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EWW 12-29

REPORT TO CORE AREA LIQUID WASTE MANAGEMENT COMMITTEE
MEETING OF WEDNESDAY, MAY 9, 2012

SUBJECT **LIFE CYCLE COSTS – CORE AREA WASTEWATER TREATMENT PROGRAM**

ISSUE

The motion referred to the Core Area Liquid Waste Management Committee (CALWMC) by the Finance and Corporate Services Committee (FCSC) concerning life cycle costs (LCC) for a 50-year period for the Core Area Wastewater Treatment Program (CAWTP).

BACKGROUND

The following motion was made at the April 11, 2012 FCSC;

> "That a report on the full life cycle costing over a 50 year period on the current Core Area Waste Project under Amendment 8 be brought forward to the Finance and Corporate Services Committee for review prior to final agreement with the Province."

A subsequent motion was carried as follows;

> "That this matter be referred to the Core Area Liquid Waste Management Committee for consideration."

A life cycle cost analysis was undertaken for the current option and presented to the CALWMC on February 23, 2011 (Appendix A). The analysis encompassed the period from commissioning (2017) to year 2030, the theoretical date at which the plant reaches capacity. The assumptions used to prepare the analysis are outlined in the report. The previous costing analysis assumed, for example, that Langford and Colwood will extend sewers throughout their communities by 2030. It appears that this is unlikely, the result being that the McLoughlin facility will have capacity beyond 2030, deferring the need for a new facility or expansion of McLoughlin for an indeterminate number of years. Each of the assumptions made for the previous analysis would need to be reviewed for applicability and validity in a 50-year life cycle cost analysis and additional assumptions considered, such as:

1. **Wastewater treatment capacity increase** – The previous analysis assumed the McLoughlin facility would be at capacity by 2030 and, as noted above, this is unlikely. A 50-year life cycle analysis will require assumptions on the timing and the amount of capacity increases.

2. **Population Growth Rate –** Historically, growth in the region has averaged 1% per year. Any change in that assumption will have an impact on any analysis for the timing and amount of capacity increases. Current projections predict a slower growth rate in the future.

3. **Location(s) of wastewater capacity increases** – The options for future capacity could include new WWTPs in the Westshore or other municipalities if growth patterns change over time. There may also be an opportunity for expansion at the McLoughlin wastewater treatment plant (WWTP) by acquiring more land, if the Department of National Defense decides to divest itself of property in the McLoughlin area, or future treatment technologies allow additional capacity at McLoughlin. Assumptions would have to be made about the location(s) of the capacity increases, land acquisition costs and future capital and operating costs.

4. **Sludge treatment and biosolids disposal, integration with solid waste** – In the future, the region may construct a waste-to-energy facility for solid waste for which digested biosolids could become a feedstock. Also, revenue generation from biogas production and phosphorous and from the sale of digested biosolids would be increasingly uncertain for the longer time frame.

5. **Capital Replacement** – Most of the mechanical, electrical and instrumentation equipment will have to be replaced during a 50-year life cycle. Assumptions on the timing and cost would have to be made. For example, with effective maintenance, the life of mechanical equipment can be extended beyond the typical 20 to 25 year useful life.

6. **Real vs. Nominal Dollars** – The funding for the project is being provided in nominal dollars (i.e., unadjusted) for inflation rather than real dollars (i.e., adjusted) for inflation. The life cycle analysis would have to make an assumption on nominal or real dollars. Nominal dollars were used in the previous life cycle analysis.

7. **Discount Rate** – The selection of the discount rate will have a significant impact on the life cycle cost analysis given the time frame for the analysis. For example, an expenditure 50 years from now at a 6% discount rate has a present value one quarter of the same expenditure at a 3% discount rate. Advice would need to be sought on, for example, the applicability of a single discount for a 50-year period.

ALTERNATIVES

1. That the Core Area Liquid Waste Management Committee direct staff to undertake a 50-year life cycle analysis for the Core Area Wastewater Treatment Program at an estimated cost of $20,000.

2. That the Core Area Liquid Waste Management Committee receive this report for information.

IMPLICATIONS

Life cycle cost is the total cost of ownership of, in this case, the Core Area Wastewater Treatment Program. Life cycle costs are summations of cost estimates from inception for, as in this case, a 50-year period as determined by an analytical study and estimate of total costs experienced in annual time increments during the 50 years with consideration for the time value of money.

The objective of life cycle cost analysis is to choose the most cost effective approach from a series of alternatives to achieve the lowest long-term cost of ownership.

Without a comparative analysis, undertaking a life cycle cost analysis of the current program will not provide meaningful information to aid in decision making.

Should the CALWMC decide to direct staff to undertake the analysis, it will be necessary to agree on the assumptions to be used or to undertake multiple analyses with different assumptions to determine a range of possible life cycle costs. The estimated cost of preparing a 50-year life cycle analysis is $20,000.

CONCLUSION

The objective of life cycle cost analysis is to choose the most cost effective approach from a series of alternatives to achieve the lowest long-term cost of ownership. The proposed analysis would only consider the current project and would therefore provide information of limited value.

RECOMMENDATION

That the Core Area Liquid Waste Management Committee receive this report for information.

