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A Review of the Report:

Okanagan Reservoir Lake Project

Prepared by
Lakeshore Environmental Ltd
December 2003

February, 2004

Foreword

The above referenced report was narrowly distributed December 19, 2003. Land and Water B.C. announced at that time a meeting would be held to discuss the report with the author on January 6, 2004. LAWBC were unable to explain why so few of those who had taken an active interest in the proposed sale of crown lease lands on drinking water reservoirs were provided with the report and advised of the meeting.

The Water Supply Association contacted its directors and a number of interested parties to inform of both the availability of the report and the subsequent meeting. Most of those contacted had not received a copy of the report nor were they aware of the meeting. In addition to the poor distribution of this information by LAWBC, the opportunity to obtain and review the report prior to the meeting on January 6 was hindered considerably by the holiday season.

Despite this late notice, the January 6, 2004 meeting was well attended by many directors from the WSABC and officials from the Regional District of Central Okanagan. Significantly, the Medical Health Officer from the Interior Health Authority, Dr. Bill Moorehead also attended, as did the MLA from Kelowna-Lake Country, John Weisbeck. All who attended the meeting were opposed to the sale of crown leases on drinking water reservoirs, except for LAWBC officials and the author of the report.

The purpose of the meeting was to review the above referenced report. Unfortunately, most in attendance had not had the opportunity to read the report because of the problems mentioned above. A critique of the report had been prepared by the WSA and a number of questions were posed to the author of the report. It quickly became evident that in addition to the many questionable assertions of the report, there were also a number of factual errors. LAWBC acknowledged that these factual errors warranted revision of what to that point had been considered the final report.

The decision was made at the meeting that LAWBC would accept written submissions on the report until mid-February 2004. This review is provided for that purpose. This review also assumes the author of the report will practice due diligence and correct basic errors such as incorrect place names, spelling errors, incorrect organization names and factual errors on issues such as water licensing.

Copies of the *Okanagan Reservoir Lake Project* report can be obtained from the WSA website at www.wsabc.com or from the website of the South East Kelowna Irrigation District at www.sekid.ca. Also available on both these sites are copies of a June 2002 position paper on the association's view towards the proposed sale of crown leases.

The following reviews of the report were provided independently by two authors. They are presented as Part 1 and Part 2. The reviews are used by permission of the authors and have been reviewed and endorsed by the board of directors of the WSABC.

Part 1 was written by Jake Thiessen. Mr. Thiessen is a councilor for the District of Lake Country and his review was originally presented to the Lake Country Municipal Council in January of 2004. Lake Country is a member of the WSABC and has taken a lead role in opposition to the crown lease sale proposal. Mr. Thiessen is a professional engineer

Part 2 was written by Mike Stamhuis. It was originally presented as a letter to Land and Water B.C. and has undergone some revision for inclusion with this submission. Mr. Stamhuis is also a professional engineer. He holds the position of General Manager of Community and Infrastructure Services with the North Okanagan Regional District and is a director with the WSABC.

It should be noted that all local authorities affected by the proposal to sell crown leases on drinking water reservoirs are opposed to this initiative. This opposition is rooted not only in the technical arguments about water quality and supply, but also in the broader long range public policy issues dealing with land use planning and source water management and protection. It is the general view of the WSABC that the sale of these lots is counter to the preservation and safety of the public water supply and counter to the dictates of sound public policy towards the stewardship of our drinking water resources.

Part 1:

District of Lake Country

Review of a report entitled Okanagan Reservoir Lake Project

Prepared by Lakeshore Environmental Ltd.

For Land and Water B.C. Inc.

December, 2003

The District of Lake Country received the Okanagan Reservoir Lake Project report on December 19, 2003. The report is somewhat unusual in that no author(s) are named other than the firm of Lakeshore Environmental Inc.

This review will look at the terms of reference for the study and review the methods, results, conclusions and recommendations of the study. Where the study focuses on specific areas this review will be primarily concerned with the reservoirs that form part of the water supply system for the District of Lake Country.

Objectives and Terms of Reference

The terms of reference and objectives of the study were obtained from Land and Water B.C., Southern Interior Region in Kamloops. The stated objective is to determine the potential impacts, risks and mitigation strategies of the proposed sale of existing recreational and commercial leases on the water quality of 16 Okanagan Reservoir Lakes and to recommend mitigation measures. The purpose of the study was to review the possible sale of the leased lots in an objective and comprehensive manner to determine any potential impacts (positive and negative) that the sale of the leases may have. In reviewing the report provided by Lakeshore Environmental Inc. it is obvious that the purpose and objectives of the study have not been addressed.

