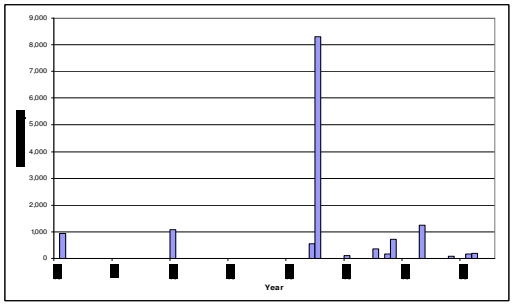
1.0 Leeston Sewage Scheme

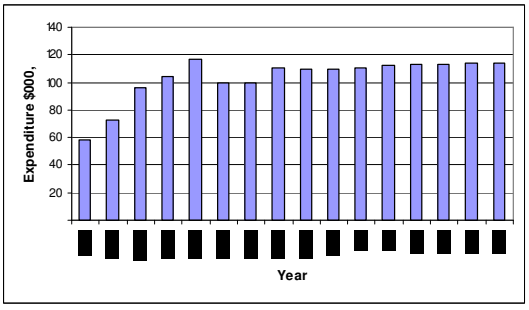
1.1 Executive Summary

Description		Quantity
Population Served		1590
Deprivation Index		3
Physical Statistics	Reticulation Length (km)	12.9
	Manholes	135
	Pump Stations	2
Value ($)	Replacement	$6,203,383
	Depreciated Replacement	$4,668,077
Flows	Annual average over 5 years	238,108 m^3/ yr – includes Doyleston
	Average daily	4,240 m^3/day – includes Doyleston
	Peak daily	23,143 m^3/day – includes Doyleston
	Minimum daily	- m^3/day
Treatment	Multi staged maturation ponds	8
Disposal	Border dyked irrigation	10.6ha
	Infiltration basins with final discharge to waterway	Utilised during high ground water levels >0.9 m
Infiltration		High during high ground water periods
Properties	Connected	566
	Not connected	61

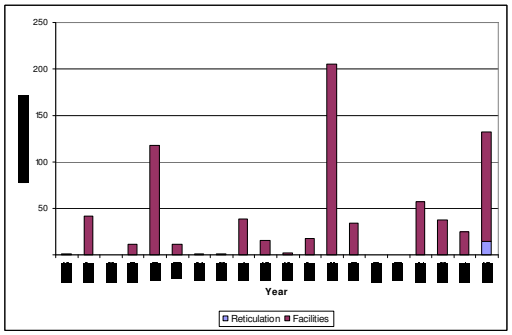
Pipework Replacement Dates



Operating and Maintenance Financial Requirements



Renewals Financial Requirements



New Capital Financial Requirements

There are no capital requirements

The key issues for the Leeston wastewater scheme are:

- High levels of infiltration that can occur during periods of high ground water

1.2 Introduction

1.2.1 Overview and History

The reticulation and oxidation pond were installed in 1975 to replace a "night cart" service for all the township plus sullage that went to local waterways (Tramway Reserve Drain) via side channels.

Leeston Township is located in a area lower than the surrounding area and soakage is very poor. Ground water levels vary from 1.5m in summer to 0.3m below ground level in winter.

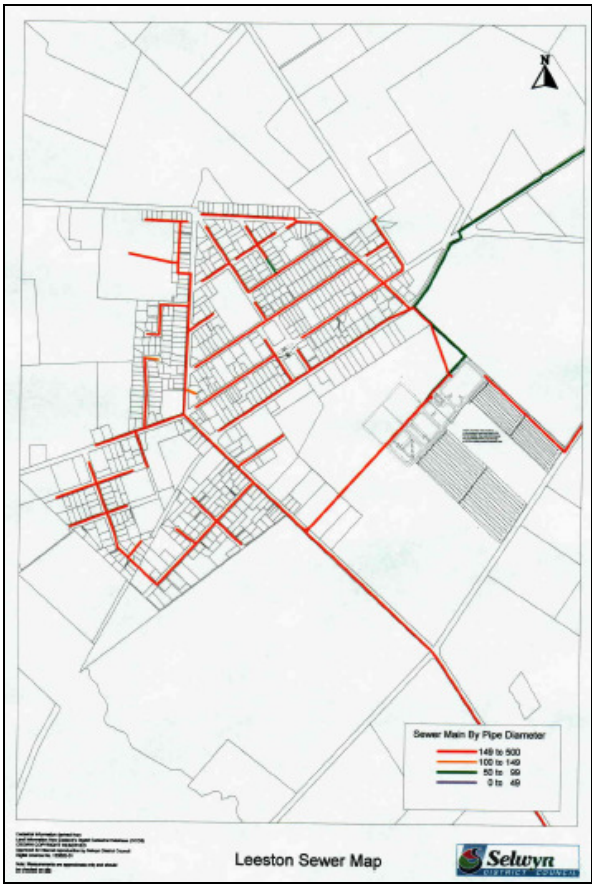
The installation of the sewer system brought further difficulties due to:

