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REPORT TO LYALL HARBOUR/BOOT COVE WATER LOCAL SERVICE COMMITTEE MEETING OF TUESDAY 01 SEPTEMBER 2009

SUBJECT **AERATION OF MONEY LAKE**

PURPOSE

To provide for information to the Lyall Harbour/Boot Cove (LHBC) Water Local Service Committee a report on the potential costs and benefits of aerating Money Lake, as proposed in a letter to the committee by a resident of the service area.

BACKGROUND

The LHBC Water Local Service Committee received an unsolicited letter in August 2009 from Mr. Michael Stewart, which proposes that the service fund the installation of two wind driven aerators on Money Lake (ATTACHMENT 1). The letter proposes that the estimated cost of the equipment of $5,087.50 be funded from the upgrade project budget on the basis that funds are available from the metering portion of the project that was substantially completed below budget. It is proposed to use local volunteer labour to install the equipment. The letter suggests that over time the proposed aerators will reduce the amount of iron present in the water.

Although the Capital Regional District (CRD) does not operate lake aeration equipment for any of its water systems, an aerator is currently operated on St. Mary Lake on Salt Spring Island by the North Salt Spring Waterworks District for the purpose of phosphorus reduction to reduce algae. The St. Mary Lake aerator, which began operation in October 2008, is driven by a 60 horsepower (hp) compressor. Although power specifications for windmill type pond aerators are not typically provided, a typical 20-foot windmill aerator produces 1.5-3 cubic feet per minute (cfm) in ideal wind conditions and operates at a maximum pressure of 30 pounds per square inch (psi). Assuming a windmill produces 3 cfm at 30 psi under ideal wind conditions, the peak power can be calculated to be about 0.25 hp. Daily average horsepower in summer when oxygen demand is highest would likely be less than 0.1 hp. Deploying two such aerators as proposed could reasonably be expected to produce roughly 0.2 hp on average, or about 0.3% of the aeration capacity of the St. Mary Lake aerator.

Money Lake is much smaller than St. Mary Lake (70,000 m^3 versus 15,666,000 m^3, or about 0.5% of the total volume of St. Mary Lake). However, the amount of organic matter (oxygen demand) per unit of volume is significantly greater in Money Lake than in St. Mary Lake. The aerator on St. Mary Lake is designed to meet the oxygen demand in the lake, and early results suggest it is adequate but not oversized. It is anticipated that two typical 20-foot windmill aerators would not produce sufficient oxygen to achieve a similar result on Money Lake.

There is a significant risk that aeration of Money Lake would have adverse impacts on drinking water quality. Although lake aeration has been widely used to improve fish habitat, it is seldom used to improve drinking water quality. Small lakes such as Money Lake are typically well mixed in winter by higher winds and lower surface temperatures, but develop a distinct separation (thermocline) between a warmer, oxygen rich surface layer and a cooler, oxygen poor bottom layer in summer. Aeration can improve the habitat for fish below the thermocline in summer by increasing available oxygen. However, water in the lower level typically contains higher concentrations of nutrients and metals than water above the

thermocline. Aeration would likely cause mixing of the lake in summer, increasing the metal and nutrient concentrations and suspended solids (turbidity) in the surface layer. Adequate aeration may over time reduce the overall levels of some nutrients and metals, but insufficient or marginal aeration would likely result in ongoing deterioration of water quality in the surface layer.

The Lyall Harbour/Boot Cove water system draws water from Money Lake using a variable depth intake structure. The operator adjusts the lake level to minimize turbidity and dissolved iron and manganese levels. Typically, water below the thermocline contains high turbidity and iron and manganese levels above Canadian Drinking Water Quality Guideline limits, but water above the thermocline meets the guidelines. Water at or near the surface can have high turbidity during common summer algae blooms, defining an optimum intake level range between the surface and the thermocline. This operational strategy has avoided the capital and operating cost of an additional water treatment process to reduce iron and manganese. There is a significant risk that aerating Money Lake would eliminate the intake depth range of acceptable source water quality, resulting in the inability of the system to maintain iron and manganese within acceptable limits.

The drinking water treatment system planned for Lyall Harbour/Boot Cove is capable of reliably and cost-effectively producing drinking water that complies with all applicable regulatory requirements. Aeration of Money Lake using two windmills as proposed in the attached letter is not expected to either increase the quality of drinking water or offset any cost of treatment.

ALTERNATIVES

1. That the Lyall Harbour/Boot Cove Water Local Service Committee receive this report for information.

2. That the Lyall Harbour/Boot Cove Water Local Service Committee authorize the expenditure of up to $5,000 from reserve funds for an engineering study of aeration of Money Lake.

3. That the Lyall Harbour/Boot Cove Water Local Service Committee authorize the expenditure of up to $6,000 from reserve funds for procurement of aeration equipment to be installed by volunteers on Money Lake.

FINANCIAL IMPLICATIONS

1. Alternative 1 has no financial implications.

2. Alternative 2 could be funded from available reserves; however, should the committee choose to pursue aeration based on the outcome of an engineering study it is anticipated that funding would be required in addition to available reserves.

3. The capital cost of alternative 3 could be funded from available reserves, although associated operation, maintenance and analysis costs may require a small increase in the operating budget.

Aeration of Money Lake is outside the scope of the capital upgrade project and associated federal/provincial grant contract. It is unlikely that grant funding could be reassigned to this purpose, with the implication that a $6,000 non-grantable expense would reduce the overall project budget by $18,000 by reducing the available funding from the community that is required to match the federal and provincial contributions.

SUMMARY

The LHBC Water Local Service Committee has received an unsolicited letter proposing that the service fund the installation of two wind driven aerators on Money Lake at an estimated cost of $5,087.50, with

the intended purpose of reducing iron in the water. The drinking water treatment system planned for Lyall Harbour / Boot Cove is capable of reliably and cost-effectively producing drinking water that complies with all applicable regulatory requirements. Aeration of Money Lake, as proposed in the attached letter, is not expected to either increase the quality of drinking water or offset any cost of treatment. There is a significant risk that aeration of the lake as proposed would increase nutrient and metal concentrations in drinking water.

RECOMMENDATION

That the Lyall Harbour/Boot Cove Water Local Service Committee receive this report for information.

Colwyn Sunderland, AScT
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