Some of the most serious shortcomings are:

1. The literature review section is basically a cut and paste copy of another report entitled Cariboo Regional District /Lakeshore Management Policy Review, dated April, 2003 by Lakeshore Environmental Ltd. Some very significant sections of the Cariboo report have been omitted, notably the standards for lakeshore lots in other jurisdictions. If the same standards were applied to the Okanagan lakeshore lots most of them would fail to meet the standards.

2. A summary of other resources that rely on water quality or quantity from these lakes (i.e. fisheries resources) was to be provided. This summary is not in the report.
3. The terms of reference call for a significant amount of water quality data, including historical records, baseline water quality and samples taken at various times and locations. Water quality samples were only collected three times at monthly intervals in 2003. The report does not present any other relevant data.
4. The report was to provide a methodology that will determine the nature and extent of any contamination related to the use of the Crown leases together with any mitigation strategies. No such methodology or mitigation strategies can be found in the report.
5. The report was to identify both the positive and negative impacts of the sale of leased properties on the water quality of the lakes. No impacts are identified.
6. The report was to provide suggestions for available mitigation measures including restrictive covenants and no build areas. These are not mentioned.
7. There was to be a review of individual leases to determine if they meet health standards and if they do not, identify measures that can be taken to comply. Visual inspections simply determined that most properties have pit toilets and no running water.
8. The contractor was to provide a separate cost estimate and methodology to address which lakes may be considered for increased storage capacity and what impacts the increased storage would have to the existing Crown leases and future land use. There is no mention in the report of increased reservoir storage.

It is noted that Land and Water B.C. budgeted $50,000 for this contract. In view of the serious shortcomings of the report one can only hope that the B.C. taxpayers did not pay the entire budgeted amount for the study.

2.1 Literature review

The report mentions that numerous studies were completed through Forest Renewal B.C. on such subjects as terrain and channel stability in selected community watersheds in the Okanagan region. It is not clear as to whether the FRBC studies were actually reviewed by the consultant since they are not listed under Section 8.0 References Cited or under selected references in Appendix V.

2.3 Lease Site Investigations

According to the report a large portion of the study consisted of field investigations of all 141 lots. If these investigations were in fact carried out one would expect to see some data on the results of the field investigations. The general statements made in the report leave a lot of unanswered questions:

- What were the distances of properties from water bodies and what is considered to be a safe distance?

- What are the slopes on which these properties are located?
- What is meant by general assessment of soil? Were any soil samples taken and analyzed?
- What was the relationship between waste disposal and depth to groundwater?
- What was found in regards to existing systems relative to Interior Health Requirements?
- What are the present uses of property and the waste disposal methods for each property?

In view of the serious shortcomings in information provided the reader is left with the impression that the field investigations consisted of nothing more than windshield observations with no real measurements taken or data acquired.

2.4 Water Quality Monitoring

This section begins by stating that the ability to assess the impact of individual residential properties on existing lake water quality using normal sampling methodologies is limited. What follows is a discussion on studies and methods that have been used by others and which have proven to be expensive and inconclusive. The consultant then expresses the opinion that water quality sampling of headwater lakes and watersheds would be useful to indicate existing water quality for use in future trend analysis. Trend analyses are long term by definition and require a significant amount of future data. It is not apparent as to how the limited water quality sampling done in 2003 can be used to determine the feasibility of using conventional septic system setbacks or the need for more stringent requirements.

The report seems to be based on the premise that the existing properties are not impacting the water quality in the lakes. This is not a reasonable assumption. What is known is that human waste is being deposited on the surface or in shallow pits in close proximity to reservoirs that are primarily used for downstream water supplies including potable drinking water. A more reasonable assumption would be that both surface runoff and groundwater move from the properties towards the lakes and carry some of the contaminants into the lakes. The objective should be to minimize human and domestic animal activities next to the reservoirs where these activities have a negative impact on water quality.

