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Project No: 60163493 Task 1

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Manager Regional Environmental Policy
Engineering and Environmental Services Department
Cowichan Valley Regional District
175 Ingram Street
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Dear Kate:

Re: Surface Water Quality Report for the South Cowichan Area

We have undertaken a literature review to identify issues surrounding the quality of water within the South Cowichan Area. A number of sources of information have been identified and are summarized in the attached appendix. We have found a number of sources of water quality information however the parameters of concern varied and the sampling was inconsistent in providing a baseline from which comparisons can be made to future trends. There was a general consensus that the water quality was adequate but that it could be impacted by increased loadings from human activities within the watershed. Of particular concern were the aging sewage treatment systems for individual properties and the failure of the samples near shellfish operations to meet the appropriate guidelines.

Simply put, the water quality was found to be adequate for human contact provided disinfection was provided prior to human consumption. The exception being the elevated coliform counts in the vicinity of the shellfish operations.

The most recent report completed by AECOM entitled, "**State of Environment Report Surface Water Quality in the Mill Bay Area, February 15, 2010**", indicated the pollutants of greatest concern included nutrients of nitrogen compounds and phosphorous plus coliform. The report provided the following six recommendations:

1. Educate the public about good operation and maintenance of septic systems.
2. Implement an inspection program for private on-site systems to ensure septic systems are functioning properly.
3. Install monitoring wells in critical areas and implement a groundwater monitoring program that routinely tests for coliform and nutrient levels in groundwater supplies.
4. Implement a surface water quality monitoring program that routinely tests for coliform and nutrient levels in area creeks and drainages.

5. Implement a marine water quality monitoring program that routinely tests for coliform levels over shellfish beds off shore of the Mill Bay area.
6. Implement recommendations set forth in the CVRD South Sector Liquid Waste Management Plan (Stanley Consulting, 1998).

At this point we would like to include further recommendations relating to collection of baseline water quality data and subsequent long-term monitoring program required to safeguard human and environmental health in the South Cowichan Area.

Scheduling Data Collection

Establishing a baseline of surface data will require at least one year of seasonal data collection from key locations within the area. This would include collection of four sample sets corresponding to the four seasons and establishing which would be the most critical time to collect data. The most important sampling time may be late summer when the surface discharges are smallest or early in the spring as noted in the Shawnigan Lake. The critical season may vary, depending upon the location of the sample and the use of the water being sampled; whether for human consumption, contact or for shellfish aquaculture.

A series of four water samples should be collected which correspond to the seasonal fluctuations in discharge and potentially quality. The samples should be collected in:

1. May, 2011;
2. August, 2011;
3. November 2011; and
4. February, 2012.

Collection of the samples would provide the District with a baseline from which to begin drawing conclusions as to the most critical time of the year and provide a starting point for identification of future trends. Examination of the first year of data will provide information to identify the critical season and would allow the district to reduce the sampling frequency to once per year in subsequent years.

Water Quality Testing Parameters

The data sampling program commenced for Shawnigan Lake can be used to build the District's future program. The water quality parameters that should be included in the testing procedures should include:

1. **Nutrients:** total P, total N, NO₃+NO₂, NO₂, total organic N, ammonia, total organic C, total inorganic C, chlorophyll a
2. **Total Metals**
3. **Anions:** dissolved chloride
4. **Physical properties:** conductivity, pH, total solids, total dissolved solids, turbidity
5. **Miscellaneous:** alkalinity, true colour
6. **Field measurements:** DO (profile), temperature (profile), Secchi depth
7. **Biological:** phytoplankton(1), zooplankton(2), chlorophyll a
8. **Bacterial:** E. Coli, enterococci, fecal coliforms

Sampling Locations

The sampling would begin in a wide area and with targeted locations. As information becomes available additional locations can be added to target specific locations that may be identified. Such instances may be to locate possible local sources of more concentrated pollutant loadings or to better understand the areal distribution of pollutant sources.

The sampling should begin with the following locations:

1. The six sampling locations within Shawnigan Lake should be continued as indicated within the report entitled, "**Water Quality Assessment and Objectives for Shawnigan Lake, BC MOE, January 2007**". While these six locations would identify the quality within the Lake itself they would not provide early warning of changes to the inflows to the Lake.
2. An additional three sampling locations on the main streams that flow into the Lake. These inflowing streams include Shawnigan Creek, McGee Creek and West Arm Inflow.

The water quality for the remaining portions of the South Cowichan Area can be established for the larger streams tributary to Mill Bay and the Saanich Inlet. The larger streams would include:

1. Shawnigan Creek at the outlet of Lake Shawnigan,
2. Shawnigan Creek near Mill Bay,
3. Hollings Creek above Handysen Creek,
4. Handysen Creek above Shawnigan Creek,
5. Malahat Creek near the mouth, and
6. Johns Creek near the mouth.

