, design, physical works. Council to manage funding for capital works requirements in line with capital expenditure programme

Asset Management strategy and policy

Asset Management Policy

The policy with respect to asset management is as follows:

• The discipline of asset management will be directed to the achievement of the Council's Vision and Goals as stated in the LTP.

• Asset management will be applied to the long term stewardship of assets, over a minimum planning horizon of 30 years (note that the LTP planning horizon is 10 years).

• Asset management will be focused on delivering the required level of service to existing and future customers in the most cost-effective way.

• Relevant legislation, regulatory and statutory requirements will be complied with.

• A robust risk management approach consistent with good AM practice will underpin all asset management activities.

• The outputs of the asset management process will be endorsed by senior management and the Council.

• The outputs of the asset management process will be communicated to relevant staff and third parties to ensure they are aware of their asset management responsibilities.

• The asset management plan will be available to all stakeholders.

• The asset management plan will be reviewed periodically to ensure it remains relevant and consistent with the LTP.

• Senior management commit to the continuous improvement of asset management practices to achieve an alignment between the quality of asset management and the nature and scale of Council's assets and activities. Senior management will define and implement Councils asset management staffing structure and protocols such that asset management decisions are underpinned by a continuously updated stream of relevant reporting data.

Asset Management Strategy

The asset management strategy to meet the policy and planning objectives is:

Levels of Service:

To maintain current levels of service, with specific, minor variations by exception, and to formally review levels of service at least every three years. Engagement with the community on satisfaction with the levels of service provided and improvements desired will be undertaken periodically. Consultation on options will be undertaken for specific, significant projects. The level of service review will inform the levels of service adopted by the Council.

Demand Forecast and Planning:

To invest in works for growth in a timely way. At present the growth rate is around 1.7% per year. Investigations are recommended to isolate and identify assets that will be reaching critical limits within the timeframe of the Plan. This will become clearer when the Premier Beehive pre-treatment work is complete, as this will dramatically affect the ability of the wastewater treatment plant to accept further biological loading. The need for works to accommodate growth will be reviewed on an annual basis to take into account any changes to the anticipated growth rates or other demand drivers.

To review demand forecasts annually based on analysis of population and economic growth projections, social and demographic data, technological advances and other relevant data.

Demand management options will also be considered when planning to meet growth and to ensure projects qualify for any external financial assistance.

Asset Service Potential: To maintain the current service potential of the asset through an appropriate level of maintenance and renewal works.

Risk Management and Resilience: To manage risk exposure through:

− An annual review of the risk management plan and implementing risk mitigation measures where risk exposure is incompatible with corporate risk policy.

− Undertake performance and condition monitoring of critical assets

− Assess resilience of critical assets to natural hazards

− Identify and manage risks relating to natural hazards and prepare programmes to address those risks.

Optimised Decision Making: Undertake economic analysis for significant decisions related to optimisation and prioritisation of projects required to mitigate unacceptable risks.

Measure Operational Performance: Service agreements with contractors will contain performance measures consistent with the AMP and Activity Key Performance indicators (KPIs) to achieve alignment from operational level to the LTP.

Maintain and Improve Information Systems: Data collection programmes (condition, asset performance, registers and service performance) will be closely aligned to the nature and scale of the assets and to tracking achievement of service targets. Asset management system functionality will be progressively developed to meet the requirements of advanced asset management planning.

Organisational Development: To develop organisational asset management capabilities to practise advanced asset management techniques.

Regular Review: To develop the AMP as a 'living' document, reviewed on a regular basis to ensure alignment with current council, organisational and asset management policy and to submit AMPs for formal adoption by the Council.

Continuous Improvement: To improve AM practices, processes, systems and plans in accordance with the improvement plan which will be reviewed annually.

Monitoring of Levels of Service Performance Measures: Monitor performance measures on a monthly basis and report to City Networks management team.

Specific Strategic Direction

Carterton District Council has identified its vision for wastewater as follows:

" Carterton District Council's long-term vision for the Dalefield Road WWTP is to discharge all treated effluent to land, except during saturated ground conditions or other unfavourable or unusual circumstances, for the purpose of improving social, environmental and cultural outcomes. The Council's aim is to achieve this in partnership with the wider community and in particular with landowners in the vicinity rather than the Council having to acquire all the land for the purpose. The rate of progress towards achieving this vision will be governed by the practical realities of achieving suitable arrangements and the ability of the Carterton community to pay for the improvements."

It is therefore planned that over the next 30 years there will be a significant investment in new assets, with a subsequent change in level of service. Whilst still in the planning phase it appears likely that this will involve the addition of storage reservoirs, land irrigation systems, and pipe reticulation.

The strategy is reliant upon minimisation of wastewater flows by control of Inflow and Infiltration (I/I). This in turn is reliant on asset maintenance to provide a suitable level of service in terms of pipe integrity.

4 Levels of service

This section defines the Levels of Service or the qualities of the service that Council intends to deliver and the measures to monitor if this is achieved. The adopted levels of service will support Council strategic goals and are based on user expectations, statutory requirements and tailored to the scale and relative simplicity of Council's asset.

The adopted levels of service also reflect the level of funding that is required to maintain, renew and upgrade the water infrastructure to provide the users with the adopted levels of service.

Levels of Service have been based on:

- User Consultation and Survey
- Strategic and Corporate Goals
- Statutory requirements and Environmental Standards
- Community Outcomes

User Consultation and Survey

The latest community survey (August 2014) by Communitrak indicates that in respect of wastewater services, the satisfaction measure for reporting purposes was 97% of those surveyed, 10% higher than the previous survey in 2012.

The survey indicates that:

OVERALL SATISFACTION WITH COUNCIL SERVICES/FACILITIES

	Very / fairly satisfied %	Not very satisfied %	Don't know / Unable to say %
Wastewater system*†	97	4	-
Town water supply*†	95	5	-
Roads (excluding State Highway 2)	93	7	-
Parks and reserves	92	2	6
Refuse collection (excl Kerbside Recycling)*†	90	5	6
Kerbside recycling*	89	10	1
Street trees*†	81	19	1
Events Centre (excluding the library)†	77	6	16
Public toilets†	74	1	26
Public library	74	1	25
Stormwater drainage system*	73	22	5
Dog control†	72	11	16
Footpaths	69	23	8
Public swimming baths	63	3	34
Business promotion	61	12	27
Transfer station	30	21	29

* NB: asked of Urban Area residents only
† does not add to 100% due to rounding

Figure 10 Satisfaction survey for wastewater system

Wastewater strategy

Council has developed a strategic vision for the town's wastewater treatment and disposal assets. Whilst specific details will take several years to develop, the broad direction and intention sets the scene for asset requirements over the next 30 years.

The strategy involves a continual effort to reduce inflow and infiltration to the reticulation system, high level disinfection of treated wastewater, and progressive increase in irrigation to land.

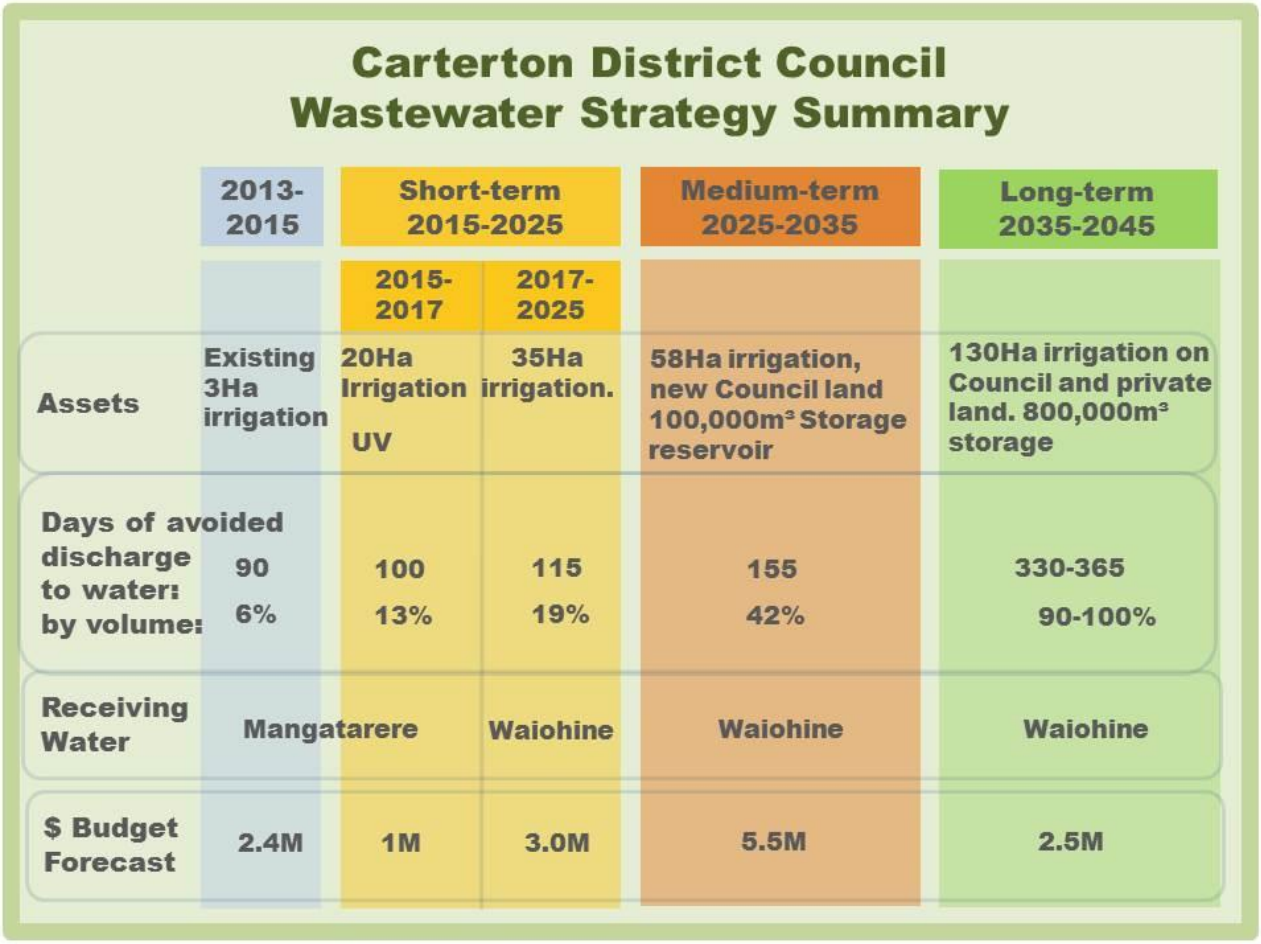


Figure 11 Carterton District Council wastewater strategy diagram

Target Levels of Service

a. Community Outcomes

Council's relevant community outcomes to the activity are tabulated as below. These outcomes drive the delivery goals and subsequent detailed levels of service and performance measures.

Table 2 wastewater contribution to community outcomes

Community Outcomes	How Wastewater Contributes
A vibrant and prosperous economy.	Effective wastewater reticulation will support a vigorous residential and commercial community.
A healthy district.	Efficient collection and disposal of treated wastewater contributes to community health and minimises public health risk.
A district which promotes sustainable infrastructure and services.	Collective ownership of resources will reduce the environmental impact of multiple

	individual systems.
A district which values and protects its natural environment.	Reticulation and wastewater treatment infrastructure capable of meeting consent requirements and sustainable environmental outcomes.

b. Detailed Target Levels of Service(LOS)

The overarching level of service requirements are achieved by the completion of a number of more specific level of service requirements. For example leaking wastewater pipes allow groundwater to enter the system, and if unchecked lead to a failure of a higher environmental service requirement.