3.1 Existing Health Standards

This section presents a strong condemnation of the current system of individual home sewage disposal system regulations and approvals. It makes the case that the Health Act does not take into account the potential for sewage disposal systems to cause pollution of adjacent waters. Essentially, as long as the system operates efficiently and effluent does not surface, the Environmental Health Officer has no authority to consider other pollution effects. If what is stated in this section is true, and there is no reason to doubt it's validity,

there is a very strong case for not allowing any sewage disposal systems adjacent to drinking water reservoirs.

3.2 New On-Site Treatment Methodologies

It is stated that there are several new alternate disposal systems available for use where conventional systems are not allowed nor are feasible. Curiously, the first of these alternate systems described is the mound system which is not new at all since it has been used in the prairie provinces for at least 50 years due to the difficulty of disposing of liquids through conventional septic fields in impervious glacial till soils.

The discussion on alternate systems is pointless since the report does not identify that any of these alternate types of systems exist in the study area. Further, there is no basis for the conclusion that the alternate systems described produce a much better quality effluent than the standard septic tank.

3.3 Lakeshore Guidelines

In this section there is considerable discussion on lakeshore management guidelines that have been developed in a number of different jurisdictions. Within B.C. the areas discussed include the Regional District of Fraser Fort George, Peace River Regional District, Thompson Nicola Regional District and Lake Windermere. Out of province jurisdictions include the State of Wisconsin, the State of Minnesota and the Province of Ontario.

The discussion is mainly a cut and paste copy of the April, 2003 report by Lakeshore Environmental Ltd. entitled Cariboo Regional District/Lakeshore Management Policy Review. What is of serious concern however is that the standards for lakeshore lots in other jurisdictions were deleted from the Okanagan report. Many of the lots in this region would not meet the standards required by other jurisdictions. For example, in the State of Minnesota the standards for sewered lakeshore lots call for minimum lot sizes of from 15,000 to 40,00 square feet (0.14 to 0.36 ha). For unsewered lots the standard increases to 20,000 to 80,000 square feet (0.18 to 0.73 ha). The Okanagan report identifies numerous lakeshore lots that are as small as 0.07 ha. In spite of this, the statement is repeatedly made that there is no problem either with the existing lots or in meeting standards for future septic systems if they are required.

In spite of the false impressions created by the omission of standards there are several points that can be gleaned from this discussion:

- Most jurisdictions seek to regulate land use within 300 metres of a lake
- There is an effort to control the density of development
- There is a need to create a protective buffer of vegetation along public waterways
- Minimize disturbances to water resources
- Minimize the impact on the environment

- Parcels must be large enough to support on-site septic disposal systems
- Preservation of water quality is paramount
- Protection of foreshore is important
- Sewage disposal setbacks are prescribed
- Site factors (soils, slopes etc.) are important evaluation criteria
- Recognition that lakes have a limited carrying capacity

One of the most important points is that management attention is needed in addition to guidelines to protect lakes. This is in recognition of the wide gap between recommended guidelines and achieving protection through effective enforcement.

3.4 Okanagan Lakeshore Zoning

Key points of this section are:

- The Okanagan-Similkameen Regional District does not have specific lakeshore development guidelines
- The Central Okanagan Regional District has a specific Foreshore Development Plan for Okanagan Lake
- CORD has no specific foreshore development plans for the remainder of the lakes within the district
- The Okanagan Shuswap Land Resource Management Plan provides direction for the management of Crown land and resources
- The OSLRMP recognizes the value of riparian management and it's implications to the various water resources
- A summary of the OSLRMP is included in Appendix 1. A number of the objectives and strategies included in the plan cover a wide range of issues from riparian integrity to considering public and local government input. A number of these may be directly related to the proposal to dispose of Crown leased lots on the reservoir lakes.

4.1 Lease Site Investigations (District of Lake Country)

With respect to Dee Lake the statement is made that the present impact on the water quality from the Dee Lake Wilderness Resort is limited to silt runoff around the boat launch site and from the construction of the new cabins. The report concludes that proper operation of this resort should not impact the quality of Dee Lake and the outlet channel. There is no data or rationale presented to support these statements.

Crooked Lake is said to have 15 recreational leases all with areas of 0.12 ha located approximately 30-45 m from the high water mark of the lake. It is stated that all of these properties have outhouses and appear to have no grey or black water discharges. Then, the surprising assessment is made that there are presently minimal impacts to water quality from these properties. The reader is left to wonder how anyone can come to such

a conclusion without any soils, topography or water quality data to support it. It must also be remembered that in Section 3.3 the statement is made that most jurisdictions seek to regulate land use within 300 metres of a lake.