- Lack of commitment by the then Ellesmere County Council to supervise the reticulation installation contract which allowed poor workmanship i.e. holes in pipes, incorrect manhole levels - giving "sags" in sections of pipe.
- Infiltration into the reticulation can be very high

In 1993 both pump stations were substantially upgraded along with installation of an aeration pond to increase treatment capacity.

In 2003 major extension of the treatment system occurred with additional ponds and the upgrading of the wastewater disposal system.

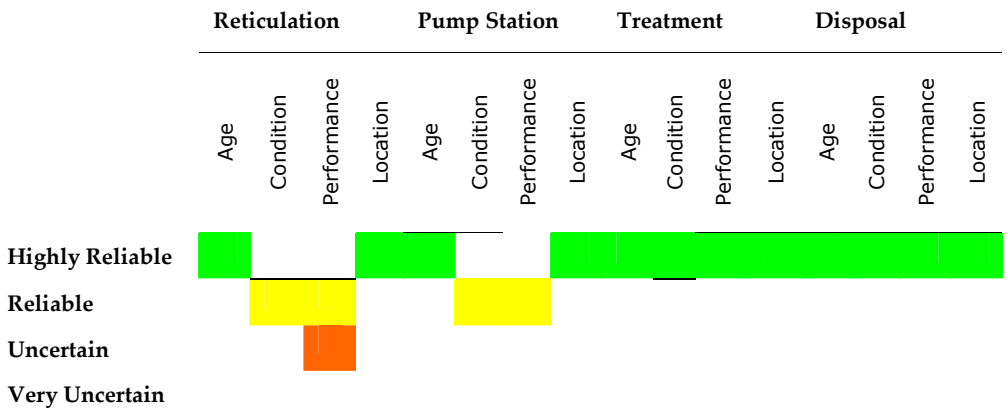
Wastewater Map



1.2.2 Knowledge of Assets

The following table details the confidence in information for facilities and reticulation.

Table 1-1: Data Confidence



1.2.3 Criticality

The following is a preliminary assessment of the critical assets within the scheme.

Table 1-2 Critical Assets

Facility or Main	Location	Reason
Pump Stations	Station and Lake Roads	Failure of pump stations will cause overflow to local waterways

1.3 Design

Table 1-3 details the design parameters for combined Leeston, Doyleston and Southbridge[1]. Following an application to Ministry of Health for SWSS (Sanitary Works Subsidy) for Dunsandel township, it was determined that the Dunsandel township would continue with the existing onsite wastewater disposal. This now frees up additional capacity for Leeston, Doyleston and Southbridge.

Table 1-3 Discharge Flows (with buffer storage)

Township	Future Design Population	Summer Average Flow		Peak Instantaneous Wet Weather Inflow to WWTP		Sustained Wet Weather Flow to Land Treatment (with buffer storage)	
		m^3/d	ℓ/sec	m^3/d	ℓ/sec	m^3/d	ℓ/sec
Leeston/Doyleston	2,200	710	8.2	4,320	50.0	1,930	22.3
Southbridge	900	240	2.8	900	10.4	320	3.7
Dunsandel*	500	150	1.7	500	5.8	250	3.0
Combined Totals	3,600	1,100	12.7	5,720	66.02	2,500	29.0

* Dunsandel proportion now available for Leeston, Doyleston and Southbridge

[1] Leeston Wastewater Treatment Plant Upgrade Report

1.4 Treatment and Disposal

1.4.1 Overview

The treatment system accepts wastewater from Leeston, Doyleston and Southbridge. The wastewater treatment plant and disposal area consist of:

