Carterton District Council

Infrastructure Strategy

2018–2048

Consultation draft

TABLE OF CONTENTS

1 PURPOSE OF THIS INFRASTRUCTURE STRATEGY

Infrastructure accounts for over half of the Carterton District Council's (CDC) annual operating expenditure and over 80% of Council's capital expenditure. This infrastructure provides the foundations on which the Carterton district community is built. It is essential to the health, safety, and land transport needs of the district and has a significant impact on the physical environment.

Good quality local infrastructure facilitates social and economic wellbeing. It enables businesses and communities to flourish. Conversely, poor infrastructure will inhibit the economic performance of Carterton district. Getting infrastructure spending right is a pre-requisite to enhancing the quality of life and attracting people to live in the district.

This infrastructure strategy outlines:

- the key wastewater, water supply, stormwater and land transport infrastructural issues the Carterton district community must address over the next 30 years:
- the options under the most likely scenario for dealing with those issues;
- the cost and service delivery implications for residents and businesses of those options; and
- the Council's current preferred scenario for infrastructure provision.

This strategy will help the Council to make informed decisions to deal with the major decisions and investment opportunities that will occur over the next 30 years.

2 BACKGROUND

2.1 LEGISLATIVE CONTEXT

Section 101B of the Local Government Act 2002 requires all local authorities to prepare and adopt an infrastructure strategy covering a period of at least 30 years, as part of its Ten Year Plan. The statutory purpose of an infrastructure strategy is to identify significant infrastructure issues for the Council over the 30-year period covered by the strategy, and to identify the principal options for managing those issues.

This strategy addresses the above purpose by outlining how CDC intends to manage its water supply, wastewater, stormwater, and roads and footpath infrastructure assets. Inclusion of these asset types in the strategy is mandatory. Other asset types (eg parks, buildings, etc.) may be included, at the discretion of CDC, but are of a relatively minor scale and value and do not form part of this Infrastructure Strategy.

The strategy is consistent with and represents a culmination of the strategies underpinning CDC's corresponding activity management plans (AMPs). The AMPs are key supporting information for the Infrastructure Strategy.

The Infrastructure Strategy will be reviewed on a three-yearly basis in line with, and as an important component of, Council's 3-yearly review of its Ten Year Plan.

2.2 HISTORICAL CONTEXT—FORMATION OF CARTERTON DISTRICT COUNCIL

Carterton District Council was formed in April 1989 from a voluntary amalgamation of the former Carterton Borough and South Wairarapa County Councils. The Borough Council had been in existence since 1887 while the County Council's origins go back to earlier roads boards in the 1850s.

2.3 GEOGRAPHICAL CONTEXT

Carterton district encompasses predominantly rural land on the eastern side of the lower North Island. The western boundary is the Tararua Ranges with the eastern boundary being the Pacific Ocean. The District is adjacent to Masterton District to the north, and South Wairarapa District to the south. Kāpiti Coast District adjoins its western boundary.

Figure 1: Carterton District Boundaries

The usually resident population of Carterton district was 8,235 at the 2013 census. The administrative and main trading centre is Carterton, with over half (57% or 4,686 in 2013 census) of the district's usually resident population residing in this town.

There are other, smaller, rural settlements located within the district including Gladstone, Flat Point and Clareville.

The predominant land use in the district is pastoral agriculture, principally beef and sheep and dairy farming, with a significant amount of forestry in the eastern hill country. The main employment sectors are agriculture, forestry, and fishing, with all of these sectors highly dependent on CDC's roading infrastructure for transport connections. Small pockets of viticulture and winemaking exist in the Gladstone area.

A moderate scale industrial precinct is located at the northern end of the district (Waingawa) with water and wastewater infrastructure connected to Masterton District Council's networks because of their proximity location. Masterton District Council provides, by agreement, potable water and treats and disposes of the wastewater and trade waste.

A large and expanding bacon and ham food processing factory is located within Carterton with water supply mostly sourced from its own bore, but is totally reliant on CDC infrastructure for wastewater treatment and disposal.

2.4 REORGANISATION PROPOSALS

The Local Government Act 2002 provides processes for initiating and determining the reorganisation of councils, including amalgamation. A joint reorganisation application prepared by the three Wairarapa councils and lodged with the Local Government Commission in May 2013 sought the establishment of a single Wairarapa unitary authority, separate from the current Wellington region. The Commission subsequently developed its preferred option comprising the amalgamation of all district and city councils in the region into a single unitary authority but that was rejected following strong negative responses from the affected community during the formal consultation procedure.

The Commission then worked with the three Wairarapa councils in developing a new proposal comprising a separate Wairarapa territorial authority, and retention of the current, separate, Greater Wellington Regional Council. A poll on that proposal was triggered, closing 12 December 2017. The poll defeated the Commission's proposal by a vote of 58.76% against, 41.24% in favour. For planning purposes, that means that the current structure of local government in Wairarapa will in all likelihood endure over the term of this strategy.

3 APPROACH TO MANAGING INFRASTRUCTURE ASSETS

CDC's approach to managing its infrastructure assets involves optimisation of the whole of life costs of its infrastructure. There are three key components of that: operating and maintenance costs, renewal costs and development activities. The three are interrelated, with the timing of renewals or new capital development impacting on annual maintenance costs.

The strategy outlines how CDC intends to manage its three-waters and roading infrastructure assets, taking into account the need to:

- maintain, renew or replace existing assets
- respond to growth or decline in the demand for services reliant on those assets
- allow for any planned changes to levels of service provided through those assets
- maintain or improve public health and environmental outcomes or mitigate adverse effects on them
- provide for the resilience of infrastructural assets by identifying and managing risks relating to natural hazards and by making appropriate financial provision for those risks.

3.1 OPERATING AND MAINTENANCE

Operational activity is work or expenditure which has no direct effect on asset condition but which is necessary to keep the asset functioning, such as the provision of staff, inspections, consumable materials (chemicals etc.), resource consent applications and compliance, monitoring, and investigations.

Maintenance can be defined as the activities that preserve an asset in a condition which allows it to perform its required function. Maintenance comprises regular servicing and immediate repairs necessary to keep the asset operational. The ongoing efficiency of routine maintenance is critical to achieve optimum asset life cycle costs that best suit the desired levels of service.

Maintenance falls into two categories, planned and reactive, each having quite different triggering mechanisms but similar objectives.

Planned maintenance comprises routine servicing of assets to maintain day to day functionality. It often entails scheduled servicing of key asset components on a rotational or seasonal basis – eg servicing of pumps, flushing of mains, mowing of roadside vegetation, etc.

Reactive maintenance entails responses to unplanned asset failure such as burst water mains, roadside slips, sewer overflows, etc.

The strategy is to maintain levels of service through timely and effective maintenance interventions until the age or condition of the asset makes it uneconomic to continue to maintain. Within this, striking a balance between the frequency of planned maintenance and the incidence of reactive maintenance, is key.

3.2 RENEWAL OR REPLACEMENT

Asset renewal or replacement does not increase the assets' original design capacity but restores, rehabilitates, replaces or renews an existing asset to extend its economic life and/or restore the asset to its original service potential. It is a key driver of CDC's infrastructure strategy because of the age profile and condition of some of the assets, and the need to develop a replacement strategy which is both affordable and sustainable.

CDC's renewal strategy is, in general, to rehabilitate or replace assets when justified by:

Asset performance: renewal of an asset where it fails to meet the required level of service due to deterioration of asset condition. Non-performing assets are identified by the monitoring of asset condition, reliability, capacity, and efficiency during planned maintenance inspections and operational activity. Indicators of non-performing assets include:

- structural failure
- repeated asset failure (blockages, mains failure, pavement failure, etc),
- ineffective water or wastewater treatment.

Economics: Renewals are programmed with the objective of achieving:

- the lowest life-cycle cost for the asset (the point at which it is uneconomic to continue repairing the asset), and
- a sustainable long term cash flow by smoothing spikes and troughs in renewals programmes based on the estimated economic lives of asset groups, and
- efficiencies, by co-ordinating renewal works with capacity upgrade work or other planned works in the area.

Risk: The risk of failure and associated financial and social impact justifies action (eg probable extent of property damage, safety risk).

Renewal works are assessed and prioritised in accordance with the following priority ranking table, the cost/benefit ratio of each project, Council's objectives and strategies, and available funds.

Priority	Renewal criteria
1 (High)	• Asset failure is imminent or has occurred and renewal is the most cost effective option • The asset is a critical asset and asset failure is likely to have major impact on the environment, public safety or property • Condition and performance ratings of asset is 4 - 5 (poor or very poor) • Asset performance is non-compliant with resource consent requirements

Priority	Renewal criteria
2	• Asset failure is imminent, but failure is likely to have only a moderate impact on the environment, public safety or property. • Asset failure is imminent and proactive renovation is justified economically • The asset is vulnerable to natural hazards and optimised renewal will improve resilience • Condition and performance ratings of asset is 4 - 5 (poor or very poor) • System upgrading scheduled within five financial years as asset is nearing end of economic life. • Asset renewal is justified on the basis of benefit cost ratio and deferment would result in significant additional costs • The asset has a high criticality rating
3	• Asset failure is imminent, but failure is likely to have a minor impact on the environment, public safety or property • Condition and performance ratings of asset is 3 (moderate/average) • Asset renewal is justified on the basis of life cycle costs, but deferment would result in minimal additional cost • The asset has a medium criticality rating
4	• Existing assets have a low level of flexibility and efficiency compared with replacement alternative • Condition and performance ratings of asset is 1 - 2 (good to excellent) • The asset has a low criticality rating
5 (Low)	• Existing asset materials or types are such that known problems will develop in time. • Condition and performance ratings of asset is 1 (excellent)

Table 1: Renewals strategy

3.3 CAPITAL IMPROVEMENTS—PLANNING FOR THE FUTURE

Growth and demand are the main drivers of new capital development, and include:

- population increase and demographics
- changes to and the incidence of new land use activities
- more stringent regulatory standards and demand for higher levels of service (eg resource consents)
- community expectations and demand for additional services.

Mitigating the effects of demand can be achieved through demand management strategies, particularly in respect of the 3-waters. CDC's capital development strategy entails maximising the use of existing asset capacity as the first priority over investment in new infrastructure.

Further consideration of each component of the strategy relative to each of the four infrastructure asset groups is provided in Section 5.

3.4 HISTORICAL EXPENDITURE

Whilst operating expenditure (Opex) has trended upwards in line with inflation and increased loan servicing costs, capital expenditure (Capex) tends to be more 'lumpy" due to the specific nature of capital projects (renewals and improvements), as illustrated in Table 2 below.

ACTIVITY	2012	2013	2014	2015	2016	2017
WW Opex	907,428	1,029,795	1,232,833	1,421,826	1,841,568	1,600,437
WW Capex	465,351	3,179,573	657,907	1,609,015	856,935	783,163
Water Supply Opex	1,467,511	1,576,338	1,676,864	1,676,864	1,773,632	2,055,560
Water Supply Capex	207,906	147,408	613,865	93,911	106,126	397,612
Stormwater Opex	174,101	165,938	175,722	173,338	165,699	185,585
SW Capex	16,585	35,898	712	28,123	26,786	559
Roading opex	3,374,926	3,627,655	3,229,949	3,429,985	3,156,942	3,357,647
Roading capex	1,945,801	2,284,727	1,908,043	1,701,863	1,729,596	1,572,402

Table 2: Historical operating and capital expenditure 2012-2017

4 DEMOGRAPHIC FACTORS

4.1 CURRENT POPULATION

With data from the latest census on 8 March 2018 not yet available, the most recent census, held in 2013, has been used as the base for population projection purposes.

For statistical purposes, the Carterton district population is distributed across four area units. The largest area unit population is the urban area of Carterton, and the smallest is Waingawa.

Area Unit	2001	2006	2013
Waingawa	258	312	480
Mt. Holdsworth	1,092	1,179	1,350
Te Wharau	1,395	1,488	1,722
Carterton	4,104	4,122	4,686
Total	6,849	7,098	**8,235**

Table 3: Inter-census area unit populations 2001-2013

(Note: The above numbers do not total exactly due to rounding of data)

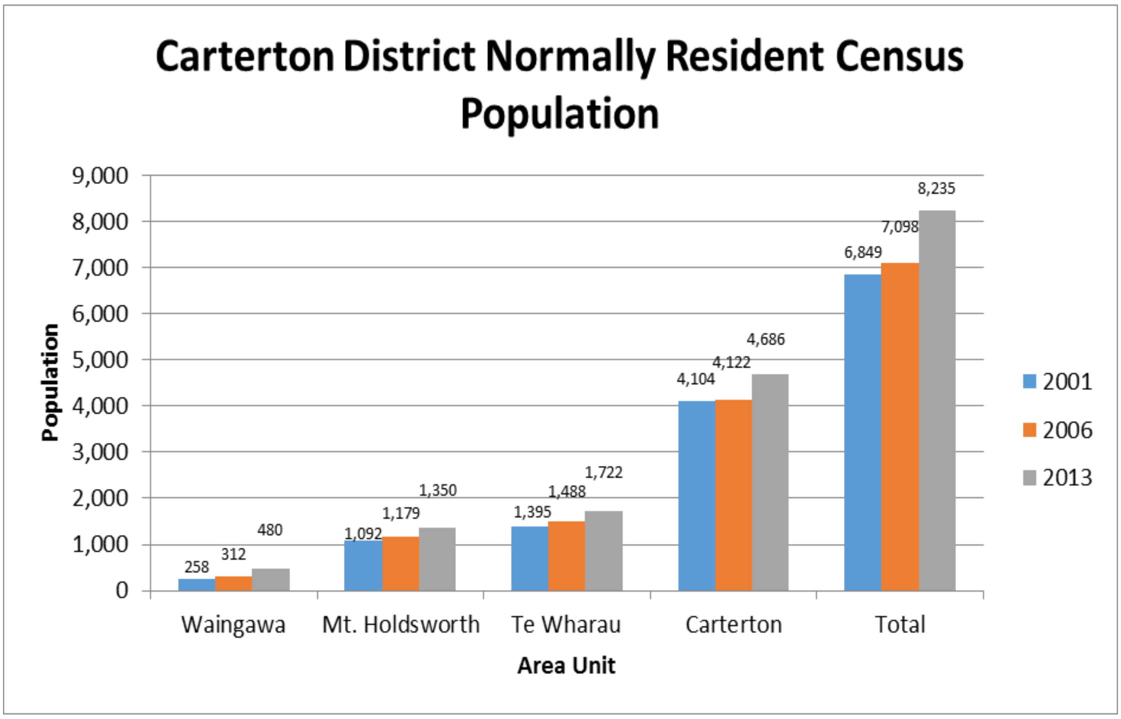


Figure 2: Inter-census usually resident population by area unit

A comparison between the 2001, 2006, and 2013 census figures (the 2011 census was cancelled and replaced with the 2013 census due to the 2011 Christchurch earthquake) shows that the major increase (16%) occurred in the 2006 to 2013 inter-census period, with nearly 50% of that occurring in the Carterton area unit. Positive growth was also measured across the remaining area units.

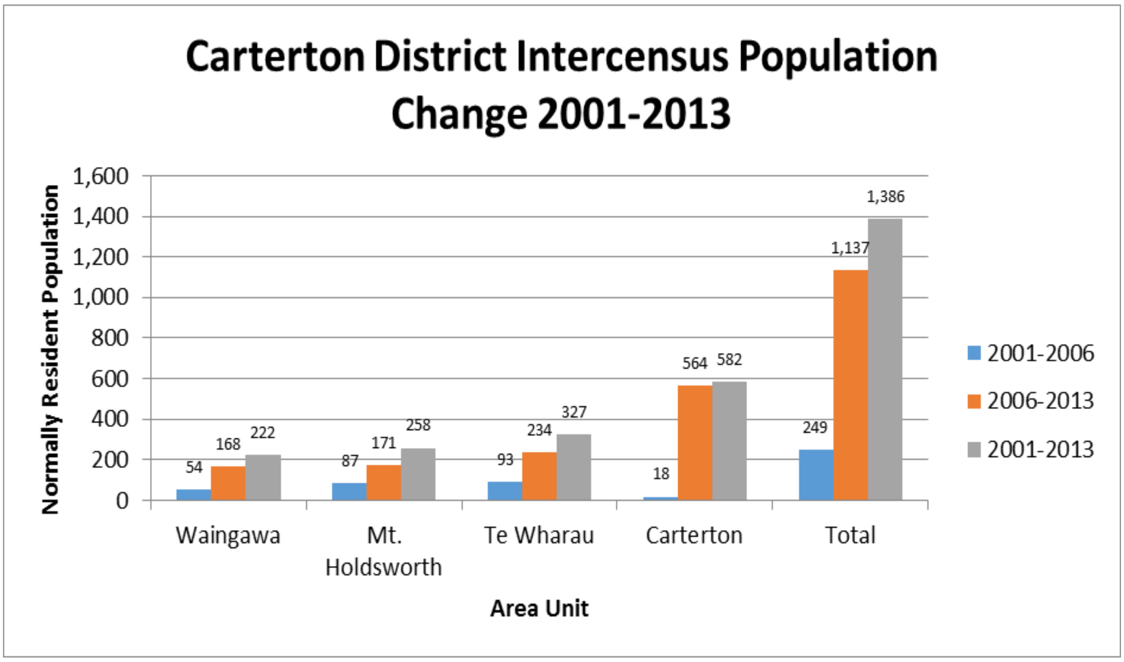


Figure 3: **Inter-census population change by area unit 2001-2013**

The Carterton district, usually resident, population increased from 6,849 in 2001 to 8,235 in the 2013 census, an overall increase of 20%, and an average annual increase of 1.7% per annum, distributed across the four area units making up the district as follows:

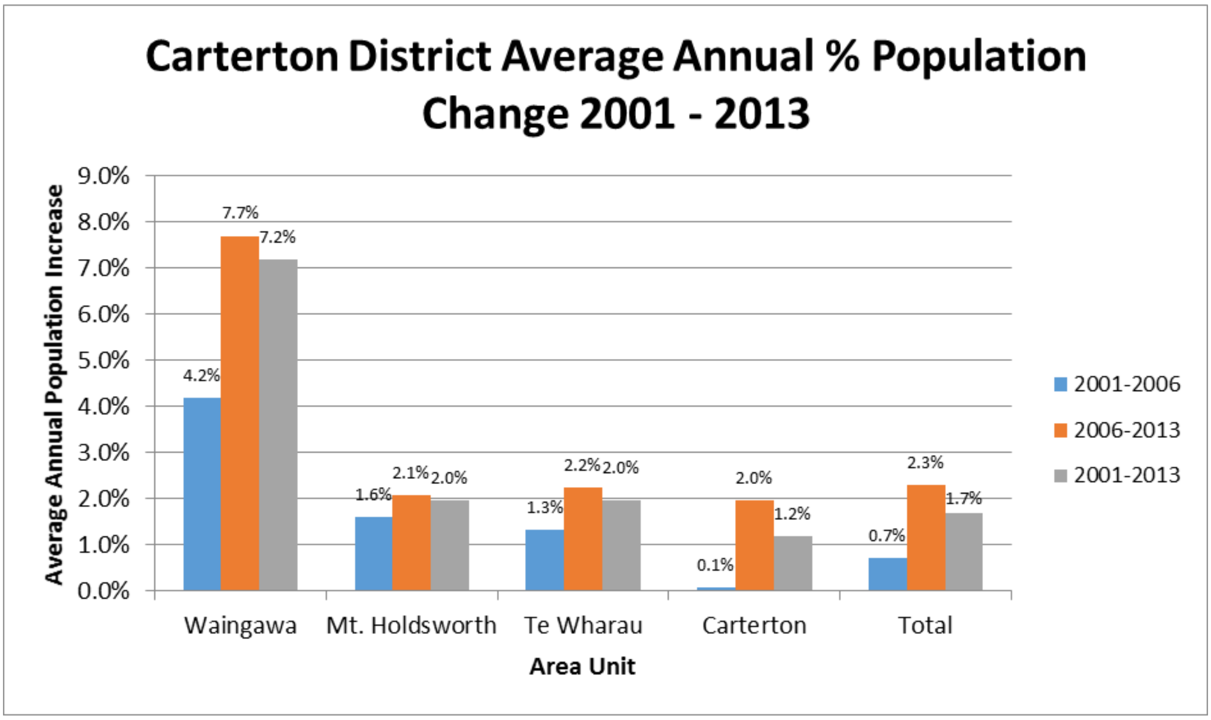


Figure 4: **Inter-census annual population change % by area unit 2001-2013**

While most of the population increase, in absolute terms, occurred in Carterton, the highest annual percentage increase occurred in the Waingawa area unit because of its low population base (258 people in 2001).