Another assessment that boggles the mind is the one that states that there is ample area on these properties to site future septic systems if that requirement becomes necessary. This is in contravention of minimum standards enforced by most jurisdictions. The District of Lake Country Official Community Plan requires a minimum lot size of 1.0 ha where septic fields are used for sewage disposal.

Swalwell or Beaver Lake has 22 recreational leases ranging in size from 0.07 to 0.23 ha in size. There is also one commercial lease encompassing 7.8 ha. Similar comments and conclusions are arrived at for the properties on Swalwell Lake as for the upstream lakes. Again there is no evidence or data to support the statement that there is presently no impact to lake water quality from these residences. The writer seems to be more impressed with the state of riparian vegetation than with what might happen to human waste discharges into surface runoff and groundwater near the lake and how these discharges will impact water quality.

Beaver Lake Resort has approximately 16 cabins, a lodge, a store and extensive campground. It is stated that there are little or no impacts from the services at the resort because of properly sited and permitted septic systems and retention of riparian areas. This statement is in contradiction of Section 3.1 where it was stated that permitting of septic systems under the Health Act does not take into account the potential for a system to cause pollution to adjacent waters.

There are 13 recreational leases on Oyama Lake and one commercial lease. The lot sizes range from 0.07 to 0.12 ha in size. As with the other lakes the conclusion is drawn that the existing leases have minimal impacts on water quality. There is no basis for this conclusion other than the visual inspections.

4.2 Water Quality

Water quality samples were collected three times on a monthly basis at the inlets and outlets of each of the study lakes. At Oyama Lake fecal coliform concentrations ranged from 8CFU/100mL to 190CFU/100mL in September. Total nitrogen concentration was 0.35mg/L and the concentration of total phosphorus was 0.029 mg/L. For the Dee Lake / Crooked Lake / Swalwell Lake chain fecal coliform concentrations ranged from below detectable limits to 9 CFU/100mL at the Crooked Lake outlet in July. Total nitrogen concentrations ranged from 0.35 to 0.62 mg/L and total phosphorus was reported to range from 0.005 to 0.021 mg/L. There is no comment on how these readings compare with Canada Safe Drinking Water Guidelines or what the source of contaminants might be.

Table 2 classifies Oyama Lake as being mesotrophic (0.01 – 0.02mg/L of total phosphorus). The Dee Lake, Crooked Lake and Swalwell Lake chain are all classified as meso-eutrophic (0.02 – 0.035 mg/L of total phosphorus). The source of phosphorus content has not been explained however the comment is made that all of these lakes can be considered tolerable for both drinking water and fisheries uses.

4.3 Watershed Impacts

The Vernon Creek Watershed is designated as a "Community Watershed" under the Forest Practices Code. This means that protection of water quality for drinking water purposes should be paramount. Nevertheless widespread uses for grazing, logging and recreational use are still prevalent in the watershed. It is not clear from data submitted in the report as to which of the uses has the greatest impact on water quality.

The report states that generally speaking, water quality in the lower part of the Vernon Creek watershed was poorer than the upper area and impacts occurred below Swalwell Lake. Fecal bacteria concentrations increased downstream after runoff events and when cattle were observed in the vicinity when sampling indicated overland runoff of fecal material. There was evidence that increase in phosphorus levels was a result of cattle waste or runoff from nutrient rich soils.

While the comments with respect to Vernon Creek below Swalwell Lake may be true these comments do not explain the contaminants that were found in the lakes upstream of Vernon Creek as reported in Section 4.2 on Water Quality.

5.0 Discussion

Most of the preamble is taken up with a general discussion of the various watershed land use impacts on water quality. There is no disagreement with most of the preamble until the generalized statement is made that human pathogens have not been the major problem in lake studies, although the possibility still exists. Firstly, there is no evidence presented to support this statement and secondly, if the possibility still exists then the report should be recommending steps to minimize human waste generating activities in watersheds that are a primary source of drinking water.

According to the authors the main reason for this study was to determine whether the existing leased lakeshore lots were having an impact on water quality. They then proceed to tell us that it is very difficult if not impossible to definitively link changes in water quality to those lots. It was therefore decided that the best way to determine the impact of the existing leases on water quality was to individually assess each property to determine potential impact. No soil test data, depth to bedrock, presence of highly permeable subsurface layers or steepness of slopes was given. The reader is therefore left with the impression that what really occurred was a casual visual observance of the properties

with no measurements taken and no data recorded. This can hardly be described as a scientific basis for reaching the conclusions that are listed in Section 6.0.

