Capital Health Region
Building Partnerships for Better Health

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November 6, 2001

Christopher M. Causton
Chairman of the Board
Capital Regional District
524 Yates Street
PO Box 1000
Victoria, BC
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Dear Chairman Causton:

Re: Senanus Drive Water Quality Issue

In response to your request of May 31, 2001 to review all of the reports on Senanus Drive water quality and to provide a report as to the extent of the health hazard, I have now completed that review. I would like to acknowledge the assistance of Mike van der Linden of the Corporation of the District of Central Saanich for providing materials that were included in this review.

The purpose of this report is to describe the extent of any health hazard associated with the water being drawn in the Senanus Drive area. Moreover, I have had additional samples taken at two points in time since your request to provide a broader perspective on this subject.

The reports I had before me were as follows:

- Assessment and report dated October 27, 2001 by Allan Dakin, P.Eng., of Piteau Associates Engineering Ltd.
- Report dated November 16, 2000 entitled, *Water Quality Assessment of Domestic Wells on Senanus Drive, Central Saanich, BC*, prepared for the Central Saanich West Voters Association by Giles Environmental Engineering.
- 2000 annual summary of raw water quality at Japan Gulch Chloramination Plant prepared by CRD Water.
- Report dated July 21, 1999 to Central Saanich Council prepared by Robert Bradbury, Chief Environmental Health Officer, Capital Health Region Health Protection and Environmental Service regarding Senanus Drive Water Quality Study.
- Report dated June 29, 1999 to Gary Nason, Clerk-Administrator, District of Central Saanich, from Von Bishop, Senior Engineering Technologist, District of Central Saanich regarding Senanus water issue.
- Final Report dated June 14, 1999 to the Municipality of Central Saanich from the Water Advisory Task Force regarding Senanus Drive Water Issues.

- Report dated June 11, 1999 entitled *Senanus Drive Well Water Quality Study*, to the District of Central Saanich from Lowen Hydrogeology Consulting.
- A report dated March 3, 1999 to the Central Saanich Council from Robert Bradbury, Chief Environmental Health Officer, Capital Health Region Health Protection and Environmental Service regarding Senanus Drive water quality.

For the purpose of my analysis the quality of water provided by the CRD Water Department for the majority of residents in the CRD was used as a benchmark. The additional samples were generated from wells in the Senanus Drive area.

As with previous assessments, the parameters discussed are listed in the Guidelines for Canadian Drinking Water Quality (6th Edition).

The following is a parameter by parameter discussion of the significant constituents in the Senanus Drive area that exceed the Guidelines for Canadian Drinking Water Quality.

Aluminum: Aluminum concentrations have from time-to-time exceeded the guideline of 0.2 mg/L. This is not a consistent finding across properties and time of year. While aluminum is not deemed a serious risk to the public's health, the role of elevated aluminum levels have been of a concern in the etiology of dementia in the elderly.

Copper: The copper concentrations generally were below the health element of 1 mg/L. Exceedances observed likely originated from within the households and could not be attributed back to the water source. Subsequent testing of tap water supports this assumption. Copper is an essential element for human health. Certain pre-existing medical conditions are associated with abnormal deposition in metabolism of copper. Addressing such unique circumstances would fall out of the domain of an assessment of a general health risk.

Chromium: On one occasion, September 18, 1996, six water samples exceeded the accepted health limit of 0.05 mg/L. There have been no further samples demonstrating exceedences of this limit. For the purpose of this report, the data on this one occurrence will be considered an artifact. Elevated chromium levels, had they been a documented feature of this water supply, would have been cause for health concerns.

Iron: Iron concentrations generally did not exceed the accepted health limit of 0.3 mg/L. Nevertheless, one sample tested at ten times the accepted element for aesthetic quality. Iron does impart a bittersweet stringent taste to the water and promotes bacterial activity within plumbing fixtures. The major issue with the iron levels observed over time is one of aesthetics in the potability of water rather than posing a health hazard.

Lead: The lead concentrations were within the Guidelines for Canadian Drinking Water Quality with one exception. No additional testing was performed on this well.

Manganese: Manganese concentrations often exceeded the aesthetic limit of 0.05 mg/L. Many of the wells consistently demonstrated levels above those outlined in the Guidelines for Canadian Drinking Water Quality. This mineral is commonly found in the ground throughout British Columbia and under certain conditions does dissolve in groundwater. Manganese imparts an almost unpalatable taste, especially at concentrations above 0.2 mg/L. The generally accepted upper limit for water aesthetics is 0.05 mg/L, a level frequently exceeded in the study area. Moreover, manganese does, like iron, promote bacterial growth in plumbing lines and fixtures.