Much of the maintenance work carried out by Council involves ensuring that these lower level service levels are achieved. It is assumed for these purposes that pipe condition is related to service level.

c. Performance standards.

Monitoring of performance standards is an integral part of service management. Regulatory changes to performance standards (2013) has required realignment of Councils monitoring and reporting in order to meet regulatory requirements. The first set of performance data under these new measures will be not be available until post July 2015.

Table 3 Performance standards for Council

The service broken down into measurable components	Performance measure	Target for year ending June					Measuring system
		2015 Annual Plan	2016	2017	2018	2019 to 2025	
The sewerage service is managed at the best possible cost for the required level of service	Expenditure is within approved budget	100%	100%	100%	100%	100%	Regular financial reporting to the Council
System and adequacy	Number of dry weather sewerage overflows per 1000 connections	na	≤5	≤5	≤5	≤5	Operational records
Management of environmental impacts	Number of abatement notices	na	≤ 1	≤ 1	≤ 1	≤ 1	Operational records
	Number of infringement notices	na	0	0	0	0	Operational records
	Number of enforcement orders	na	0	0	0	0	Operational records

The service broken down into measurable components	Performance measure	Target for year ending June					Measuring system
		2015 Annual Plan	2016	2017	2018	2019 to 2025	
	Number of successful prosecutions	na	0	0	0	0	Operational records
Response to sewerage system faults[1]	Median attendance time[2]	na	≤60 mins	≤60 mins	≤60 mins	≤60 mins	Operational records
	Median resolution time[3]	na	≤240 mins	≤240 mins	≤240 mins	≤240 mins	Operational records
Customer satisfaction	Total number of complaints received per 1000 connections[4]	na	≤20	≤20	≤20	≤20	Operational records

Of significance is the future change in level of service that will be required by the new wastewater treatment consent, and more so at the expiry of that short-term consent and commencement of a long-term one. This change in level of service is driven primarily by environmental issues, as well as community needs. This is further described in section 6.3

Since 2011 more strategic needs assessment has been introduced and renewals are now (2014/15) triggered by a mix of reactive and proactive identification of service level needs. Work is currently underway to improve both information systems and asset condition record systems. Although not yet complete there are already indications that this will drastically increase:

- Confidence in reliability of asset records
- Councils ability to forecast renewal needs
- Councils ability to make strategic asset decisions

Improvement Actions:

Use the GIS in coordination with a system for recording physical faults/works/repairs/replacements, the aim being to increase confidence in the data for asset condition and subsequent renewal programs. This will enhance the renewal program confidence levels.

5 Growth and Demand

Growth and demand are driven by:

- Population growth

[1] sewerage overflows resulting from a blockage or other fault in the territorial authority's sewerage system
[2] from the time that the Council receives notification to the time that service personnel reach the site.
[3] from the time that the territorial authority receives notification to the time that service personnel confirm resolution
[4] total number of complaints received about: sewage odour; sewerage system faults; sewerage system blockages; and the Council's response to issues with its sewerage system, expressed per 1000 connections to the territorial authority's sewerage system.

- Changes in water usage patterns i.e. water consumption for domestic, commercial and industrial users
- I/I rates linked to climate change effects
- Wastewater contaminant load – linked primarily to commercial/industrial waste contributions
- Service level changes driven by Resource Consent requirements

Population Demand Growth projections

The Carterton district, usually resident, population increased from 6,849 in 2001 to 8,235 in 2013, an overall increase of 20%, and an average annual increase of 1.7% per annum. At the current rate of uptake of zoned residential land, it is estimated that within the planning timeframe (2030) there will be a capacity shortfall for future greenfield development. To grow the town, Council will therefore need to develop strategies to overcome this shortfall, either by re-zoning of surrounding land, or by promoting more intensive development within the current town boundaries. Either option will have implications in terms of the wastewater assets.

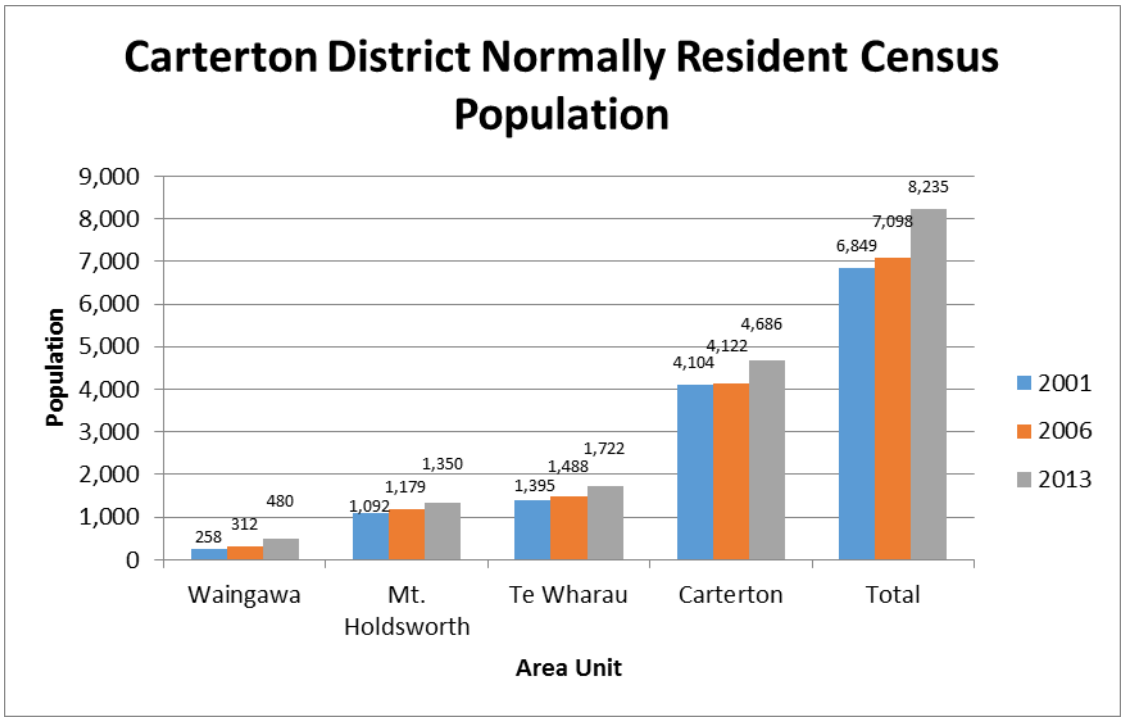


Figure 12 Population estimates for Carterton

Despite the population increase, asset renewal and repair appears to be leading to neutral or decreasing flows. Target flows have been identified, and continual renewal/upgrade will be needed to maintain this target. Currently renewals are keeping up with level of service decrease attributable to pipe deterioration.

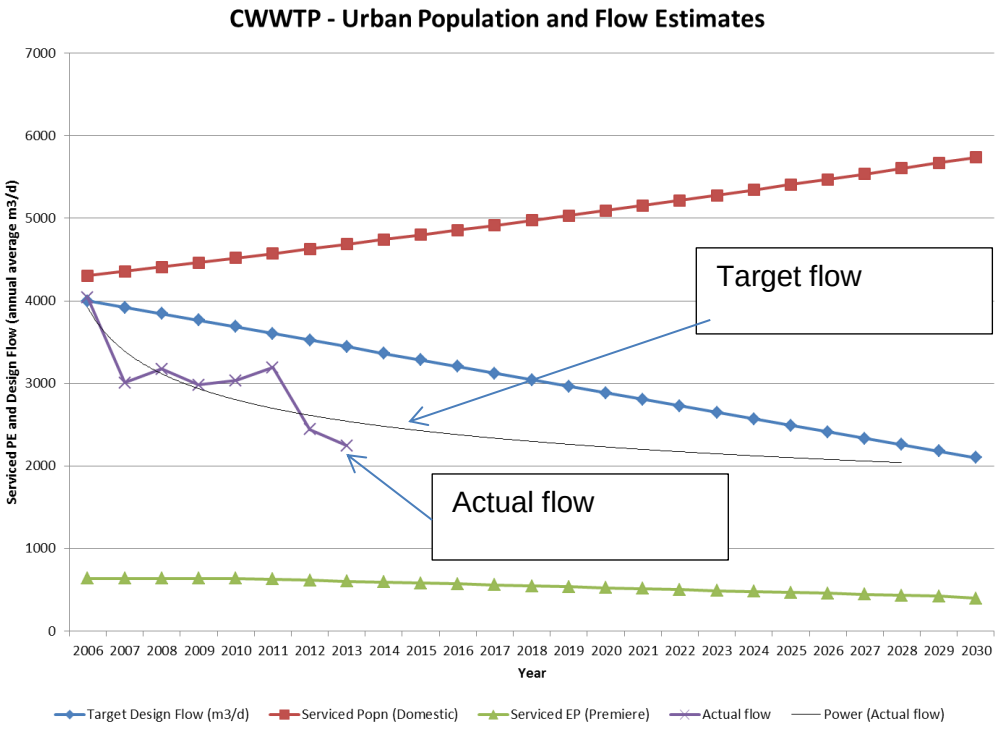


Figure 13 Average daily flow actual versus target

It is anticipated that there will be gains and losses from year to year depending on meteorological conditions and delays between pipe failures and renewal.

Trade Waste

In addition to population increases, there is a large commercial ham and bacon small goods operation (Premier Beehive) that connects to the town wastewater system. Investigations in 2014 indicate that the biological load imposed on the wastewater treatment plant by Premier Beehive exceeds that of the rest of the township. A dedicated flow measurement device is now installed at Premier to monitor flows.

Processes are underway to reduce the load from Premier by installation of on-site pre-treatment.

Apart from Premier Beehive, significant industrial growth is not anticipated to occur within the Carterton township as provision for such growth and land use is provided elsewhere to the north at Waingawa, which is not serviced by the Carterton municipal wastewater system.

Premier Beehive have reported an intention to increase production, however there are insufficient details at this stage to ascertain what effects there may be on the Council wastewater system. This is further complicated by Premier's intention to install a pre-treatment system on its own land, which could dramatically reduce the load to the Council system.

Legislative Change

Legislative Change can significantly affect Council's ability to meet minimum levels of service with changes likely to require improvements to infrastructure. Consent requirements for the wastewater discharge are the key driver of the medium term level of service requirements. The Draft Natural Resources Plan, whilst not yet a legal document, gives an indication that policy changes are likely to place greater burden on Councils for avoidance of environmental impacts from municipal wastewater systems.

Customer expectations

Customers require a high standard of wastewater disposal, and with a continued increase of expectations in relation to the environment, this can be expected to continue.

Demand management actions

5.1.1 Leak detection & repair

An integral part of reticulated wastewater asset management is to identify and mitigate against infiltration and inflow into the sewer system from the reticulation system. Successful reduction of inflow and infiltration (I/I) can reduce flows ultimately requiring treatment at the wastewater treatment plant, and offset requirements for increasing system capacity to accommodate population or commercial growth.
Council is actively engaged in a programme of leak detection and repair of inflow and infiltration (I/I) into the wastewater system. Historically I/I has accounted for a greater flow contribution than the population, and caused peaks some 6-10 times the base flow.
Asset renewals have been triggered over recent years by serviceability (high flows) issues identified by flow measurement at key points in the reticulation system.

I/I repairs reduces peak and base flows, providing greater service capacity, reducing energy demand at the treatment plant, and facilitating more sustainable disposal options.

As a part of Council's wastewater consent from Greater Wellington Regional Council, reporting is required on Infiltration and Inflow both quarterly and an annual report. Appendix 2 details work undertaken in 2013/2014.

5.1.2 Pressure reduction

The water supply system pressure can affect the amount of water used by the public and hence the amount of wastewater generated. Pressure reduction measures were instigated in late 2011, reducing the town supply by 10m head. It is not possible to accurately estimate the effects of this work, or that of the installation of universal water meters.