The property site investigations showed that most of the cottages are serviced by outhouses and have no running water. What is not clear is how these observations could lead the authors to conclude that the properties are having little or no impact on the water quality of the lakes. Outhouses usually discharge untreated human wastes directly to an unlined open pit. If this pit is located in permeable soils in near proximity to the water table it is highly probable that there will also be a direct link to the lake. This is a more likely source of contamination than the normal septic tank and disposal field system. Similarly, the situation of no running water does not mean that waste and contaminants are not getting into the lake. People still wash dishes, clothes and bodies even though the water has to be transported from the lake or a nearby well. The wastewater is then either dumped in the outhouse or disposed of on the ground surface. Either way, there is a potential for contaminants entering the lake.

The report also states that in the vast majority of cases, there was ample property available to meet Interior Health standards for the construction of septic systems. Given the small lot sizes described in Section 4.1 this statement is unsupportable.

The report expresses a concern about the large number of campers using unregulated camping areas with no services resulting in human wastes being left near lakes and streams. It is also felt that a decrease in services at Forestry Recreation sites or closure of these sites will present a major potential impact to water quality of streams and lakes in these watersheds. The downstream water users are concerned not only with unregulated camping but also with all human activities in the watersheds that are the source of their drinking water. These human activities must be closely regulated and their impacts minimized. Regulation will be more difficult if lease holders become property owners.

6.0 Conclusions

- On-site inspections of lease properties and the way that these inspections were done cannot support the conclusion that the properties are having little or no impact on water quality in the reservoirs
- There is no evidence to support the statement that the majority of properties have sufficient area to site conventional septic systems if required in the future.

7.0 Recommendations

All of the recommendations seem to be based on the premise that a decision will be made to sell the leased properties. The recommendation should have been made to not sell the lots thereby retaining a greater level of control over what happens on the properties.

It is curious that one of the recommendations is that dry wells for effluent treatment be not allowed on lakeshore properties. Throughout the report there are statements to the effect that existing outhouses do not have a negative impact on water quality. What then, is the difference between a dry well and an open pit outhouse?

District of Lake Country Summary and Conclusions

- The report prepared by Lakeshore Environmental does not meet the objectives and purpose of the study as called for in B.C. Land and Water's terms of reference.
- There are serious omissions of standards from other jurisdictions provided in the literature review section. Existing lots would fail to meet these standards if they were applied to the Okanagan reservoirs.
- The water quality samples taken are virtually worthless in determining impacts from existing lease lots.
- There is no soils, topography or other pertinent data provided.
- The report did not identify the potential impacts of the sale of leased properties on water quality of the reservoirs.
- The report does not provide suggestions on available mitigation measures.
- There is no mention of future potential for increased storage in the reservoirs.

In view of the serious shortcomings of this report the District of Lake Country strongly recommends that Land and Water B.C. take no action to sell the lease lots. Sale of the lots would result in further loss of control of the use of these properties and the potential negative impacts that this would have on water quality. This control is critical since the lots are located on the source of drinking water of many downstream residents.

As a purveyor of water the District of Lake Country is held responsible for providing safe drinking water to the water users. It is unfathomable to contemplate how one arm of the Government of B.C. can hold a local authority responsible for safe drinking water while another arm of the same government takes a rather blasé approach to maintaining control over land use on the perimeter of reservoirs that have been created solely for the purpose of water supply. Future demands for water will require that these reservoirs be expanded which will become much more difficult if the lease lots are sold.

Part 2

Excerpt from Letter to Land and Water B.C. Inc.

1) In Sections 3.3.5. and 3.3.6. of the report, the consultants make reference to the work done in Wisconsin and Minnesota. The consultants have copied verbatim sections 3.1.5. and 3.1.6. from their April 2003 report to the Cariboo Regional District entitled "Lakeshore Management Policy Review". However, in each of these sections they have deleted the paragraphs outlining actual lot size standards for these states. The omitted paragraphs indicate standards that would NOT be met by the vast majority of the lots proposed for sale. For some reason the consultants fail to mention this fact in their report.