- Screening plant
- Oxidation and maturation ponds in series for improved wastewater quality
- Wetlands with alternating open water areas, planted areas and gravel beds, to improve wastewater quality
- Provision for future UV disinfection of treated wastewater, if required
- Six rapid infiltration basins (RI) are used when the local ground water is higher than 0.9 metres from ground surface - treated wastewater is discharged to the RI basins and ground water is then pumped from beneath the RI basins and then discharge to Tramway Reserve drain
- Discharge of treated wastewater is from the wetlands to the existing irrigation area when local ground water is low
- Irrigation via border dyke areas with piped head races and bubble-up valves
- Use of border dyked areas for stock grazing and hay making (for removal of nitrogen via removal of grass)
- Automation of the WWTP and disposal functions via the SCADA system

1.4.2 Treatment and Disposal

The following table is an overview of the treatment and disposal components.

System	Description	Year installed or Upgraded	Condition	Performance	Criticality
Screenings	For removal of plastics and material greater than 6mm	2003	1	1	Low
Pond system	Maturation ponds and wetlands with aerators and rock filters	1975 & 2003	1	1	Medium
Border dyke land disposal	8 irrigation areas (10.6ha)	1975, 1985 & 2003	1	1	Low
Alternate wet weather disposal	Land infiltration and discharge to water way	2003	1	1	High

1 = Very Good (Industry Standard) 2 = Good 3 =Moderate 4 =Poor 5 =Very Poor

1.4.3 Issues

The sludge was dredged from the oxidation pond in 1999/00. Further sludge removal from the oxidation pond will be required by 2020. Funding for the maintenance of the treatment and disposal system is via the three contributing townships and based on the number of connections.

1.5 Pump Stations

1.5.1 Overview

Leeston Township is divided into two catchments. Catchments gravitate to either Lake Road or Station Street pump stations. These two pump stations pump directly to the screen at the

WWTP. Flows from Doyleston and Southbridge townships are directly to the WWTP and therefore do no use the Leeston pump stations.

1.5.2 Pump Station Details

The following table is an overview of the two pump stations.

Table 1-4: Schedule of Pump Stations

Pump Station	Description	Year installed or Upgraded	Capacity (l/l)	Condition	Performance	Criticality
Lake Rd	Two submersible pumps pumping via dual pipelines to WWTP (l/s both pumps working)	1975 1993	37	3	3	High
Station St	Two submersible pumps pumping to WWTP (l/s both pumps working)	1975 1993	33.5	3	3	High

1 = Very Good (Industry Standard) 2 = Good 3 =Moderate 4 =Poor 5 =Very Poor

1.5.3 Pump Station Issues

There are no issues for the Leeston pump stations.

1.6 Supply Reticulation

1.6.1 Overview

A schedule of the pipe asset statistics is shown in Table 1-5 below.

Table 1-5 Schedule of Pipework Length (m)

Diameter mm	AC	UPVC	Total
100	42	50	91
150	10,049	1,473	11,522
200	86	1,258	1,343
Total	**10,176**	**2,780**	**12,956**

1.6.2 Condition

The condition of mains installed in the mid 1970's has not been rated but will be assessed in 2006/07. This will be undertaken by scoring the condition using the CCTV that was carried out in 2003 and where possible the CCTV carried out in the early 1990's. Additional CCTV has been programmed for 2007/08 to complete the condition assessment.

