CAPITAL WORKS PROGRAM

2008 – 2017

Prepared by

Mould Engineering

SOUTH EAST KELOWNA IRRIGATION DISTRICT

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Prepared by:

Mould Engineering
#206 – 437 Glenmore Road
Kelowna, BC V1V 1Y5
Phone: 250-868-2072
Fax: 250-868-2078
E-mail: mouldeng@silk.net

December 2007

SOUTH EAST KELOWNA IRRIGATION DISTRICT
CAPITAL WORKS PROGRAM 2008 – 2017

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SOUTH EAST KELOWNA IRRIGATION DISTRICT

CAPITAL WORKS PROGRAM
2008-2017

1. INTRODUCTION

This report is an updated, ten-year Capital Works Plan for supplying water to new residential and agricultural users within the South East Kelowna Irrigation District (SEKID). The plan was last revised in 2006, and covered the period of 2006-2016. Capital Works Plans are normally updated every two to three years in order to reflect the actual growth that has occurred, adjust growth projections, ensure the conceptual plan meets these new projections, and update the cost estimates for proposed works. This also provides the District with a review of Capital Expenditure Charge (CEC) rates. The capital expenditure and cash flow projection tables in this report have been updated to reflect the current situation.

Important considerations in this plan are rapidly escalating construction costs, lower growth rates, and newer types of residential development. Construction costs are escalating at a rate higher than inflation due to a very robust real estate market in the Okanagan. The major project currently under construction is the Turtle Lake Reservoir, and the total cost will exceed the estimate contained in the 2006 CWP by a significant amount. The rate of growth in the District is expected to slow considerably since the major residential development in the District, Gallagher's Canyon Resorts, has nearly reached the full build-out stage.

A further consideration in this report is the need to amend the Capital Expenditure Charge Rate Schedule in order to include other types of residential development. At present, only single-family residential, bare land strata and mobile home parks are included in the rate schedule. Recently, the District has received a number of applications for secondary accommodation such as basement suites, carriage houses, farm labour housing, and recreational vehicle parks. Also, it is anticipated that some multi-family housing applications may be forthcoming, and therefore a rate for this type of accommodation should be included in the new Schedule of Rates.

2. WATERSHED HYDROLOGY AND STORAGE

Calculations of available annual runoff and yield from the Hydraulic/KLO/Stirling Creek Watersheds are based on a report prepared by the Ministry of Environment in 1979, and revised in 1984. The gross average annual runoff from SEKID's watershed is just over 20,170 Mega Litres (ML or Million Litres) per year.

SEKID has implemented a stream flow monitoring program, providing data for a more in-depth review of the hydrology of the watersheds. About five years of data is needed to make a reliable evaluation, and until that work is completed, the estimates for reliable, long-term yield will continue to be based on the Ministry of Environment calculations. It is here where future water supply changes, such as climate change, will impact the system. It should be noted that the data collected to-date from the monitoring program shows considerable discrepancies from the Ministry of Environment's 1984 estimates. It is imperative that this new data be carefully reviewed as soon as possible. A summary of the Ministry estimates follows:

Table 1
SEKID WATERSHED
Sub-Basin Physiographic and Flow Data

Catchment ID	Sub Basin Name	Drainage Area (sq mi)	Median Elev. (ft)	Annual Runoff Estimate	
				ac-ft	Mega Litres
11	Canyon Creek	2.16	5,180	1,100	1,360
31	Affleck Creek	1.10	5,400	540	670
14	Canyon Lakes	0.91	5,880	670	830
15	Upper Stirling Diversion	1.42	5,470	850	1,050
16	Lower Stirling Diversion	2.54	4,740	840	1,040
17	Myra Ditch Local	0.42	4,850	170	210
18	Pooley Ditch Local	3.56	4,990	1,520	1,870
19	McCulloch Reservoir Local	11.22	4,300	2,210	2,720
21	Fish, Browne, Long Meadow Lakes	1.51	4,320	380	470
10	Pooley Creek	7.04	5,670	5,680	7,000
9	Mid Hydraulic Creek	18.30	4,070	2,390	2,950
22	Hardy Creek	1.50	4,500	300	370

SEKID's water supply infrastructure is designed to provide each user with enough water to fill their needs for 29 out of 30 years.

