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1.0 INTRODUCTION

The Regional District of Central Okanagan (RDCO) is comprised of two unincorporated electoral areas, Ellison/Joe Rich and Westside, and three member municipalities; Kelowna, Peachland and Lake Country. The RDCO has experienced rapid growth in recent years and this trend is expected to continue into the foreseeable future. In order to meet the sanitary sewer collection and treatment needs of this growing region the RDCO has made considerable financial investment in wastewater infrastructure to serve the Westside, Peachland and the Westbank First Nations (WFN).

The Regional Wastewater Treatment Plant (WWTP) provides treatment for much of the Westside as well as for WFN and the District of Peachland. Although, the WFN and Peachland own their respective collection infrastructure the RDCO provides operations and maintenance services. The WWTP is owned and operated by the Regional District and receives utility fees to cover these costs from the connected users.

The Regional District has a clear understanding of what their “cash” expenses are for the operation and maintenance of the system. These costs include salaries, supplies, heat, electricity, etc. What is not clear is the extent of their “non-cash” expenses. The non-cash expenses represent the annual depreciation of the existing infrastructure. Understanding what the depreciation expenses are is important since in theory this represents the amount of reserve funds that need to be set aside annually to pay for the eventual replacement of this infrastructure.

The Regional District commissioned this study to gain a clearer understanding of what the depreciation expenses are for their infrastructure and the timing of future infrastructure replacement/renewal. By understanding their future capital needs and the annual depreciation expense the Regional District will be able to verify that the sewer user rates charged contain an adequate allowance to meet future capital replacement/renewal needs. The Regional District also requested that the depreciation expenses be determined separately for WFN, Peachland and the RDCO. This report documents the results of this assignment and is organized as follows;

- Section 1 – Is an introduction
- Section 2 – system overview
- Section 3 – basis of cost estimates
- Section 4 – capital renewal and depreciation estimates
- Section 5 –discussion and analysis



2.0 SYSTEM OVERVIEW

The Regional Sewer System services, the following areas on the west side of Okanagan Lake:

- Westbank
- Glenrosa
- Smith Creek
- Lakeview Heights
- Casa Loma
- Westside Industrial Park
- West Kelowna Estates
- District Municipality of Peachland
- Tsinstikeptum Indian Reserves 9 and 10

A collection system consisting of trunk mains, lift stations, and force mains collect the wastewater and transport it back to the Westside Regional Wastewater Treatment Plant (WWTP) which is located at the south end of Gellatly Road approximately two kilometers south of the Westbank Yacht Club. The WWTP is the only treatment facility and it services the entire area.

2.1 Westside Regional Wastewater Treatment Plant

The WWTP treats sewage from the Westside electoral areas as well as from Peachland and the WFN. The RDCO owns and operates this treatment plant and funds its operation through the utility rates charged to the connected users.

The WWTP has two distinct treatment trains. The original train was commissioned and put into service in 1989 and the second in 1994. The original train was taken out of service in 1994 as an operational cost saving measure. Currently, the Regional District is equipping the original train with a new fine bubble aeration system (membrane disc) and installing new pumps on the Return Activated Sludge (RAS) lines of the secondary clarifiers. When completed, the WWTP will have a capacity of approximately 16 ML/day. Currently the plant treats approximately 10.0 ML/day.

2.2 Collection System and Lift Stations

The Regional District is responsible for the operation and maintenance of 29 lift stations, 1 dosing chamber and approximately 225 km of collection systems piping (including WFN and Peachland). Wastewater flows by gravity to the treatment plant with the exception of sewage from Peachland



which is pumped via a forcemain. The majority of the collection piping is PVC and was installed within the last 20 years. A small amount of AC pipe exists which was installed in the late 1960's.

The WFN and the District of Peachland own their respective collection system infrastructure; however the RDCO is responsible for the day to day operations and maintenance of the system.



3.0 BASIS OF COST ESTIMATES

Most capital assets will require reinvestment towards the end of their useful life. The monetary value of this work is termed the replacement cost of the asset. When estimating the value, the following principles were employed:

Caution must be exercised in escalating historical costs.

As technologies change, regulations and design standards are modified and the availability of labour and materials vary, judgment is required to develop a realistic replacement cost for the RDCO's assets.

The replacement cost should reflect the use of current technology.