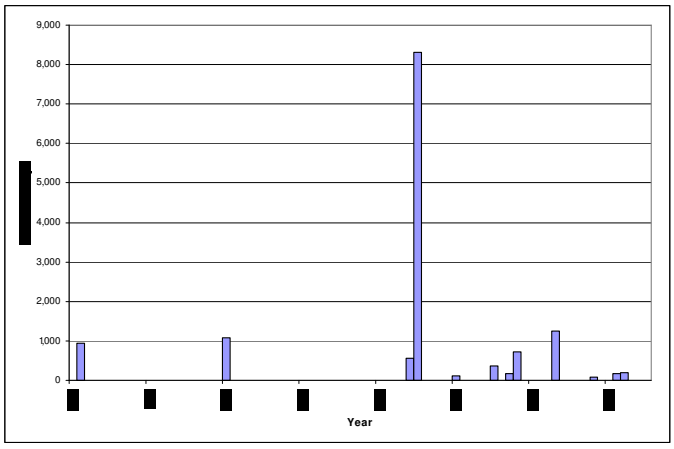
1.6.3 Performance

The performance of the reticulation is considered by Council engineers to be moderate but dependent on levels of infiltration. Hydraulic modelling of the reticulation is programmed for 2006/07 and 2007/08 to ensure future development can be facilitated and renewals to be based on accurate calculations.

1.6.4 Pipe Network Replacement Date

Table 1-6 details the expected year of mains replacement.

Table 1-6 Pipework Replacement Dates



1.6.5 Infiltration

During high ground water periods (associated with high rainfall) the reticulation can be quickly inundated. Significant investigations (using CCTV) and subsequent repairs were undertaken in late 1980's and early 1990's. This resulted in a significant number of repairs being carried out that included replacement of a large number of scalloped inspection points, broken pipes, London junctions and poor lateral connections. This work resulted in a reduction in wet weather flows but it is considered that significant additional reductions in wet weather flows are achievable.

It is considered by Council engineers that the majority of infiltration is now via the laterals from the house to the property boundary. Investigations are programmed for 2007/08 to ascertain the extent and options available.

1.6.6 Property Inspections

Every property within the township was inspected by Council staff in 2000 with the next inspections to be carried out in 2010/11.

1.6.7 CCTV

The majority of reticulation was CCTV in 1988-1993 (with extent of coverage estimated at 95%). Further CCTV was carried out in 2004/05 to ascertain any changes in asset condition but no condition rating was carried out at that time. Condition rating of existing CCTV has been programmed for 2006/07.

1.7 Environmental Management

1.7.1 Rights to Take and Discharge Permits

Table 1-7: Schedule of Resource Consents

Consent Number	Description	Date Issued	Expiry Date	Quantities
				Instantaneous (Lts/sec)
CRC011678	To take and use groundwater	Apr-02	Jul-29	120

Consent Number	Description	Date Issued	Expiry Date	Quantities
				Instantaneous (Lts/sec)
CRC011679	To discharge contaminants into air from construction and operation of additional wastewater treatment and disposal facilities	Apr-02	Jul-29	
CRC011680	To discharge contaminants into land and groundwater from the operation of additional wastewater treatment and disposal facilities	Apr-02	Jul-29	
CRC011681	To discharge up to 120 litres per second of extracted groundwater into Tramway Reserve Drain	Apr-02	Jul-29	120
CRC930165	To discharge treated sewage effluent via border dyke irrigation system	Aug-94	Jul-29	
CRC941475	To discharge contaminants to air	07-Sep-94	07-Sep-29	
CRC941476	To discharge contaminants into land,	07-Sep-94	07-Sep-29	10
CRC950253	To discharge oxidation pond effluent onto land via border dyke irrigation for Leeston Sewage Treatment facility,	20-Mar-95	28-Jul-29	

1.7.2 Resource Consent Compliance

A summary and interpretation of the resource consent monitoring data was undertaken in 2006 by CH2M Beca Ltd. CH2M Beca Ltd summarised and interpreted the monitoring data to date for resource consent compliance[2]. The summary and interpretation of the monitoring data indicated that the majority of the resource consent conditions had been met. Those conditions that were not meet were considered minor and related to reporting or not taking ground water samples.

CH2M Beca Ltd comments are; "as long as Environment Canterbury adopts a "partnership approach" to resolving the inconsistent wording of some of the conditions, there don't appear to be any "flags appearing", that would require significant expenditure in the immediate future. Also, the Pond 8 median faecal coliform value is just under the 300 trigger limit which if exceeded, could initiate the need for UV disinfection within 6 months. Equally, a good case could be made to Ecan for not needing UV, if the exceedence was minor and there are no effects on shallow groundwater (which has yet to be tested)."

1.7.3 Consenting Issues

The obtaining of the resource consents for the Leeston WWTP required obtaining individual agreements with the following:

- Taumutu Runanga
- Canterbury Health Board
- Property owners in the immediate area of the WWTP

A number of these agreements have annual reporting requirements that have yet to be reported on. These need to be considered during the normal reporting process that the Council has with Environment Canterbury.