Compared with the 2001 and 2006 censuses, the 2013 population decline in the 25–39 years age bracket was off-set by an increase in population from 40 years and above. More marked increases in population distribution were represented across the 50–74 years age brackets, although the variation from 2006 in absolute terms is relatively minor—less than 300 across the district—and will not impact on the capacity of current infrastructure.

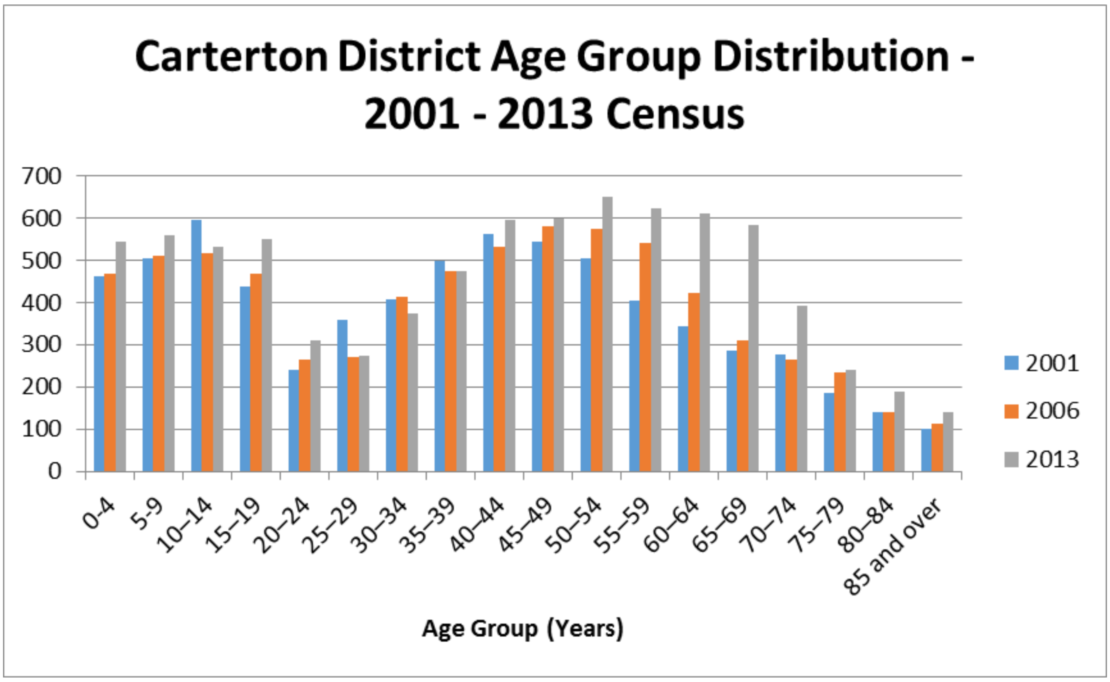


Figure 5: Inter-census population age profile—2001-2013

4.2 GROWTH PROJECTIONS

An indicator of future population growth trends can be drawn from the incidence of new lots and dwellings:

Year	New Subdivision Lots			New Dwellings		
	Urban	Rural	Total	Urban	Rural	Total
2007	80	109	189	47	36	83
2008	35	60	95	31	28	59
2009	21	37	58	21	29	50
2010	51	55	106	25	27	52
2011	14	21	35	24	20	44
2012	8	30	38	42	23	65
2013	41	50	91	50	20	70
2014	42	28	70	47	25	72
2015	32	43	75	27	14	41
2016	33	12	45	7	5	12
Total since 2007	357	445	802	321	227	548
%	45%	55%		59%	41%	

Table 4: New lots and dwellings 2007 - 2016[1]

On average, 80 new lots per year were created over the 2007-2016 period, with 45% urban and 55% rural.

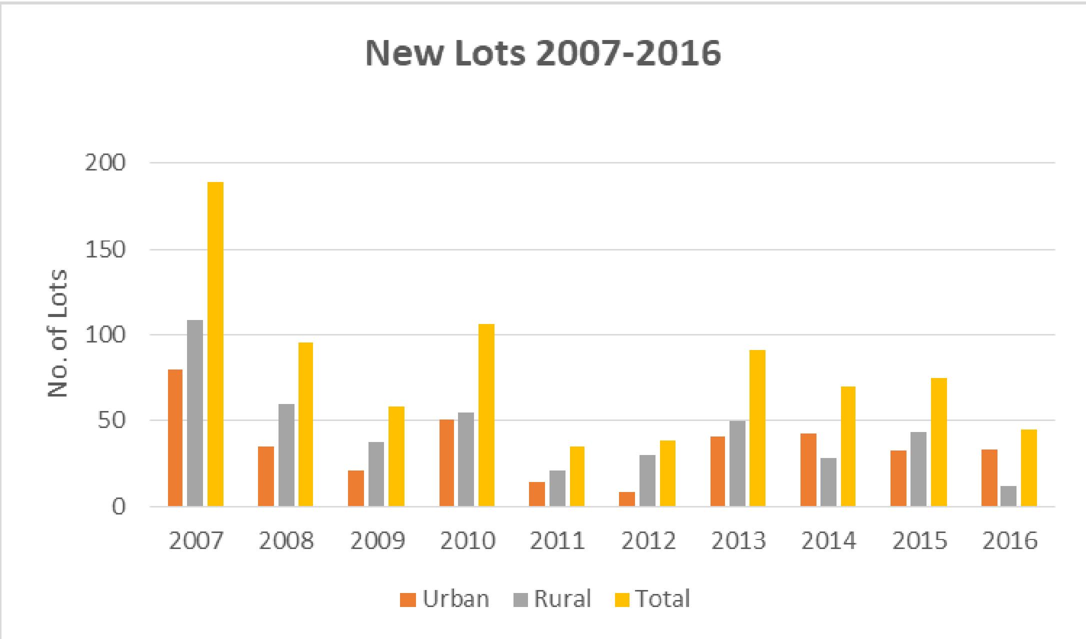


Figure 6: New subdivisional lots 2007 - 2016

Similarly, an average of 55 new dwellings were created per year, weighted 59% urban and 41% rural.

[1] From Boffa Miskell draft Urban Growth Strategy dated 20 Sept 2017

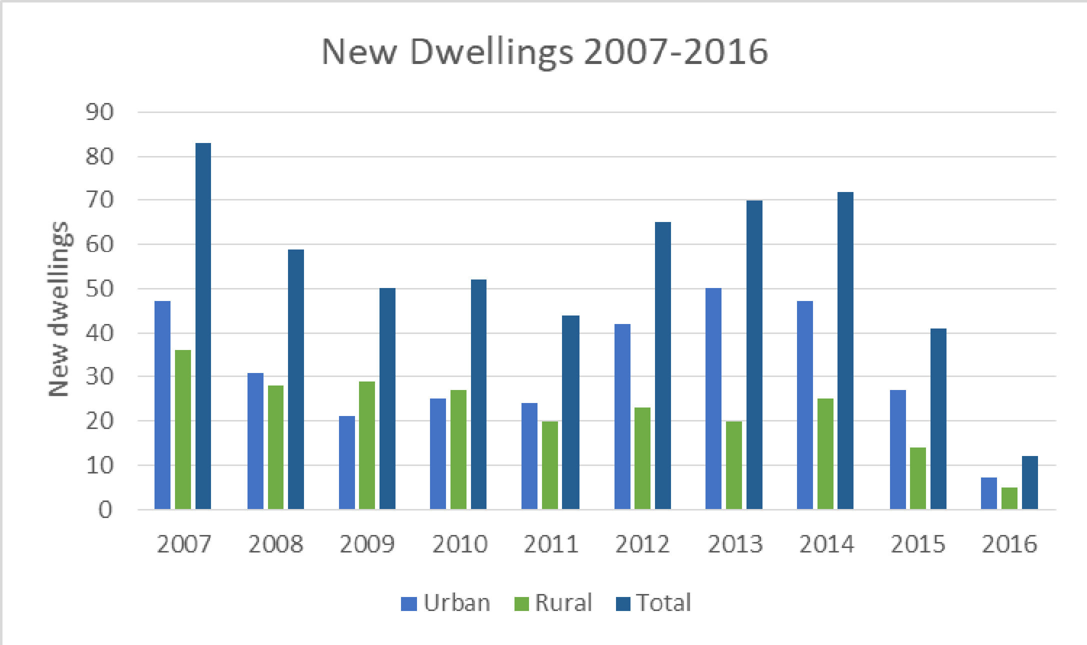


Figure 7: New Dwellings 2007 - 2016

Commencing with the 2013 Census as the base, the Statistics New Zealand projected population growth scenarios for Carterton district are shown in Table 5 below[2]:

Population Projection Scenario	2013[3]	2018	2023	2028	2033	2038	2043	2048
High	8,490	9,590	10,150	10,650	11,100	11,500	11,850	12,319
Medium	8,490	9,360	9,650	9,900	10,050	10,150	10,200	10,405
Low	8,490	9,130	9,160	9,140	9,030	8,830	8,560	8,567

Table 5: Population projection scenarios for Carterton District 2013-2048

Between 2013 and 2048, Carterton district's population is projected to increase by 1,915 (up 23%) under the 'Medium' population projection. Under the 'High' population projection, the district may potentially increase by 3,829 people (up 45%). Of this projected growth, the 65+ age group proportion of the total population is the only age that increases.

[2] Adapted from Boffa Miskell draft Urban Growth Strategy dated 20 Sept 2017 by extending out to 2048.
[3] 2013 Census usually resident district population was 8,235.

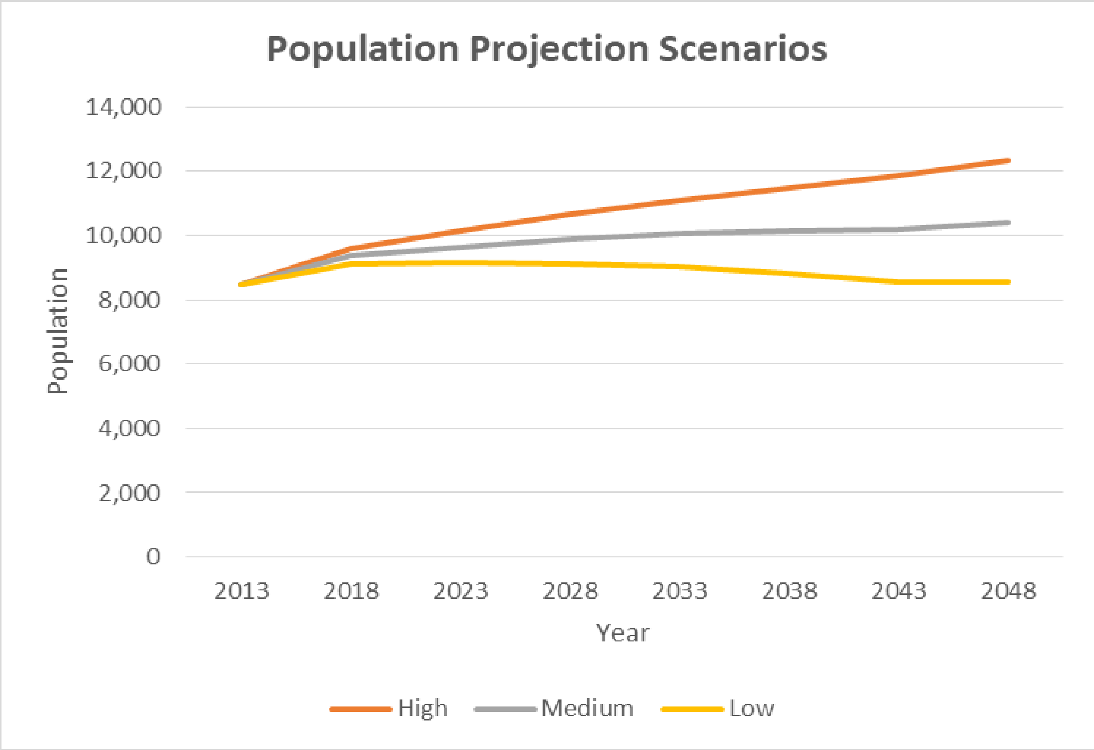


Figure 8: Population projections – Carterton District

To calculate the number of houses needed to accommodate the projected additional population, the average household size for Carterton district of 2.4 persons has been used. Applying that to the projected population over the next 30 years (ie from 2018-2048), the projected household growth is for an additional 798 households under the Medium Projection scenario and 1,595 under the High Projection scenario, over the 2013-48 period.

Added to current household numbers, this means that Carterton District's households will grow from 3,294 to 4,092 households (up 24%) between 2013 and 2048 under the Medium Projection, and to 4,889 under the High Projection. Annualising the growth projections equates to the need for an additional 27 or 53 houses per year for 30 years (medium and high projection scenarios respectively).

Of particular relevance to the projected demand on CDC's water, wastewater and stormwater infrastructure is the projected number of new urban dwellings over the next 30 years (2018-48). Table 4 above identifies an average annual increase of 32 new urban dwellings per year over the 2007-16 period. That equates to an additional 1,124 new urban dwellings on top of the estimated 1,953 dwellings in 2013. The total projected number of urban dwellings will approach 3,076 by 2048, with an equivalent usually resident urban population increasing from approximately 4,686 in 2013 to 7,382 by 2048.

In 2017, Boffa Miskell prepared an urban growth strategy for the District, including an updated assessment of the remaining capacity for future residential parcels within the Carterton residential zones of the Wairarapa Combined District Plan. That identified that Carterton Township (ie the residential area) makes up only 0.4% of the total land area of

Carterton District and is managed by a residential zone and a low density residential area as defined in the Wairarapa Combined District Plan. The current remaining areas for the residential zone and low density area are outlined in Table 6 below.

Zone	Total Land Area of Zone (ha)	Current Remaining Capacity (ha)	Additional Housing Capacity Available
Residential	289.7	41.6	800
Low Density	219.1	51.5	180
Total Residential Zone	508.8	93.1	980

Table 6: Carterton residential zone – remaining capacity

Carterton Township will need to accommodate approximately 1,124 additional houses by 2048, assuming the above growth projection. Boffa Miskell has identified that approximately 180 new houses can be accommodated in the current zoned areas for Carterton, and based on the minimum lot size of 400m^2 plus an additional 30% allowance for roads and reserves, an additional 800 houses could be accommodated within the existing zoned land. That would leave a deficit of approximately 7.5 ha (equivalent to 144 houses), as summarised in Table 7 below.

Zone	Remaining Residential Land Area 2013 (ha)	Additional Housing Required	Land Required for Additional Housing (ha)	Land Capacity Available by 2048 (ha)
Residential	41.6	944	49.1	-7.5
Low Density	51.5	180	51.5	0
Total Residential Zones	93.1	1124	100.6	-7.5

Table 7: Carterton Township Residential Land Capacity by 2048

Table 7 shows that, at the rate of 32 new urban houses per year, the remaining residential zoned land in Carterton will be fully subscribed by about 2044, ie in 26 years' time. Beyond that, CDC will need to plan for future residential development outside the current zoning, together with the provision of infrastructure to support that development.

CDC's draft Urban Growth Strategy identifies proposed, supplementary residential areas to the west and east of the current residential zone to accommodate future growth. In both cases, provision will need to be made for extension of the CDC's network infrastructure to service these areas.

In summary, the above demographic trends indicate that there will be a medium increase in residential demand for urban water, wastewater and stormwater infrastructure at Carterton. For the past few years, Council has been working on improving the condition of its core infrastructure assets, particularly the water supply and wastewater activity areas, in order to support public health outcomes and to meet its resource consent requirements. The demographic growth trend supports an approach involving maintenance, renewal and capital improvements to the existing infrastructure to maintain current levels of service, alongside moderate increase in new capacity for water and wastewater treatment and storage.

The water, wastewater, and stormwater infrastructure in particular is principally designed for residential use in the urban area, with industrial access to these services secondary and dependent on availability of capacity within current consent limitations, and appropriate on-site pre-treatment. Similarly, any additional reticulation capacity required within the respective pipe networks would need to be funded by developers.

4.3 LEVELS OF SERVICE

Current levels of service provided by CDC's three-waters infrastructure (water supply, wastewater, and stormwater) are likely to continue to be dominated by minimum regulatory requirements such as drinking water standards, the regional policy statement, and resource consents.

Wellington Regional Council's Proposed Natural Resources Plan (PNRP) has been notified and submissions are currently and sequentially being heard across multiple hearing streams. It is expected the PNRP will impact on minimum levels of service across each of the three waters because of the higher environmental standards and the need to mitigate the effects of rural and urban land use activities on natural resources. Retaining current levels of service will likely require greater attention to efficient water management and environmental impacts, for all systems—see asset specific discussion of this under Section 5.

For the roading infrastructure, a move to standardised, national, customer levels of service for each of the new road classifications could potentially result in reduced customer levels of service for rural access roads. Many of CDC's roads are in this category. This could manifest in the form of a reduced incidence of routine maintenance, and in some cases, increased reactive maintenance response times. Overall, the effects of ONRC on current levels of service for the CDC roading network are expected to be no more than minor, if any.

The processes required to finalise these core, regulatory, levels of service planning processes are still some way off. In the case of the Proposed Natural Resources Plan, completion of hearings is expected to extend well into 2018, and some aspects may be contested through the Environment Court. For the roading infrastructure, the proposed new levels of service associated with One Network Roading Classification project will take effect from 1 July 2018, but are not likely to have significant impact on the current levels of service for CDC's road and footpath networks.

Either way, financial provision for mandatory changes to levels of service as a result of regulatory planning processes or external funding criteria, will be phased in to CDC's budgetary provisions through future annual and long-term planning processes, once they are finalised.

In all cases, the capital costs relate to maintaining levels of service. There is no growth-related expenditure relating to additional asset capacity over the term of the plan. It has been assumed that any new infrastructure required as a result of the projected population growth will be funded by developers and downstream asset capacity will be sufficient to accommodate the projected growth.