J.A. (Jack) Hull, MBA, P.Eng.
General Manager, Integrated Water Services

JH:hr
Attachment: 1

APPENDIX A

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Report #EWW 11-13

REPORT TO CORE AREA LIQUID WASTE MANAGEMENT COMMITTEE
MEETING OF WEDNESDAY 23 FEBRUARY 2011

SUBJECT **LIFE CYCLE COSTS – CORE AREA WASTEWATER TREATMENT PROGRAM**

ISSUE

To provide a full life cycle cost analysis for the core area wastewater treatment project.

BACKGROUND

At its meeting of January 12, 2011, the Core Area Liquid Waste Management Committee approved a motion "that staff provide a full life-cycle cost analysis on the core area wastewater treatment project".

The attached memo from Stantec provides the following information based on the assumptions detailed in the memo:

1. Summary of annual costs in 2030 (Table 1)

2. Summary of life cycle costs for the period 2017-2030 (Table 2)

3. A breakdown of annual operating and maintenance costs in 2030 and for the period 2017-2030 (Table 3)

RECOMMENDATION

That the Core Area Liquid Waste Management Committee receive this report for information.

Tony Brcic, PEng
Project Manager, Wastewater Treatment Project

J.A. (Jack) Hull, MBA, PEng
General Manager, Integrated Water Services
Concurrence

TB:hr
Attachment: 1

Memo

APPENDIX A

Stantec

To:	Tony Brcic, P.Eng. Capital Regional District	From:	Gilbert Cote, P.Eng. Victoria BC Office
File:	149009002	Date:	February 9, 2011

Reference: Life Cycle Cost Analysis - Wastewater Treatment Program

A life cycle analysis of the wastewater treatment program was carried out for the period starting in 2017 when the plant will be operational to the year 2030 when the wastewater treatment plant may have reached its design capacity.

The following cost inputs were included in the LCC calculation:

1. Capital Cost – The share of the CRD for the capital cost is one third of all costs except for land and interim financing for which there are no subsidies. The share of the CRD is estimated at $287.6 million. In order to finance its share, the CRD will borrow this amount. The annual debt repayment based on an amortization period of 25 years and an interest rate of 6% is **$22.4 million.**

2. Operating and Maintenance Cost – The O&M cost include power, chemicals, water, labour, repair and maintenance of equipment and disposal of biosolids. When the plant reaches its design capacity of 107.8 ML/d in 2030, the annual O&M cost is estimated at **$14,571,000.** The cost of some items such as power, chemical and disposal of biosolids will initially be lower since it is estimated that the flow into the plant in 2017 will be approximately 82% of the design flow.

3. Revenues – Revenues from the sale of resources from the processing of biosolids include bio-gas, tipping fee for receiving FOG, phosphorus (struvite) and low grade fuel from the dried biosolids. Similarly to the operating expenses, the revenues will increase with time as the sludge production of the liquid plant goes up with increased flow. The estimated revenues in the year 2030 are **$3,121,000**.

In order to carry out the life-cycle cost calculation for the 2017-2030 period, the net present value of the expenditures for each year for debt servicing, O&M cost and revenues was calculated using a discount rate of 6%.

The results are summarized in Table 1 and Table 2 and the breakdown of the O&M costs is outlined in Table 3.

Reference: Life Cycle Cost Analysis – Wastewater Treatment Program

Table 1 – Summary of Annual Cost in 2030				
	Total O&M Cost	**Debt Servicing**	**Total Annual Cost (O&M + Debt Servicing)**	**Revenues**
Annual Cost in Year 2030 (1)	$14,571,000	$22,400,000	$36,971,000	$3,121,000

Note: (1) Expressed in year 2010 dollars

Table 2 – Summary of Life Cycle Cost for 2017-2030				
	Total O&M Cost	**Debt Servicing**	**Total Annual Cost (O&M + Debt Servicing)**	**Revenues**
Life-Cycle Cost 2017-2030	$90,945,000	$146,778,000	$237,723,000	$17,473,000

Table 3 – Details of Operating and Maintenance Cost		
Item	**Annual Cost in Year 2030**	**Life-Cycle Cost (2017-2030)**
Power	$3,735,000	$21,930,200
Chemicals	$2,116,900	$12,548,500
Water	$316,000	$2,070,600
Labour	$2,440,000	$15,988,300
Equipment maintenance & repairs	$5,398,100	$35,371,600
Disposal of biosolids	$565,000	$3,035,800
Totals	**$14,571,000**	**$90,945,000**

The assumptions used in estimating the operating and maintenance costs and the revenues are as follows:

<u>Operating and Maintenance Cost</u>

- Cost of electricity at $0.08/kWh
- Power cost includes electricity for digester gas scrubbing equipment

Reference: Life Cycle Cost Analysis – Wastewater Treatment Program

- Treated effluent will be chlorinated and reused for tank rinsing and cleaning at the McLoughlin Pt plant. Piped municipal water to be used for rinsing at other locations.
- Chemical cost includes alum and polymer for use in the primary clarifiers during wet weather and peak organic loading conditions only
- Disposal cost of biosolids at $100 per tonne of dry solids
- Annual maintenance and repairs cost estimated at 1.1% of construction cost (excluding contingencies and fees)

Revenues

- Tipping fee for FOG of $0.07/litre (based on tipping fee charged by Metro Vancouver in 2009)
- FOG delivered to digester based on 70% diversion rate in 2017 increasing to 77% diversion by 2030
- Purified digester gas sold to Terasen at $8/GJ
- Dried biosolids sold as low grade fuel at 80% of the value of coal - $1.68/GJ

STANTEC CONSULTING LTD.

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