Strengthening of the reporting process is required to enable compliance with the reporting requirements of the resource consents and individual agreements.

[2] Leeston STP Consent Compliance Report - December 2005

Comments from Environment Canterbury

The following are comments from Environment Canterbury[3] regarding compliance of effluent disposal resource consents.

"SDC generally has an acceptable level of compliance with the consents it holds to operate its community wastewater treatment plants. The Council usually provides monitoring information within the required timeframes and SDC staff are responsive to requests for further information or clarification. Information provided is in a useful and clear format.

Environment Canterbury, however does have significant concerns about the recent performance of the SDC Leeston WWTP, this is due to the historical effluent quality being discharged despite repeated minor non-compliant with some conditions. The accumulative effect of this over time has lead to a significant non-compliance with other conditions in the consent that will be difficult to address due to lack of early intervention."

1.8 Maintenance and Operating

1.8.1 Maintenance Contract

Maintenance of the reticulation and general work around the treatment plant is carried out by SICON Ltd under Maintenance Contract 849. The Leeston wastewater scheme (including the treatment plant) Operation Manual has been assessed as moderate. Enhancement of the existing manual is programmed for 2006/07.

1.8.2 Maintenance Issues

After several years of monitoring data being provided, analysis has shown biological activity in this natural system is very cyclical ie temperature dependant. The performance is generally within the original design and where data has been collected (excluding the monitoring bore data which was not collected) within the consent conditions.

1.8.3 SCADA

The pump station and treatment plant is monitored by Council's SCADA system and has the following alarm and monitoring capacity:

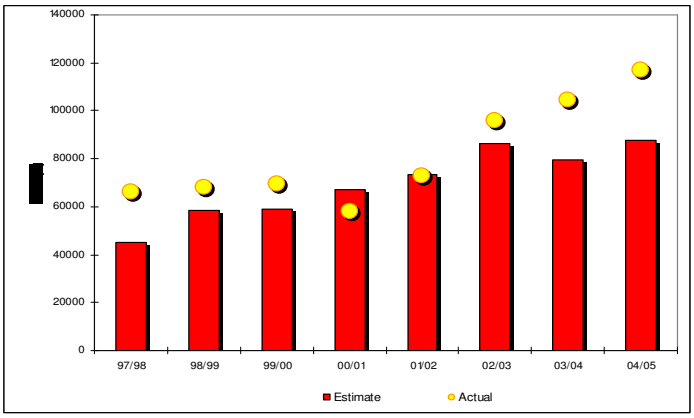
Site Name	Phase Failure	Pump Operation	Well Level and High Alarm	Total Outflow	Dissolved Oxygen	Treatment Plant Operation
Leeston - Lake Rd Pump Station	Y	Y	Y	-	-	-
Leeston - WWTP	Y	Y	-	Y	Y	Y
Leeston - Station St Pump Station	Y	Y	Y	-	-	-

1.8.4 Actual Operating versus Estimated Costs

The following table details the comparison between annual estimates and actual annual costs.

[3] CRC Memorandum of 20th October 2005

Table 1-8: Actual Costs versus Estimates 1997/98 – 2004/05



- Pond leakage and plant die off resulted in increased costs in 2003/04 and 2004/05

1.8.5 Future Maintenance Financial Programme

Table 1-9 details the maintenance and operating costs (excluding depreciation).

1.9 Renewals Capital Expenditure

1.9.1 Overview

Table 1-9 details the renewals programme for the period 2006/07 to 2026/27.