Table 2
Storage Volumes

Source	(ML)	(ac-ft)
Reservoirs		
McCulloch Reservoir	16,615	13,475
Fish, Browne, Long Meadow	930	755
Turtle Lake	2,020	1,640
Total Storage	**19,565**	**15,870**

The annual usable yield for a storage volume of 19,565 da m^3 (15,870 ac-ft) is estimated to be 15,940 da m^3 (12,930 ac-ft), as shown on Figure 2, opposite. These values include 2,020 da m^3 (1,640 ac-ft) of storage on Turtle Lake which increases the safe annual yield by about 800 da m^3 (650 ac-ft).

Turtle Lake has a very limited natural watershed, 136 ha (230 acres), and the annual runoff into the reservoir in a low flow year is approximately equal to the amount of evaporation from the reservoir surface. The calculations therefore have not included any net runoff from Turtle Lake. Turtle Lake, an off-stream reservoir, will be filled by diversions from Stirling Creek during high flow periods and spring freshets.

After completion of Turtle Lake, the total safe annual water available for use in SEKID is estimated to be:

1. Hydraulic/KLO Creek Watersheds		15,940 da m^3	12,930 ac-ft
2. Wells:			
.1 East Kelowna No. 1	560 da m^3		
.2 East Kelowna No. 2	560 da m^3		
.3 O'Reilly Road	170 da m^3		
		1,290 da m^3	1,045 ac-ft
Total		**17,230 da m^3**	**13,975 ac-ft**

The estimated water use in Year 2017, as shown in Table 4 on page 7, is 17,170 da m^3, so the District will have very little water available for new users after the end of the planning period providing that the hydrology re-assessment has not resulted in a change in runoff estimates.

The actual water diverted from Hydraulic Creek to the distribution system since 1974 is shown on Figure 3 opposite. The actual use is less than the theoretical calculation for several reasons.

1. Not all Grade 'A' land is using water.
2. The theoretical calculation is based on the driest, hottest year on record (1970) prior to 1980.

Since actual use over the years is less than the theoretical calculation, the District has a significant built-in safety factor against water shortages.

3. GROWTH AND WATER DEMAND PROJECTIONS

Growth

Predicting growth rates in a rural area like SEKID is difficult, since growth is highly dependent on economic conditions and land use policies. In the Kelowna region, growth rates have been high with little indication of slowing down. Reviewing historic growth patterns is a useful guide to make future predictions. The area of irrigated land and the number of serviced lots since 1974 are tabulated below in Table 3 below. To assist in estimating the average annual increase in irrigated land, we have also examined rates that exclude Gallagher's Canyon Golf Resort, which is a one-time increase. Gallagher's is approaching full build-out, so growth rates are expected to drop dramatically.

Table 3
Historic Growth Patterns in SEKID

Year	Grade 'A' Serviced Land		Number of Residential Units	Time Period Years	Average Increase in Grade 'A' Land		Average increase in Service to Residential Units
	(ha)	(ac)		(yr)	(ha/yr)	(ac/yr)	Units/yr
1974	1,755	4,337	657				
1995	2,156	5,327	1,340	21	19.1	47.2	33
1997	2,155	5,325	1,447	2	0.0	0.0	53
1999	2,238	5,530	1,575	2	41.5	102.5	64
2002	2,275	5,622	1,763	3	12.3	30.4	63
2003	2,278	5,629	1,911	1	3.0	7.4	148
2004	2,293	5,665	1,936	1	15.0	37.1	25
2005	2,349	5,803	1,973	1	56.0	138.4	37
2006	2,371	5,371	2,060	1	22	54	87
				Average annual growth since 1995	19.5	48	65
				Growth rate excluding Gallagher's Canyon	5	12	9

Interesting trends in this table include:

- Average annual growth in irrigated land over the last 11 years in SEKID is 19.5 ha/year. Over the last two years, this average has increased to 39 ha/year. The bulk of the increase comes from Gallagher's.
- If Gallagher's Canyon development is not included, growth over 11 years is 5 ha/yr.
- New domestic services average 65 per year over the 11 years of record. If Gallagher's is excluded, the number drops to 9 per year.