For example, a wood stave drainage pipe would be replaced with a widely used pipe (i.e. PVC, concrete, etc.) and an obsolete lift station control panel would be replaced with one based on current technology.

At this stage all costs are in "2005 dollars"

Present dollars refers to the cost of undertaking the work. During the refinement of the financial strategy, considerations for interest rates and inflation can be incorporated as needed.

3.1 Sanitary Lift Stations

Replacement values for the sanitary lift stations are based on recent costing for similarly sized lift stations in British Columbia. All of the estimate values contain a 30% allowance for Engineering and Contingency.

Lift Stations	1 to 20 hp	25-50 hp	50-100 hp
Electrical and Controls	\$55,000	\$100,000	\$200,000
Mechanical	\$35,000	\$70,000	\$150,000
Chamber	\$70,000	\$150,000	\$300,000
Site Works*	\$55,000	\$100,000	\$250,000
Total	\$215,000	\$420,000	\$900,000

* Site works includes;

- General civil works
- Dewatering allowance



- Removal and disposal
- Tie-ins

Optional Costs

Description	Cost	Unit
40kw Genset installed	\$40,000	each
80kw Genset installed	\$60,000	each
VFD's (1-20hp)	\$5,000	each
VFD's (25-60hp)	\$10,000	each
VFD's (60-100hp)	\$15,000	each

The RDCO lift stations were valued using the above rates, based on the available information for each station.



3.2 Collection System

An inventory of the collection system was provided by RDCO and expanded to include system information available from the District of Peachland geographic information system (GIS). The Tables provided in Appendix B provides an inventory summary of the available information. Some of the collection system attribute data was not available. In order to progress the calculations it was assumed that pipe material was PVC, date of installation was 1980 and the unit rate associated with 200 mm diameter pipe was employed.

Some collection system works within the District of Peachland have yet to be included in the GIS. In those cases inventories were derived from the contract tender quantities associated with those works.

At this stage the analysis of the infrastructure inventory is based on general units (e.g. length of sewer main by diameter and material), rather than detailed cataloguing (e.g. number of manhole, services, etc.). It would be ideal for the inventory to contain the detailed cataloguing, however the efforts necessary to compile that additional detail would be significant while the resulting financial accuracy would only improve slightly. Cost data for the collection system is based on recent tender data for the BC interior, as outlined in the table below.

Description	Units	Pipe Diameter									
		750	675	600	525	450	375	300	250	200	150
Pipe - includes services, cleanouts, and miscellaneous	\$/m	570	520	470	420	370	320	270	245	220	200
Manholes	each	5000	5000	2300	2300	2300	2300	2300	2300	2300	2300
	spacing	100	100	60	60	60	60	60	60	60	60
	\$/m	50	50	38	38	38	38	38	38	38	38
Sub-total	\$/m	620	570	508	458	408	358	308	283	258	238
Engineering and Contingency	30%	186	171	153	138	123	108	93	85	78	72
Total Cost per meter		\$810	\$740	\$660	\$600	\$530	\$470	\$400	\$370	\$340	\$310



3.3 Treatment Plant

The replacement values for the current treatment plant are based on available information from the Regional District and on Urban Systems' experience in the design and construction of WWTP of similar capacity.

Description	Replacement Value
LIQUID TRAIN	
Headworks, odour control control gate, screens, etc.	1,000,000
Grit Removal	1,500,000
Primary Clarifiers Existing	1,550,000
Primary Clarifiers New	900,000
Bioreactors	2,900,000
Bioreactors	2,900,000
Secondary Clarifiers	200,000
Secondary Clarifiers	1,700,000
Secondary Clarifiers	1,700,000
Existing building and filters	1,650,000
New effluent filters and building	1,250,000
Existing disinfection equipment (2 x new \$)	700,000
New disinfection equipment +channel modifications	350,000
SOLIDS TRAIN	
Existing Fermenters	550,000
New Fermenters	550,000
Storage Tanks, DAF, centrifuge, Alum, Blowers	2,000,000
PS Pump	150,000
WAS Pumps	200,000
RAS Pump	200,000
Other	
Process Piping/Instrumentation	1,100,000
Site and Site Piping	1,000,000
Roads and Parking	500,000
Administration Building	4,000,000
Total	\$ 28,550,000



4.0 CAPITAL REPLACEMENT AND DEPRECIATION ESTIMATES

This section of the report provides a summary of the replacement values and approximate depreciation expense for all of the District's wastewater infrastructure assets. A brief definition for some of the terminology that is used in this section is provided below.