Table 1-9: Future Operating and Maintenance Financial Requirements 2006/165

Excluding: Depreciation and Loan Interest

	06/07	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Expenses										
Support Services	18268	27753	27284	26910	27500	27928	28930	29121	29187	29420
Consultants Fees	4557	4700	4700	4732	4820	4908	4964	4996	5052	5085
Consultants Fees - other	1519	1567	1567	1577	1607	1636	1655	1665	1684	1695
Insurance and Rates	2239	2239	2239	2239	2239	2239	2239	2239	2239	2239
Infiltration Detection	3038	3133	3133	3155	3214	3272	3310	3331	3368	3390
Electricity - Pump stations	8608	8878	8878	8939	9105	9271	9377	9438	9544	9604
Mtce - Pump Station	7595	7834	7834	7887	8034	8181	8274	8327	8421	8474
Mtce - Reticulation	8102	8356	8356	8413	8569	8726	8826	8883	8982	9039
Routine Checks	3500	3500	3500	3500	3500	3500	3500	3500	3500	3500
Share of Treatment & Disposal	42155	42512	42157	41973	42082	42202	42172	41949	41862	41641
Total Expenses	99581	110472	109648	109325	110670	111863	113246	113450	113839	114087

Treatment & Disposal	**Shared between Leeston, Doyleston and Southbridge**									
Consultants Fees	3432	3562	3613	3682	3783	3884	3967	4050	4147	4234
Resource Consent Fees	1536	1595	1618	1649	1694	1739	1776	1813	1857	1896
Monitoring Water Quality	13000	13000	13000	13000	13000	13000	13000	13000	13000	13000
Rates	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Ecological assesment	4400	4400	4400	4400	4400	4400	4400	4400	4400	4400
Harts Creek W.M.T	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000
Mtce - Treatment Area	15365	15951	16177	16486	16940	17393	17764	18135	18568	18959
Irrigation areas Regrass(6 year rotation)	5000	5000	5000	5000	5000	5000	5000	5000	5000	5000
Electricity - Aerators	1500	1557	1579	1609	1654	1698	1734	1770	1813	1851
Total treatment & Disposal	55233	56065	56387	56827	57471	58115	58642	59169	59784	60340

Scheme Improvements

Operations Manuals & Procedures	5,000									
Improvement Plan items	27,259									
Wet well paint	3,000									
Property Inspections					4,000				4,000	
Property Infiltration study		25,000								
IP I1 CCTV		17,000								
IP3 Pipe Performance/Condition Rating	15,000									
Total Scheme Improvements	50,259	42,000	0	0	4,000	0	0	0	4,000	0

Table 1-10: Future Renewals 2006/07 to 2026/27 ($000,)

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	SEWERMAINS																				15
Lake RD PS	PUMP UNIT SUBMERSIBLE 1		12															12			
	PUMP UNIT SUBMERSIBLE 2		12															12			
	SCADA SYSTEM				10															10	
	SCADA RT				1															1	
	BACK FLOW PREVENTER									1											
	LEVEL PROBE	1						1										1			
	HIGH LEVEL ALARM FLOAT	1									1										
	WET WELL																			13	
	ELECTRICAL SWITCHBOARD												18								
Station St PS	ELECTRICAL SWITCHBOARD														18						
	PUMP UNIT SUBMERSIBLE 1		12															12			
	PUMP UNIT SUBMERSIBLE 2		6															6			
	SCADA SYSTEM					10															10

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	SCADA RT					1															1
	GROUND WATER LEVEL PROBE											1									
	BACK FLOW PREVENTER									1											
	LEVEL PROBE								1											1	
	HIGH LEVEL ALARM FLOAT							1										1			
Treatment Plant																					
	FLOW METER									8											
	SCADA SYSTEM						10														
	SCADA RT						1														
	G/WATER MONITORING WELL														17						
	WET WELL																	13			
	G/WATER LEVEL PROBE 1											1									
	GROUND WATER LEVEL PROBE 2											1									
	BACK FLOW PREVENTOR										1										
	AERATOR 1					27															27
	AERATOR 2					27															27
	AERATOR 3					27															27
	AERATOR 4					27															27
	MAIN SWITCHBOARD																		37		
	FLOW METER IN FACULTATIVE PONDS									8											
	SCADA SYSTEM													10							
	SCADA RT													1							
	CONTROL AND FIELD TERMINATIONS													22							
	WIND DIRECTION AND SPEED INSTRU													2							
	PUMP UNIT SUBMERSIBLE GWPA													12							
	PUMP UNIT SUBMERSIBLE GWPB													12							
	PUMP UNIT SUBMERSIBLE GWPC													12							
	PUMP UNIT SUBMERSIBLE GWPD													12							