Sampling for coliform should also be undertaken in the vicinity of the shellfish aquaculture operations to obtain baseline data for future use.

We trust this information will be sufficient to establish the initial acquisition of baseline water quality information and will form the basis for continued data acquisition that will be used to safeguard the surface water quality within the South Cowichan Area.

Sincerely,
AECOM Canada Ltd.



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JD/
Encl.

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Appendix A
Surface Water Quality South Cowichan Area
Literature Summary

1. Shawnigan Lake Water Quality Study, BC MOE, February 1984

1. Identified an issue of deteriorating water quality in Shawnigan Lake
2. Summarized data collected from 1977 through 1979
3. Identified a major change in the zooplankton species composition and attributed the change to logging and settlement in the watershed
4. Indicated the nutrient loading from streams was proportional to the density of development
5. Proposed total phosphorous, turbidity, Fecal coliform and TSS be used as a provisional measure to protect lake water quality and prevent eutrophication

2. Groundwater Supply, Subdivision of Lot 107, Malahat District, Mill Bay, BC. Sept. 29, 1992 by Thurber Engineering Ltd.

1. Identified groundwater supply is adequate in quantity and quality for 31 lot subdivision along Deloume Road. Long term yield is stated to be 3.2 L/s or 50 USgpm with a recommended maximum pumping rate of 1.6 L/s or 25 USgpm.
2. Water quality is satisfactory except for total coliform

3. Shawnigan Lake North Water Systems Disinfection and Supply Source Review, Cowichan Valley Regional District, John Braybrooks Engineering

1. Samples taken at the SLNW system intake during 2003.
2. Focus on biological and turbidity measurements

4. Shawnigan Lake Water Quality Assessment, 1976 – 2004, Ministry of Water, Land and Air Protection, July 2004

1. Examined chemical and biological aspects of water quality in Shawnigan Lake
2. Compared temperature and clarity to previous studies
3. Confirmed DO was similar to past observations
4. Identified a declining trend in phosphorous and chlorophyll levels suggesting a reduction in biological productivity of the lake,
5. Recommended ongoing monitoring and implementation of development controls to protect water quality
6. Quality constituents
 - Nutrients – Phosphorous, Nitrogen, Organic Carbon
 - Halides – chloride, fluoride, bromide
 - Metals –
 - DO
 - Temperature
 - PAH

5. Shawnigan Lake North Water System Disinfection and Waters Source Review, March 2005, John Braybrooks Engineering

1. 570 homes served by system
2. Shawnigan Lake licensing for maximum use of 434,500 gpd, includes applications of 263,500 lgpd plus applications
3. recorded use of 220,000 lgpd.
4. WQ samples at intake had elevated faecal coliform counts
5. Hypo chlorination system eliminated coliform when working properly
6. No filtration of surface water supply

6. Water Quality Assessment and Objectives for Shawnigan Lake, BC MOE, January 2007

1. Presents ambient water quality objectives for Shawnigan Lake
2. Presents results from water quality sampling
3. Recommends a sampling program at six (6) locations within the Lake as shown in the report and as documented below:

Site	Depth	Parameters	Timing
1199901	Surface, mid-depth, bottom (1 m above bottom)	Nutrients: total P, total N, NO ₃ +NO ₂ , NO ₂ , total organic N, ammonia, total organic C, total inorganic C, chlorophyll a	Spring overturn (preferably before Feb 28)
1199902			
1199903	Surface, bottom (1 m above bottom)	Total Metals Anions: dissolved chloride Physical properties: conductivity, pH, total solids, total dissolved solids, turbidity Miscellaneous: alkalinity, true colour Field measurements: DO (profile), temperature (profile), Secchi depth Biological: phytoplankton ⁽¹⁾ , zooplankton ⁽²⁾ , chlorophyll a	
1199904			
E257436	Surface, bottom (1 m above bottom)	E. Coli, enterococci, fecal coliforms ⁽³⁾	
E257437			
<ol style="list-style-type: none"> 1. Surface (0.5m) unconcentrated 1 L sample preserved with Lugol's solution. 2. Vertical haul from 10m to surface. Preserved with 5% formalin. Mouth size of net must be recorded. 3. If any of these results exceed objective levels, further sampling should be conducted during the summer low flow period and fall freshet, consisting of at least 5 weekly samples in a 30 day period. 			

7. Satellite Park Waterworks, Yield Evaluation of Existing Well Completion Report. Sept 26, 2007. By Thurber Engineering Ltd.

1. Existing water supply well for subdivision in Cobble Hill near La Fran Road and Aros Road
2. Estimated safe yield 8.5 L/s with recommended maximum pumping rate of 6.3 L/s.
3. WQ indicated pH of 6.4 was the only parameter outside guideline values. Turbidity exceeded guideline values for post treatment but acceptable for a raw water supply for filtration.