5.1.3 Recycled water use

The wastewater treatment plant uses approximately 100m³/d for washing inlet screens etc. Work has been carried out to develop and install a recycled water use system for this activity, using treated water from the wastewater treatment process. This was installed in December 2011, and is thought to be responsible for a 3% reduction in sewer flows into the treatment plant.

5.1.4 Water abstraction and wastewater production

As noted in the Water Supply Asset Management Plan, the water take from the Kaipaitangata has been progressively reduced. In addition to reducing the amount of wastewater produced, this has the compounding positive effect of increasing the amount of water in the Kaipaitangata and subsequently the Mangatarere River, providing increased dilution and reduction of adverse effects from the wastewater discharge.

5.1.5 Demand Management

Demand management has the potential to reduce the water use of Carterton's residences, and subsequently reduce the sewer flows. Council staff are currently carrying out detailed analysis of issues and options to be developed.

6 Risk Assessment

Risk Management processes aim to be generally consistent with the intentions of AS/NZS 4360: 2004 “Risk Management” Standard however of a scale appropriate to the asset.

Risk type

Risk is divided into two broad categories:

- level of service risks, and
- statutory, financial, and management risk

Risks to reduction of level of service

It was identified in the previous (2012) Asset Management Plan needs improvement. The 2012 revision set a base level to which further work can be added and refined. Work is in progress to identify asset information gaps, and define uncertainty of asset data. This work is reliant on guidance from an asset management policy.
For sewerage assets, asset data acquisition and condition rating are key elements to identifying risk areas.

Key risks	Service/asset related impact of changes	Risk mitigation strategies
Asset vulnerability to natural hazards	Flood, fire, high wind, earthquake, lightning, and liquefaction can all negatively impact infrastructural assets. Whilst relatively low probability, asset failure due to natural hazards is potentially catastrophic, with potential loss of service.	The vulnerability of components of the wastewater system has been assessed by the Wairarapa Engineering Lifelines Association (Wairarapa Engineering Lifelines Association, 2003). It assess the significance, vulnerability, and overall risk to assets. This Asset Management Plan instigates the incorporation of asset vulnerability into renewal and upgrade planning with the aim to enhance resilience. Methodologies for integration of vulnerability data is immature at this stage, and it is envisaged that this will develop as feedback is received from early planning decisions.
Consent renewal for Mangatarere discharge to	Council obtain a short-term consent in 2013 to discharge water to land and water until	Investigations into treatment techniques, land acquisition options, water reuse and potential

water	2017. In 2014 Council applied for and obtain a short-term consent (to coincide with the main consent renewal) to irrigate treated wastewater to land via a centre pivot irrigator. The 2017 long-term consent will require significant infrastructure development in order to provide suitable reduction in adverse effects.	coordination with the Wairarapa Water Use Project are to be carried out during the short-term consent in order to inform decisions for the long-term plan. Council has a draft strategy (fig. 11) that identifies intent to progressively increase the proportion of yearly flows discharged to land.
Climate variability	Climate change induced variability in rainfall patterns and hence wastewater and surface flows, is clearly a potential risk for wastewater treatment and environmental effect changes. It is becoming increasingly clear that climate variability is becoming reality sooner than anticipated.	Climate change induced risks need to be more fully understood, and more detailed work in this area is required during the term of this plan. In the meantime, demand management work constitutes a prudent risk management action.
Identification of critical assets	Decision making in terms of asset renewal needs prioritisation to optimise the process. Whilst asset vulnerability is a key part, the relative criticality of assets throughout the network is also important.	An initial estimate of asset criticality was made in the 2012 revision, to be refined over time.
Level of service risk mitigation	The continually developing environmental policy framework under which Council must operate poses risks in terms of meeting levels of service	Service standards need to be developed and continually updated to reflect both the progression of the wastewater strategy and the national legislative environmental policy.

Statutory, financial, and management risk

In the context of statutory, financial, and management risk, Carterton's risk management mitigation criteria are based around goals of:

- The fulfilment of legal and statutory obligations
- The safeguarding of public and employee's Health and Safety requirements
- Asset, 3rd Party Property Damage & Losses Insurances
- Contingency Planning for foreseeable emergency situations

Hence appropriate to the scale of Carterton's activity, probability and impact management of these risks is tabulated as follows;

Risk Type	Typical Events	Risk Probability	Impact	How Managed
Legal and Statutory	Discharge Consent breach Environmental Damage	Moderate Low	Med Med	Regular monitoring and reporting. Instigate investigations to inform the long-term consent application.
Health and Safety	Product Quality Non compliance Infectious Disease outbreak	Moderate Low	Low High	Manage utilizing in house Standard Operating and QA procedures. Notification to relevant authorities
3rd Party Property Damage Liability	Inundation, damage from failed pipelines	Low	Med	Routine procedures and insurance cover
Service Delivery Failure	Service Restoration, failure to meet KPI's Asset condition failure Unforeseen natural disaster resulting in loss of infrastructure	Moderate Moderate Low	Low/Med Low High	Manage by routine procedures Active Replacement Programme based on acquired knowledge. Identify critical assets, and develop mitigation/redundancy/alternative service strategies. Regional Civil Defence and in house emergency management plans
Financial	Un-planned loss or cost to reinstate infrastructure	Low	High	Adequate Disaster Insurance in place
Contingency Planning	Supplementary measures/ actions to ensure continuity of treatment and disposal e.g. due to meteorological conditions	Moderate	Medium	Plan for controlled reactions to increasing levels of stress from meteorological conditions. Reduce I/I levels to reduce risk.

Lifeline assets

The methodology used in the WELA study for lifeline assets is as follows:

- Divide the network into components and network segments
- Assess the importance and redundancy
- Assess their vulnerability to damage or failure due to specific natural hazards, and
- The impact of such damage or failure

A matrix relating vulnerability and impact is then used to determine the risk to service provision, and hence priority of competing renewal options.
A specific output of this 2015 revision is to set in motion a methodology to identify assets with a high level of risk of failure, and to instigate procedures to more closely identify risks and mitigation procedures.

All wastewater asset components have been allocated specific importance rating – rated from 1 (least critical) to 5 (most critical).

Table 4 Importance of component or network segment

Importance rating	Description
1	Not important.
2	Assets of some importance.
3	Important assets.
4	Very important assets.
5	Essential or extremely important assets.

Probability of damage occurring: This section takes into account the design, materials, age, construction, and condition. Hence, an asset nearing the end of its service life that has reduced structural capability would have increased likelihood of failure compared to one that suffers no loss of structural capability.

Table 5 Qualitative vulnerability assessment – the likelihood of damage or failure

Likelihood rating	Description
A	Almost certain (once /year or more)
B	Likely (1:50 years)
C	Possible (1:150 years)
D	Unlikely (1:500 years)
E	Rare (1:3000 years)
N	Almost impossible (probability negligible to nil)

Qualitative assessment of impact of loss of service: this incorporates a number of factors in a sequence of consideration:

- The importance ranking of the component
- The degree of disruption caused by loss of the asset
- The resources and effort required to reinstate the asset
- The time required and priority for restoring the service
- The inter-relationship with other parts of the network

- The social disruption
- The economic disruption

Table 6 Qualitative assessment of impact of loss of service

Level	Measure	Description
5	Catastrophic	Extreme impact of damage or failure
4	Major	High impact of failure
3	Moderate	Medium impact of failure
2	Minor	Low impact of failure
1	Insignificant	Very little impact
N	Negligible or nil	No impact

These are combined in a matrix to evaluate overall service supply risk, and hence priority for renewal:

Table 7 Qualitative risk analysis matrix-level of risk.

	Impact/consequences					
Likelihood	**N**	**1**	**2**	**3**	**4**	**5**
A	N	L	M	H	E	E
B	N	L	M	M	H	E
C	N	L	L	M	M	H
D	N	L	L	L	M	H
E	N	L	L	L	L	M
N	N	N	N	N	N	N

Legend:

E	Extreme risk	M	Moderate risk	N	Negligible risk
H	High risk	L	Low risk		

Importance:	5 Extremely Important 4 Very Important 3 Important 2 Some Importance 1 Not Important	Vulnerability:	A Almost Certain B Likely C Possible D Unlikely E Rare N Almost Impossible	*WAIRARAPA ENGINEERING LIFELINES ASSOCIATION* **Network: Carterton sewer**

QUALITATIVE VULNERABILITY ASSESSMENT CHART (AS/NZS 4360:1999)

COMPONENT/ SEGMENT	Imp.	Vulnerability												Comments/Description
	Ranking 1 - 5	Ground Shaking	Lique-faction	Fault Displace-ment	Land- slide	Ground Settle- men	Flood	Local Wind Effect	Tsu- nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire	
Treatment Plant														
Screen	4	C	C	N	N	D	C	D	N	D	D	D	D	ContraShear
Pump Station	2	C	C	N	N	D	C	N	N	E	E	C	E	
Primary Clarifier	2	C	C	N	N	D	D	N	N	D	E	E	E	RC in ground tank
Sludge Digester	2	C	C	N	N	D	D	N	N	D	E	E	E	Imhoff RC tank
Main Fluming	3	C	C	N	N	D	D	N	N	D	E	E	E	Screen to pump station
Internal Pipework	2	C	C	N	N	D	N	N	N	N	N	N	N	PS to Clarifier to Digester to Ponds
Power Supply	4	C	C	N	N	D	N	B	N	E	B	D	D	Overhead supply
Oxidation Ponds	3	C	C	N	N	D	C	N	N	E	C	C	N	Three ponds
Sewer Reticulation														
Pump Stations	3	C	C	N	N	D	C	E	N	N	E	C	E	Seven small lift stations
RC pipelines	3	C	E	N	N	D	N	N	N	N	N	N	N	
GEW pipelines	3	B	E	N	N	C	N	N	N	N	N	N	N	
AC pipelines	3	B	E	N	N	C	N	N	N	N	N	N	N	
PVC pipelines	3	D	E	N	N	D	N	N	N	N	N	N	N	

Figure 14 Excerpt from Wairarapa Engineering Lifelines Association Study report - vulnerability

Impact of Damage:	5 Catastrophic 4 Major 3 Moderate 2 Minor 1 Insignificant N Nil	Level of Risk:	E Extreme H High M Moderate L Low N Negligible

WAIRARAPA ENGINEERING LIFELINES ASSOCIATION

Network: Carterton sewer

QUALITATIVE IMPACT OF DAMAGE & LEVEL OF RISK CHART

(AS/NZS 4360:1999)

COMPONENT/ SEGMENT	Impact of Damage												Level of Risk											
	Ground Shaking	Lique-faction	Fault Displace-ment	Land-slide	Ground Settle-ment	Flood	Local Wind Effect	Tsu-nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire	Ground Shaking	Lique-faction	Fault Displace-ment	Land-slide	Ground Settle-ment	Flood	Local Wind Effect	Tsu-nami	Volcanic Ash	Wind Storm	Severe Storm	Wild Fire
Treatment Plant																								
Screen	3	3	N	N	3	3	2	N	1	2	2	3	M	M	N	N	L	M	L	N	L	L	L	L
Pump Station	2	2	N	N	1	1	N	N	1	1	1	3	L	L	N	N	L	L	N	N	L	L	L	L
Primary Clarifier	2	2	N	N	1	1	N	N	1	1	1	2	L	L	N	N	L	L	N	N	L	L	L	L
Sludge Digester	2	2	N	N	1	1	N	N	1	1	1	2	L	L	N	N	L	L	N	N	L	L	L	L
Main Fluming	2	2	N	N	1	1	N	N	1	1	1	2	L	L	N	N	L	L	N	N	L	L	L	L
Internal Pipework	2	2	N	N	1	N	N	N	N	N	N	N	L	L	N	N	L	N	N	N	N	L	N	N
Power Supply	2	2	N	N	1	N	2	N	1	4	1	3	L	L	N	N	L	N	M	N	L	H	L	L
Oxidation Ponds	4	4	N	N	3	4	N	N	3	3	1	N	M	M	N	N	L	M	N	N	L	M	L	N
Sewer Reticulation																								
Pump Stations	3	3	N	N	1	3	N	N	N	1	3	2	M	M	N	N	L	M	L	N	N	L	M	L
RC pipelines	4	4	N	N	2	N	N	N	N	N	N	N	M	L	N	N	L	N	N	N	N	N	N	N
GEW pipelines	4	4	N	N	3	N	N	N	N	N	N	N	H	L	N	N	M	N	N	N	N	N	N	N
AC pipelines	4	4	N	N	3	N	N	N	N	N	N	N	H	L	N	N	M	N	N	N	N	N	N	N
PVC pipelines	2	3	N	N	2	N	N	N	N	N	N	N	L	L	N	N	L	N	N	N	N	N	N	N