The Council assesses financial contributions under the Resource Management Act 1991.The legislation has changed and financial contributions will cease in April 2021. A review of the contributions policy is planned, with a view to replace financial contributions with development contributions under the Local Government Act, at a similar level of revenue. This will be done in conjunction with a review of the District Plan.

4.4 CLIMATE CHANGE

Climate change projections[4] for Wairarapa are there will be significant impacts to the Wellington Region by 2090 if global emissions are not significantly reduced. They include:

- warmer temperatures (+3^{0} C)
- significant increase in the number of hot days (>25^{0} C) from 24 days now to 94 days
- frosts in the high elevations of the Tararua Ranges are likely to disappear
- spring rainfall will reduce by up to 10% on eastern areas
- the risk of drought will increase in Wairarapa
- more extreme rainfall events.

These impacts will require Council to consider the capacity and resilience of Carterton's water supply, stormwater drainage and wastewater systems.

More frequent droughts may affect the security of the Carterton water supply. Currently the supply relies on adequate water flows from the Kaipaitangata River and Lincoln Road well-

[4] Greater Wellington Regional Council's Climate Change Report (June 2017)

field to maintain a supply throughout the year and has limited storage capacity for a sustained drought. The impact of that is further considered under clauses 5.3.4 and 5.3.5.

Conversely, more frequent, high intensity rainfall will challenge the existing capacity of the urban stormwater drainage network and downstream drainage channels. Similarly, increased inflow and infiltration to the sewerage network is likely to be a consequence of higher rainfall events.

Equally, the roading network can be expected to be exposed to harsher environmental conditions, impacting on roadside bank stability and drainage.

4.5 RISKS AND RESILIENCE OF INFRASTRUCTURE

The main risks to CDC's infrastructure from natural hazards are major earthquakes, droughts, and flooding. Climate change variability in rainfall patterns and hence groundwater and surface flows, is a potential risk for all water utilities and associated changes to environmental effects.

Parts of Carterton district are built on old flood plains that could be subject to liquefaction in a major earthquake. Part of the Council's reticulation renewals programme will involve using different construction methods and materials to provide greater earthquake resilience in pipelines. Council does not consider this risk is so great that it should bring forward its renewals programme. Instead it will address resilience at the time pipes are replaced.

Previous risk mitigation measures include the installation of baffles in the town water reservoirs to reduce water "surge" during a major seismic event, bore-field development to provide an auxiliary supply in the event of drought or trunk main failure from the Kaipaitangata supply, and incorporation of seismic design in the construction of all bridge structures.

Risk mitigation and resilience measures are incorporated in CDC's renewals strategy as a means of prioritising replacement work, and include the replacement of brittle pipe materials with modern, flexible materials and jointing systems. The funding of these measures is built into forecast asset renewal and capital works programmes, with funding from depreciation reserves, contributions, or loans.

Additional assessment of the likelihood and consequence of the above risks, followed by intervention and mitigation strategies to improve resilience of CDC's critical assets, is an on-going process. This work has been developed and costed in CDC's asset management plans. Financial provision for any necessary risk mitigation measure identified has been included in the 2018 review of the Infrastructure Strategy.

Risk mitigation measures will be maintained, funded from forecast programmes, to ensure CDC's critical assets including bridges, treatment plants, storage reservoirs and trunk mains are designed and routinely inspected, assessed, and strengthened to improve resilience to natural hazards. Critical assets are defined as those that would have the greatest consequence in the event of failure.

Flood protection of the district is the responsibility of GWRC and is therefore not addressed in this strategy.

5 SIGNIFICANT INFRASTRUCTURE ISSUES FOR CARTERTON DISTRICT

5.1 GENERAL

This strategy relates to Carterton District Council's (CDC's) wastewater, water supply (including water races), stormwater drainage, and road and footpath infrastructure. The tables on the following pages summarise the significant infrastructure issues facing CDC, the proposed response to those issues, and the implications of taking or not taking the action proposed by the response. In many instances, the same principal response option is capable of addressing several infrastructure issues.

5.2 CDC WASTEWATER SCHEME

5.2.1 Wastewater assets

CDC owns and manages a single community wastewater scheme in the district, at Carterton. The scheme comprises approximately 43 km of sewer pipe ranging in size from 63mm to 380mm diameter. 70% of the network is 150mm diameter, reflecting the relatively small catchment and easy ground contours. Pipe lengths do not include the private wastewater laterals that amount to approximately 19.4km.

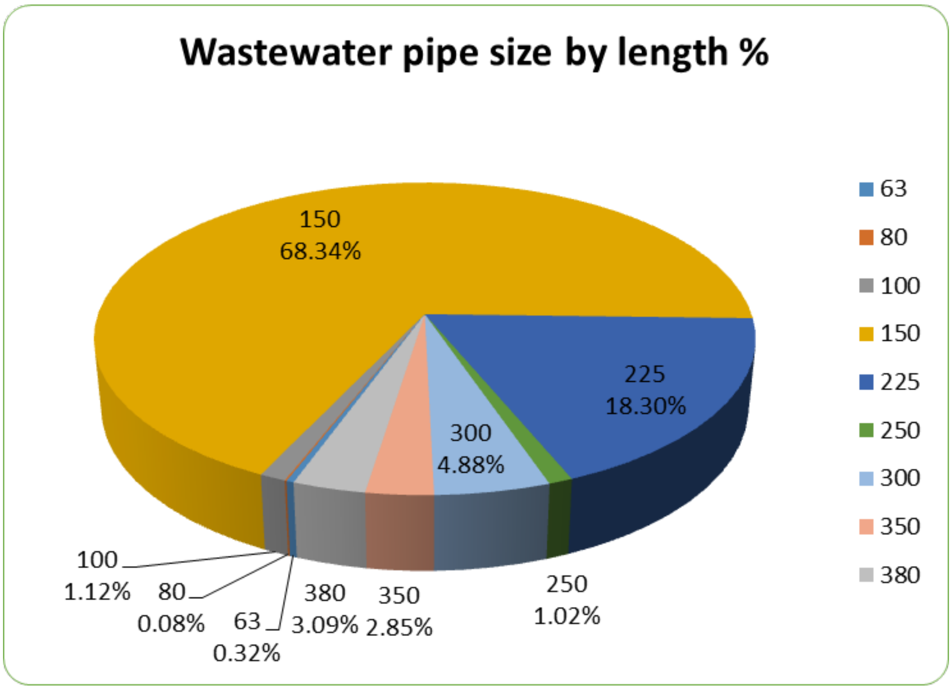


Figure 9: Pipe size distribution - Wastewater[5]

Thirty-six percent of the pipe material comprises earthenware pipes. The bulk of the reminder is PVC (36%) and concrete (23%).

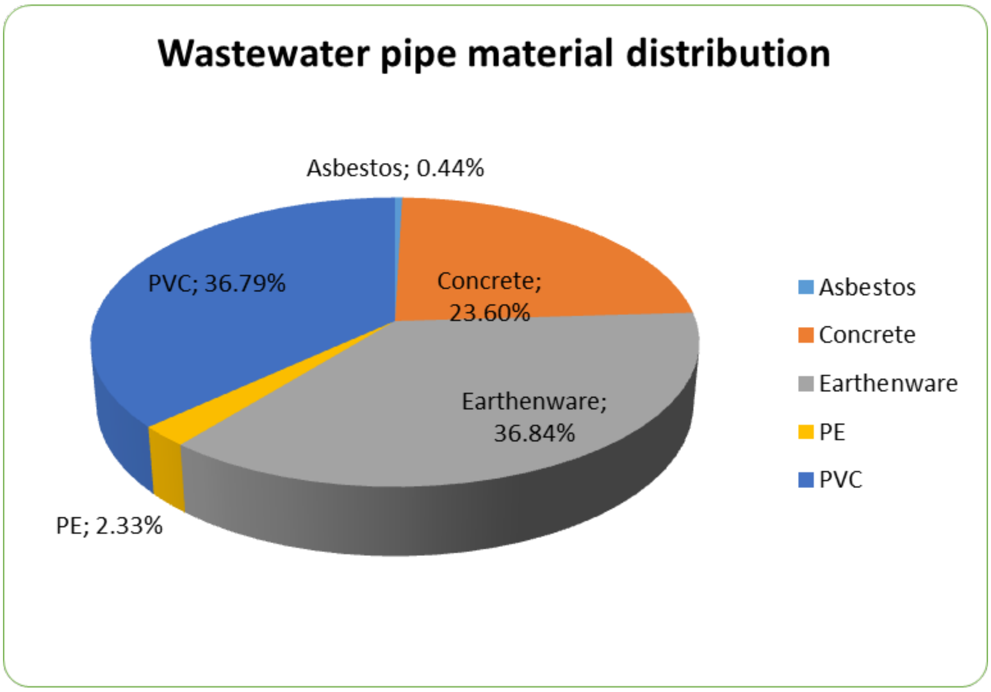


Figure 10: Pipe material type distribution - wastewater

[5] All WW asset data from CDC WW AMP 2018–21

Earthenware and asbestos cement pipe types tend to be brittle and a large proportion is approaching the end of their useful lives—a factor in the wastewater renewals profile.

Pipe condition assessments are used to inform renewal planning, noting that the timing of pipe replacements is usually influenced by deterioration in serviceability of the network as distinct from structural capacity. Poor condition sewer pipes located above groundwater will continue to provide relatively high serviceability compared with the same condition pipes located below groundwater.

Pipe condition data suggests 56% of the wastewater network is in average condition. 36% of pipes are rated as good or poor condition, as illustrated below:

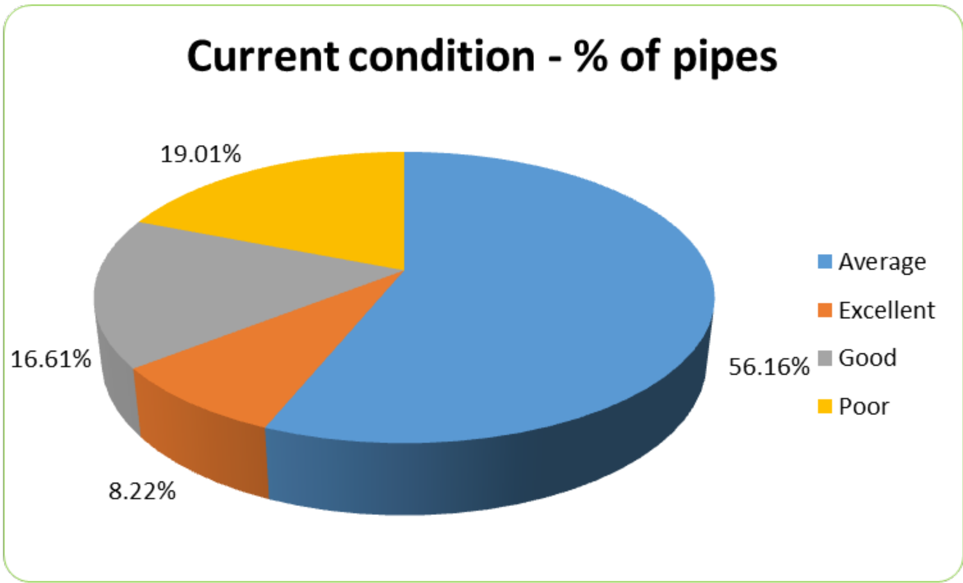


Figure 11: Current Wastewater Condition (ex CDC's AssetFinda AMIS data base)

Figure 12 below shows pipe length grouped by asset age. The majority of the 43km of wastewater pipes are 40-70 years old. Within that, approximately 25.0km are 60-70 years old. There is a high proportion of pipes in the reticulation network that are older than the generally expected average lifespan of 60 years. Pipe age is however only an indicator of actual pipe longevity, with some pipes lasting longer or shorter than the nominal life. Pipe condition is monitored using CCTV to assess remaining useful life and replacement programming, taking account of pipe serviceability factors—pipe condition does not always impact on serviceability.

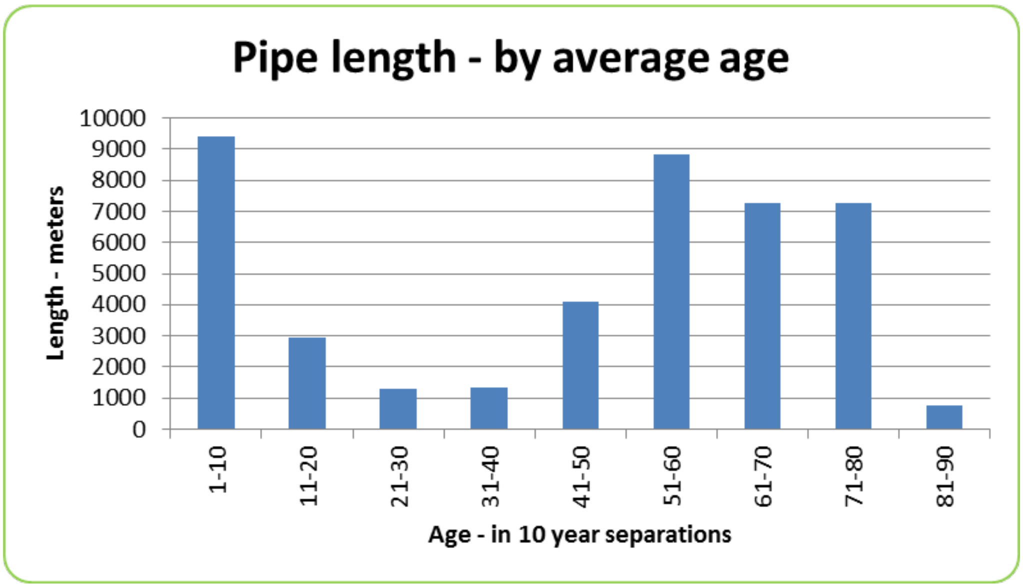


Figure 12: Average age of sewer pipes

Converting pipe age and condition into remaining life produces the following indicative profile: (excludes private wastewater laterals)

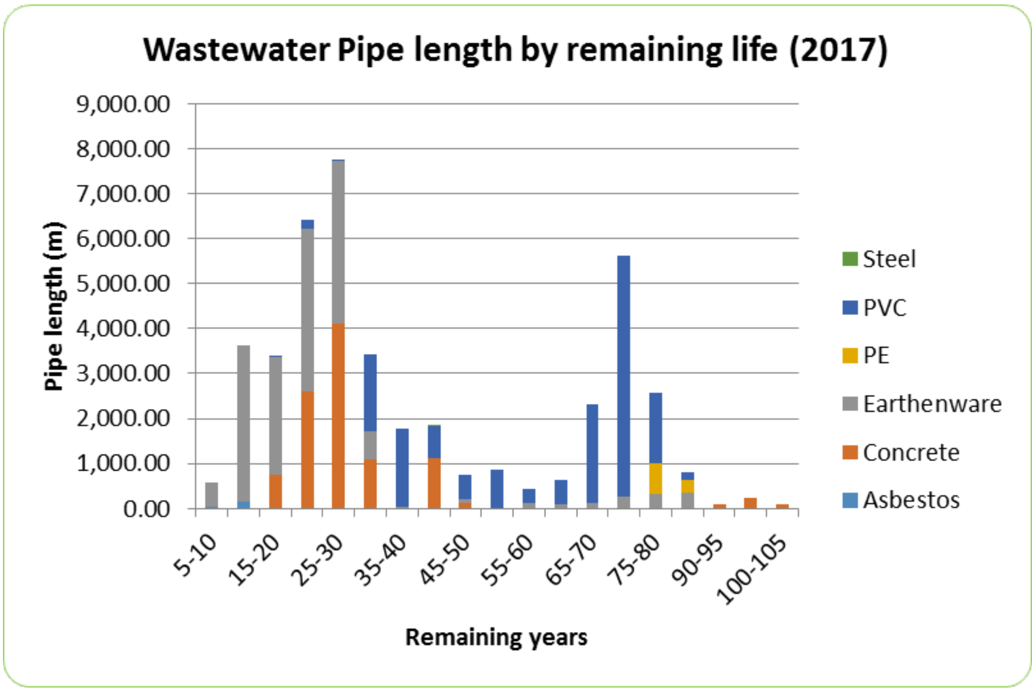


Figure 13: Estimated remaining life of sewer pipes

CDC has established an annual replacement programme to address deterioration of its older wastewater infrastructure and to maintain current levels of service. A long-run programme has been developed to smooth the peaks and troughs of the indicative programme based on remaining useful life and historical demand. Approximately 4.6km of sewerage pipes have been replaced since 2008 through implementation of this programme.

In addition to the pipe reticulation, the Carterton wastewater infrastructure assets include 15 pump stations and a three stage wastewater treatment plant with tertiary effluent irrigated to a 65.6ha CDC owned property.

5.2.2 Asset data confidence

Asset data confidence is reliable for inventory, capacity, and historical expenditure, but is low for data condition as summarised in Table 8. Part of CDC's asset management improvement programme involves progressive capture of asset condition data using CCTV pipe surveys and data logging during repair work.

Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Physical Parameters			X	
Asset Capacity			X	
Asset Condition		X		
Valuations			X	
Historical Expenditures				X
Design Standards			X	

Table 8: Wastewater asset data confidence levels

5.2.3 Asset value

The wastewater infrastructure had an optimised depreciated replacement value in 2016[6] of $6,179,470, as summarised in Figure 14:

Asset Type	Optimised Replacement Cost	Optimised Depreciated Replacement Cost
Pipe Reticulation	$9,099,296	$3,110,762
Reticulation fittings	$2,013,240	$853,886
Pump Stations	$590,578	$391,927
Treatment Plant	$3,046,747	$1,374,234
Wastewater upgrade	$1,024,544	$448,661
Total	**$15,774,404**	**$6,179,470**

[6] CDC asset revaluations for the 3-waters infrastructure are completed every three years. The most recent valuation of the waters was in 2016.

Figure 14: Wastewater asset valuation summary 2016

5.2.4 Levels of service

The key levels of service to be met through the wastewater infrastructure are both customer based and technical, but are dominated by the latter—essentially, compliance with the operative resource consents for the discharge of treated effluent and associated activities. Customer levels of service relate to odour management, incidence of overflows, responsiveness to service requests etc.

New discharge consent applications and a notice of requirement for designation of the entire wastewater treatment and irrigation site were made in April 2017. The new consents were issued effective from 19 January 2018 for a period of 35 years, expiring 2053.

5.2.5 Wastewater Treatment Plant Upgrade

The Council has a long-term vision of ultimately removing the discharge of effluent to Mangatārere Stream all year round, except in exceptional circumstances. The Council is currently upgrading its wastewater treatment systems to meet that vision. The key components of the upgrade are:

Stage 1:

- Inflow & infiltration investigation, condition assessment, rehabilitation/replacement, and control (on-going)
- Manage trade wastes (on-going. New trade waste consent required for Premier Beehive)
- Upgrade UV disinfection plant to 10,000m^3/day capacity (2014)
- Obtain and implement consent for Stage 1 irrigation on Daleton Farm (completed 2014)
- Operate, monitor and record effects of irrigation on soil, groundwater and air
- Use trial results to inform 2017 consent applications (completed).