Replacement Value – The replacement value is the cost in 2005 dollars to replace the asset to the same capacity and level of performance using the current technology. For example the replacement value of a 200mm diameter Asbestos Cement sewer pipe would be based on a PVC pipe which provided the same capacity.

Effective Life – The effective life is an estimate of what a typical useful life for this type asset would be. This number is somewhat subjective but is needed in order to calculate an annual depreciation value. The total effective life for each asset is calculated by pro-rating the individual life expectancy of the various systems (i.e. mechanical, electrical, etc.) with the systems value. In this way the average effective life is weighted proportionately to the value of each system.

Annual Depreciation – The annual depreciation is defined as the replacement value divided by the estimated effective life of the asset. In cases where the residual value is zero then the asset is considered to be fully depreciated and thus the annual depreciation is also zero. The annual depreciation in accounting terminology would be considered a straight-line type of depreciation with no salvage value. Table 4.1 below summarizes the expected life spans used in the analysis.

TABLE 4.1 – SUMMARY OF EXPECTED LIFESPANS

Asset Type	Expected Life Span (Years)
PVC Pipe	80
HDPE Pipe	80
Concrete Pipe	80
Steel Pipe	50
Lift Station Chambers	50
Mechanical and Pumping Systems	20
Electrical and Controls	20
Site Works	50



Accumulated Depreciation – The accumulated depreciation reflects the sum of the annual depreciation amounts from the initial installation of the asset to the current year. It approximately represents the amount of funds that ideally should have been set aside to date, so that adequate funds are available to replace the asset at the end of its useful life.

4.1 Lift Stations

Based on the information provided by the Regional District and the costing information presented in Section 3, the replacement values of the Districts 29 lift stations and 1 dosing chamber were calculated. In addition the annual depreciation allowance that should be budgeted for each of the lift stations was calculated based on the year of construction and the average useful lifespan of the stations primary components. Appendix A provides the detailed data sheets for each of the lift stations and dosing chamber as well as any additional “as-built” information that was available. Table 4.2A provides a summary of the value and the depreciation of the lift stations by area. Table 4.2B provides a complete listing of the value and depreciation for each lift station.

TABLE 4.2A – LIFT STATION VALUE AND DEPRECIATION SUMMARIZED BY AREA

Area	Replacement Value	Annual Depreciation	Accumulated Depreciation
RDCO	7,835,000	260,000	2,083,000
Peachland	2,355,000	79,000	403,000
WFN	1,525,000	50,000	148,000
	11,715,000	389,000	2,634,000



TABLE 4.2B – LIFT STATION VALUE AND DEPRECIATION

Station ID	Location	Area	Year Constructed	Replacement Value	Annual Depreciation	Accumulated Depreciation
LS-1	East Trunk	RDCO	1990	430,000	14,000	210,000
LS-2	Pritchard Drive	RDCO	1993	215,000	7,000	84,000
LS-3	Newport	RDCO	1990	215,000	7,000	105,000
LS-4	Green Bay	RDCO	1992	215,000	7,000	91,000
LS-5	East Boundary	RDCO	1992	460,000	16,000	208,000
LS-6	Brentwood/Westgate	RDCO	1997	215,000	7,000	56,000
LS-7	Ross Road	RDCO	1996	215,000	7,000	63,000
LS-8	Stevens Road	RDCO	1996	215,000	7,000	63,000
LS-9	Faulkner	RDCO	1994	420,000	14,000	154,000
LS-10	Ensign	RDCO	1990	420,000	14,000	210,000
LS-11	Bayview	WFN	1990	215,000	7,000	105,000
LS-12	Grandview Terrace	RDCO	1993	215,000	7,000	84,000
LS-13	Crystal Springs	RDCO	1990	215,000	7,000	105,000
LS-14	6th Street	Peachland	1998	610,000	19,000	133,000
LS-15	Main	Peachland	1998	1,020,000	35,000	245,000
LS-16	Hardy St.	Peachland	2004	255,000	9,000	9,000
LS-17	Renfrew Rd.	Peachland	2004	255,000	9,000	9,000
LS-18	Whitworth Rd.	RDCO	1997	215,000	7,000	56,000
LS-19	Hitchner	RDCO	1990	215,000	7,000	105,000
LS-20	Casa Loma	RDCO	2004	2,040,000	69,000	69,000
LS-21	Sunnybrae	RDCO	1990	215,000	7,000	105,000
LS-22	Sunnyside	RDCO	2001	215,000	7,000	28,000
LS-23	IR 10 Dosing Chamber	WFN	2004	470,000	15,000	15,000
LS-24	Lower Casa Rio	RDCO	2004	215,000	7,000	7,000
LS-25	Sun Village	WFN	2004	420,000	14,000	14,000
LS-26	Westpoint	WFN	2004	420,000	14,000	14,000
LS-27	Robinson Place	Peachland	2004	215,000	7,000	7,000
LS-28	Collins Hill	RDCO	2004	215,000	7,000	7,000
LS-29	Keloka	RDCO	2004	215,000	7,000	7,000
LS-30	Horizon Village	RDCO	1990	420,000	14,000	210,000
LS-31	Pebble Beach	RDCO	2001	420,000	14,000	56,000
	Total			11,715,000	389,000	2,634,000