There is one new development, Canyon Ventures Ltd., which is expected to develop 110 residential lots within the next ten years. This development will add an average of 11 lots to the expected 9 lots per year in the rest of the District for a total anticipated increase of 20 lots per year. The Canyon Ventures Property is classed as Grade 'A' land, so no increase in Grade 'A' will result from this development. Growth is also expected in the form of recreation vehicle (RV) parks on ALRA land, which is estimated at 5 pads per year.

Is there enough water to support new irrigated land and residential connections in the near future?

- Since the *City of Kelowna 2004 Official Community Plan* (OCP) does not indicate any additional large developments, we expect the growth in irrigated area to only increase by 5 ha/year. There is enough water supply from SEKID to support long term a growth rate of 5 ha/yr.
- However, development beyond 5 ha/yr, SEKID is at risk of a water deficit within this ten year plan.
- A sanitary sewer collection system is currently under consideration for the Hall Road area. Sewer service, if approved, will permit subdivision of large lots into smaller ones. The 2004 City of Kelowna OCP Servicing Plan lists the Hall Road area as Priority 4, which will extend the time of construction. Since the Hall Road area is supplied by an independent water system, expansion in this area will not be included in any calculations until the provisions of sewers is more definite. The City has made an application for grant funding for the sewer system, and the District has begun preliminary planning for the water system.

- The increase in residential users is expected to be about 20 per year, which is about a 1% growth rate, well below the historic rate in Kelowna.

Water Demand Projections

The projected water demand in 2017 is calculated as follows:

Table 4
Predicted Demand by Year 2017

Demand	Volume	
	ML	Ac-ft
Year 2006 Grade 'A' Demand 2,453 ha @ 6.86 ML/ha	16,827	13,647
New Grade "A" 5 ha x 10 years x 6.86 da m^3/ha	343	278
Residential on Grade "A" Land 20 units x 10 years x 0	0	0
Residential on Grade "A" Land Secondary Suites – 5 x 10 years x 0	0	0
Estimated Demand in Year 2017	17,170	13,925
Water Availability – from Table 2	17,230	13,975
SURPLUS (DEFICIT)	**60**	**50**

For comparison purposes, a graph showing the actual annual water diverted from Hydraulic Creek is shown in Figure 3, opposite page 4.

4. DISTRIBUTION SYSTEM

4.1. SYSTEM ANALYSIS

The distribution system has been modeled using the 'Waterworks" computer program. This model has proven very dependable and accurate over the years. The design criteria used in the analysis of the distribution system include both standard design values and values obtained from experience with other Improvement Districts. These criteria are shown in the table below.

Table 5
Design Criteria

	Metric	English
1. Peak Day Demand		
a. Irrigation	From 0.78 to 1.01 lps/ha	5.0 to 6.5 USgpm/acre
b. Single-Family Domestic:		
Fee Simple Lots	0.12 lps/conn	2.0 USgpm/conn
Bare land Strata	0.06 lps/conn	1.0 USgpm/conn
c. Multi-Family Domestic		
Low Density	0.04 lps/unit	0.6 USgpm/unit
High Density	0.03 lps/unit	0.5 USgpm/unit
2. Peak Hour Demand		
a. Irrigation	0.78 tp 1.01 lps/ha	5.0 to 6.5 USgpm/ac
b. Single-Family Domestic		
Fee Simple Lots <1/3 ac	0.18 lps/lot	3.0 USgpm/lot
Bare land Strata	0.12/lot	1.9 USgpm/lot
c. Multi Family Domestic		
Low Density	0.06 lps/unit	1.0 USgpm/unit
High Density	0.04 lps/unit	0.6 USgpm/unit
3. Annual Water Use		
a. Grade 'A; Land	6.86 ML/ha	2.25 af/ac
4. Maximum Velocities		
a. Mainlines	2.44 m/s	8.0 ft/s
b. Distribution System	2.0 m/s	6.5 ft/s
c. Pressure Reducing Valves	7.0 m/s	23.0 ft/s
5. Pipeline Friction Factors		
a. Asbestos-Cement, Concrete Pipe	C = 130	C = 130
b. PVC or Steel-Epoxy Lined	C = 140	C = 140
c. Steel – Unlined	C = 110	C = 110
6. Minimum Pressure		
a. Irrigation @ Highest elevation on lot	310 kPa	45 psi
b. Residential Main Floor Level	275 kPa	40 psi
c. Fire Flows @ Hydrant	140 kPa	20 psi
7. Maximum Pressures	830 kPa	120 psi
8. Fire Flows		
a. Rural Residential	30 lps	475 USgpm
b. Urban Residential	60 lps	950 USgpm