8. South Cowichan Water Plan Study, Worley Parsons, February 11, 2009

1. Compilation of water resource information in South Cowichan
2. Future population projections
3. Policy review
4. Included total mass balance as it relates to potential supply and consumption
5. Primary focus appeared to be groundwater
6. Recommended establishing a baseline water quality monitoring program
7. No water quality information or specific monitoring recommendations were included

9. South Cowichan Water Supply Study, Feb. 13, 2009, Worley Parsons

1. Estimation of current water use, identified a lack of information from major users
2. Characterization of groundwater and surface water resources- identified data limitations in hydrogeology data. Suggests additional data gathering for surface water. Priority is recommended for groundwater information collection.
3. Groundwater vulnerability mapping, MOE undertaking work, this may be complete. Verification is required as to status, information, and recommendations.
4. Surface Water Quality Assessment. Not included in this study but recommended
 - Periodic water quality sampling to establish baseline conditions

- 4 times a year over a 2 year period
 - From key streams, lakes and reservoirs
5. Watershed boundary shown on Figure 11 shows several streams crossing the watershed boundary indicating some errors in the presented data.

10. State of the Environment Report Surface Water Quality in Mill Bay Area, AECOM, February 15, 2010

1. Included collection of recorded and sampling data from streams directly tributary to Mill Bay and Saanich Inlet to south Bamberton.
2. Focus of study was on the types of contaminants that are released by human activities that include agriculture, sewage disposal, and road runoff.
3. Provides baseline of surface water quality in the Mill Bay Area.
4. Identified issues with meeting shellfish harvesting, and drinking water guidelines for total coliform.
5. Concluded that streams are contaminated by sewage effluent, likely from failed septic systems or the over reliance of this type of treatment and disposal.
6. Recommends regular inspection and maintenance of septic systems
7. Recommends implementation of a regional water quality monitoring program for both surface and groundwater.

11. SW Mill Bay – Environmental Overview, AECOM, April 2010

1. Review of ecological aspects of the individual properties near Rat Lake, Handysen Creek watershed, pocket wetlands and several small tributaries and drainage paths.
2. No water quality information included

12. Shawnigan Surface Water Treatment Study, Sept 2010, Genivar

1. Decca Road water treatment facility
 - 1775 population in Shawnigan Lake North
 - Chlorination and distribution
 - Surface source from Shawnigan Lake
2. Review of treatment and supply regulation coupled with options for compliance
3. Water consumption – average 19.4 L/s
4. Results of water testing shown below:

Parameter	Number of Samples	Minimum	Maximum	Median
• Total Coliform (CFU/100 mL)	15	0	320	0.03
• Faecal Coliform (CFU/100 mL)	15	0	15	0
• Non-Coliform Bacteria (CFU/100mL)	14	0	8100	335
• Turbidity (NTU)	8	0.37	1.1	0.53
• pH	8	6.57	7.2	6.85
• UV Transmission (%)	4	74.9	79.7	78.6
• TOC (mg/L)	8	0	4.4	3.55
• Total Trihalomethanes (µg/L)	5	36	86	51
• BDCM (µg/L)	5	0.42	9.8	3.9
• True Colour (TCU)	8	2.83	10	5
• Tannins and Lignins (mg/L)	3	0.021	0.28	0.22

Information from Nearby Areas

13. Water Quality Assessment of Koksilah River at Highway 1 Bridge (1971 – 2003), Environment Canada and BC Ministry of Environment, November 2004

1. 33 years of water quality data collected from 1971 to 2003
2. 19 separate parameters measured

14. Cowichan Basin Water Management Plan, Westland Resource Group Inc., March 2007

1. Collaborative process identifying objectives for planning water supply
2. Identified a process to establish a supply management plan
3. Developed an Implementation strategy for a Water Management Plan
4. Quantity management was emphasized while water quality was not mentioned
5. Outlines the process needed to create and implement a water management plan

15. Ambient Water Quality Assessment And Objectives For The Cowichan And Koksilah Rivers Vancouver Island,

- <http://www.elp.gov.bc.ca/wat/wq/objectives/cowichan/cowichan.html>
- http://www.elp.gov.bc.ca/wat/wq/wq_area_3.html
- <http://www.elp.gov.bc.ca/wat/wq/homesubs/author.html>
- http://www.elp.gov.bc.ca/wat/wq/wq_area_3.html
- <http://www.elp.gov.bc.ca/wat/wq/objectives/cowichan/cowichan.html>
- <http://www.elp.gov.bc.ca/wat/wq/public/wqar.html>
- <http://ilmb.gov.bc.ca/risc/pubs/aquatic/design/index.htm>
- <http://ilmb.gov.bc.ca/risc/pubs/aquatic/interp/index.htm>
- <http://cvrd.bc.ca/DocumentCenterii.aspx?FID=120>