Stage 2:

- Apply for and obtain new resource consents for the discharges associated with the activity and a land use designation for the site (completed April 2017)
- Construct earthworks on the site in preparation for new irrigator (2017/18)
- Provide 200,000m^3 on-site storage on Daleton Farm (2018/19)
- Relocate riverine discharge to the lower reaches of Mangatārere Stream, just above the confluence with Waiohine River (2019/20)
- Extend irrigation on Daleton Farm (2020/21)
- Discharge to stream only at stream flows greater than three times median
- Construct new trunk sewer to the east of Carterton to accommodate projected urban expansion.

Stage 3:

- Investigate options for supplementary, off site bulk storage of effluent
- Develop supplementary, off-site, bulk storage (800,000m^3)
- Extend irrigation off Daleton Farm.

The scheme has been designed for a projected population of 8,500 by the end of the new 35-year consent period (ie by 2052). Critical to that will be careful management and control of trade waste discharges, in particular that from the major Carterton industry, being Premier Beehive NZ. Premier's current organic load is significant—equivalent to approximately 50% of the total load discharged to the WWTP.

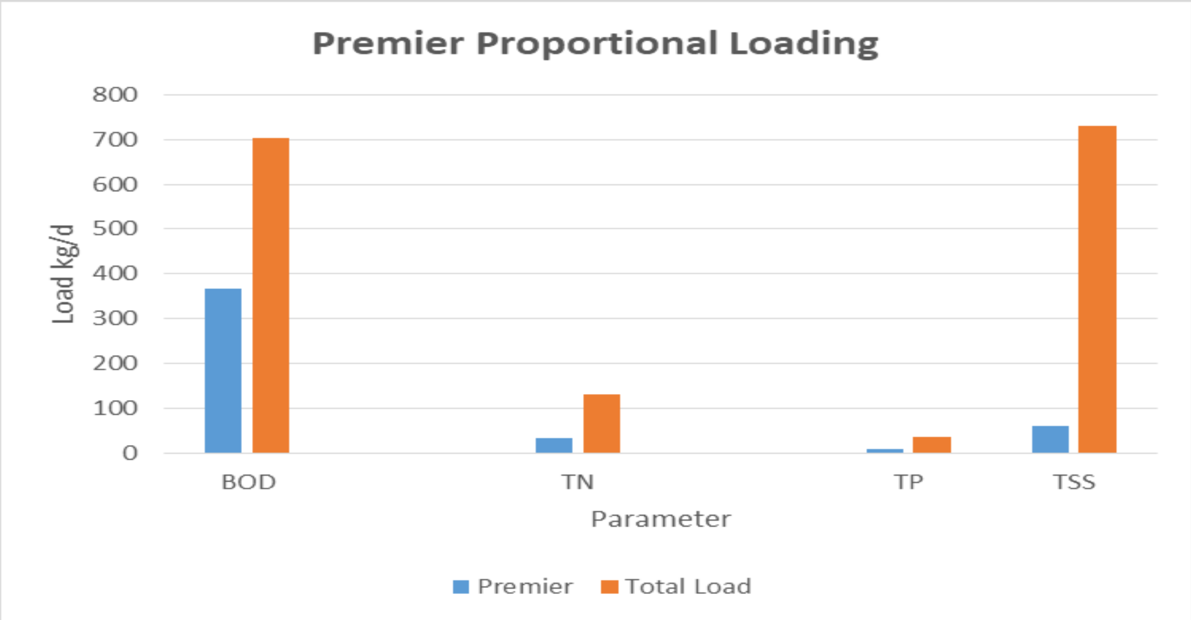


Figure 15: Premier Beehive trade waste discharge load as a proportion of total load

The corresponding action under Stage 1 of the strategy will be fundamental to managing trade waste discharges to the Carterton WWTP.

5.2.6 WW infrastructure management issues

Infrastructure management issues include:

Table 9: Summary of issues - Carterton Wastewater Scheme

Issue	Description	Options	Implications
Asset Renewal or Replacements	High infiltration rates entering pipe network.	**Preferred option** Proactive programme of condition assessment of entire pipe network, including visual inspection, CCTV, and recording findings during maintenance work. This will be used to identify priority repairs and renewals in line with the Pipe Repair Manual and following the optimised decision making process codified in NAMS. This will be followed by programmed repairs and renewals. There will also be ongoing reactive repairs and renewals. A repeat condition assessment is planned in 20 years' time.	Assessment work to be undertaken in years 1 and 2 of 10YP to understand where the infiltration is occurring, at a cost of $270,000. Repairing or replacing pipes to stop infiltration will result in less wastewater needing to be treated and discharged from the wastewater treatment plant.
		Other options Continue current approach of reactive, ad hoc renewals as issues arise.	Being unplanned and ad hoc is likely to be at a higher unit cost. Failures will be likely which will result in an unacceptable level of service, including increased wastewater requiring treatment.
Response to Demand	Future demand includes increased residential growth projection beyond capacity of current residential zoning. Projected population growth could see the current urban population in Carterton township increase by	**Preferred option** Treatment plant and disposal capacity is being upgraded in line with current and projected demand.	Forecast cost of treatment plant upgrade is approximately $19.5 million over the 30-year planning period. Loan servicing and associated operating costs have been

Issue	Description	Options	Implications
	605 over the 2018–48 planning period.	Application of trade waste by-law to provide mechanism for controlling trade waste discharges and recovering costs from industrial users proportional to volume and concentration of discharge. The by-law is currently being reviewed. This is expected to be completed in 2018/19, and any changes will need to be subsequently implemented. An additional trunk main is planned for 2012/24 at a cost of $855,000 to the east of Carterton township to accommodate projected residential growth in the north-east of town in line with the Urban Growth Strategy.	provided for in the Ten Year Plan.
		Other options There are no other viable options. "Do-nothing" is not a viable option as the current infrastructure would not meet future demand and would likely result in failures, loss of service levels and adverse impacts on the environment.	
Levels of Service (LoS)	LoS focus is on reliability of service, capacity, public health, and environmental protection. There is potential for higher environmental standards in the next 30 years.	**Preferred option** Environmental protection will be enhanced through implementing the planned treatment and disposal upgrade in line with the new resource consents, which take into account the expected implications of the GWRC's proposed Natural Resources Plan.	Current levels of service, as improved through replacement and upgrades of main components of scheme, will be increased and then maintained through the period. This is part of the overall treatment plant upgrade project (see immediately above).
		Other options There are no other viable options. "Do-nothing" is not a viable option as the current	

Issue	Description	Options	Implications
		infrastructure would not meet future demand and would likely result in failures which would adversely affect the environment and potentially on public health.	
Public Health and Environment	The operative resource consents provide the legal right to operate the Carterton sewage treatment plant and to ensure any adverse effects of the activity on the environment are avoided or mitigated. Operational practices mean there are no public health issues.	**Preferred option** Ongoing monitoring of the treatment plant to ensure it complies with the new discharge consent conditions. There is provision in years 11–30 of the 10YP to expand the treatment and disposal to full discharge to land. Any unanticipated requirements from the proposed Natural Resources Plan could be dealt with as part of this expansion.	The financial impacts of the recent and future treatment plant and effluent disposal upgrades have been included in the 2018–2028 Ten Year Plan. The cost of expanding the land discharge in years 11-30 is $23.1 million.
		Other options Do not move towards total land discharge of treated wastewater	The expectation of the community is that the Council will ultimately remove all treated wastewater from natural waterways for environmental and cultural reasons. Monitoring the impacts of the upgraded treatment and disposal system currently being installed will confirm and quantify any impacts of the new discharge regime. The benefits and affordability of total land discharge will be tested prior to a final commitment to the preferred option.
Risk and Resilience	Gradual ground movement or more sudden and significant ground movement caused by a	**Preferred option** Wastewater service continuity and	Current risk mitigation measures will be

Issue	Description	Options	Implications
	seismic event.	environmental and public health is threatened by breakage or leaks. Network components will have specific vulnerability to risk according to materials. The design and materials used for renewals will take into account earthquake resilience. The proposed 200,000m^3 effluent storage reservoir will be designed to protect against potential liquefaction of the foundations or embankment failure due to a large seismic event.	maintained through the strategy period and no additional cost. Condition assessment and subsequent rehabilitation/replacement programming, commencing with critical assets, will be given a high priority. The assessment is planned for years 1 and 2 in the 10YP at a cost of $270,000.
		Other options There are no other viable options.	
	Climate change is likely to cause increased intensity storm events, including flooding. Conversely, drought conditions are more likely and will cause low flows in the receiving waterways, limiting the opportunity to discharge treated wastewater.	**Preferred option** The additional 200,000m^3 storage capacity will act as a buffer in high rainfall events when the farm soil conditions prevent land discharge. Should that be inadequate, treated effluent can be discharged to the river, provided it is in high flow. Long periods of low flow in Mangatārere River will also be buffered by the storage capacity, along with the ability to irrigate.	If the reservoir capacity is inadequate, there is the potential to breach the land discharge consents and contaminate surrounding groundwater with untreated waste. The probability of this risk occurring is considered to be low within the term of this strategy but the potential consequences are high.
		Other options There is no viable alternative option.	

5.2.7 Funding mechanism

The CDC wastewater scheme is funded using a combination of rates and user charges (trade waste charges). The rate component is split between a targeted rate (90%) and general rates (10%).

5.2.8 Disposal of wastewater infrastructure

There are no disposal issues in respect of CDC's wastewater assets.

5.3 CDC WATER SUPPLY SCHEMES

CDC owns and manages a municipal water supply scheme for Carterton township, and two rural water race schemes – Carrington and Taratahi.

5.3.1 Carterton water supply assets

The Carterton urban supply comprises a dam and two storage reservoirs totalling 1500 m^3 at the Kaipaitangata intake, supplemented by a four-bore well-field and 500 m^3 storage in Lincoln Road. Only two of the bores are used for production, with Bore 1 disused since 2015 and Bore 4 unstable, producing high turbidity on start-up. The well-field details are summarised in Table 10 below:

Bore No.	GWRC Category	Aquifer	Date drilled	Consent expiry	Depth to top of screen	Screen length	2016 Daily Yield (m3/d)	Long Term Yield m3/d	Status
1	C	2	1991	2034	25.9	1.5	1,555	1382	Disused since 2015 due to e-coli presence
2	B	1	1988	2034	14.0	6.6	1,814	1123	Current production bore
3	B	1	2005	2034	13.3	4.0	2,160	1382	Current production bore
4	C	2	2006	2034	26.0	2.0	518	518	Unstable – high turbidity on start-up

Table 10: CDC Well-field details

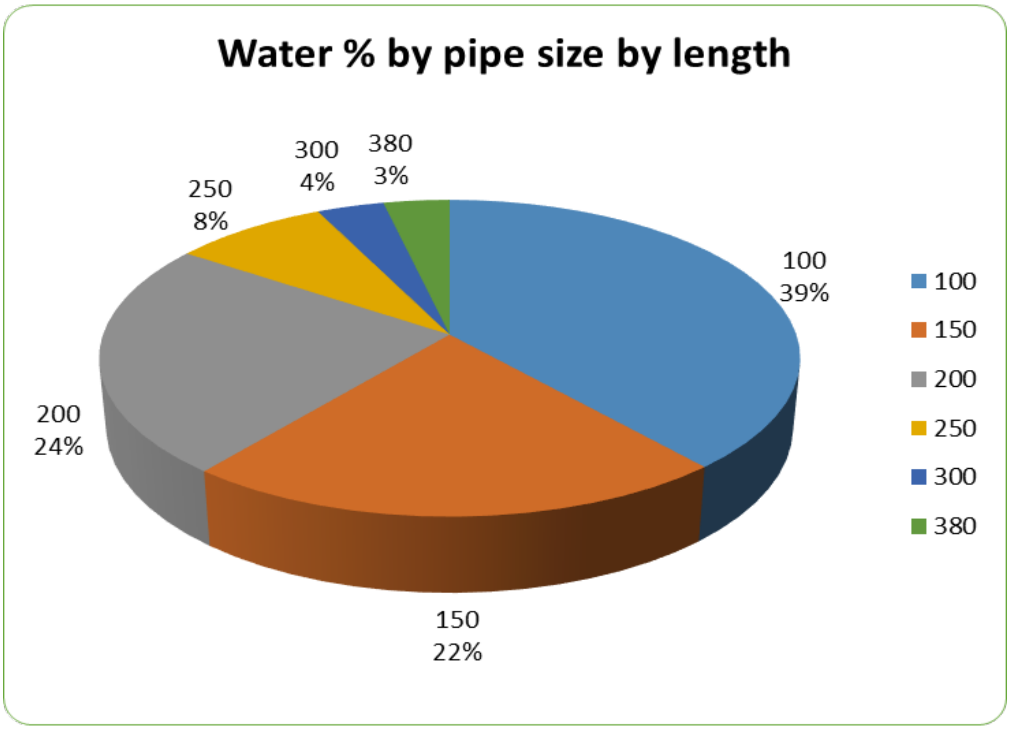
Water treatment involves pH adjustment, chlorine and UV disinfection at both sources, with filtration provided at the Kaipaitangata Stream source. Additional filtration is being trialled at the well-field.

The water supply reticulation consists of approximately 60.6km of watermains, including 8km of 380mm diameter trunk main[7].

Asset type	Unit	Quantity	Comments
Pipes	km	60.6	Diameter from 20 – 380mm
Hydrants	No.	281	
Valves	No.	256	
Tobies	No.	2,535	Metered water connections
Kaipaitangata storage 1	m^3	1,000	Timber tank
Kaipaitangata storage 2	m^3	500	Reinforced concrete tank
Lincoln Road borefield storage 1	m^3	200	Timber tank
Lincoln Road borefield storage 2	m^3	300	Timber tank

Table 11: Water supply reticulation assets

Pipe diameter varies from 100mm diameter to 380mm diameter, with 39% comprising 100mm diameter and a further 46% split approximately evenly between 150mm and 200mm diameter.



[7] All water supply asset data taken from CDC Water AMP 2017

Figure 16: Pipe size distribution

A large proportion of the total length of pipe is nearing the end of its theoretical design life (60 years+). Pipe age is, however, only an indicator of actual pipe longevity, with pipes lasting longer and shorter than the nominal design life. Pipe condition is monitored during maintenance activities to assess remaining useful life and replacement programming that will maintain the required levels of service.

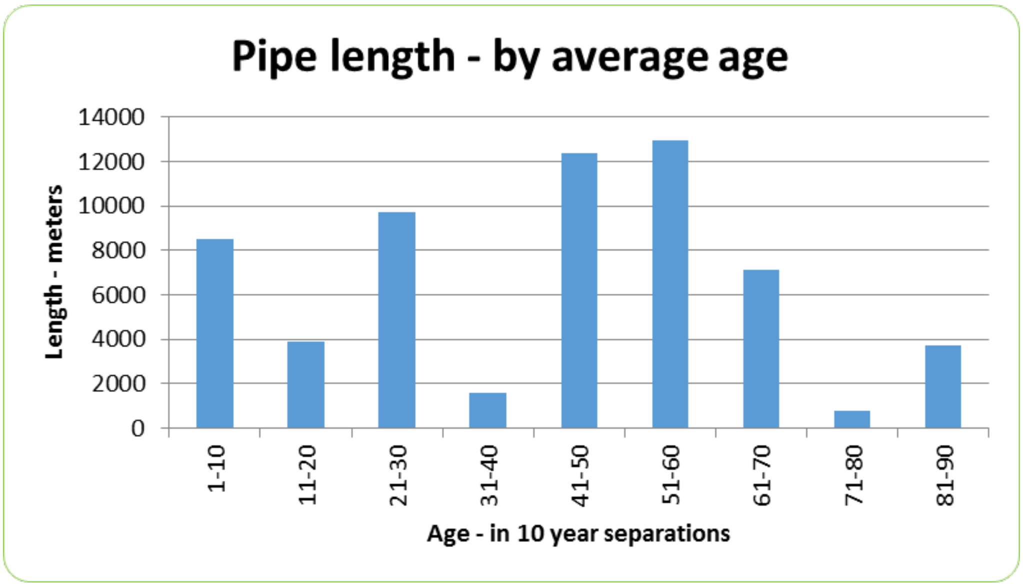


Figure 17: Pipe age distribution

40% of the reticulation is split between asbestos cement (30%) and PVC (32%) pipe material. The use of asbestos cement pipe over other materials was common place on New Zealand from 1950s through to the 1970s and is likely to dominate the older lengths of the reticulation at Carterton.

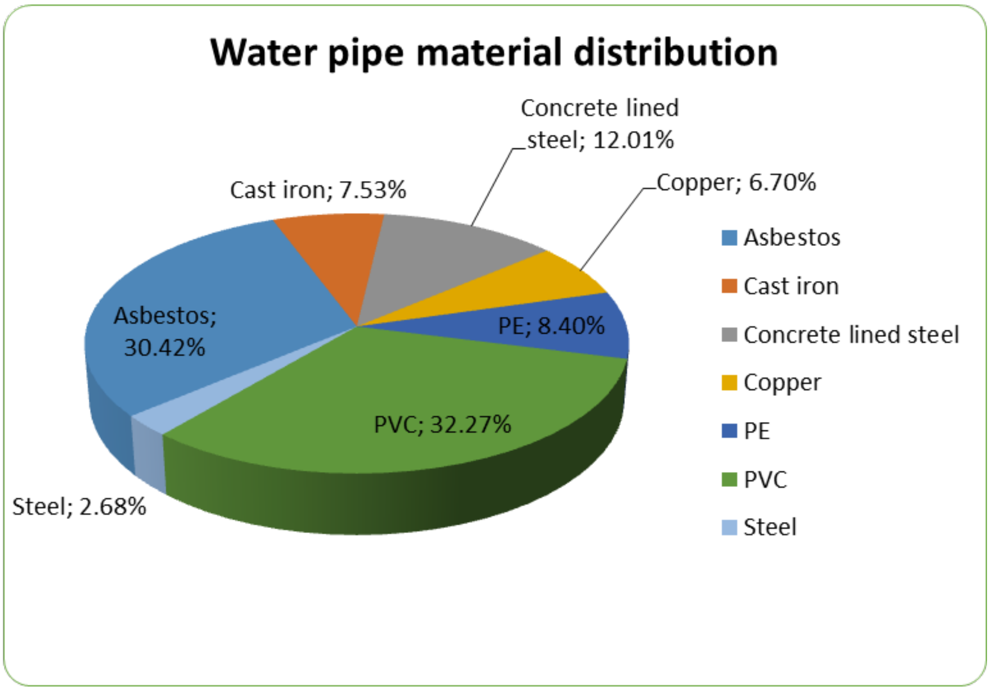


Figure 18: Pipe material by %

The condition assessment, shows 86% of the total pipe length is rated fair or better. 14% is rated poor or very poor.