Figure 15 Damage & risk level from WELA report

6.1.1 Non-lifeline assets

For non-lifeline assets, renewal prioritisation, when required, will follow a similar format by combining the importance rating and condition rating as follows:

Table 8 Non-lifeline asset importance rating

Importance rating	Description
1	Not important. Assets for which no specific criticality assessment has been carried out. Assets servicing minor demand areas, with multiple redundancy or service options.
2	Assets of some importance. Assets servicing moderate demand areas with redundancy or multiple service options.
3	Important assets. Assets servicing moderate demand areas with difficult or costly alternative service options.
4	Very important assets. Assets servicing significant areas with difficult or costly alternative service options.
5	Essential or extremely important assets. Assets servicing significant areas with no redundancy or alternative service options.

Table 9 Non-lifeline asset condition rating in terms of likelihood of failure

Condition rating	Description
A	Failure very unlikely to occur within a year
B	Failure unlikely to occur within a year
C	Failure possible within a year
D	Failure likely to occur within a year
E	Failure has occurred/almost certain to occur within a year

Table 10 Non-lifeline asset priority matrix for renewal

	Importance rating				
Condition rating	**1**	**2**	**3**	**4**	**5**
E	L	M	H	VH	VH
D	L	M	M	H	VH
C	L	L	M	M	H
B	L	L	L	M	H
A	L	L	L	L	M

Legend:
VH Very high priority

H High priority
M Moderate priority
L Low priority

6.1.2 Asset Criticality

Critical assets for the wastewater system are generally those with no redundancy and those that, if failure occurred, would lead to a whole system failure, or would jeopardise human health.

Hand in hand with identification of critical assets (refinement of the WELA work) should be an emergency management plan that identifies actions in the case of system failures for whatever reason. Whilst it would not be possible to envisage all scenarios, those involving critical assets should be identified and a course of action given consideration.

The critical assets identified below (fig. 16) are a provisional first cut and highlights that this area needs further work.

Once critical assets have refined, an overall risk management strategy is advisable, incorporating for example the vulnerability of earthenware and asbestos cement pipes, with the criticality of different parts of the system. Earthquake, liquefaction, flooding and wind appear to be the most likely causes of damage to the system.

This process has been started for example by budgeting for a backup generator. A structured systematic approach is needed to identify the major risks and develop proactive preventative action plans.

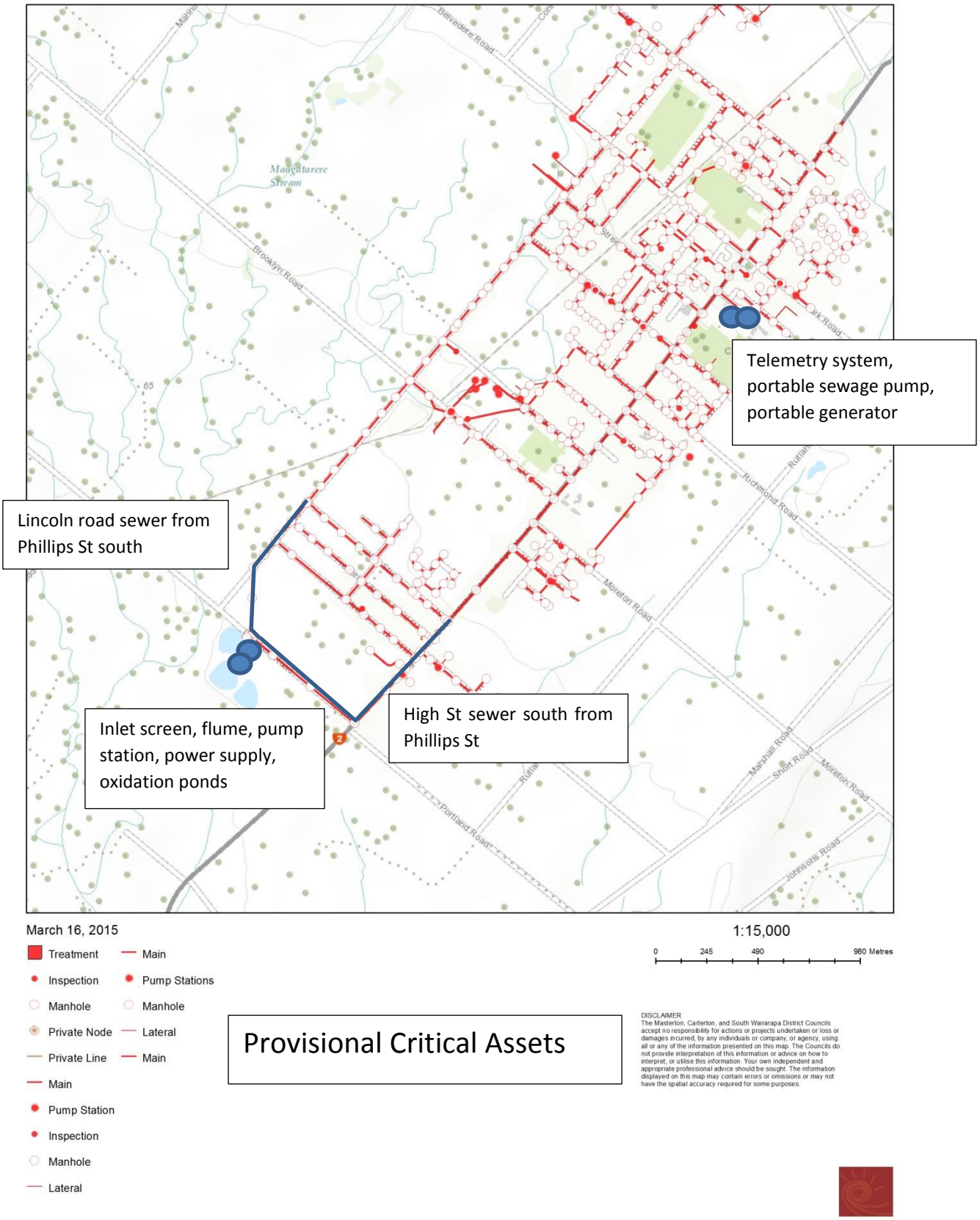


Figure 16 Critical assets

Theoretical asset renewal dates have been colour coded to give a visual indication of relative end-of–service for each asset.

`This information is then distilled into financial budget information in section 7.

Estimated best and worst replacement date

Base Residual life (yrs)

Individual pipe identifier

Condition rating

CARTERTON DISTRICT COUNCIL

2014

Reference	Location	Condition	Description	Size	Length	Unit	Base Life	current unit rates	Const Date	Age	Act/Est	replacement date worst	replacement date best	Residual life
SMGE001A	1 Gertrude St	3	Runs from Gertrude thru to Frederick St	150	114.5	m	80	190	1960	54	Est	2030	2050	26
SMGE001B	Gertrude St	3	Runs from Gertrude thru to Charles St	150	118.9	m	80	190	1960	54	Est	2030	2050	26
SMFR0001	1 Fredrick St	3	runs from 1 - 17 Frederick St (B)	150	154.9	m	80	190	1960	54	Est	2030	2050	26
SMFR0017	17 Frederick Street	3	runs from 17 - 29 Frederick St	150	123.3	m	80	190	1960	54	Est	2030	2050	26
SMFR0029	29 Frederick Street	3	Runs from 29 - 35 Frederick Street	150	100.8	m	80	190	1960	54	Est	2030	2050	26
						612.4								
SMFR0046	46 Frederick Street	3	runs from 46 - 58 Frederick St	150	135.7	m	80	190	1990	24	Est	2060	2080	56
SMFR0058	58 Frederick Street	3		150	100.2	m	80	190	1990	24	Est	2060	2080	56
SMFR0069	69 Frederick Street	3	Runs from 69 - 75				80	190	1990	24	Est	2060	2080	56
						4.5								
SMHI0420	420 High St	3	1 to 9 Charles st				80	190	1960	54	Est	2030	2050	26
SMCH0011	11 Charles	3	11-15 Charles				80	190	1960	54	Est	2030	2050	26
SMCH0015	15 Charles	3	15-17 Charles				80	190	1960	54	Est	2030	2050	26
SMCH015B	17 Charles	3	17-27 Charles				80	190	1960	54	Est	2030	2050	26
SMCH0027	27 Charles	3	27-40 Charles St	150	122.3	m	80	190	1960	54	Est	2030	2050	26
SMCH0040	40 Charles st	3	40 Charles to Daffodil junction	150	17.9	m	80	190	1960	54	Est	2030	2050	26
SMMO0004	4Moore St	3	4-14 Moore	150	89.5	m	80	190	1975	39	Est	2045	2065	41
SMMO0020	20Moore St	3	20-26 Moore St	150	21.6	m	80	190	1975	39	Est	2045	2065	41
SMMO0014	14 Moore St	3	14-20 Moore St	150	50.6	m	80	190	1975	39	Est	2045	2065	41
SMMO0017	17 Moore St	3	Moore St to Diamond	150	94.1	m	80	190	1975	39	Est	2045	2065	41
SMDI0030	30 Diamond	3	Diamond St to Premier	150	63.7	m	80	190	1965	49	Est	2035	2055	31
SMDI0022	22 Diamond	3	22-30 Diamond	150	96.9	m	80	190	1965	49	Est	2035	2055	31
SMDI0010	10 Diamond	3	10-22 Diamond	150	113.4	m	80	190	1970	44	Est	2040	2060	36
SMHI0316	316 High St	3	10 Diamond St to High St	150	121.8	m	80	190	1970	44	Est	2040	2060	36
SMBO0008	8 Booth St	3	4-8 Booth St	150	46.7	m	80	190	1970	44	Est	2040	2060	36
SMBO0003	3 Booth St	3	3-7 Booth St	150	35.9	m	80	190	1970	44	Est	2040	2060	36
SMBO0007	7 Booth St	3	7 Booth St to Diamond	150	77.7	m	80	190	1970	44	Est	2040	2060	36
SMDI0021	21 Diamond	3	Diamond St to 1 Tait Place	150	52.9	m	80	190	1965	49	Est	2035	2055	31
SMTA0006	6 Tait Place	3	6-10 Tait Place	150	24.6	m	80	190	1965	49	Est	2035	2055	31
SMTA0010	10 Tait Place	3	10 Tait place to Moreton Rd	150	78.0	m	80	190	1970	44	Est	2040	2060	36
SMMO0032	32 Moreton Rd	3	Moreton to Deller Drive	150	467.5	m	80	190	1965	49	Est	2035	2055	31
SMDE027B	27 Deller Drive	3	Moreton to Deller Drive	150	83.4	m	80	190	1965	49	Est	2035	2055	31
SMHO0006	27 Deller Drive	3	west from 27 Deller	150	78.1	m	80	190	1965	49	Est	2035	2055	31
SMDE027A	27 Deller Drive	3	25-27 Deller	150	18.4	m	80	190	1965	49	Est	2035	2055	31
SMDE0015	15 Deller Drive	3	15-25 Deller	150	103.0	m	80	190	1965	49	Est	2035	2055	31
SMDE0012	12 Deller Drive	3	7-15 Deller	150	84.6	m	80	190	1965	49	Est	2035	2055	31
SMDE0015B	15 Deller Drive	3	15 Deller heading west	150	89.8	m	80	190	1965	49	Est	2035	2055	31
SMDE0001	1 Deller Drive	3	1-7 Deller	150	42.1	m	80	190	1965	49	Est	2035	2055	31
SMKI0023	23 King St	3	23 King to Deller	150	58.2	m	80	190	1965	49	Est	2035	2055	31
SMKI0015	15 King St	3	15-23 King St	150	57.9	m	80	190	1965	49	Est	2035	2055	31
SMCO0041	41 Costley	3	Brooklyn to Costley	150	315.7	m	80	190	1955	59	Est	2025	2045	21
SMCO0039	39 Costley	3	on private property	150	28.2	m	80	190	1955	59	Est	2025	2045	21
SMCO0039A	39 Costley	3	39-46 Costley	150	50.9	m	80	190	1975	39	Est	2045	2065	41
SMCO0046	46 Costley	3	46-59 Costley	150	123.7	m	80	190	1975	39	Est	2045	2065	41
SMCO0031	31 Costley	3	31-39 Costley	150	83.3	m	80	190	1955	59	Est	2025	2045	21
SMCO0017	17 Costley	3	17-31 Costley	150	72.8	m	80	190	1955	59	Est	2025	2045	21
SMCO0011	11 Costley	3	11-17 Costley	150	66.8	m	80	190	1955	59	Est	2025	2045	21
SMCO0007	7 Costley	3	7-11 Costley	150	37.3	m	80	190	1975	39	Est	2045	2065	41
SMHI0245	245 High St	3	High st to 3 Costley	150	94.1	m	80	190	1952	62	Est	2022	2042	18