4.2 Collection System

Based on the information provided by the Regional District and the costing information presented in Section 3, the replacement value of the District's collection system was calculated. In addition the annual depreciation allowance that should be budgeted was calculated based on the year of installation and the average useful lifespan for pipe of the same material. Appendix B provides details on the system cost and depreciation calculations. Tables 4.3 and 4.4 below provide a summary of this information.

TABLE 4.3 – GRAVITY COLLECTION SYSTEM VALUE AND DEPRECIATION SUMMARY

Area	Replacement Value	Annual Depreciation	Accumulated Depreciation
RDCO	61,582,000	770,000	7,673,000
Peachland	9,115,000	114,000	156,000
WFN	11,676,000	147,000	1,872,000
	82,373,000	1,031,000	9,701,000

TABLE 4.4 – FORCE MAINS VALUE AND DEPRECIATION SUMMARY

Area	Replacement Value	Annual Depreciation	Accumulated Depreciation
RDCO	2,435,000	30,000	284,000
Peachland	2,519,000	32,000	194,000
WFN	662,000	8,000	22,000
Total	5,616,000	70,000	500,000



4.3 Treatment Plant

Based on the information provided by the Regional District and the costing information presented in Section 3, the replacement value of the District's Wastewater Treatment Plant was calculated. In addition the annual depreciation allowance that should be budgeted was calculated based on the year of installation and the average useful lifespan for the primary components. Table 4.5 provides a summary of this information.

TABLE 4.5 –TREATMENT PLANT VALUE AND DEPRECIATION SUMMARY

Description	Replacement Value	Annual Depreciation	Accumulated Depreciation
LIQUID TRAIN			
Headworks, odour control, gate, screens, etc.	1,000,000	40,000	440,000
Grit Removal	1,500,000	60,000	660,000
Primary Clarifiers Existing	1,550,000	31,000	341,000
Primary Clarifiers New	900,000	18,000	-
Bioreactors	2,900,000	58,000	638,000
Bioreactors	2,900,000	58,000	-
Secondary Clarifiers	200,000	4,000	68,000
Secondary Clarifiers	1,700,000	34,000	374,000
Secondary Clarifiers	1,700,000	34,000	-
Existing building and filters	1,650,000	33,000	363,000
New effluent filters and building	1,250,000	25,000	-
Existing disinfection equipment	700,000	28,000	308,000
New disinfection equipment +channel modifications	350,000	14,000	-
SOLIDS TRAIN			
Existing Fermenters	550,000	11,000	121,000
New Fermenters	550,000	11,000	-
Storage Tanks, DAF, centrifuge, Alum, Blowers	2,000,000	80,000	-
PS Pump	150,000	6,000	-
WAS Pumps	200,000	8,000	-
RAS Pump	200,000	8,000	-
Other			
Process Piping/Instrumentation	1,100,000	44,000	-
Site and Site Piping	1,000,000	20,000	220,000
Roads and Parking	500,000	10,000	110,000
Administration Building	4,000,000	80,000	880,000
	28,550,000	715,000	4,523,000



4.4 Summary

The information presented above has been summarized in Table 4.6 by Area for the information that was presented above.