The model was updated in 2005 with all works constructed up to December 2005, including new developments in Balldock, Gallagher's Canyon and Luxmoore Road. The most significant new demand on the system in the last two years was 900 USgpm for the Gallagher's Canyon Golf Course, whose delivery is directly off the mainline at PRV 4M. The total demand, using the above parameters, is 36,650 USgpm; 97% of which is supplied through the Hydraulic Creek mainline. Flow records from 2003, the hottest year on record, indicate a maximum day demand of 26,150 USgpm, which is only 75% of the theoretical peak.

The pipeline distribution system is designed and modeled using 85% of the peak demand. This assumption is based on the following:

The use of the irrigation application rates recommended by the Ministry of Agriculture for each particular soil type creates an unrealistically high demand in the model. The application rates were based on irrigation technology used in the 1960's. More modern irrigation equipment and agricultural metering has improved irrigation efficiency and lowered peak demand values. New values should be applied to each lot and soil type at some time; however, in the interim, the theoretical peak demands will be multiplied by 85% for this analysis. This will create a model that is still slightly conservative, yet more meaningful and useful than using theoretical values. A copy of the existing system analysis is included in Annex 2.

4.2. MODELING SUMMARY

The analysis revealed no major system deficiencies under the current peak demand conditions. The addition of the golf course demand has had a negligible effect on pressures in the distribution system. There is no need for additional pipeline upgrades at this time to increase pressures in the system. A new pipeline loop at Saucier Road, however, will help reduce pipe velocities in that area. Any adjustments to pressure zones can be made at the pressure reducing valves, and at this point, no PRV adjustments are necessary.

There is still need for system improvements to address localized service problems in certain developments. These improvements are described in Section 5.

5. SYSTEM IMPROVEMENTS

5.1. WATER SUPPLY FACILITIES

Cost estimates for new water supply projects have been updated to account for the increased construction costs within the Okanagan. These figures have been reviewed, and past cost estimates revised to more realistic costs for 2008 Construction.

5.1.1. Turtle Lake Reservoir

The Turtle Lake Reservoir is currently being constructed. The project which was started in 2005 will be completed in Year 2008. Significant unexpected foundation problems coupled with construction costs escalating at a rate higher than inflation have pushed the estimated cost of the project from $1.8 million to $2.66 million. A grant has been received from the Canada–BC Water Supply Expansion Program (CBC WESP) which will reduce the District's share to $2.295 million. The District has spent $1.55 million to date on this project.

Estimated Cost to Complete *$1,110,000*

5.2. DISTRIBUTION SYSTEM

5.2.1. Saucier Road Pipeline

Completion of the 200 mm pipeline on Saucier Road to interconnect with existing pipelines as shown on Figure 4, opposite page 11, will reduce pipeline velocities in the 500 mm and 450 mm mains, and provide an important loop for re-directing flows to facilitate maintenance and operational procedures. Materials for the project were purchased in 2007.

Estimated Cost *$82,000*

5.2.2. Gallagher's Fairway 15/Jean Road Pipeline

A 200 mm pipeline, from the south-west side of the Gallagher's Canyon Development (Fairway 15) to Jean Road will improve fire flow and provide looping in the general area. This pipeline will also allow a larger area to be supplied with treated water from the Field Road Reservoir, and is therefore partially water quality-related.