Figure 17 Excerpt from asset register

Improvement Actions:

a) Refine asset criticality assumptions
b) Develop a critical asset register
c) Develop risk management plans

7 Life Cycle Management

An asset's useful life cycle is finite in time terms and depending on type can range from 10 to 120 years depending on the nature of the asset.

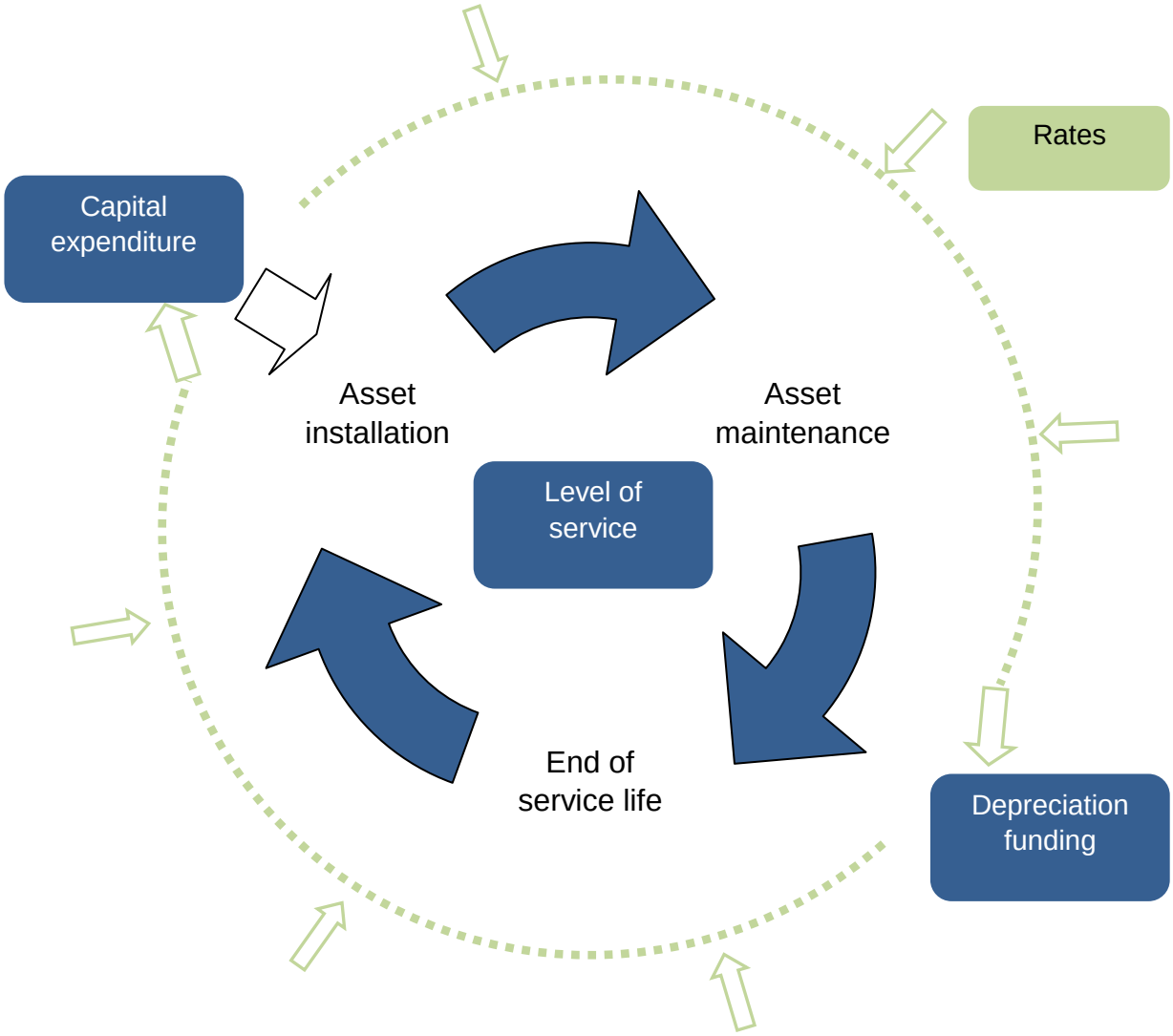


Figure 18 Asset renewal to maintain service levels

Successful life cycle management encompasses the adoption of appropriate:

- Target Levels of Service
- Risk Management systems
- Demand Management Regimes
- Routine operations and maintenance plan
- Asset renewal programmes

- Asset Improvement Programmes
- Levels of Funding

Asset life

The asset life assumed is based on NAMS guidelines, refined by local experience. Condition rating is assumed to alter asset life by increasing predicted longevity for assets in good condition, and decreasing predicted longevity for assets in poor condition as follows:

				Life expectancy yrs from base life for renewal				
condition	condition description	Serviceability	Life	Concrete	Asbestos	E/ware	PVC	manholes
1	excellent	no leaks	>75% life left	+40	+20	+20	+40	+40
2	Good	no leaks	>50% life left	+20	+10	+10	+20	+20
3	average	no leaks	>25%life left	0	0	0	0	0
4	poor	minor leaks	<25% life left	-10	-10	-10	-10	-10
5	very poor	major leaks	failure imminent	-20	-20	-20	-20	-20
Base life dia >150mm				90	80	80	120	80
Base life dia 150mm or less				80	70	70	120	-

Figure 19 Asset base life expectancy and condition life expectancy modification

Operation and Maintenance (O&M)

The O&M strategy aims to generally retain the current levels of service by implementing a balanced programme of planned and reactive works for reticulation and wastewater treatment plant operations. Infiltration detection now forms an integral and on-going component of the activity which is performed largely by Council staff. Renewals/repairs are largely carried out by tender following reactive assessment of pipe condition or failure of service level.

Maintenance forms a significant part of asset management for the wastewater system in terms of pumps and control systems. For the gravity reticulation system, there is less programmed maintenance that can be carried out, and the focus is more on condition inspection.

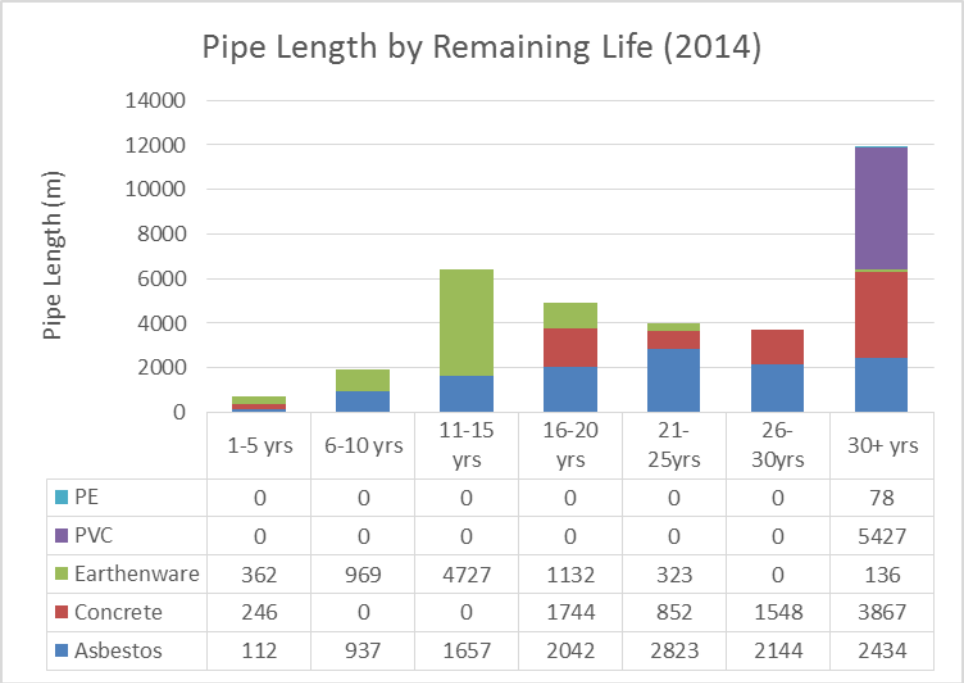
Asset Renewal

It is proposed to, during the currency of this AMP and beyond, to obtain condition information so that a rolling programme of renewal work can be devised and funded.

Whilst assets have a notional life expectancy, the actual life can vary significantly. Council has adopted a condition rating and life expectancy that reflects this uncertainty by assigning an estimated life expectancy range (fig. 18). Thus, the shorter life expectancy

scale leads to a most conservative funding strategy, and the greater life expectancy to a least conservative funding strategy. By understanding the variability inherent in asset life, appropriate funding and risk scenarios can be adopted.

The 2015 wastewater asset register revisions have led to a greater confidence level in asset life, and the ability to differentiate remaining pipe life by material type (fig. 19).



	1-5 yrs	6-10 yrs	11-15 yrs	16-20 yrs	21-25yrs	26-30yrs	30+ yrs
PE	0	0	0	0	0	0	78
PVC	0	0	0	0	0	0	5427
Earthenware	362	969	4727	1132	323	0	136
Concrete	246	0	0	1744	852	1548	3867
Asbestos	112	937	1657	2042	2823	2144	2434

Figure 20 Estimated remaining life by pipe material

This 2015 Asset Management Plan aims to strengthen the causal links between asset condition, planning, and funding mechanisms.