TABLE 4.6 –TOTAL WASTEWATER INFRASTRUCTURE

Area	Replacement Value	Annual Depreciation	Accumulated Depreciation
RDCO	71,852,000	1,060,000	10,040,000
Peachland	13,989,000	225,000	753,000
WFN	13,863,000	205,000	2,042,000
Sub-total	99,704,000	1,490,000	12,835,000
Treatment Plant	28,550,000	715,000	4,523,000
Grand-Total	128,254,000	2,205,000	17,358,000



5.0 ANALYSIS AND DISCUSSION

5.1 Analysis

Table 4.6 summarizes the calculated replacement value and annual depreciation expenses for each of the RDCO, the WFN and Peachland wastewater infrastructure. The Treatment plant value and depreciation expense has been shown separately since the treatment plant depreciation represents a shared cost.

The depreciation expense for the wastewater infrastructure should be distributed proportionally to Peachland customers, RDCO customers and WFN customers based on the relative values of the collection system infrastructure (including lift stations and forcemains) in their respective areas. The depreciation expense of the treatment plant should be distributed equally to all of the customers of the utility.

Table 5.1 summarizes the 2005 utility revenue split between residential and other accounts;

TABLE 5.1 – 2005 UTILITY REVENUE BREAKDOWN

Revenue Breakdown	Residential Connections	Other Connections	% Residential
RDCO	1,480,305	240,636	86%
Peachland	218,463	54,843	80%
WFN	375,185	38,120	91%
Total Revenues	\$2,073,953	\$333,599	86%

The information in Table 5.1 can be used to distribute the depreciation expense (Table 4.6) between residential and other users resulting in Table 5.2;

TABLE 5.2 – DISTRIBUTION OF DEPRECIATION EXPENSE

Depreciation Expense	Total Annual Depreciation	Amount Attributable to Residential	Amount Attributable to Other
RDCO	1,060,000	912,000	148,000
Peachland	225,000	180,000	45,000
WFN	205,000	186,000	19,000
Treatment Plant	715,000	616,000	99,000



Table 5.3 provides the number of connections to the wastewater utility at the close of 2005.

TABLE 5.3 - CURRENT SEWER CONNECTIONS BY SERVICED AREA

	Residential Connections	Other Connections
RDCO	6,547	419
Peachland	897	88
WFN	1,516	72
Total (Nov 2005)	8,960	579

To fairly distribute the depreciation expense to residential and other users, the total depreciation expense should be distributed based on the maximum number of users that the system can service rather than the current number. The major components of the collection system have been designed to serve approximately 24,000 connections. Since there are currently only 8,960 connections it would be most equitable if each residential user was apportioned 1/24,000th rather than 1/8960th of the depreciation expense of the collection system. Similarly the treatment plant can service approximately 16,500 connections.

Tables 5.4, 5.5 and 5.6 which show the estimated annual depreciation expense per residential account based on 24,000 connections for the collection systems and 16,500 residential connections for the treatment plant.

TABLE 5.4 - DEPRECIATION EXPENSE NET OF TREATMENT PLANT

Depreciation Expense Per Residential Connection Net of Treatment Plant	\$ per Year
RDCO	56
Peachland	80
WFN	49

TABLE 5.5 - DEPRECIATION EXPENSE FOR TREATMENT PLANT

Depreciation Expense Per Residential Connection for Treatment Plant	\$ per Year
RDCO	46
Peachland	46
WFN	46



TABLE 5.6 – TOTAL DEPRECIATION EXPENSE PER RESIDENTIAL CONNECTION

Total Depreciation Expense Per Residential Connection	\$ per Year
RDCO	102
Peachland	126
WFN	95

5.2 Discussion

The weighted average of the adjusted depreciation expense in Table 5.4 is approximately \$119 per residential customer per year. Given the degree of accuracy of the data inventory, it would be reasonable to assume that the depreciation expense for each of the respective areas is approximately equal to the weighted average.

In addition to the depreciation expense that is attributed to the residential customers an additional \$309,000 per year is attributed to other users. Since the types and size of these users vary widely the District will need to consider the fairest method to distribute this amount to each individual non-residential account.

The accumulated depreciation values presented in Table 4.6 provide a rough measure of the funds that ideally should have been put aside to date to meet future capital replacement requirements. This value assumes that no money will be available from other funding sources and that the replacement will be funded from 100% from reserves and not through borrowing.



APPENDIX A

Lift Station Data Sheets and As-built Drawings



APPENDIX B

Collection System and Forcemain Listing



APPENDIX C

Sewer Collection System Drawings