Estimated Cost *$45,000*

5.2.3. Miscellaneous Undefined Pipelines

This contingency fund allows the upgrade of pipelines or pressure regulating stations to meet the water demands of new development.

Estimated Cost *$100,000*

5.2.4. Pressure Reducing Station No. 32M Upgrading

A Pressure Reducing Station is needed on Carter Road to connect the residential areas along McCulloch Road to the Field Road Reservoir system, which improves the water quality in this area and reduces the demand on the mainline by the peaking factor. The Field Road source will be the main supply to the residential area west of Carter Road to Lupin Court with PR 10K serving as a backup for fire flows or emergencies. The majority of this project is water quality-related with approximately 20% related to growth

Estimated Cost *$20,000*

5.2.5. Land Acquisition for new Well and/or Pump Station

Land or right-of-way is required either for a new well or a pumped diversion off Mission Creek. Improved water quality versus additional water quantity will likely be the principal reason to develop new water sources; therefore, considerable funds have not been included in this plan for additional quantity. Further costs can be determined at a later stage.

Estimated Cost *$20,000*

Table 6

Capital Works Program - Schedule & Cost Estimates
Year 2008-2017

	Historic												
	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	TOTAL
1. WATER SUPPLY PROJECTS:													
1.1 Turtle Lake Reservoir													
.1 Re-design Drawings & Dam Manuals	61,400	115,000	20,000										**$ 20,000**
.2 Engineering & Project Management		100,000	100,000										**$ 100,000**
.3 Reservoir Access Roads & Burning	50,100	139,600	15,000										**$ 15,000**
.4 Borrow Pit Reshaping & Seeding		240,000	13,000										**$ 13,000**
.5 Dam Construction		782,200	849,000										**$ 849,000**
.6 Stirling Creek Diversion, & Misc.			113,000										**$ 113,000**
2. DISTRIBUTION SYSTEM IMPROVEMENTS													
2.1 Pipelines													
.1 Saucier Road	18,000			82,000									**$ 82,000**
.2 Gallaghers / Jean	49,500					45,000							**$ 45,000**
.3 Miscellaneous Pipelines												100,000	**$ 100,000**
2.2 PR Station No 32M								20,000					**$ 20,000**
3. LAND ACQUISITION												20,000	**$ 20,000**
4. PLANNING AND ENGINEERING	23,094	20,000	10,000	15,000	10,000	15,000	10,000	15,000	10,000	15,000	10,000	10,000	**$ 120,000**
TOTAL ESTIMATED CONSTRUCTION COSTS	$ 202,094	$ 1,396,800	$ 1,120,000	$ 97,000	$ 10,000	$ 60,000	$ 10,000	$ 35,000	$ 10,000	$ 15,000	$ 10,000	$ 130,000	**$ 1,497,000**
REVENUE: CEC FUNDS	$ 320,194	$ 103,600	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	$ 170,000	**$ 1,700,000**
CBC WSEP GRANT		$ 365,000											**$ -**
Balance	$985,945	$57,800	($892,200)	($864,200)	($747,200)	($674,200)	($548,200)	($440,200)	($302,200)	($162,200)	($10,200)	$28,800	
Bank Interest (5%)	$0	$0	($45,000)	($43,000)	($37,000)	($34,000)	($27,000)	($22,000)	($15,000)	($8,000)	($1,000)	$0	
Balance after Interest	$986,000	$57,800	($937,200)	($907,200)	($784,200)	($708,200)	($575,200)	($462,200)	($317,200)	($170,200)	($11,200)	$28,800	$28,800

6. COST SUMMARY AND PROGRAM SCHEDULE

The estimated costs of the works needed to supply the anticipated growth within the South East Kelowna service area over the next ten years are summarized below. The projected Program Schedule and Cost Estimates are shown in Table 6 opposite. The timing of individual projects is speculative and subject to change.