Asset condition and leak detection investigations in 2010-2012 highlighted the benefits of targeted CCTV condition investigations. There is a balance between the cost of investigative work and variability inherent in assessments that are based on information that is more anecdotal. Recent work suggests that best outcome of proactive expenditure is to follow an investigation protocol:

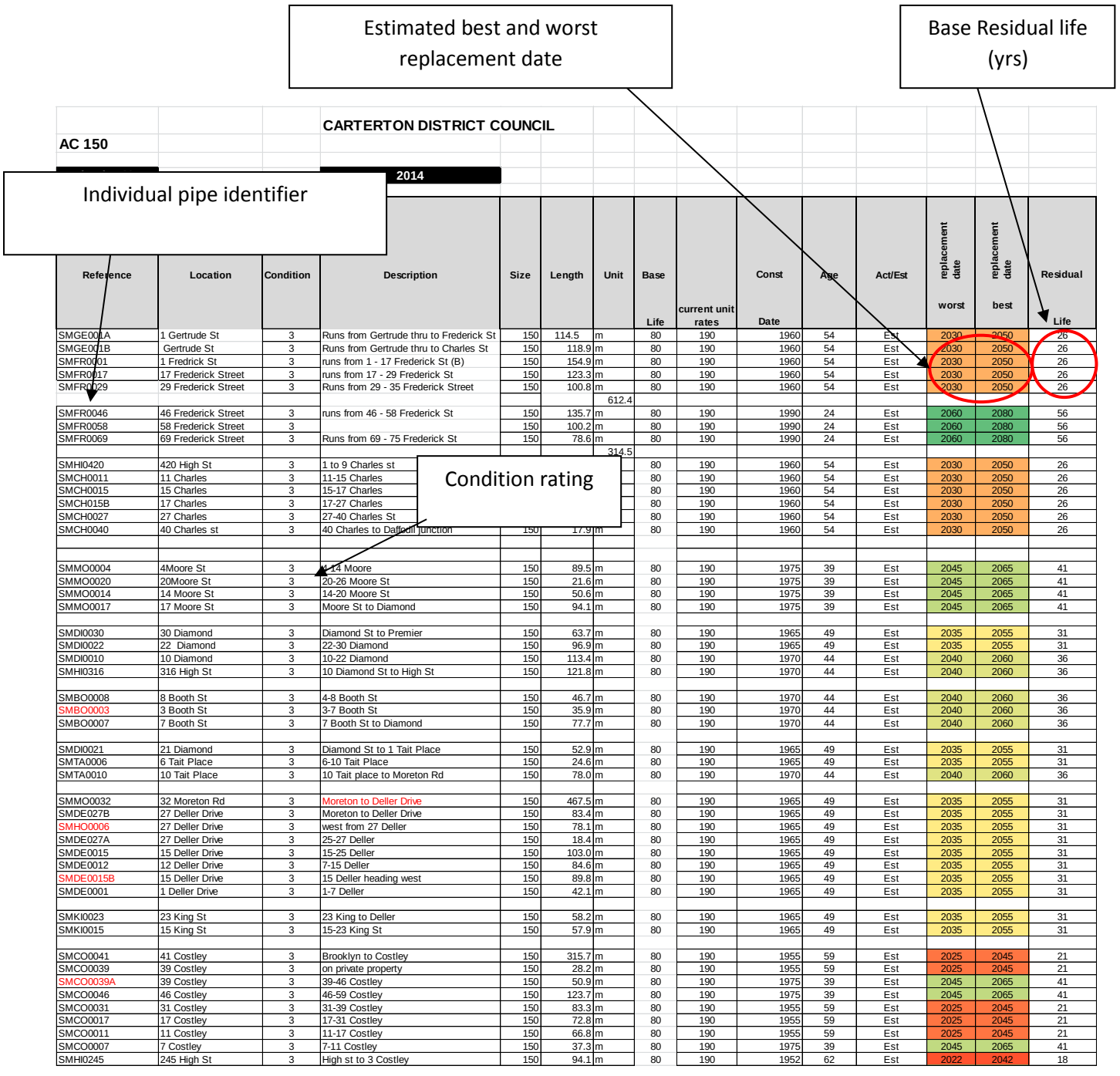
- Log operator notes on problem areas
- Carry out flow monitoring investigations to pinpoint hydraulic problem areas
- Condition rate pipes by CCTV
- Remediate highest priority

These however also require an asset register that captures age and condition data for individual pipe lengths. This is a significant change from the approach adopted to date. Work in this regard has been 90-95 % completed at time of writing, and it is clear that this approach will facilitate improved asset management planning options.

As better data is collected, more refined life expectancies may be achievable, which would in turn increase the accuracy of the renewal predictions.

Theoretical asset renewal dates have been colour coded to give a visual indication of relative end-of–service for each asset.

This information is then distilled into financial budget information in section 7.



CARTERTON DISTRICT COUNCIL

AC 150

2014

Reference	Location	Condition	Description	Size	Length	Unit	Base Life	current unit rates	Const Date	Age	Act/Est	replacement date worst	replacement date best	Residual Life
SMGE001A	1 Gertrude St	3	Runs from Gertrude thru to Frederick St	150	114.5	m	80	190	1960	54	Est	2030	2050	26
SMGE001B	Gertrude St	3	Runs from Gertrude thru to Charles St	150	118.9	m	80	190	1960	54	Est	2030	2050	26
SMFR0001	1 Fredrick St	3	runs from 1 - 17 Frederick St (B)	150	154.9	m	80	190	1960	54	Est	2030	2050	26
SMFR0017	17 Frederick Street	3	runs from 17 - 29 Frederick St	150	123.3	m	80	190	1960	54	Est	2030	2050	26
SMFR0029	29 Frederick Street	3	Runs from 29 - 35 Frederick Street	150	100.8	m	80	190	1960	54	Est	2030	2050	26
						612.4								
SMFR0046	46 Frederick Street	3	runs from 46 - 58 Frederick St	150	135.7	m	80	190	1990	24	Est	2060	2080	56
SMFR0058	58 Frederick Street	3		150	100.2	m	80	190	1990	24	Est	2060	2080	56
SMFR0069	69 Frederick Street	3	Runs from 69 - 75 Frederick St	150	78.6	m	80	190	1990	24	Est	2060	2080	56
						314.5								
SMHI0420	420 High St	3	1 to 9 Charles st				80	190	1960	54	Est	2030	2050	26
SMCH0011	11 Charles	3	11-15 Charles				80	190	1960	54	Est	2030	2050	26
SMCH0015	15 Charles	3	15-17 Charles				80	190	1960	54	Est	2030	2050	26
SMCH015B	17 Charles	3	17-27 Charles				80	190	1960	54	Est	2030	2050	26
SMCH0027	27 Charles	3	27-40 Charles St				80	190	1960	54	Est	2030	2050	26
SMCH0040	40 Charles st	3	40 Charles to Daffodil junction	150	17.9	m	80	190	1960	54	Est	2030	2050	26
SMMO0004	4Moore St	3	4-14 Moore	150	89.5	m	80	190	1975	39	Est	2045	2065	41
SMMO0020	20Moore St	3	20-26 Moore St	150	21.6	m	80	190	1975	39	Est	2045	2065	41
SMMO0014	14 Moore St	3	14-20 Moore St	150	50.6	m	80	190	1975	39	Est	2045	2065	41
SMMO0017	17 Moore St	3	Moore St to Diamond	150	94.1	m	80	190	1975	39	Est	2045	2065	41
SMDI0030	30 Diamond	3	Diamond St to Premier	150	63.7	m	80	190	1965	49	Est	2035	2055	31
SMDI0022	22 Diamond	3	22-30 Diamond	150	96.9	m	80	190	1965	49	Est	2035	2055	31
SMDI0010	10 Diamond	3	10-22 Diamond	150	113.4	m	80	190	1970	44	Est	2040	2060	36
SMHI0316	316 High St	3	10 Diamond St to High St	150	121.8	m	80	190	1970	44	Est	2040	2060	36
SMBO0008	8 Booth St	3	4-8 Booth St	150	46.7	m	80	190	1970	44	Est	2040	2060	36
SMBO0003	3 Booth St	3	3-7 Booth St	150	35.9	m	80	190	1970	44	Est	2040	2060	36
SMBO0007	7 Booth St	3	7 Booth St to Diamond	150	77.7	m	80	190	1970	44	Est	2040	2060	36
SMDI0021	21 Diamond	3	Diamond St to 1 Tait Place	150	52.9	m	80	190	1965	49	Est	2035	2055	31
SMTA0006	6 Tait Place	3	6-10 Tait Place	150	24.6	m	80	190	1965	49	Est	2035	2055	31
SMTA0010	10 Tait Place	3	10 Tait place to Moreton Rd	150	78.0	m	80	190	1970	44	Est	2040	2060	36
SMMO0032	32 Moreton Rd	3	Moreton to Deller Drive	150	467.5	m	80	190	1965	49	Est	2035	2055	31
SMDE027B	27 Deller Drive	3	Moreton to Deller Drive	150	83.4	m	80	190	1965	49	Est	2035	2055	31
SMHO0006	27 Deller Drive	3	west from 27 Deller	150	78.1	m	80	190	1965	49	Est	2035	2055	31
SMDE027A	27 Deller Drive	3	25-27 Deller	150	18.4	m	80	190	1965	49	Est	2035	2055	31
SMDE0015	15 Deller Drive	3	15-25 Deller	150	103.0	m	80	190	1965	49	Est	2035	2055	31
SMDE0012	12 Deller Drive	3	7-15 Deller	150	84.6	m	80	190	1965	49	Est	2035	2055	31
SMDE0015B	15 Deller Drive	3	15 Deller heading west	150	89.8	m	80	190	1965	49	Est	2035	2055	31
SMDE0001	1 Deller Drive	3	1-7 Deller	150	42.1	m	80	190	1965	49	Est	2035	2055	31
SMKI0023	23 King St	3	23 King to Deller	150	58.2	m	80	190	1965	49	Est	2035	2055	31
SMKI0015	15 King St	3	15-23 King St	150	57.9	m	80	190	1965	49	Est	2035	2055	31
SMCO0041	41 Costley	3	Brooklyn to Costley	150	315.7	m	80	190	1955	59	Est	2025	2045	21
SMCO0039	39 Costley	3	on private property	150	28.2	m	80	190	1955	59	Est	2025	2045	21
SMCO0039A	39 Costley	3	39-46 Costley	150	50.9	m	80	190	1975	39	Est	2045	2065	41
SMCO0046	46 Costley	3	46-59 Costley	150	123.7	m	80	190	1975	39	Est	2045	2065	41
SMCO0031	31 Costley	3	31-39 Costley	150	83.3	m	80	190	1955	59	Est	2025	2045	21
SMCO0017	17 Costley	3	17-31 Costley	150	72.8	m	80	190	1955	59	Est	2025	2045	21
SMCO0011	11 Costley	3	11-17 Costley	150	66.8	m	80	190	1955	59	Est	2025	2045	21
SMCO0007	7 Costley	3	7-11 Costley	150	37.3	m	80	190	1975	39	Est	2045	2065	41
SMHI0245	245 High St	3	High st to 3 Costley	150	94.1	m	80	190	1952	62	Est	2022	2042	18

Figure 21 Asset life expectancy range – excerpt from main renewal spreadsheet

Asset Development

7.1.1 Wastewater treatment plant

7.1.2 Consent requirements

In order to meet increased environmental demands, asset development is required for both the immediate consent duration, and the longer-term solution that will be required at the end of the initial consent period.

Whilst neither set of requirements is finalised, budget forecasting needs to account for the major financial implications of these undertakings.

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Renewal Strategy

The renewals approach has been refined to incorporate consideration of criticality and vulnerability in decision making, and utilises asset maintenance history and condition. ***In practice, with a relatively small infrastructure such as Carterton's, decision making has historically been straightforward, and has not required detailed assessment.*** However if, and when, multiple renewals are necessary and compete against budget constraints, a more formal process is required to prioritise the renewal choices.