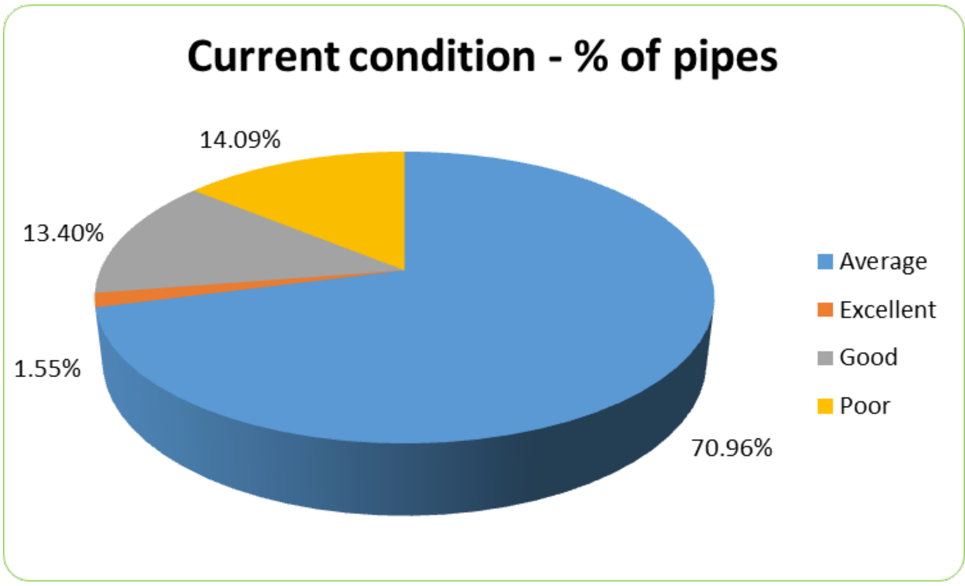


Figure 19: Water supply pipe condition (ex CDC's AssetFinda AMIS data base)

Pipe sections in the poor category are prioritised for replacement to ensure levels of service are maintained. The combination of material type, age, condition, and diameter produces the following remaining useful life profile. This influences the need for an affordable, long-run pipe renewal programme due to the congestion of pipe length with an estimated remaining life greater than 60 years

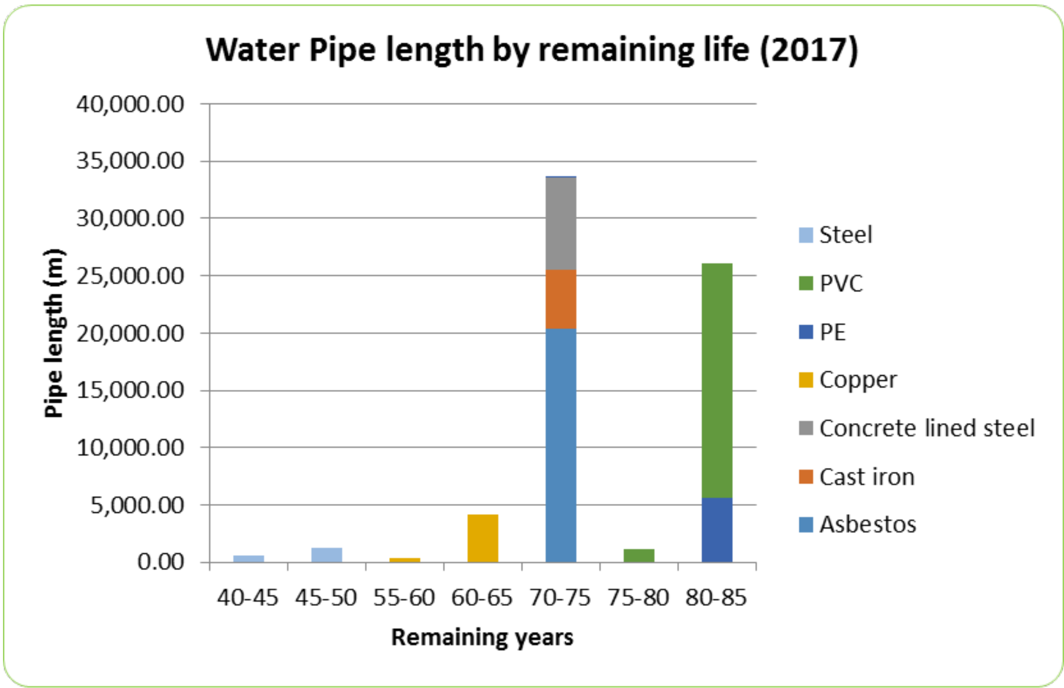


Figure 20: Remaining useful life profile – water pipe reticulation (includes laterals)

5.3.2 Asset data confidence

Asset data confidence for the Carterton water supply is reliable for all but asset condition. Inspection of pressurised water main condition is more difficult than for sewer pipes because of access constraints while the main is in operation. For that reason, the opportunity for assessing asset condition is limited to pipe repairs and maintenance history – pipe failure etc. Even so, the impact of that is relatively minor given the accumulated knowledge of pipe attributes and risk criticality that has been gathered over time.

Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Physical Parameters			X	
Asset Capacity			X	
Asset Condition		X		
Valuations			X	
Historical Expenditures				X
Design Standards			X	

Table 12: Asset data confidence

5.3.3 Asset value

The optimised depreciated replacement value of the Carterton water supply assets in 2016[8] was $7.83M, as summarised in Table 13 below.

Asset Type	Optimised Replacement Cost	Optimised Depreciated Replacement Cost
Pipe reticulation	$12,787,331	$4,754,609
Reticulation fittings	$3,476,811	$1,043,125
Kaip. Headworks	$1,010,140	$416,087
Kaip. Treatment Plant	$577,424	$151,718
Supplementary Supply	$2,774,252	$1,465,443
Total	**$20,625,959**	**$7,830,982**

Table 13: Carterton water supply asset value 2016

[8] CDC asset revaluations for the 3-waters and roading infrastructure are completed every three years. The most recent valuation of the waters was in 2016.

5.3.4 Levels of service

Levels of service considerations delivered through CDC's water supply infrastructure include technical and customer considerations. Customer levels of service include water taste, odour, reliability of supply and responsiveness to customer service requests.

Higher technical levels of service driven by the Health (Drinking Water) Amendment Act 2007, the GWRC Proposed Natural Resources Plan, resource consents for the respective takes and security of supply, are the key level of service issues impacting on the Carterton urban water supply. The operative resource consents are as follows:

Scheme	Consent Expiry Date
Carterton – Kaipaitangata intake	2013 - consent renewal in progress[9]
Carterton – Lincoln Road bores	30 September 2034

Most recently (December 2017), the Havelock North Drinking Water Enquiry reported its findings and recommendations, included recommended changes to the principal legislation. A preliminary assessment of the recommendations in respect of CDC's water supply is that the impacts will be only minor. CDC does not operate untreated water supplies, and its current treatment processes are, or soon will be, in accordance with the Drinking-Water Standards for New Zealand 2005 (Revised 2008).

5.3.5 Water supply strategy

The current consent to take water from the Kaipaitangata Stream surface water allows up to 5,000m^3 per day and a minimum rate of abstraction of 60 L/s at any stream flow. The consent renewal application anticipates a reduced take under the Proposed Natural Resources Plan. A maximum take of 4,000m^3/day has been applied for, with no take below stream flows less than 100 L/s, and no more than 50% of stream flow at any other time. Further, GWRC's recent modelling of the Kaipaitangata and Waiohine surface water and groundwater catchments indicates there is already an over-allocation of these natural resources.

Recent monitoring of stream flow records show that stream flows can drop below 100 L/s for much of the January to March summer peak period, as occurred during January–March 2015 (see Figure 21 below). Climate change may worsen those stream conditions.

[9] Application for renewal of the consent for the Kaipaitangata take was lodged with the regional council more than six months prior to the consent expiry date. The consent therefore remains operative in accordance with s.124 of the Resource Management Act 1991. The application awaits further stream flow and proofing investigations by CDC, scheduled for 2017/18 summer.

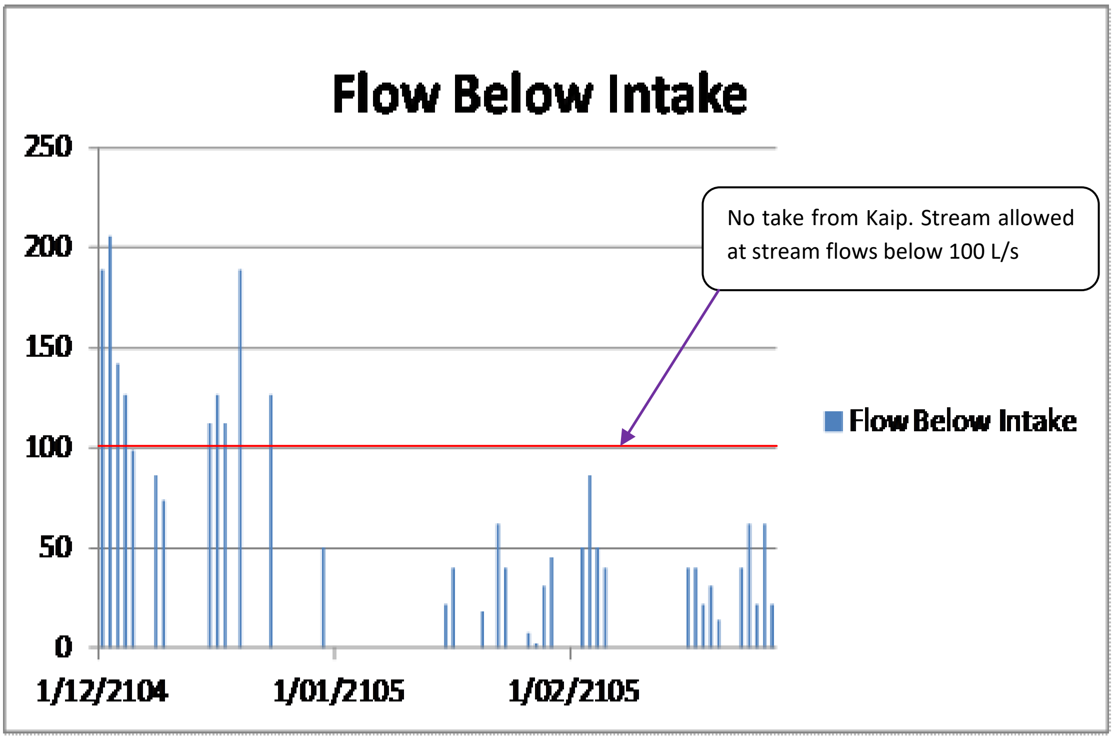


Figure 21: Kaipaitangata Stream flows (L/s) below intake—January to March 2015

The above scenario means that the total demand for Carterton, under dry summer conditions, will need to be met from the Lincoln Road bore-field supply. Under those circumstances, the role of the bore-field shifts from a supplementary supply to the principal (sole) supply.

Within that lies another problem, with the reliable bore-field yield now assessed at 2,500m^3/day (from bores No. 2 and 3). Current average demand is 2,000m^3/day, peaking at 3,500m^3/day peak. Forecast demand is for an average of approximately 6,500m^3/day by the end of the 2018–2048 planning period with current peak summer demand exceeding supply capacity immediately if total supply is to be met from the borefield (ie when stream flow is less than 100 L/s).

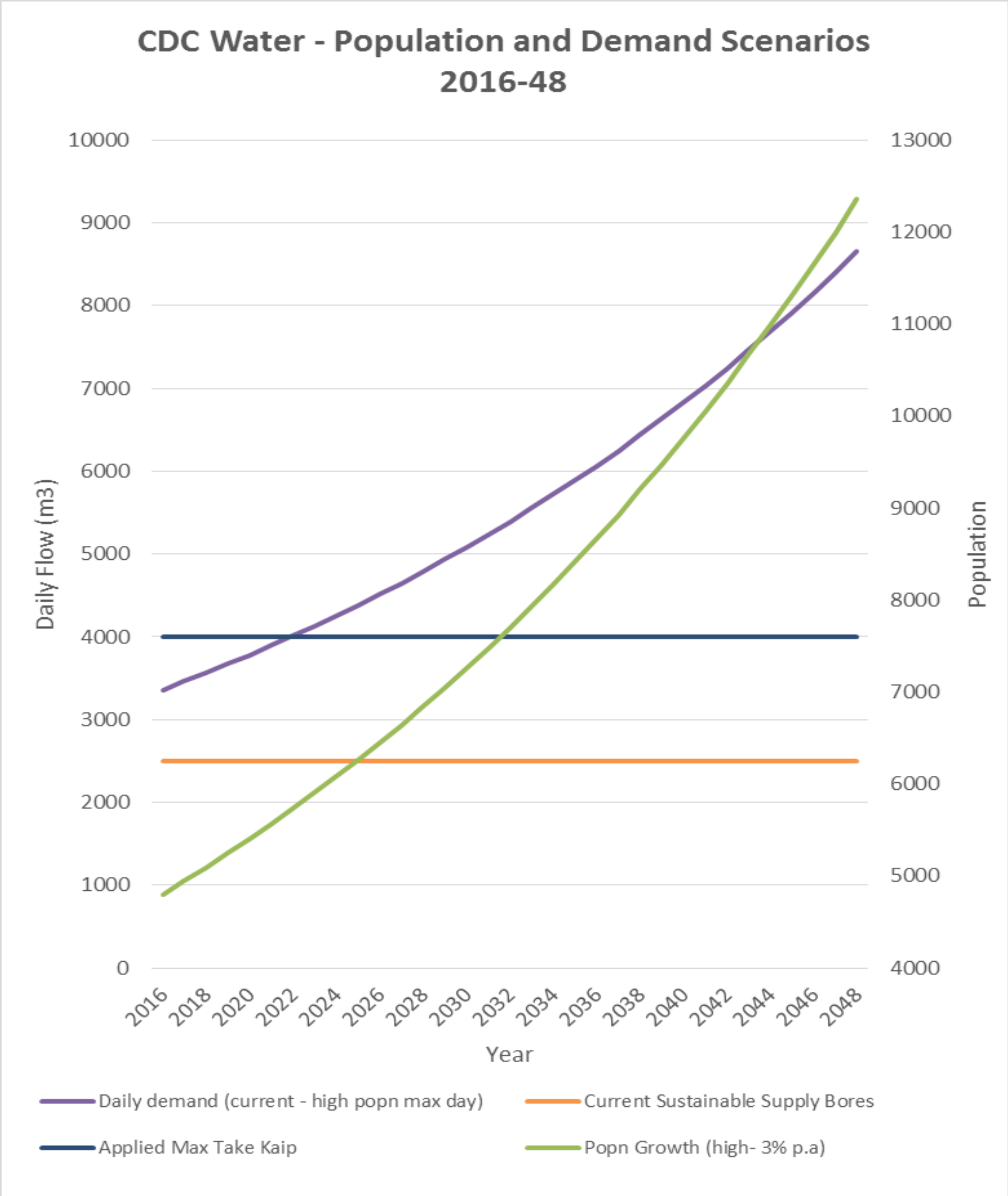


Figure 22: Carterton municipal supply versus demand[10]

There are two other, deeper, bores comprising the CDC supplementary supply. One of those (Bore No.1) has not been used since 2015 due to detection of e-coli, and the other (Bore No. 4) has been found to be unstable and of low yield. Bore No.1 would require additional

[10] NZET December 2016

treatment barriers before it could be commissioned—this is the subject of current (2017/18) trials—but would then increase the combined yield to approximately 4,000m3/d.

Arising from the above is a draft water supply strategy. The key elements of that include:

- Investigate impact of proposed consent conditions on Carterton demand over the 2017/18 summer period, but at a reduced minimum stream flow of 80 L/s, and measure effects on downstream ecology. Refine draft conditions following those investigations.
- Review CDC revenue and financing policy to reduce pricing elasticity through more effective use of universal metering to increase relationship between water use and price.
- Promote greater water use of water conservation measures to offset unnecessary consumption and reduce costs to users.
- Investigate alternative storage and supply options over years 2 and 3 of the IS.
- Add MoH approved filtration to the supplementary groundwater supply by 2021/22 to enable the use of Bore 1 and increase the overall supplementary yield from 2,500m^3/d to 3900m^3/d.
- Increase treated water storage to three days by 2024.
- Undertake construction of a supplementary supply, or 200,000m^3 raw water storage, over the period 2025–2028 of IS.

5.3.6 Infrastructure management issues - Carterton water supply

Table 14: Summary of Issues—Carterton Water Supply Scheme

Issue	Description	Options	Implications
Asset Renewal or Replacements	Large parts of the reticulation are near the end of its theoretical useful life, increasing the risk of mains failure or leaks. Asbestos cement pipe makes up 23% of the reticulation, with its remaining, nominal, useful life expiring over the next 30 years	**Preferred option** Mains replacement programme based on pipe condition. A desktop assessment will analyse data in the asset management system to identify likely parts of the network that should be given priority for replacement. This will determine remaining useful lives, and identify location within Carterton, and maintenance history. Also considered will be the Urban Growth Strategy. An optimised decision-making process will be applied, in accordance with NAMS, to finalise a replacement programme. The programme will be implemented over the next ten years.	An investigation and replacement programme of $120,000 per year over the next 10 years is required to maintain current levels of service. A reduced replacement programme extending over a longer period could result in reduced levels of service and increase in maintenance cost due to increased mains failure, loss of water and supply interruptions.
		Other options Continue current approach of reactive, ad hoc renewals as issues arise.	Being unplanned and ad hoc is likely to be at a higher unit cost. Failures will be likely, which will result in an unacceptable level of service, including increased water loss.
Response to Demand	The Carterton water supply is designed for residential and commercial/industrial demand. Potentially, demand could exceed consented supply and recommended storage capacity during peak summer periods. Additional demand beyond current supply capacity is anticipated due to the urban	**Preferred option** Continue four-yearly programme of water main leak detection. At the same time develop more extensive demand management techniques including water conservation (in conjunction with	Growth-related implications for the Carterton water supply scheme are dependent on sufficient residential zone capacity to meet projected demand beyond 2030. Smart meters will be introduced in 2019/20

Issue	Description	Options	Implications
	population growth projection and effects of climate change, subject to available capacity of residential zone. It is expected that future consents will restrict water take from the Kaipaitangata Stream during low flow/high demand periods, placing increased demand on bore water source and storage.	stormwater and wastewater demand management), low volume water fittings, water use pricing and the installation fo smart meters. In the short-medium term (starting in 2020) investigate options for augmentation of supply and additional storage.	to improve pricing and meter reading options, at a cost of $939,000. Water conservation measures will be rolled out immediately within business-as-usual operational budgets.
		Other options Continue with demand management and not investigate additional supply	A healthy and safe urban community needs a reliable water supply. Demand management alone is very unlikely to guarantee the supply required for the growing number of households in the near future.
Public Health and Environment	There is a risk of bacteriological or protozoal contamination. Increased standards or structural changes to water management may be an outcome of the Havelock North water supply contamination inquiry. The resource consent for the Kaipaitangata Stream take expired on 25 March 2013 with the renewal application still under review (2017). The Lincoln Road borefield consent expires in 2034.	**Preferred option** Develop evidence of the level of compliance with NZ Drinking Water Standards, including a catchment assessment, and from that investigate options for upgrading the treatment plants, as necessary. Install protozoa micro filtration at Lincoln Road bore field in 2021/22. Comply with resource consent conditions to avoid adverse effects on the environment.	Enhanced treatment and storage will improve public health and environmental protection but at greater cost. The protozoa micro filtration at Lincoln Road bore field in 2021/22 will cost $164,000.