1. Water Supply Works	
.1 Turtle Lake Reservoir (to complete)	$1,110,000
2. Distribution System	
.1 Pipelines	
.1 Saucier Road	82,000
.2 Gallagher's Fairway 15/Jean Road	45,000
.3 Miscellaneous Pipelines	100,000
.2 Pressure Reducing Station No. 32M	20,000
3. Land Acquisition	20,000
4. Planning & Engineering	120,000
TOTAL	**$1,497,000**

A detailed breakdown of the cost estimates is contained in Annex 1. The Turtle Lake costs shown above do not include $1,550,000 for work completed to date.

Table 7
Capital Expenditure Charge Rates

1. Residential		
Residential on Grade 'A' Land		
Single Family	$4,000	per SFEU
Bare Land Strata < 1,010 m^2	$3,100	per unit
RV & Mobile Home Parks	$2,500	per pad
Secondary Suites > 46 m^2	$1,000	per unit
Secondary Suites < 46 m^2	$0	per unit
Farm Help Accommodation >46 m^2	$1,000	per unit
Farm Help Accommodation <46 m^2	$0	per unit
Multi-Family	$3,100	per unit
Residential on Grade 'G' Land		
Single Family Detached	$5,600	per unit
Bare Land Strata < 1,010 m^2	$3,900	per unit
RV & Mobile Home Parks	$3,300	per pad
2. Irrigation	$12,000	per Ha
3. Commercial and Industrial		
Building with no sprinkler system		
First 250 m^2 (minimum charge)	$4,000	
Over 250 m^2	$20/m^2$	
Building with approved sprinkler system		
First 250 m^2 (minimum charge)	$4,000	
Over 250 m^2	$10/m^2$	

The amount of revenue that would be generated by the projected development is summarized in Table 9 below.

Table 8
Potential CEC Revenues over 10 Year Plan

Category	No. of Units	CEC Rate	Amount
1. Residential			
Residential Single Family (units) on Grade 'A' Land	200	$4,000	$800,000
Secondary Suites	50	$1,000	$50,000
RV & Mobile Homes	50	$2,500	$125,000
Bareland Stratas	20	$3,100	$62,000
2. Irrigation (ha)	50	$12,000	$600,000
3. Commercial & Industrial			$63,000
4. Total			**$1,700,000**

7. CAPITAL EXPENDITURE CHARGES

Development Charges (CEC's) are levied on applicants for new service. Different types of development place different demands on the water system, and estimates were made to separate the costs attributable to each class. Commercial developments, for instance, are usually low water users, but require system capacity for high fire flows. Fire flows have a major impact on pipeline and reservoir sizes, and consequently costs. Residential users have fairly high water requirements with high peak demands, while irrigation demands are relatively constant in summer, with no requirement for fire flows or winter supply. CEC's have been re-calculated and are shown in Tables 7 and 8 opposite.

Table 9
Cash Flow Projections
Year 2008 - 2017

Year	Revenues	Const. Costs	Interest	Balance
Balance at Year-End 2007				57,800
2008	170,000	1,120,000	45,000	(937,200)
2009	170,000	97,000	43,000	(907,200)
2010	170,000	10,000	37,000	(784,200)
2011	170,000	60,000	34,000	(708,200)
2012	170,000	10,000	27,000	(575,200)
2013	170,000	35,000	22,000	(462,200)
2014	170,000	10,000	15,000	(317,200)
2015	170,000	15,000	8,000	(170,200)
2016	170,000	10,000	1,000	(11,200)
2017	170,000	130,000	-	28,800
TOTAL	$1,700,000	$1,497,000	$232,000	$28,800

8. FINANCIAL IMPLICATIONS

The cash flow implications of the ten-year plan are summarized in Table 9, opposite. In order for revenues to balance anticipated costs over the next ten years, it will be necessary to increase CEC rates. The reason for this increase is the significant rise in construction costs in the Okanagan since 2006. Unit costs for urban pipeline installation have also increased due primarily to a shortage of contractors in the region, as well as increased fuel and labour market shortages which have increased salaries.

A deficit occurs in the bank balance for the planning period, so borrowing is required to complete construction on the time line indicated. The Turtle Lake Reservoir project is partially completed, and construction is expected to be completed by fall 2008, and be fully operational by 2009.