Criticality and vulnerability should underpin the renewal decision making process. Criticality or the consequence of failure is a practical assessment of the economic, social, cultural and environmental drivers related to asset components. Vulnerability incorporates the probability of failure due to naturally occurring conditions.

7.1.3 Asset renewal and capital works overlap

Whilst capital works to maintain or improve level of service, and renewal of assets, are normally separate in terms of funding and investigation, there are some circumstances where both need simultaneous consideration. This occurs when the deterioration of an asset affects its structural capability and hence vulnerability to damage from natural hazards, and where an improvement in the asset capability would improve the resilience of the network system.
Asset renewal prioritisation is therefore divided into two categories:

- **Lifeline assets**
- **Non-lifeline assets**

To recognise the overall value to the service, lifeline assets assessed under the WELA study as being high or extreme risk are assigned automatic priority in terms of renewal so that failure risks can be mitigated by new design/material/construction.

Improvement Actions:

a) Apply unique identifiers to all wastewater assets
b) Update asset register to include identifiers for all assets
c) Collection of renewal/repair and servicing data is currently fragmented. There need to be positive (formal) links between asset modifications and the asset register. This should be defined by the Asset Management Policy.
d) Define asset citicality

8 FINANCIAL INFORMATION

Summary of asset value

Re-valuation of the infrastructural assets relevant to this activity was undertaken in June 2013 by Opus International Consultants Ltd, Strategic Management Services. There are some omissions (laterals) for which there is insufficient data and that are yet to be entered into the register. None of the land irrigation system work in late 2014 has been included.

Replacement cost is the cost of re-building the existing asset to an equivalent level of service. The assets have been depreciated on a straight line basis over the economic life of the asset.

Table 11 Summary of network value

Network component	Optimised replacement cost ($)	Optimised depreciated replacement cost ($)	Annual depreciation ($)
Reticulation	7,489,165	3,287,690	94,619
Sewer fittings	968,673	503,964	9,687
Pump stations	566,512	362,499	15,255
Sewage treatment plant	2,311,148	863,126	56,434
Sewerage upgrade	966,551	508,808	50,860
Total	**$12,302,047**	**$5,526,088**	**$226,855**

Renewal Forecast

Information from Section 6 has been used to identify renewal costs based on theoretical asset life (fig. 21).

However, wastewater assets may need renewal sooner, or later than the theoretical renewal date, presenting a range of possible renewals dates and therefore a range of yearly budgets.

Whilst confidence levels in pipe assets has improved certainty in life expectancy, the same steps need to be taken with manholes and pumps. For example there are currently no collated records of when pumps were serviced (altering the asset life), or manholes grouted or even replaced. Thus identification of individual assets and allocation of a unique identifier for all wastewater assets is an immediate action requirement.

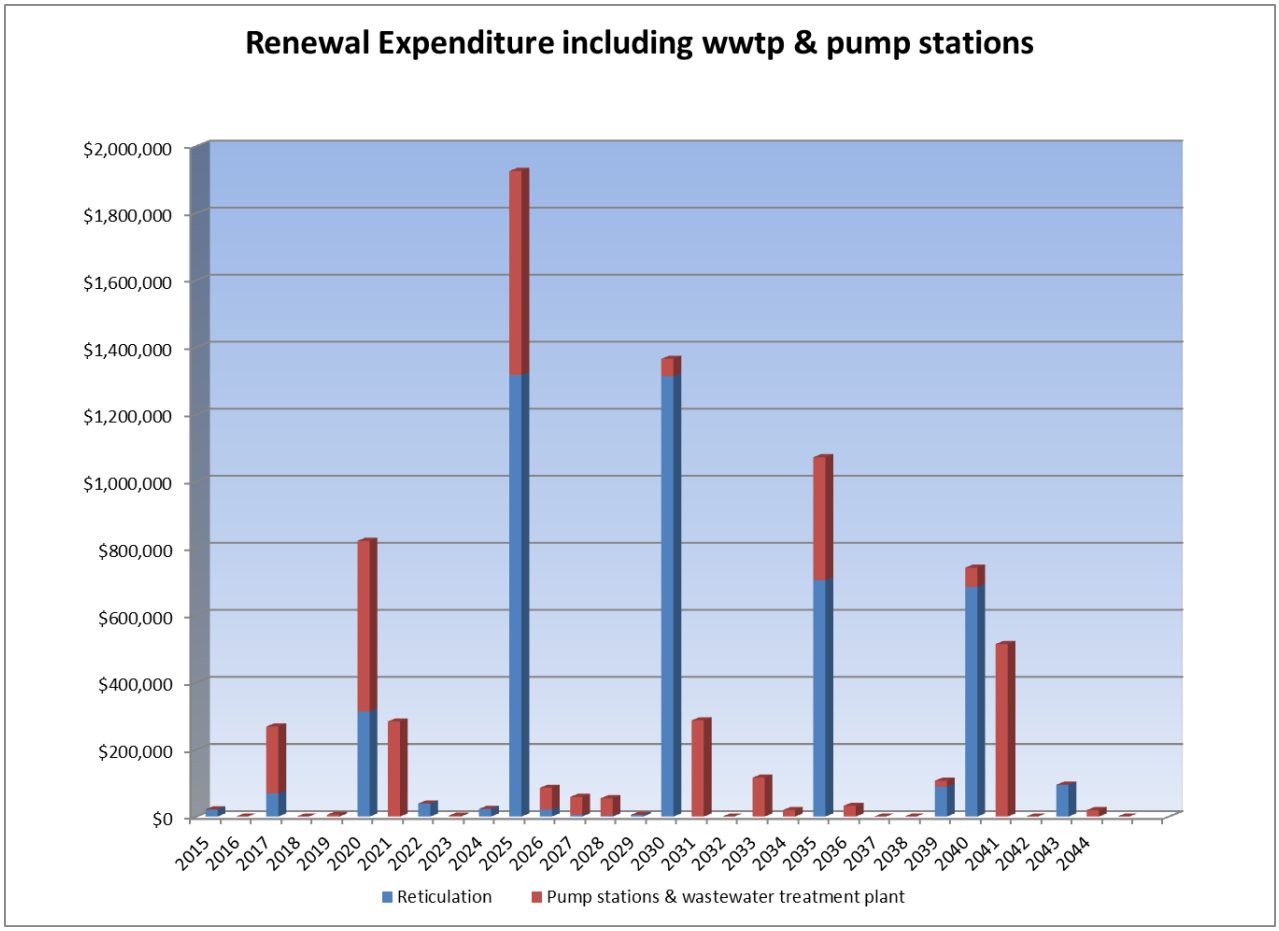

Figure 22 Budget based on base asset life renewal

The renewal forecast equates to an average expenditure of $265,553 per year for the period of the Long-Term Plan (2014-2034). For this period the renewal expenditure is close to the annual depreciation of $227,000 (fig. 22), however this is dependent on the asset condition rating.

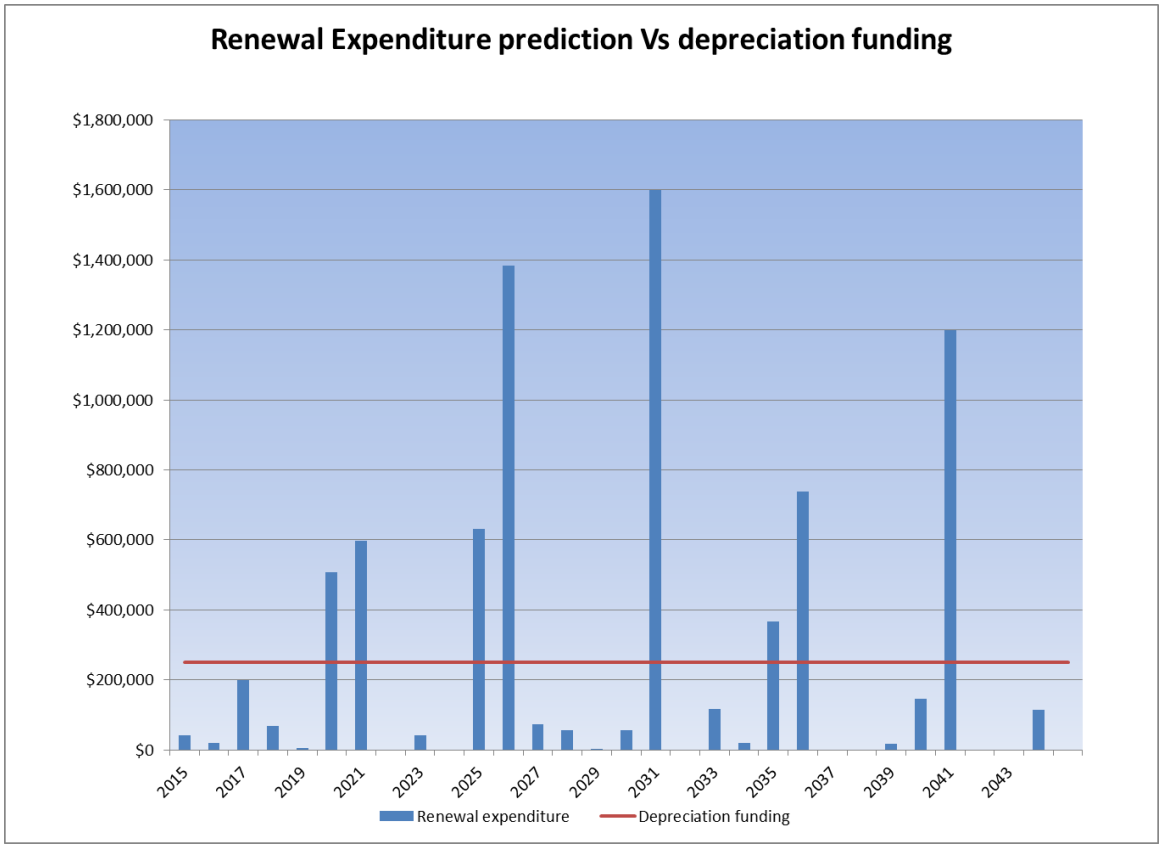

Figure 23 Renewal expenditure forecast Vs Depreciation funding

Development work forecast

Capital expenditure patterns were modified in 2011/2012 to reflect the successful identification of I/I and wastewater pipe condition by flow and CCTV investigations.

A direct comparison of the draft LTP capital renewals programme and base life renewal budget (to 2026) highlights the budget risk during this period (fig.23).