Issue	Description	Options	Implications
		Other options There are no other viable options given the risks to human health.	
Risk and Resilience Issues	Continuity of supply is identified as a risk during sustained drought periods due to the effects of climate change. Low flows in the Kaipaitangata Stream during peak summer demand periods will limit the ability to extract water from this source. The water storage reservoirs are critical assets. The smaller, 500m^3, reservoir at the Kaipaitangata take is the oldest—approximately 40-years old. The 1,000m^3 Kaipaitangata reservoir was constructed in 2008, with the two bore reservoirs constructed in 2003. Resilience of these reservoirs to a major seismic event is key to the integrity of the supply. Internal baffles were installed inside the Kaipaitangata storage reservoirs during 2014/15 and the bore reservoirs in 2012 to reduce the impacts of water 'surge' during a large seismic event. The brittle pipe materials and jointing systems of older pipes, particularly the trunk mains, makes these assets more vulnerable to failure during seismic events.	**Preferred option** Develop more extensive demand management techniques (see above). Assess susceptibility of soil structures to liquefaction during a major seismic event and implement further resilience measures for critical assets as required over the next 10 years. Include the use of flexible pipe materials and jointing systems in future annual pipe replacement programmes. Duplication of the riskiest sections of the trunk main feed from the Kaipaitangata take in 2019/20. Increase storage of treated water at Lincoln Road wellfield and Kaipaitangata over the period 2020–2024.	Current risk mitigation measures will be maintained through the strategy period. Not completing the work risks the water supply being severely restricted during extended drought conditions. The probability of the risk occurring is considered to be moderate, with the severity of consequences being high to critical Seismic protection of the reticulation trunk mains is critical to the resilience of the water supply. Not replacing the pipes would leave them vulnerable to breakage or complete failure in the event of earthquakes or other ground movement. The probability of this risk occurring is considered to be low to moderate within the term of this strategy but the severity of the consequences are expected to be high. Increased storage will provide an emergency supply of up to four days if treatment were interrupted. The cost of duplicating the sections of the

Issue	Description	Options	Implications
			trunk main feed in 2019/20 is $522,000. The cost of Increased storage over 2020–2024 is $3,529,000
		Other options Continue to rely on our ability to quickly fix any damaged pipe work following a major event and retain current storage capacity and rely on households to store their own emergency supplies.	These are high risk options. Based on the experience of other communities the risks of this option outweigh the costs of the preferred option.

5.3.7 Water race assets

The Taratahi and Carrington water races supply non-potable water to rural properties. The assets comprise surface intakes and 278km and 39km of open channel races respectively. Consents to take water are critical to maintaining adequate, all year supply quantities for domestic and commercial/industrial use. Table 15 summarises current consent expiry dates:

Scheme	Consent Expiry Date
Carrington Water Race	28 June 2023
Taratahi Water Race	28 June 2023

Table 15: Water supply resource consents expiry dates

The Water Wairarapa Project is currently under investigation led by Wellington Regional Council. While principally targeted at rural water use, the potential exists for the project to be extended to include urban water supply needs, either supplementary to or in substitution of current supply arrangements for Carterton. This could include supplementing the water races during river low flow periods. There are uncertainties over the viability of this project, although these are expected to be clarified in 2018/19. The Council will continue to work with Greater Wellington Regional Council, the other Wairarapa District Councils and the Water Wairarapa Establishment Board to understand the viability of the project over the course of this strategy period.

5.3.8 Infrastructure management issues – Carterton water races

Table 16: Summary of issues—Carrington and Taratahi water races

Issue	Description	Options	Implications
Asset Renewal or Replacements	Intake weirs will require replacement in 10 plus years' time, complete with a new screen for the Carrington intake. Need for Taipo rock protection of intakes to be monitored and programmed. Progressive replacement programme for culverts, from 300mm diameter to 500mm diameter, to improve maintenance access.	**Preferred option** Current maintenance and replacement programmes to be reviewed to investigate more cost-effective options for proactively managing the water races, including asset renewals and maintenance. Monitor need for and timing of replacement screen for Carrington water race and erosion protection for both intakes.	The move towards more proactive, rather than reactive, management, including maintenance, is expected to enable replacements to be funded from the existing operational budget.
		Other options Continue reactive water race management.	This option would not deliver the most cost-effective water race services resulting in additional funding required for replacements.
Response to Demand	Current capacity is not always adequate for primary use of water races—stock water supply.	**Preferred option** Implement water quantity monitoring programme, including water budget audit to investigate use, efficiency, and measures to reduce water loss. Install flow gauges at tail races. Continue with installation of weirs where water races join streams Develop a new bylaw to control water race use.	Responding to demand will be met from within existing operational budgets. Improving the management of the water races through improved monitoring and controls will enable future demand to be met within current water allocations, and reduce the risks of insufficient water to meet the demands of current and future users.

Issue	Description	Options	Implications
		Develop a demand management strategy.	
		Other options There are no other viable options	
Public Health and Environment	Both water races are non-potable supplies suitable for stock watering purposes and domestic use. Persons using the water for drinking purposes do so at their own risk contrary to relevant legislation and CDC regulations relating to the use of the supply.	**Preferred option** Ensure users are informed of unsuitability of water race as a potable supply. Resource consents provide the legal mandate to take water for stock at an environmentally sustainable rate.	Monitoring water race use so that it is consistent with their purpose and consents is fundamental to CDC's supplier and compliance accountabilities. This option will not increase the costs of managing the water races, but it will improve the management of the races and the Council's compliance with its resource consents.
		Other options There are no other viable options	
Risk and Resilience Issues	Low flows in the stream during droughts limit the ability to extract water from the stream. Conversely, flood conditions impose risk of damage to the intake structures. Cross-overs across streams are vulnerable to earthquake damage.	**Preferred option** Develop a plan to progressively install boundary gates to improve water race accessibility and responsiveness. Investigate options and risks for seismic protection of cross-overs.	Current risk mitigation measures will be maintained through the strategy period within operational budgets. The progressive installation will mean costs can be spread over time with no financial impact on water race ratepayers.
		Other options There are no other viable options	

5.3.9 Funding mechanisms

CDC's urban water supply activity is funded through a combination of rates and user charges (universal water metering). Water meters provide a more direct linkage between consumption and cost to users, and can be used as an effective method to reduce demand.

The Carterton water supply rate is a combination of a targeted rate (90%) and the general rate (10%).

Water by meter is charged for water consumption in excess of 225m^3 per year per connected rating unit. Currently, residential water meters are read every six months and commercial every three months. That means that residential user consumption at the end of the first round of meter reading is likely to be well within the annual volume allocation. The economic incentive to reduce unnecessary consumption is unlikely to be realised until after the second round of meter reading has been completed and invoiced—well after the period of peak summer consumption.

CDC intends to introduce smart meters in 2019/20, which will allow more options around reading, pricing, and billing, and will form part of a wider demand management plan.

Water race services are funded using a combination of the general rate (10%) and separate targeted rates (90%) for each scheme calculated on land area on a differential basis.

5.3.10 Disposal of water supply infrastructure

There no disposal issues in respect of CDC's water supply assets.

5.4 STORMWATER DRAINAGE

5.4.1 Stormwater assets

CDC's stormwater infrastructure comprises two piped components other than the open earth chanels. The primary component consists of 16 km of piped stormwater drainage, 52% of which is reinforced concrete and 13% is uPVC.

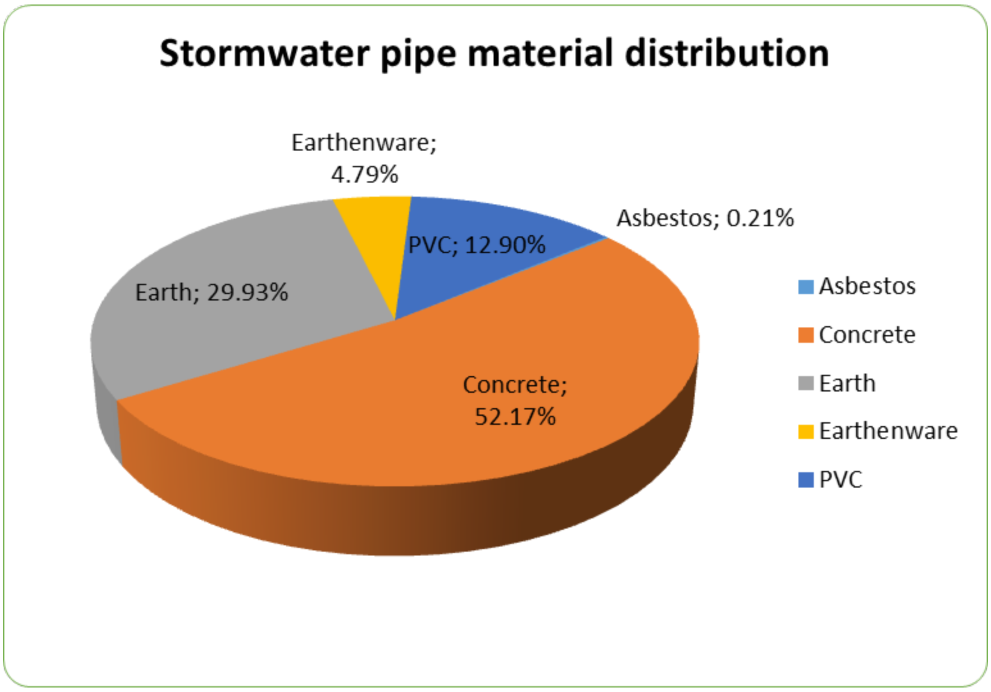


Figure 23: Stormwater pipe material[11]

Pipe sizes range in diameter from 100mm to 1,200mm, with 26% 225mm diameter and 32% (9.9km) 300mm diameter. In addition, the primary stormwater assets include 400 street sumps and 141 manholes, plus 7 km of open drains in the urban area and approximately 20km of open drain in the rural area (referred to as the "eastside" diversion), in part with the rural water race network), complete with discharge structures. The secondary component consists of overland flow paths, including the roading network. The multiple Carterton stormwater discharges are consented through a district wide comprehensive consent. The consent expired on 30 May 2016, with the outcome of Wellington Regional Council's Proposed Natural Resources Plan to determine the consenting requirements for stormwater discharges, moving forward.

[11] All SW asset data from CDC SW AMP 2017

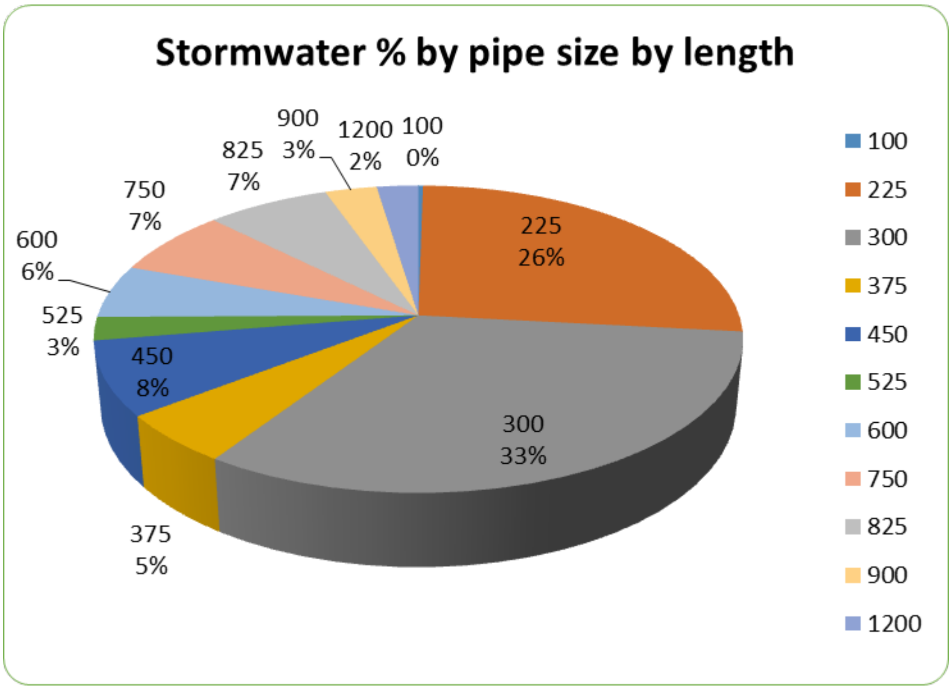


Figure 24: SW pipe diameter distribution

The stormwater pipe network varies in age, with the earliest pipes laid in the 1950s, and most recent pipes laid as part of current subdivision development. The pipe age profile shows that approximately 2.5km (15%) of pipe is 60-70 years old and 10km (58%) is under 30 years old.

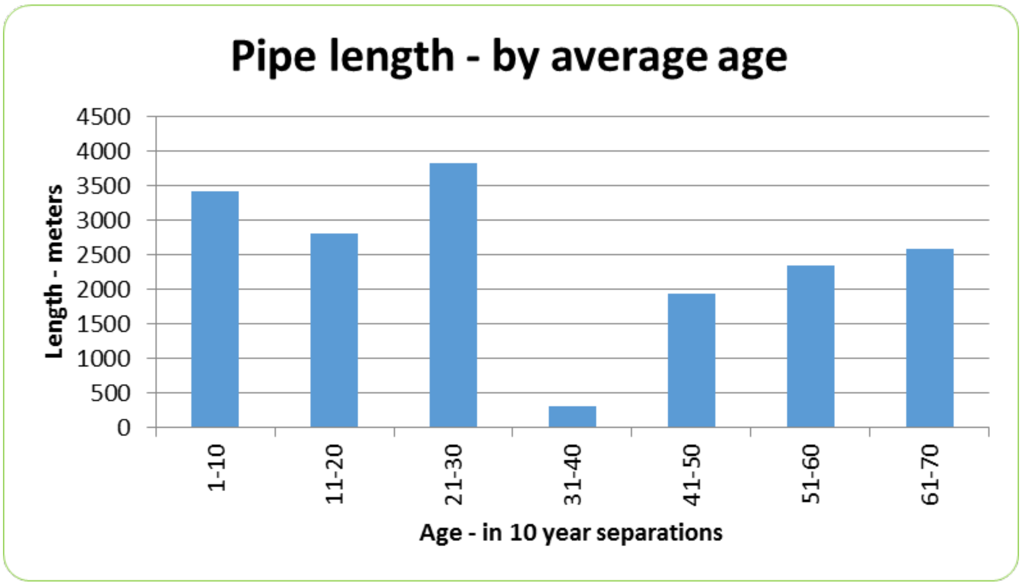


Figure 25: Age profile of stormwater pipe network

The condition rating of the network is positive, with only 3.3% of the piped network rated as poor, noting the high uncertainty rating attaching to that (refer to Table 17).

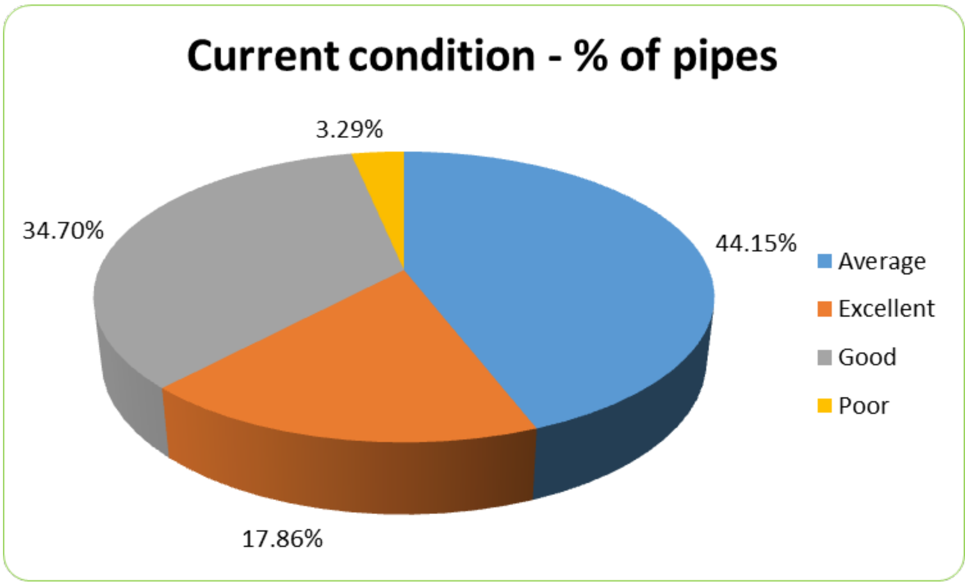


Figure 26: Condition rating of stormwater network (ex CDC's AssetFinda AMIS data base)

The combination of pipe material type, age, and condition produces the following remaining life profile: (excludes private wastewater laterals)

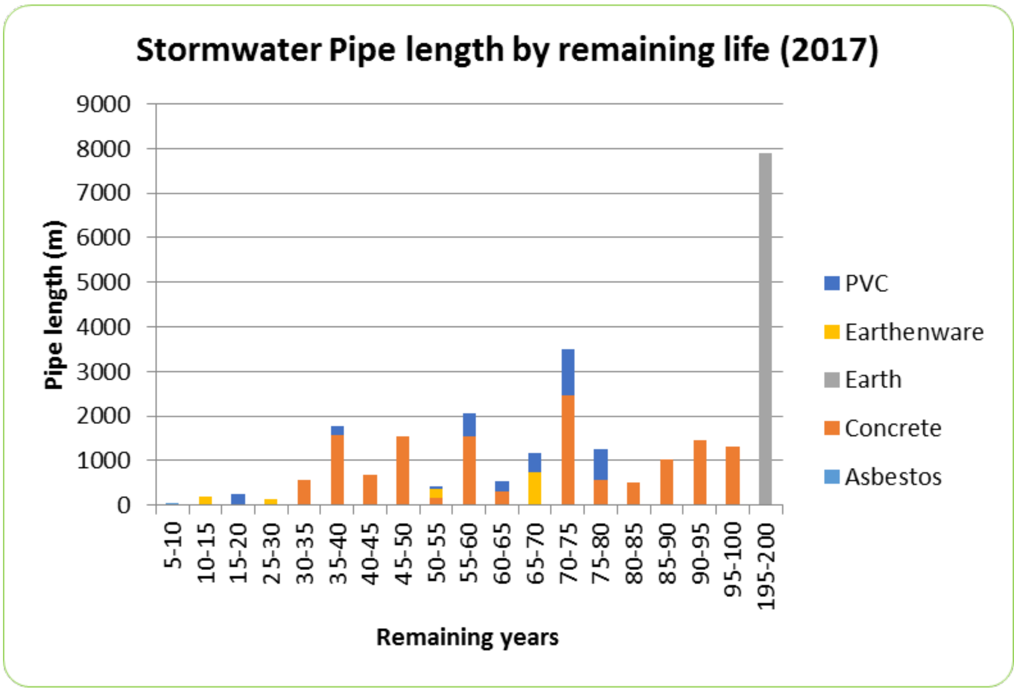


Figure 27: SW reticulation - remaining life distribution (including laterals)

5.4.2 Asset data confidence

Asset data confidence is reliable for stormwater inventory, capacity, and historical expenditure, but is low for data condition as summarised in Table 17. Part of CDC's asset management improvement programme involves progressive capture of asset condition data using CCTV pipe surveys and data logging during repair work.

Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Physical Parameters			X	
Asset Capacity			X	
Asset Condition		X		
Valuations			X	
Historical Expenditures				X
Design Standards			X	

Table 17: Stormwater asset data confidence

5.4.3 Asset value

CDC's stormwater infrastructure had an optimised depreciated replacement value of $5.5 million in 2016[12] as summarised in Table 18 below:

Asset Type	Optimised Replacement Cost ($)	Optimised Depreciated Replacement Cost ($)
Reticulation	$7,046,331	$4,552,139
Open Drains	$251,978	$182,915
Manholes	$679,371	$509,953
Sumps	$285,336	$200,815
Soak Pit Chambers	$84,921	$75,538
Total	**$8,347,938**	**$5,521,359**

Table 18: Stormwater asset valuation

5.4.4 Levels of service

Levels of service (LoS) for the stormwater activity are based on technical and customer requirements. Until recently, customer levels of service had dictated service levels, with technical levels of service expected to be more dominant consequent on adoption of the regional council's Natural Resources Plan.