Also note that this Capital Works Plan does not account for escalation of costs as required by Development Cost Charge standard practices. A review of this document is recommended every two or three years to monitor growth rates and construction costs, and ensure that revenues and expenditures are being maintained. It is likely that periodic increases in the CEC rates will be required.

9. FUTURE WATER SUPPLY OPTIONS

Beyond the ten-year time frame of this Capital Works Plan, additional water sources will be required to meet future growth. We have identified some options below. To date, the most viable water source seems to be from groundwater.

9.1. EAST KELOWNA WELLS NO. 3 & 4

A report prepared by Golder Associates in 2007 estimated that the annual recharge to the aquifer that underlies the East Kelowna Bench is 8,300 dam^3. Current withdrawals by existing wells are less than 1,000 dam^3 per year, so the aquifer should be able to support at least two more high capacity wells.

Other possible projects include:

9.2. RAISING MCCULLOCH RESERVOIR

McCulloch Reservoir could be raised to increase storage capacity. There are some significant problems to overcome, however, to implement the project.

- There is limited extra water to capture from this watershed.
- The reservoir will not fill every year, so storage has to be carried through a series of low runoff years. The amount of storage needed will be about four times the annual usable volume, resulting in considerable storage costs to service more land. The cost includes:
    - Six dams to rebuild,
    - A new outlet structure at the North Dam,
    - A new spillway,
    - Extensive reservoir clearing.
    - A number of recreational leases, a commercial lease, and the KVR railway R/W will be impacted, and expensive to relocate.

9.3. MISSION CREEK

Mission Creek is a possible future water source for the District, provided that upland storage is developed. There are some undeveloped, but expensive, potential reservoir sites in the Mission Creek watershed.

An interesting alternative may be a joint works development of the Gopher Flats site with Black Mountain Irrigation District (BMID). This project was investigated in some detail in the '80s, but was never constructed for economic reasons. The BMID is actively pursuing approvals and funding for the project.

9.4. WILKINSON CREEK DIVERSION

A portion of Wilkinson Creek could be diverted into the Stirling Creek Watershed to augment runoff to McCulloch Reservoir. A previous attempt by the District to obtain a water license authorizing the diversion was abandoned following objections from water licensees and environmental interests on Kettle River. Obtaining a water license may be possible provided that the diversion only occurs during spring freshet.

10. WATER CONSERVATION

If existing users were more efficient, water could be freed up for new users. The District implemented an agricultural metering program in 1998 which resulted in a considerable reduction in irrigation water use. Since 1998, all new residential services have had meters installed. The metering program has been very effective in reducing water use and it may be possible to further reduce water consumption. The Provincial Ministry of Agriculture is working on an Agricultural Demand Model which may provide some information on theoretical water demands for a variety of soil and crop types.

When the model is available for public use and the results have been carefully reviewed the District can then consider whether there is an opportunity to further reduce water demands. It is considered unlikely that a substantial reduction can be realized in the short term.

11. RECOMMENDATIONS AND CONCLUSIONS

In order to meet the water supply requirements of existing users and also supply the growth projected for the next ten years, it is recommended that the Trustees:

1. Adopt a new Capital Charge Bylaw in 2008 authorizing the collection of charges on new developments as outlined in this report.

2. Contact the City of Kelowna to determine whether the transfer of lands in the area of Dehart/Swamp Roads is still in the City's plans, and if so, determine the time frame for implementation.

3. Adopt a borrowing bylaw to raise $950,000 to fund the CEC account shortfall.

4. Continue the stream flow monitoring program and update the watershed data. Runoff conditions may have changed since the 1984 Ministry of Environment calculations, and the amount of reliable long-term yield from the watershed may be reduced, a critical factor for long-term planning, if correct.