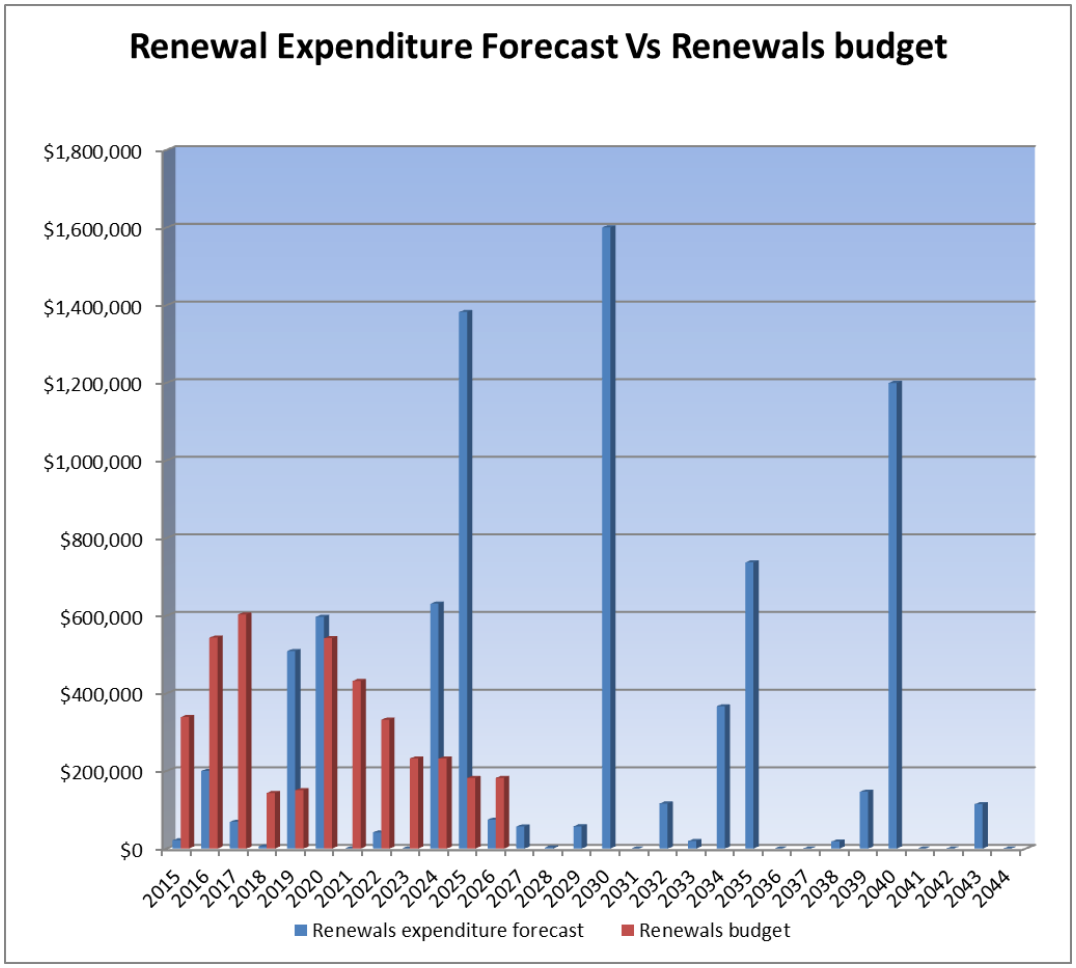

Figure 24 Capital works programme vs renewal budget forecast (base life)

Financial conclusions

- The base life asset renewal forecast over the next 30 years ≈$265,000/year (excludes new development works) suggests that the current depreciation funding (≈$227,000/year) does not cover budget risks for this period, but is relatively close. However there are significant spikes in the renewal forecast when a large number of pipes reach the end of their predicted life simultaneously. This will have to be managed by progressive replacement and by smoothing the funding curve.
- Although allowance for capital expenditure has been made in the LTP, plans are not yet sufficiently developed enough to give certainty to any forecast.
- It seems likely that, on the balance of probability, historical treatment of depreciation funding may have had the effect of increasing the depreciation funding rate required over the future period in order to maintain assets at a consistent level.
- Although some budget risk exists due to the unknown lifespan of assets, in general the asset performance appears slightly more optimistic than the original base life renewal, reducing the effect of historical depreciation funding.
- The recent inclusion of greater asset condition investigations over this period gives increased confidence in both asset management practice and budget risk mitigation.

Asset management depreciation funding is relatively new in New Zealand in terms of the asset life of pipes and concrete structures, and only became mandatory for Councils in the late 1990's. Thus the cycle of installation, depreciation funding, and replacement is incomplete, and several decades of funding are 'missing from the kitty'. For example, a pipe constructed in 1940 with a nominal 80 year life will have had almost 60 years of unfunded asset deterioration and perhaps 15 years of funded (fig. 124).

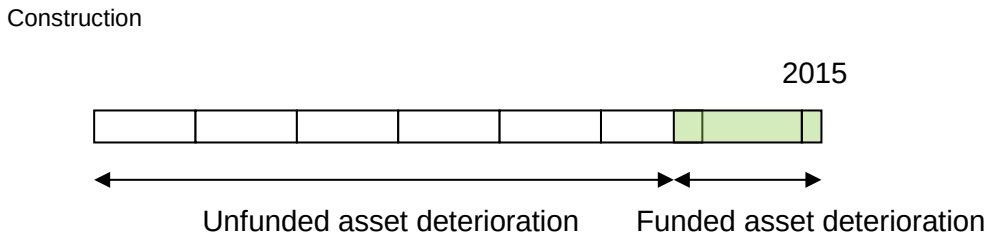

Figure 25 Example of funded and unfunded asset deterioration

This inevitably leads to a funding shortfall when as the asset approaches the end of its useful life. It appears that this is the situation now faced by Carterton District Council for some of its assets.

9 Assumptions

Assumptions in the preparation of this Water Asset Management Plan include:

That wastewater assets will remain in Council ownership throughout the planning period (10 years) and that there will be an ongoing requirement for this activity.

Water demand management activities will continue to tackle obvious water conservation measures until a Water Demand Strategy is complete (reduction in water use reduces sewer flows and subsequently treatment costs.

All new subdivision applications are assessed in accordance with the current District Plan and the New Zealand Standard NZS 4404:2010, “Land Development and Subdivision Engineering”. All designs are in accordance with the standards, they are checked and agreed to by Council’s engineers before construction commences and are inspected during construction, including witnessing of the relevant tests. The developer is expected to meet all costs of the works including the connection to Council’s existing network

Whilst the demand upon this activity will increase due to anticipated growth (which cannot be quantified) the operational requirements for this activity will remain similar for the next ten years.

Maintenance works will continue to be delivered by Council’s Works Department staff, while renewal, upgrade and new works will normally be completed by contractors selected by competitive tender or day work rates.

Funding will be required to provide for renewal as described elsewhere in this Asset Management Plan. That funding of maintenance and renewal works will be by annual rates charges and depreciation, while funding for capital works will generally be from loans and development contributions as appropriate.

Asset values will be re-adjusted at each plan revision to give a current overall asset value.

Financial and future work forecasts are based on the currently available knowledge of asset condition and performance, to the levels of service that have been undertaken to be delivered. More detailed evaluation of asset renewal requirements will be undertaken in the near future to identify programmes of work.

The following basic assumptions have been made in preparing 30 year funding requirement forecasts:

- All expenditure is stated in dollar values as at 30 June 2014 with no allowance made for inflation over each subsequent year of the 30 year planning period.
- No significant increase in overhead costs will occur during the 2015-2045 planning period.
- Operational cost will increase with upgrades at plants required to meet higher levels of final effluent quality required
- It is anticipated that there will be a gradual but continual increase in operation and maintenance expenditure in real terms over the planned period due to ever more stringent compliance requirements leading to higher compliance costs and the continued ageing of the asset. A small part may be offset by improved asset management decision making made possible by enhanced information used in asset management systems
- Improved asset renewal decision making is expected to reduce maintenance needs made possible by enhanced information used in the asset management system which should help to slow the rise in operating cost. As this reduction is difficult to quantify, it has been assumed that the net effect will be neutral and has not been provided for in the financial forecast.
- There will be no additional assets vested in Council from subdivisional development over the term of the AMP. This assumption will be reviewed in the next 3 year planning cycle
- Programmed renewal works are expected to result in reduced cost of maintenance over time. As this possible reduction is difficult to quantify it has not been allowed for in the financial forecasts.
- Maintenance allocations are based on maintaining current levels of service including compliance with current resource consents.
- Significant increases in the renewal funding may result from more detailed evaluation of assets.
- Changes in the district population will not have material impact on the expenditure forecasts for the wastewater schemes over the 2015-45 period
- Significant increases in the funding requirement may result from more detailed evaluation of asset renewal requirements and the need to meet higher resource consent standards

These assumptions and the AMP will be reviewed in 2017 in light of improved asset information that will be collected and recorded over the next 3 years ahead of the 2018-28 LTP.

Reconciliation of reticulation pipework assets is 95% complete at time of writing (further work needs to be done to rationalise the data on laterals in the reticulation system). Renewal forecasts are based on this data as, even with its incompleteness, it is seen as the most accurate data to work from. This work is likely to be completed before the LTP is completed.

The system is comprised of components ranging in age from 1 to 75 years, with differing levels of confidence in the material type, age, and condition. The NAMS confidence grades are used:

Data Confidence		
Grade	Description	Accuracy
1 2 3 4 5	Accurate Minor inaccuracies 50% estimated Significant data estimated All data estimated	100% +/- 5% +/- 20% +/- 30% +/- 40%

These are then applied to the wastewater assets as follows:

Asset Type	Carterton District Council Data Confidence grade
Reticulation pipe age	2
Reticulation pipe material	2
Reticulation type condition	5
Pumps stations	2
Headworks	2-3
Ponds	3
Wastewater treatment plant Outflow measurement & reticulation condition	1

Forecast confidence rating	
Confidence Grade	General meaning
A Highly reliable	Data based on sound records,

	procedure, investigations and analysis, documented properly and recognized as the best method of assessment.
B Reliable	Data based on sound records, procedures, investigations and analysis, documented properly but has minor shortcomings, for example the data are old, some documentation is missing, and reliance is placed on unconfirmed reports or some extrapolation.
C Uncertain	Data based on sound records, procedures, investigations and analysis which is incomplete or unsupported, or extrapolated from a limited sample for which grade A or B data is available.

Asset Type	Forecast confidence rating
Pipe reticulation	B/C
Manholes	C
Pump stations	C
Wastewater treatment plant	C

D Very uncertain	Data based on unconfirmed verbal reports and/or cursory inspection and analysis.

10 Improvement Actions Plan

Recommendations

Action	Responsibility	Completion Date
Adoption of the asset management policy noted in this document or variation thereof. Appoint or delegate a position of asset manager.	Senior management	July 2015
Put systems in place to ensure that assets that have been replaced are removed from the asset register.	Asset manager	October 2015
Put systems in place to ensure that the construction date used for assets is updated on the asset register as renewals are made. This will largely be achieved by having unique identifiers for all wastewater assets.	Asset manager	July 2015
Put systems in place to ensure the effective capture of renewal/maintenance/condition data.	Senior management/Asset manager/ Operations staff	October 2015
Ensure that assets that have both capital and maintenance aspects are adequately reflected in the asset register. Each item needs its own register inclusion or minor assets that are more realistically operational items should be removed from the register.	Asset manager and operations staff	Dec 2015
Review/update GIS data to include the pipe location by street: this is how pipe assets are replaced, and so should be reflected on the asset register. In addition different pipes may	GIS operator	May 2015

have different condition rating depending on location (e.g. in the verge vs in the road).		
Identify assets that require investigation as to currency. For example, there are items that may no longer be required as more modern equivalents have been installed. Following investigation, the original assets could be removed from the register.	Asset manager/operations	October 2015
The methodology adopted in section 6 should be applied in the near future to develop a lifeline (critical asset) register, and investigations undertaken to report on the condition, possible risk mitigation measures, and alternative service/redundancy strategies in case of damage from significant natural events.	Asset manager	October 2015
Identify all earthenware and asbestos cement pipe locations and assess redundancy and alternative service strategies for those pipes (vulnerability risk).	Asset manager	December 2015
A pump register should be instigated, showing purchase date, age, and scheduled service dates. A review of pump service versus life expectancy should be carried out, to give either a revised asset life, or amended replacement value.	Operations	October 2015
Identify estimated wastewater	Wastewater project	October 2015

treatment plant lifespan in terms of flow capacity and population growth.	team	
Develop level of service standards for the planned infrastructure upgrades: currently standards do not reflect the nature of the planned work (largely around the change in level of service in irrigating wastewater to land).	Wastewater project team	November 2016
Formulate a policy on demand management for wastewater.	Water/wastewater project team	November 2016

11 APPENDICES

1) Wastewater Consent

2) Infiltration and Inflow reporting

3) Initial Review of Pump station data

12 Appendix 1 Main Wastewater consent & 2014 land irrigation consent

13 Appendix 2 Infiltration and Inflow reporting

14 Appendix 3 – Initial Review of Pump station data