		2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
	PUMP UNIT SUBMERSIBLE GWPE													12							
	PUMP UNIT SUBMERSIBLE GWPF													12							
	GROUND WATER LEVEL PROBE 3										1										
	GROUND WATER LEVEL PROBE 4										1										
	GROUND WATER LEVEL PROBE 5										1										
	GROUND WATER LEVEL PROBE 6										1										
	PONDING SENSORS BD1-6 AND IBA-F										9										
	LEVEL TRANSDUCER (POND 8)										3										
	FLOW METER									21											
	PLANT WASHDOWN PUMP													4							
	WEIR GATE C5/2A													4							
	WEIR GATE C5/2B													4							
	WEIR GATE C10/2A													4							
	WEIR GATE C10/2B													4							
	ISOLATION GATE 1													4							
	ISOLATION GATE 2													4							
	ROTATING SCREEN													70							
	TOTAL	1	42		11	117	11	1	1	39	16	2	18	205	35			57	37	25	132

Table 1-11: Future Operating, Maintenance Forecasted Cost Trends

Excluding: Depreciation and Loan Interest

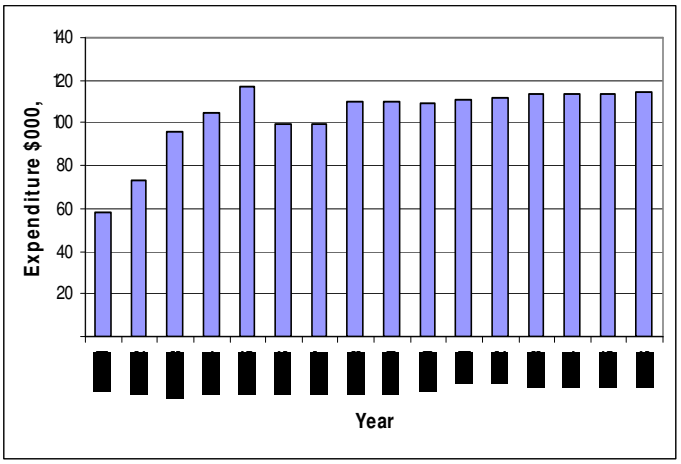
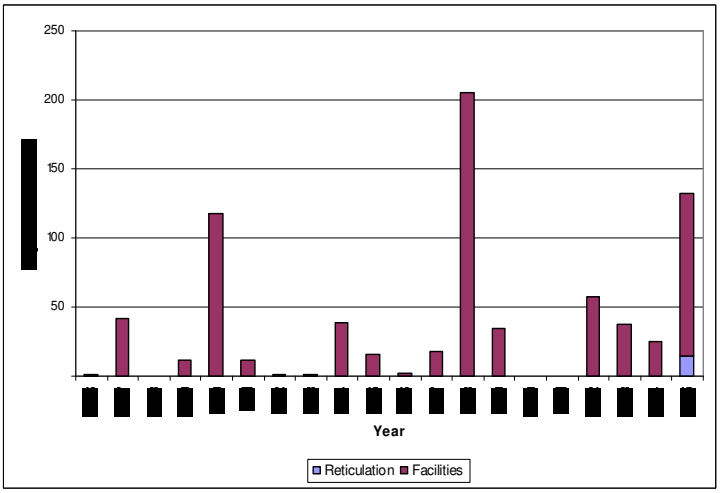