2) In Sections 3.4.1. and 3.4.2. the consultants discuss the policies of the Okanagan-Similkameen Regional District and the Central Okanagan Regional District with respect to land use around lakes. Omitted in any part of the discussion is the fact that both Regional Districts have passed resolutions opposing the proposed sale of leased lots. As with the discussion regarding the two states, any discussion around policy not mentioning this must be considered as a serious misrepresentation of the facts.

3) In Section 4.1. of the report the consultants discuss the various lakes (reservoirs) and the lots proposed for sale thereon. Typical lot sizes tend to be around 0.12 hectare with some lots as small as 0.07 hectare. There are repeated references to these lots having "ample area for future septic systems." This is interesting because in their report to the Cariboo Regional District, Lakeshore Management recommend "...as a minimum standard for all lakes in the District: ...i.v. continue the Lakeshore Residential zoning minimum parcel size of 0.4 ha (1 acre) and establish a minimum lot width of 45.7m (150 feet) for all lakeshore property within the Regional District." The majority of the lots proposed for sale would not conform to this recommendation from the consultants.

4) In the same section of their report to the Cariboo Regional District, the consultants also make the following recommendation: "... iii) Ensure that buffer leave strips are required on all new developments within .... 250m of a high sensitivity lake to protect water quality and shoreline habitat. A buffer strip of 15 metres is recommended ...." For some reason, this recommendation is conspicuously absent from any recommendations listed by the same consultant in Section 7 of the Report.

5) In Section 4.1.1. the Report makes reference to Lots 1685 and 1733 on Swalwell Lake as follows: "Lots 1685 and 1733 are more developed and appear to be serviced by septic systems. These properties have poor riparians that have been cleared resulting in siltation problems. Improvements are needed to the riparian areas to alleviate impacts to water quality." Here is direct evidence of more development impacting water quality yet the consultant somehow fails to make the simple connection that fee simple ownership of property will encourage development. This is in spite of the fact that, in Section 9.0 of their report to the Cariboo Regional District, the consultants identify Horse Lake as having 88.2% of total residences classified as permanent, and a reference to another report as follows: "Horse Lake has had a detailed assessment of water quality (Zirnhelt et al, 1997). The report concluded that phosphorus levels may be increasing in Horse Lake....."

6) In Section 3.1. of the Report, the consultants repeat verbatim the first three paragraphs of Sections 5.1. of their report to the Cariboo Regional District. What is of concern is the remaining 1½ pages of discussion in the Cariboo Regional District report that the consultants have omitted from this Report. These 1½ pages largely discuss the shortcomings of septic systems and their management, to protect water quality. Given that the discussion of the Report suggests reliance on "Standard Health Branch Inspections" the absence of this section is telling.

7) In Section 3.5. of the Report, reference is made to the OSLRMP guidelines and a list of "objectives and strategies that may be related ..." The list is in Appendix 1 and is nine pages long. I have been advised by members of the LRMP Implementation Monitoring Committee that these nine pages list strategies and objectives that appear to be **in conflict** with the proposal. It is interesting to note that in the Text Section 3.5. the statement is made: "However, it is considered important that the listed strategies be reviewed prior to final decisions made on disposition of the leases." Strangely, this is absent from the Report's recommendations.

8) In Section 5.2.2. a table shows that the vast majority of the lakes already suffer from some eutrophication, being either mesotrophic of meso-eutrophic. Given that the consultants had a demonstrated awareness of the inadequacy of Health Regulations to protect water quality (Cariboo Regional District Report April 2003) and that they recognize in this section the potential of eutrophication to damage water quality, I cannot understand why they do not strongly recommend against the sale of the majority of the affected lots.

9) In their conclusions, the consultants state, "it appears, based on observation and published reports, that other activities in the watershed

have a much greater chance of impacting water quality in the watersheds." This statement shows clear bias in two ways. First, in Section 4.3. the consultants attempt to make the case that activities other than human are the main detriments to water quality. Percentages of ecoli generation are provided for humans alone at 7.8% and 15% respectively on Kelowna and Mission Creeks. Somehow the consultants have failed to consider domestic animals as a direct relation to human activity and the fact that their combined contributions are 26% and 28% respectively. This is hardly insignificant. Second, this conclusion carried with it the implication that we should not be concerned about human impact as other quality impacts are worse implies a cavalier attitude towards the issue in general.