[12] CDC's three-waters infrastructure is revalued every three-years. The most recent valuation was in 2016.

Customer levels of service relate to effective drainage of surface water from land and buildings, response times, etc. Technical LoS relate to stormwater quality and impact on receiving waters.

A current project involving construction of a bypass channel on the western side of Carterton is aimed at restoring stormwater drainage capacity of the Waikākāriki Stream during storm events. Land use development along the Waikākāriki Stream has impacted on levels of service. The bypass channel will divert peak stream flows to avoid surface flooding of the adjoining urban area. Consent application and project implementation was scheduled to be completed in 2015/16, but has since been deferred.

5.4.5 Infrastructure management issues

The current infrastructure management issues are relevant to CDC's stormwater activity:

Table 19: Summary of issues—stormwater drainage

Issue	Description	Options	Implications
Asset Renewal or Replacements	Ageing pipe assets may fail. Current records indicate that the majority of pipe assets are relatively young, with oldest pipes laid in the 1950s.	**Preferred option** Develop and implement an ongoing stormwater pipe condition assessment programme. Additional capacity will be incorporated in pipe replacements, as required, based on actual and forecast growth.	The stormwater renewals programme will be prioritised using information from the condition assessment. Priority repairs and renewals will be assessed using the Pipe Repair Manual and following the optimised decision making process codified in NAMS. Budget provision has been made of $250,000 per annum for the condition assessment, renewals, and upgrade of the stormwater network.
		Other options There are no other viable options. leaving the asset run to failure would result in surface flooding during high rainfall events, which are likely to become more frequent as a result of climate change.	
Response to Demand	Demand will increase with residential growth.	**Preferred option** The stormwater drain on the east side of town will be progressively replaced to accommodate projected residential growth in the north-east of town in line with the Urban Growth Strategy.	The Eastside drain will cost a total of $750,000 over a period of ten years starting in 2022/23. Without replacing the drain the risk of surface flooding would be high which could result in property damage and road closures

Issue	Description	Options	Implications
			during high rainfall events..
		Other options There are no other viable options that would avoid the risks to property.	
Levels of Service	Current reticulation capacity copes with most rainfall events or surface flooding of short duration. Beyond that, drainage of excess surface water relies on secondary flow paths. More intense rainstorms due to the effects of climate change could erode current levels of service.	**Preferred option** The planned work on Waikākāriki Stream bypass channel will achieve an improved level of service by reducing the potential for surface flooding to the west of town. Maintenance and progressive pipe replacements of damaged pipes over the term of the strategy will improve performance of the current network.	The Waikākāriki bypass is budgeted to occur in 2023/24 at a cost of $285,000. The planned development of a stormwater management plan will provide insight as to the scope and scale of future levels of service planning.
		Other options Do nothing.	Not responding to the risk of flooding will result in a risk to the community that is unacceptable, especially as the risks will be elevated over time due to the impacts of climate change.
Public Health and Environment	Stormwater from the Carterton network discharges to the Mangatārere and Waikākāriki streams. There are no litter traps or treatment systems in place but higher environmental standards are signalled in GWRC's Proposed Natural Resources Plan. The Wellington Regional Council's Proposed Natural Resources Plan includes a requirement for preparation of stormwater	**Preferred option** Once the Natural Resources Plan is finalised, we will respond to any new standards required. Seek a general ("global") consent for stormwater discharges. This is likely to need a stormwater management plan.	Resource consent will provide legal mandate for current stormwater discharge activity and will include guidance on future requirements for quantifying and mitigating any adverse effects of the activity on the receiving environment. The preliminary estimated capital cost of measures to mitigate the adverse effects of stormwater discharges is $454,000, which is

Issue	Description	Options	Implications
	management plans to improve planning, control, and mitigation of adverse effects from stormwater discharges.		provided for over two years, in 2022/23 and 2023/24.
		Other options There are no other reasonable options.	
Risk and Resilience Issues	Current risks include pipe failure, flooding of property due to impaired stormwater capacity and blocked secondary flow paths. A major flood event could overtop the banks of Mangatārere or Kaipaitangata Streams with consequential flooding of property. Flood control is currently the responsibility of Wellington Regional Council.	**Preferred option** Identification and protection of secondary flow paths through catchment management plans. Repair and replacement of damaged stormwater pipes.	Current risk mitigation measures will be maintained through the strategy period. Failure to complete this work will increase the risk of flooding and damage to property.
		Other options Do nothing.	Not responding to the risk of flooding will result in a risk to the community that is unacceptable, especially as the risks will be elevated over time due to the impacts of climate change.

5.4.6 Funding mechanism

The stormwater activity is funded through a targeted rate (90%) on all rating units within the urban area, calculated on land value, plus the general rate (10%).

5.4.7 Disposal of stormwater infrastructure

There are no disposal issues in respect of CDC's stormwater assets.

5.5 ROADS AND FOOTPATHS

5.5.1 Roading assets

CDC's road and footpath infrastructure assets comprise the following:

Asset Component	Quantity	Units	Comments
Pavement – Sealed	Urban 35.6	Km	Sealed Pavement area 1,950,058 m2
	Rural 273.0		
Pavement - Unsealed	Urban 0.2	Km	Unsealed pavement area 616,327 m2
	Rural 158.5		
Bridges	49	No	
Culverts > $3.4m^2$	33	No	Total clear opening (waterway area) greater than $3.4m^2$
Culverts < $3.4m^2$	1,888	No	
Kerb & Channel	46.72	Km	
Underpasses	17	No	Privately owned – listed only for reference
Catch-pits	367	No	
Stormwater Channel	193.8	Km	
Guard Rails	601	M	
Sight Rails	240	M	
Footpaths	46.3	Km	
Street Lighting	1,114	No	Includes 377 on State Highway 2
Signs	1,964	No	

Table 20: Road and footpath assets[13]

Associated assets include carparking and retaining structures.

[13] All roading data from CDC Roading and Footpaths AMP 2017

The maintenance strategy for CDC's roads and footpaths is to achieve current target levels of service through effective intervention strategies and fit for purpose material selections, consistent with One Network Roading Classification (ONRC). The latter instils a national and consistent approach to roading standards for each classification.

The majority of the Carterton road network consists of access roads because of the low traffic volumes.

Hierarchy	Length (m)	Description
Primary collector	25,184	These are locally important roads that provide a primary distributor/collector function, linking significant local economic areas or population areas.
Secondary collector	156,902	These roads link local areas of population and economic sites. They may be the only route available to some places within this local area.
Access	156,008	This is often where your journey starts and ends. These roads provide access and connectivity to many of your daily journeys (home, school, farm, forestry etc). They also provide access to the wider network.
Low volume	105,902	Low volume roads are a subset of the 'Access' class listed above.

Table 21: Roading classification[8]

Renewal strategies for unsealed roads is based on an average assumed depth loss of 10mm over the entire pavement, accepting that metal loss varies site by site. A 5–7 year return cycle is programmed, where a minimum 50mm layer will be placed on each return. This achieves an average of 30–35km per annum maintenance treatment. Full rebuilding of unsealed pavements is resulting in improvements to the unsealed network. The positive effect of this improvement is the ability to now reduce the overall annual target length. This will be continually monitored and revised as required.

The target length for resealing the network is 17km per annum. This includes chipseals and thin asphaltic surfacing.

As a result of recent culvert inspections, road drainage culverts identified as being dangerous or having inadequate capacity due to regular flooding, have been identified and prioritised. A programme to extend and/or replace the affected parts of the current drainage system is planned over the next 5 to 10 years starting with the highest priorities.

CDC's indicative bridge renewal profile demonstrates a relatively modest replacement programme through to 2034, with significant expenditure forecast for 2069. A detailed study of the ageing bridge asset within the network is to be carried out in 2025 ahead of intervention and replacement if required. The study will encompass actual risk, projected life, traffic impacts etc. An assessment of bridge usage versus bridge condition and anticipated failure timeframes will be included, together with an assessment of the impacts, if any, of using alternatives routes. The purpose of the study is to make best use of the existing infrastructure by understanding the travel demand on roads with bridges and provide possible alternatives to bridge renewal. If bridge renewal is still considered the best option, the study will identify a more accurate timeframe for renewal.

The two yearly, routine bridge inspections will continue to be carried out to identify any required maintenance and minor component renewal. These routine inspections do not address likely timeframes for whole of bridge replacements.

The growth and probable resultant increase in demand on the network is not expected to require any significant new roading, or additional capacity on the existing network. The increase in forestry related traffic will have an impact on maintenance and safety on outlying rural roads, and priorities for works may be adjusted to meet that demand. Access to any new residential/retirement developments will be provided by the developers. The need for any major upgrades is not seen at this stage, but the network will continue to be monitored to ensure improvements such as urban by-passes are provided in a timely manner.

CDC intends to review demand forecasts for the district roading network. The study will encompass an assessment of future demand due to increased use originating from proposed subdivision development and logging operations, and the actual and potential impact it will have on the roading network. This will enable the Council to better plan its road renewal and maintenance requirements. The study is scheduled for 2018/19.

Minor safety projects will be introduced to target the dominant contributing factors to roads accidents, namely:

- too fast for conditions
- poor handling
- alcohol
- lack of attentiveness
- loss of control on bends on rural roads.

5.5.2 Asset data confidence

Asset data confidence is reliable for roading and footpaths inventory, capacity and historical expenditure, but is low for data condition as summarised in Table 22. Part of CDC's asset management improvement programme involves progressive capture of asset condition data using RAMM surveys and data logging during repair work.

Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Physical Parameters			X	

Attribute	Very uncertain	Uncertain	Reliable	Highly reliable
Asset Capacity			X	
Asset Condition				X
Valuations			X	
Historical Expenditures				X
Design Standards			X	

Table 22: Roading and footpaths asset data confidence

5.5.3 Asset value

CDC's roading and footpath infrastructure had an optimised depreciated replacement value of $144 million as at 30 June 2017[14] as summarised in Figure 28.

Asset Component	Optimised Replacement Cost	Optimised Depreciated Replacement Cost
Formation	$63,510,135	$63,510,135
Pavement	$58,092,543	$46,743,443
Drainage	$19,272,686	$10,902,906
Footpaths	$7,947,783	$3,973,892
Signs and Road Markings	$536,024	$268,012
Traffic Facilities	$468,677	$234,338
Bridges Culverts	$39,416,555	$17,481,447
Retaining Walls	$66,555	$65,109
Street Lighting	$1,469,862	$890,342
TOTAL	**$190,780,831**	**$144,069,625**

Figure 28: Roading and footpath valuation 2017

5.5.4 Levels of service

Customer levels of service are shaped by three key considerations developed under the ONRC framework. They are:

[14] CDC's roading and footpath infrastructure is revalued every three years. The previous valuation was in 2014.

- Mobility (travel time reliability, resilience of the route)
- Safety
- Amenity (travel quality, aesthetics)
- Accessibility (land access and road network connectivity)
- Responsiveness.

Technical levels of service include asset condition ratings, pavement strength, surface roughness, geometry, cost efficiency.

5.5.5 Infrastructure management issues

Table 23: Summary of issues—Roads and Footpaths

Issue	Description	Options	Implications
Levels of Service	Levels of service include road safety, reliability and accessibility, responsiveness, and smoothness of ride. The maximum allowable weight and dimension limits for heavy commercial vehicles have been increased (known as 50Max). There is a portion of the bridge stock that is either known to be unable to cater for this increased loading, or insufficient details of the bridges is known to be able to confirm acceptability of the loading. This limits the routes available for these HPMV vehicles.	**Preferred option** Key bridges will be strengthened as part of the renewal of structure components.	50Max vehicles are affecting the LOS of unsealed roads to forestry areas, and structures. Increased maintenance in the short-term and renewal funding long term may impact on funding requirements for both Council and NZTA. If NZTA will not subsidise this work, ratepayers may have to fund the shortfall.
		Other options Retain current levels of service.	Retaining the current bridge strengths will result in a chance of failure, risking people's safety.
Public Health and Environment	Road maintenance and construction operations will be carried out to ensure protection of public health and the environment. Transport related greenhouse gas emissions are monitored by GWRC.	**Preferred option** The current length of unsealed road is not planned to be reduced during the strategy period, except for safety or other compelling reasons. Current roading operations will be monitored to ensure public safety and environmental impacts are managed appropriately. Resource consents for road construction will be obtained where needed.	Current public health and environmental protection measures will be adhered to.

Issue	Description	Options	Implications
		Other options Adopt a seal extension programme.	The costs of extending the length of sealed roads would not outweigh the benefits and would unlikely attract NZTA subsidy.
Risk and Resilience	The district is subject to earthquakes and severe weather events causing flooding, slips, and washouts. Reliable access to all areas of the district can be affected. Critical assets include bridges, large culverts, and bluff areas, where natural hazards could trigger failure and isolation of communities.	**Preferred option** Alternative routes are maintained for collector roads. There will be regular road inspections and remedial work where required.	Current risk mitigation measures will be maintained through the strategy period. A level of risk related to isolation of communities is deemed acceptable.
		Other options There are no other viable options.	

5.5.6 Funding mechanism

The roads and footpaths activity is funded from NZTA’s subsidy and the general rate, the latter calculated from the capital value of each rating unit in the district.

5.5.7 Disposal of road and footpath infrastructure

There no disposal issues in respect of CDC’s wastewater assets.

6 INFRASTRUCTURE INVESTMENT PROGRAMME

6.1 THE MOST LIKELY SCENARIO

The following tables summarise the most likely scenario for managing CDC's infrastructure assets, taking account of the above issues. The 30-year term of the strategy provides a high-level insight as to the significant decisions that might need to be taken beyond the relatively short-term, 10-year planning horizon of the 2018–2028 Ten Year Plan. All amounts are inflation adjusted through to 2028. Thereafter, all expenditure forecasts are in 2028 dollar values.

The principal options shown are, in many cases, the only options available other than 'do nothing'. The variable is timing. As noted above, current and proposed levels of service are a minimum, dominated by regulatory and technical considerations. Customer levels of service are more discretionary and need to be considered in the context of projected population changes and ability to pay. Options such as demand management have some practicable relevance for Carterton District, namely in respect of the three waters infrastructure. Overall, the small ratepayer base of the District is sensitive to relatively modest increases in expenditure, with water and wastewater services predominantly funded by Carterton urban ratepayers. Any increases in the capacity of CDC's core infrastructure needs to be well researched, evaluated, and sustainable.

The tables below show the indicative estimates of operational and capital expenditure up to 2048, by infrastructure asset type, for the most likely scenario. The estimates are shown on an annual, inflation-adjusted basis for the first 10 years, followed by 5-yearly uninflated sub-totals covering the remaining 20 years of the strategy:. All amounts are inflation adjusted.

Table 24: CDC Infrastructure — operating and maintenance expenditure forecasts by infrastructure asset type 2018–2048

YEAR	1	2	3	4	5	6	7	8	9	10	11-15	16-20	21-25	26-30
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2029-33	2034-38	2039-43	2044-48
Wastewater O&M														
Carterton WW including Waingawa	6,157,733	2,812,510	2,976,440	3,123,098	3,124,781	3,236,267	3,347,381	3,309,623	3,377,465	3,427,573	17,518,632	18,113,669	19,276,156	20,577,125
Water supply O&M														
Carterton WS including Waingawa	1,833,915	1,887,348	2,035,776	2,201,057	2,266,721	2,395,904	2,497,492	2,453,959	2,503,675	3,078,982	18,350,874	24,277,950	34,885,217	58,117,295
Rural Water (both races)	421,379	430,315	438,961	447,743	457,200	466,926	477,194	487,731	499,213	510,831	2,732,766	3,056,753	3,419,501	3,826,147
Total water supply	2,255,294	2,317,663	2,474,736	2,648,800	2,723,921	2,862,830	2,974,686	2,941,690	3,002,888	3,589,812	21,083,640	27,334,703	38,304,718	61,943,442
Stormwater drainage O&M														
Carterton Stormwater	265,656	274,983	282,911	305,569	318,004	354,472	388,887	400,962	411,392	420,768	2,220,212	2,353,654	2,468,282	2,596,372
Roading and footpaths O&M														
Carterton Roading and Footpaths	3,636,783	3,777,745	3,867,374	3,983,559	4,067,482	4,178,875	4,296,507	4,401,714	4,544,296	4,639,964	24,273,222	25,090,987	26,986,546	29,116,460
Grand Total Network O&M	**12,315,466**	**9,182,900**	**9,601,461**	**10,061,026**	**10,234,188**	**10,632,444**	**11,007,462**	**11,053,989**	**11,336,041**	**12,078,118**	**65,095,707**	**72,893,013**	**87,035,702**	**114,233,399**