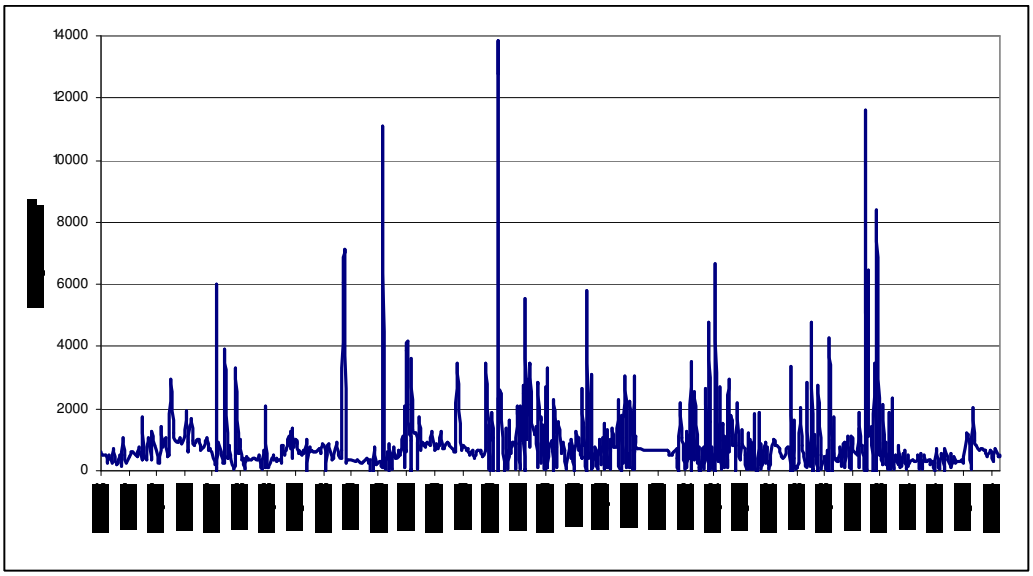
Table 1-12: Projected Renewals Expenditure



1.10 Daily Wastewater Quantities

Table 1-13 details the daily wastewater quantities for the Leeston sewerage scheme for the period November 1996 to November 2004.

Table 1-13: Annual Wastewater Quantities

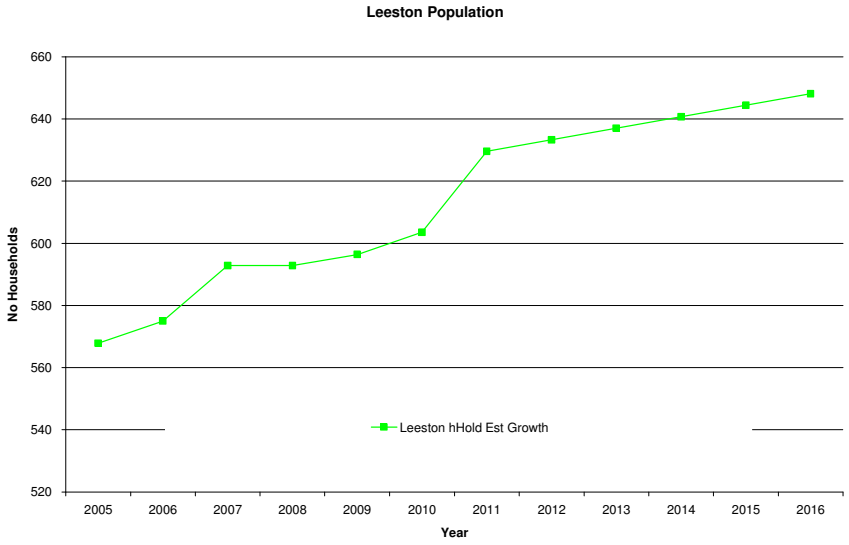


1.11 Future Demand and New Capital Expenditure

1.11.1 Population Projections

Population forecasts for all towns and selected rural-residential areas were developed by Max Barber (Planning Consultant) for the Asset Management Department in late 2005. These population predictions will be considered by Council in early 2006 as the official population predictions for the period 30th June 2005 to 30th June 2016. The following table details the population predictions for Leeston.

Table 1-14: Population Projections 2005/2016 (High Growth Rate)



1.11.2 Future Demand

Table 1-15 indicates that while there is an overall spare capacity in treatment and disposal there is a shortfall in some individual townships. This may be resolved if either

a) Dunsandel does not connect to the Leeston WWTP and/or
b) a reduction in wet weather flows are achieved in Leeston and/or
c) Actual discharge values for Leeston are shown to be less than the design.

Table 1-15: Predicted Demand and Spare Capacity

Township	Design Population (pe)	Predicted 2015/16 Population	Spare Capacity (pe)
Leeston/Doyleston	2,200	1900	300
Southbridge	900	970	-70
Dunsandel	500	540	-40
Combined Totals	3,600	3410	190

Thus the figures shown in Table 5.14 will require revision later in 2006.

1.12 Capital Expenditure

The capital expenditure is only required in 2006/07 for keyless access estimated at $1500.

1.13 Disposal Programme

No disposal of assets is considered necessary over the next 10 years.