Based on the levels of aluminum, iron and manganese being in the upper limits of the respective guideline parameters, it is probable that conditions within the household plumbing promotes the leaching of lead in the solder in copper pipe joints. While many serious health affects have been associated with lead, this metal does not appear to be present in sufficient amounts to pose a significant risk to health.

Zinc: Zinc concentrations have on a couple of occasions exceeded the health limit of 5 mg/L. This has not been a consistent elevation over time. It has been suggested that the source of this element is likely the water supply system from the house plumbing rather than from the groundwater. Given the source of the zinc, it will not be considered within the scope of the health hazard assessment of the local water.

Sodium: The sodium concentrations had a broad range and the average of samples exceeded the water quality guideline of 200 mg/L. The human body does require sodium for normal functioning, however in a typical diet only 10% of the total sodium intake comes from drinking water. On an average day, this would mean that approximately 20 mg/L of sodium would come from the drinking water. In the summer months, almost all the premises sampled would have a water supply that would exceed this expectation. Nevertheless, in healthy individuals the kidneys are quite capable of excreting excess sodium intake. However, elevated sodium levels in drinking water could adversely affect individuals with cardiac, renal and circulatory problems. A routine component of medical management of these conditions includes placing restrictions on sodium intake, which would preclude consumption of Senanus Drive drinking water by those so affected. As well, at over 200 mg/L the tolerance for consumption of such salty water is limited.

Chloride: The chloride concentrations ranged widely and was somewhat influenced by the season in which the samples were drawn. A significant number of samples exceeded the water quality guideline of 250 mg/L. However, there are no adverse human health effects documented as a result of high concentrations of chloride. The higher levels do affect the taste of the water, and at higher levels rendering it difficult, if not impossible, to drink.

The source of this chloride has been suggested as originating from salt water intrusion in the late summer and early fall. In addition, it has been suggested there may a highly mineralized body of water below the "cap" of fresh water which is regenerated annually with winter rains. Regardless of the explanation as to source, there does appear to be an emerging cyclical trend to the presence of chlorides in the groundwater.

Total Dissolved Solids: Total dissolved solids measure the amount of dissolved salts in water, using a range that includes fresh water, slightly saline water and moderately saline water. A significant proportion of the samples generated had total dissolved solid concentrations that exceeded the water quality guideline of 500 mg/L and this would certainly influence the acceptability of this source of water for consumption. The issue remains one of aesthetics rather than risk to human health.

Water Quantity: A number of the properties in the area of interest are seasonally occupied by non-residents. Draw down on the aquifer is likely most intense during the summer and early fall, a time associated with poor water quality less likely to meet the Guidelines for Canadian Drinking Water Quality for a variety of aesthetic parameters.

Water Treatment Devices: Water treatment devices, while highly effective, are obliged to require a significant amount of water to achieve production of potable and palatable water for household purposes. These improvements must be achieved without introducing a potential hazard to health, such as the elevated sodium levels that can be associated with some treatment processes.

Conclusions:

1. During the summer and late fall period, many wells in the Senanus Drive area pump water that does not meet the Guidelines for Canadian Drinking Water Quality for a range of aesthetic parameters.

2. Many of the parameters that did not meet the drinking water guidelines are taste and colour related aesthetic parameters, including hardness, chloride, iron and manganese. Of these, many samples had concentrations that were well above the established Guidelines.

3. Sodium levels were of significant elevation and frequency to warrant alerting any residents who are on severe and moderately restricted sodium diets not to consume local waters. Sodium concentrations were almost routinely above the 200 mg/L drinking water guideline level in the summer and fall periods.

4. While some water samples had sporadically elevated concentrations of metals such as copper, chromium, lead and zinc, most were only just above the current drinking water guideline and not routinely found in subsequent sampling. Other sources could account for the observed levels.

5. Given the poor aesthetic quality of the drinking water, water treatment units would be required to enable individuals to consume the average recommended amounts of water per day suggested by Health Canada and other authorities. The capital and operating costs of these units, as well as their potential benefits, were not considered as part of this review. An integrated approach of the various technologies would be required to ensure not only a potable water supply, but a water supply that meets the Guidelines for Canadian Drinking Water Quality, such as that achieved by the CRD Water Department.

6. In recognizing that technologies could be employed to make the water palatable, consideration must be given as to what increased demands would be placed upon the existing supply. It was beyond the scope of this review, but it would have to be established whether wells which are already of low yield, would have the ability to pump the extra water to operate these systems. The technology solutions would not be viable if they in fact exacerbated the existing situation in causing even less water of poorer quality to be available to the residents of this area.

Yours sincerely,

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Medical Health Officer and Director of Research

copy to: Directors, W. Jordan, M. Williams, J. Ha