Annex 1

Cost Estimates

1. Turtle Lake Reservoir
2. Distribution System
   - .1 Saucier Road Pipeline
   - .2 Gallagher's Fairway S/Jean Road
   - .3 Miscellaneous Undefined Pipelines
   - .4 PR Station No. 32 M
   - .5 Land Acquisition

CAPITAL WORKS PROGRAM
TURTLE LAKE RESERVOIR
COST ESTIMATE TO COMPLETE

January 2008

1.	*Cut-off Dam (South Dam)*			
1.1	Access Road	$ 5,000		
1.2	Stripping Dam Site, Borrow Pits, & Cutoff Trench	-		
1.3	Outlet Gate, Sluice & Energy Dissipator	55,000		
1.4	Semi Pervious Fill	217,000		
1.5	Impervious Fill	52,000		
1.6	Rock Riprap	12,000		
1.7	Piezometers & Surface Reference Points	6,000		
1.8	Toe Drain	3,000		
	Sub Total		*$*	*350,000*
2.	*Outlet Dam (North Dam)*			
2.1	Dewatering, Outlet Channel Backfill, & site prep	$ 8,000		
2.2	Outlet Gate, Discharge Pipe, Energy Dissipator, & Measuring V	113,000		
2.3	Impervious Fill	55,000		
2.4	Semi Pervious Fill	252,000		
2.5	Pervious Fill	13,000		
2.6	Rock Rip Rap	12,000		
2.7	Outlet Channel Brushing & Excavation	5,000		
2.8	Toe Drain	5,000		
2.9	Spillway, Road Culverts, I Riprapped Channel	14,000		
2.10	Piezometers Surface Reference Points	13,000		
	Sub Total		*$*	*490,000*
3.	*Saddle Dams (North and South)*			
3.1	Access Road	$ 2,000		
3.2	Stripping Dam Site	2,000		
3.3	Pervious Fill	4,500		
3.4	Impervious Fill	-		
3.5	Rock Rip Rap	2,000		
3.6	Surface Reference Points	-		
3.7	Moose Habitat	5,500		
	Sub Total		*$*	*16,000*
4.	*Stirling Creek Diversion*			
3.1	Diversion Structure & Rock Riffles	$ 33,000		
3.2	Clearing R/W	-		
3.3	Pipeline - 600 mm	30,000		
			$	*63,000*
5.	*Reservoir Clearing& Borrow Pit Restoration*			
4.1	Clearing, Burning, ac	$ 8,000		
4.2	Reshape and Seed Borrow Pits	13,000		
			$	*21,000*
6.	*Contingencies (5%)*		*$*	*30,000*
7.	*Engineering & Project Management*		*$*	*120,000*
8.	*District Administration (5%)*		*$*	*20,000*
	PROJECT TOTAL TO COMPLETE		*$*	*1,110,000*

CAPITAL WORKS PROGRAM
DISTRIBUTION SYSTEM

Cost Estimates

January 2008

1. Saucier Road Pipeline				
.1 200 mm PVC Pipe, 360 m @ $108 Installation only		$ 39,000		
.2 Valves & Fittings, Installation only		3,000		
.3 Pipe & Fittings Purchase		22,000		
.4 Pavement, 100 m^2 @ $20		2,000		
.5 Engineering & Contingencies @ 25%		11,000		
.6 District Administration @ 10%		5,000		
	Sub Total		*$*	*82,000*
2. Gallagher's Fairway S/Jean Road				
.1 200 mm PVC Pipe, 420 m @ $180		76,000		
.2 Valves and Fittings		15,000		
.3 Engineering & Contingencies @ 25%		23,000		
.4 District Administration @ 10%		11,000		
	Sub Total	*$ 125,000*		
	x 35% of Project		*$*	*45,000*
3. Miscellaneous Undefined Pipelines			*$*	*100,000*
4. PR Station No. 32 M				
.1 Excavation and Backfill		$ 5,000		
.2 Vault		20,000		
.3 Mechanical		30,000		
.4 Electrical		13,000		
.5 Power Supply		5,000		
.6 Engineering & Contingencies @ 25%		18,000		
.7 District Administration @ 10%		9,000		
	Sub Total	*$ 100,000*		
	x 20% of Project		*$*	*20,000*
5. Land Acquisition			*$*	*20,000*
6. TOTAL			*$*	*267,000*