Figure 29: O & M infrastructure expenditure forecasts by activity

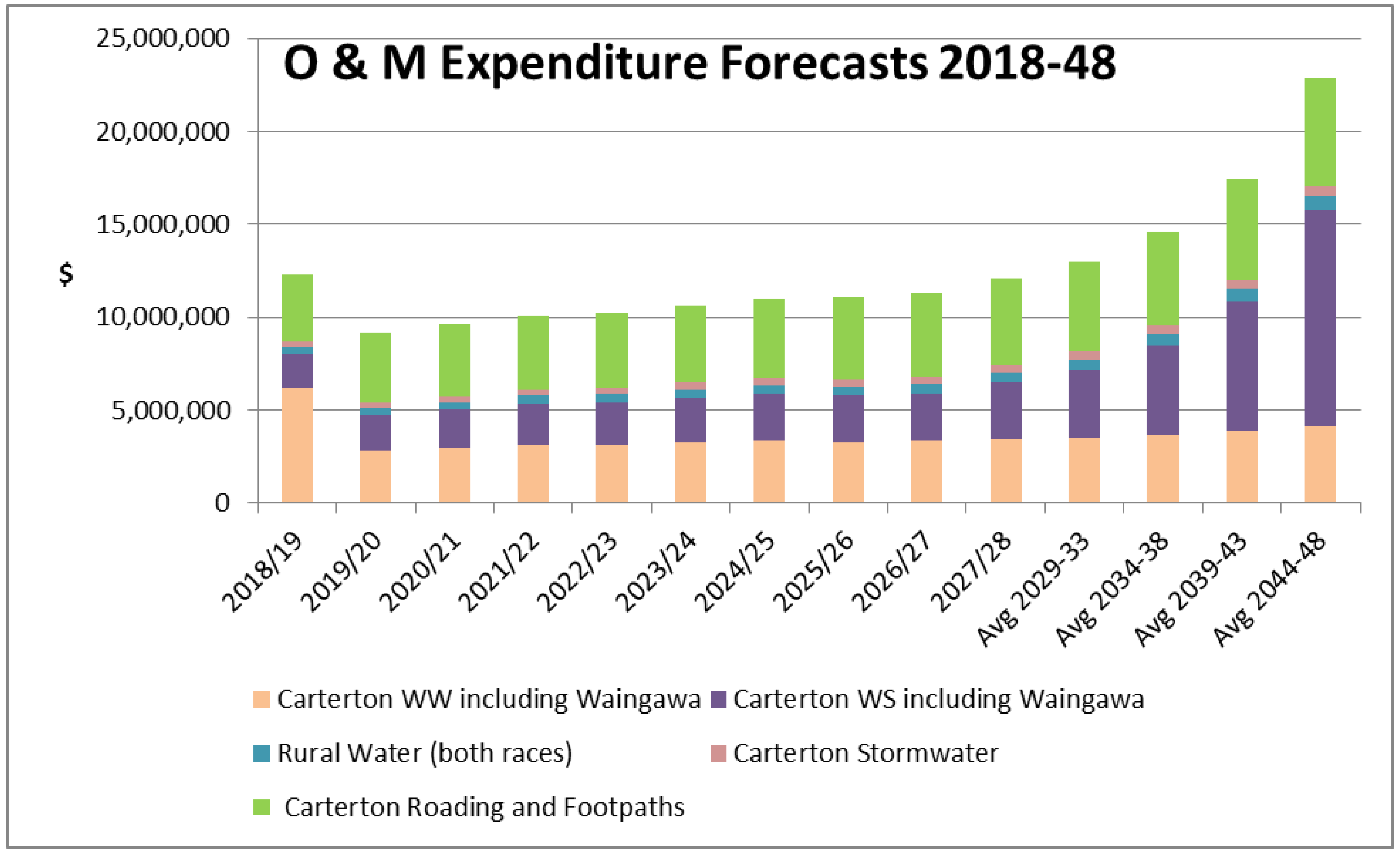
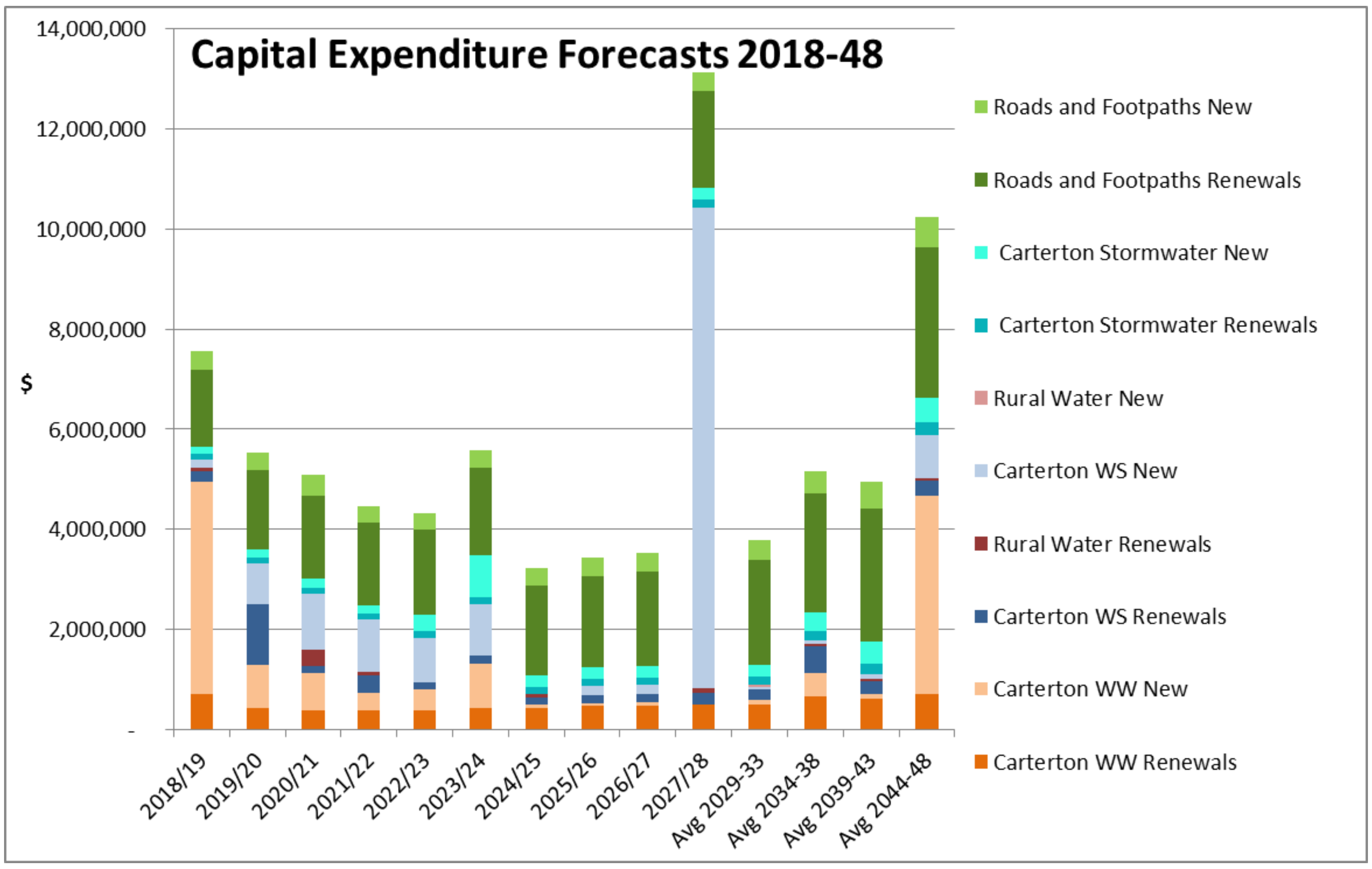


Table 25: CDC infrastructure capital expenditure forecasts by infrastructure asset type 2018–2048

YEAR	1	2	3	4	5	6	7	8	9	10	11-15	16-20	21-25	26-30
	2018/19	2019/20	2020/21	2021/22	2022/23	2023/24	2024/25	2025/26	2026/27	2027/28	2029-33	2034-38	2039-43	2044-48
Wastewater Capital—Renewals														
Carterton WW Renewals	696,322	429,716	375,232	392,040	392,480	418,747	423,540	479,200	482,160	495,096	2,461,496	3,271,543	3,064,194	3,555,516
Wastewater Capital—New														
Carterton WW New	4,246,984	868,141	742,831	332,679	405,013	902,679	63,332	51,754	53,136	7,578	488,029	2,357,730	488,040	19,779,160
Wastewater Capital - Total														
Total Wastewater Capital	**4,943,306**	**1,297,857**	**1,118,063**	**724,719**	**797,493**	**1,321,426**	**486,872**	**530,954**	**535,296**	**502,674**	**2,949,525**	**5,629,273**	**3,552,234**	**23,334,676**
Water Supply Capital—Renewals														
Carterton WS Renewals	227,173	1,215,617	149,773	361,004	141,048	144,337	148,005	151,547	170,355	235,550	1,006,138	2,726,800	1,271,519	1,492,410
Rural Water Renewals	71,470	-	319,800	76,230	-	-	81,900	-	-	88,410	95,200	215,740	244,020	276,080
Total Water Supply Renewals	298,643	1,215,617	469,573	437,234	141,048	144,337	229,905	151,547	170,355	323,960	1,101,338	2,942,540	1,515,539	1,768,490
Water Supply Capital—New														
Carterton WS New	147,024	803,110	1,119,300	1,034,550	892,000	1,036,028	-	179,700	184,500	9,611,430	196,305	297,413	434,007	4,355,706
Rural Water New	-	-	-	-	-	-	-	-	-	-	193,120	-	-	-
Total Water Supply New Capital	147,024	803,110	1,119,300	1,034,550	892,000	1,036,028	-	179,700	184,500	9,611,430	389,425	297,413	434,007	4,355,706
Water Supply Capital - Total														
Total Water Supply Capital	**445,667**	**2,018,727**	**1,588,873**	**1,471,784**	**1,033,048**	**1,180,365**	**229,905**	**331,247**	**354,855**	**9,935,390**	**1,490,763**	**3,239,953**	**1,949,546**	**6,124,196**
Stormwater Drainage Capital—Renewals														
Carterton Stormwater Renewals	122,520	125,160	127,920	130,680	133,800	136,920	140,400	143,760	147,600	151,560	816,600	924,600	1,045,800	1,183,200
Stormwater Drainage Capital—New														
Carterton Stormwater New	142,940	146,020	191,880	141,570	323,350	844,340	222,300	227,620	233,700	239,970	1,207,210	1,926,250	2,178,750	2,465,000
Stormwater Drainage Capital - Total														
Total SW Drainage Capital	**265,460**	**271,180**	**319,800**	**272,250**	**457,150**	**981,260**	**362,700**	**371,380**	**381,300**	**391,530**	**2,023,810**	**2,850,850**	**3,224,550**	**3,648,200**
Roads and Footpaths Renewals														
Roads and Footpaths Renewals	1,529,458	1,599,046	1,634,308	1,669,570	1,709,431	1,749,292	1,793,753	1,836,680	1,885,740	1,936,333	10,432,895	11,812,705	13,361,158	15,116,583
Roads and Footpaths New														
Roads and Footpaths New	367,560	336,825	421,070	326,700	334,500	342,300	351,000	359,400	369,000	378,900	2,041,500	2,311,500	2,614,500	2,958,000
Roads and Footpaths Capital — Total														
Total Roads and Footpaths Capital	**1,897,018**	**1,935,871**	**2,055,378**	**1,996,270**	**2,043,931**	**2,091,592**	**2,144,753**	**2,196,080**	**2,254,740**	**2,315,233**	**12,474,395**	**14,124,205**	**15,975,658**	**18,074,583**
GRAND TOTAL NETWORK CAPITAL	**7,551,451**	**5,523,635**	**5,082,114**	**4,465,022**	**4,331,621**	**5,574,643**	**3,224,230**	**3,429,661**	**3,526,191**	**13,144,827**	**18,938,493**	**25,844,281**	**24,701,988**	**51,181,655**

Figure 30: Renewals and new capital expenditure forecast by activity 2018-28



6.2 TOTAL EXPENDITURE SUMMARY—MOST LIKELY SCENARIO

In addressing the issues identified in the previous sections of this strategy, CDC expects to spend $176.5 million on new or replacement infrastructure between 2018 and 2048. Over the same period, $446.8 million is expected to be spent on operating costs, including direct labour, depreciation, materials, and maintenance.

Operating expenditure relates to day-to-day administration, financing, and maintenance of the respective infrastructure assets.

Capital works comprise two categories—renewal/replacements and new.

The above forecast totals are distributed across the four infrastructures asset activity areas as follows (totals for 2018–2048):

Infrastructure activity	Operating expenditure ($m)	Capital expenditure (replacements) ($m)	Capital expenditure ($m)
Wastewater	$110.4	$16.9	$30.8
Water supply	$176.5	$10.9	$20.5
Stormwater drainage	$13.1	$5.3	$10.5
Roads and footpaths	$146.9	$68.1	$13.5
TOTAL	**$446.8**	**$101.2**	**$75.3**

Table 26: Forecast expenditure 2018-48

The table above shows that expenditure across the four infrastructure activity areas will continue to be dominated by operational requirements (operating costs, labour, depreciation, materials, and maintenance) between 2018 and 2048. Total operating expenditure is expected to average $14.9 million per year for the period covered by this strategy.

6.3 SIGNIFICANT CAPITAL WORKS PROGRAMME SUMMARY

Significant decisions to be made regarding new infrastructure projects (defined, for the purpose of this strategy, as being $0.5 million or more of capital expenditure) that are expected to be required during the 2018–2048 period are shown in the tables below. The estimated capital costs and timing are based on forecast amounts included in the above tables.

6.3.1 Wastewater

Significant decision and principal option	Estimated Cost	Estimated Timing
Renewal	16,940,000	2018-2048

Significant decision and principal option	Estimated Cost	Estimated Timing
Construct Storage dam - Daleton Farm	4,230,000	2018-2019
Rutland Road Sewer - Design and Construction	860,000	2023- 2024
Duplicate primary SED tank	650,000	2034-2038
Land purchase for bulk storage	1,300,000	2034-2038
Construct large storage reservoir 800,000m^3	12,950,000	2044-2048

Table 27: Significant capital expenditure items – Wastewater Activity

6.3.2 Water Supply

Significant decision and principal option	Cost	Timing
Renewal	9,440,000	2018-2048
Investigate security and sustainability of water supply	530,000	2019-2021
Water Supply - Both WTP Increase water storage capacity	3,530,000	2020- 2024
Design and consent investigation and confirmation	360,000	2025-2027
Construction of new supplementary supply	9,600,000	2027-2028
Kaipaitangata Main Supply (overall 8km long) - Critical zones duplicated	520,000	2019-2020

Table 28: Significant capital expenditure items – Water Supply Activity

6.3.3 Stormwater Drainage

Significant decision and principal option	Cost	Timing
Renewal	10,660,000	2018–2048
Waikākāriki Stream diversion	290,000	2024
East Drain	740,000	2022-2032
Stormwater treatment : design and construction	450,000	2023-2024

Table 29: Significant capital expenditure items – Stormwater Activity

6.3.4 Roading and Footpaths

Significant decision and principal option	Cost	Timing
Renewals	68,070,000	2018-2048
New Levels of Service	13,460,000	2018-2048

Table 30: Significant capital expenditure decisions – Roading & Footpaths Activity

7 ASSUMPTIONS

The above strategy for managing CDC's infrastructure assets is based on the following assumptions:

Assumption	Level of Uncertainty	Potential Effects of Uncertainty
Depreciation Average asset lives at a project level for new works have been used to calculate depreciation.	Medium	Depreciation is an annual expense to reflect the reduced economic potential of an asset. Because revenue (cash) covers this expense (non-cash) a cash reserve builds up over an asset's life to help fund the asset's replacement at the end of its life. This depreciation reserve is the principal funding mechanism for asset renewals. If the depreciation is inadequate, renewal projects may have to be reprioritised, or scaled down, or they may be funded through a different source such as increased borrowing or rates.
Natural disasters That there are no major natural disasters requiring additional funding for reinstatement of assets.	Medium	There is medium risk of a natural disaster occurring during the 30-year period requiring additional funds to repair or reinstate assets. Some further provision for increasing the resilience of the assets has been built into this plan but there is still further work to be undertaken to determine the desired level of resilience and the further asset improvements to achieve this.
Service potential Service potential of the asset is maintained by the renewal programme.	Pipe networks—Medium Roading and Footpaths—Low	There is medium risk that the service potential of the pipe network assets will not be maintained by implementation of the renewal programme since the latter is not based on reliable asset condition information or planning.
Asset lives Asset lives are accurately stated.	Pipe networks—Medium Roads and Footpaths—Low	The risk that pipe network asset lives are inaccurate is medium. Lives are based on generally accepted industry values, modified by local knowledge and condition assessment. The condition of sections of pipe networks has been confirmed using CCTV and other methods of visual inspection. The potential effect is that, for the unconfirmed pipe lengths, the effective lives of pipe assets might be overstated, with a consequential impact on depreciation funding and the respective renewals programme.

Assumption	Level of Uncertainty	Potential Effects of Uncertainty
Changes to levels of service It is assumed that no significant changes to levels of service are required other than those specifically identified in this strategy.	**Wastewater assets** Low	Levels of service due to increased regulatory requirements for the Carterton wastewater discharge have been accommodated in the strategy. Uncertainty regarding new levels of service is low for CDC's wastewater scheme because of the new 35-year consents effective 19 January 2018. Different levels of service from that assumed could mean higher or lower capital expenditure and associated financing, depreciation, operating, and maintenance costs, or it could impact operating costs and resource requirements. Different technology may be needed.
	Roading assets Low	NZTA's current nation-wide move towards a common roading classification, and review of roading subsidy rates, could result in reduced NZTA funding towards CDC's road maintenance and renewal programmes. The consequence would be either an increased local contribution or a reduction in levels of service. The strategic assessment of the likelihood of that occurring is low. Different levels of service from that assumed could mean higher or lower capital expenditure and associated financing, depreciation, operating, and maintenance costs, or it could impact operating costs and resource requirements. Different technology may be needed.

Assumption	Level of Uncertainty	Potential Effects of Uncertainty
	Stormwater assets Medium	In order to meet increased environmental demands, stormwater asset development may be required in conjunction with the GWRC Proposed Natural Resources Plan. The likelihood of asset development to meet these requirements is unknown, and will not be predicted without some knowledge of actual stormwater effects. Council will carry out sampling of selected stormwater outlets to ascertain the potential effects and identify catchment capacities and the relevance of data collected for future structure planning input. Different levels of service from that assumed could mean higher or lower capital expenditure and associated financing, depreciation, operating, and maintenance costs, or it could impact operating costs and resource requirements. Different technology may be needed.

Assumption	Level of Uncertainty	Potential Effects of Uncertainty
	Water supply assets Medium	Changes to technical levels of service for the Carterton water supply take from the Kaipaitangata Stream are expected due to the current consent renewal process and changes mooted in the Wellington Regional Council Proposed Natural Resources Plan. Provision has been made to address the potential impacts of those changes in the water supply strategy (refer to Section 5.3.5.) Amendments to NZ Drinking Water Standards as a result of the Report of the Havelock North Drinking Water Enquiry – Stage 2, are likely, including a new mandatory requirement to treat all water sources, including groundwater, regardless of the assessed catchment security. Groundwater previously assessed as secure will no longer be exempt from water treatment requirements, including disinfection. The CDC supplementary bore supply is already treated with chlorine and UV, with provision for filtration included in Year 4 of the 2018–2028 10YP. The scope and scale of filtration treatment is currently under investigation, with the results of that work to inform CDC's water supply strategy, and the required budget. Ultimately, the actual timing of implementation may be controlled through new legislative requirements. The CDC surface take at Kaipaitangata Stream is already fully treated. Different levels of service from that assumed could mean higher or lower capital expenditure and associated financing, depreciation, operating, and maintenance costs, or it could impact operating costs and resource requirements. Different technology may be needed.

Assumption	Level of Uncertainty	Potential Effects of Uncertainty
Maintenance and operational costs These are largely based on historical rates and assume similar contract rates throughout the planning period.	Low	BERL inflation factors have been applied to the programmes and budgets over the first ten years of this IS. Budgets for the remaining years of the IS are based on Year 10 budget estimates. No further inflation is applied beyond Year 10. Where the actual inflation rate is different from that forecast, the cost of projects and expenditure will be different from that forecast. Higher than forecast inflation would likely mean higher operating and capital costs and higher revenue; higher capital expenditure could mean greater borrowing; and there would be pressure on rates to increase to cover these costs.
Construction Costs No major changes relative to current cost structure.	Low	It is possible that the price of some components will change relative to others. Budgets are reassessed each year for the AP process to mitigate this risk. BERL inflation factors applied to the 10YP also incorporate an element of price changes in different activity sectors.
NZ Transport Agency Subsidies Subsidies will continue at the approved rate of 53 percent.	Low	If the rate or dollar level of subsidy decreases, roading projects may be reprioritised, or scaled down, or they may be funded through a different source such as increased borrowing or rates.
Council policy No significant change to Council policy that impacts on assets and services.	Low	Any significant change will require a full review of asset management plans and implications identified at the time.
Vested assets No assets are gifted to the council as a result of subdivision.	Low	The Council's preference is receive infrastructure or development contributions by way of cash, rather than land or other assets. If assets are vested as a result of subdivision, this will replace cash revenue.

Table 31: Summary of assumptions