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Dear Dr. Corneil, Brian Gregory and Gordon Mosely:

Re: Request that the Drinking Water Officer issue a Drinking Water Hazard Abatement and Prevention Order regarding the contamination of unconfined Hullcar aquifer #103, pursuant to section 25 of the *Drinking Water Protection Act*.

On behalf of the Save Hullcar Aquifer Team[1], we hereby request that you issue a Drinking Water Hazard Abatement and Prevention Order to address nitrate contamination in unconfined Hullcar aquifer #103 ("the Hullcar Aquifer"), an important source of public drinking water. Specifically, we request that you order a complete and permanent moratorium on the application of liquid manure effluent on a 210 acre field owned by HS Jansen and Sons Farm Ltd. ("the field of concern")[2], a probable source of the contamination.

[1] Including Al and Cathie Price.

[2] As identified in Compliance Order 76600-20 Armstrong (See Appendix C)

Attached are letters that support the issuance of a drinking water protection order from the following organizations:

- Steele Springs Waterworks District
- Township of Spallumcheen
- Shuswap Environmental Action Society

In addition, the attached letter from the City of Armstrong states it is not in a position to advocate a particular action -- but that the City "support[s] strongly the need for the Province to address this urgent situation immediately." Similarly, the attached letter of concern from the BC Groundwater Association states: "We ask that regulatory officials make it an immediate priority to carefully consider the Order request and take further action to remedy this situation."[3]

You clearly have the jurisdiction to issue such an order. Section 25 (1)(a) of the *Drinking Water Protection Act* ("the Act") authorizes you to issue an order if you have:

> *"…reason to believe that (a) a drinking water health hazard exists or (b) there is a significant risk of an imminent drinking water health hazard."*[4]

As this letter will detail, there can be no doubt that the present circumstances amount to a drinking water health hazard. The nitrate levels in Steele Springs, which draw from the Hullcar aquifer to supply drinking water to approximately 150 people served by the Steele Springs Waterworks District, have measured near or above the maximum allowable limit set in the Guidelines for Canadian Drinking Water Quality since March 14th, 2014.[5] In addition, there are 46 known water wells within the same Hullcar aquifer.[6] While a comprehensive assessment of nitrate levels throughout the aquifer has yet to be completed, measurements conducted by the Steele Springs Waterworks District have shown that several private wells drawing from the aquifer have nitrate levels

[3] See Appendix M for the letters identified. Note that the letter of concern from the BC Groundwater Association abstained from advocating for a particular course of action against a particular individual at this time.
[4] Section 25 (1) reads: "A drinking water officer may make an order under this section if the drinking water officer has reason to believe that (a) a drinking water health hazard exists, or (b) there is a significant risk of an imminent drinking water health hazard.
[5] See Appendix A.
[6] Golder Associates Ltd, *Groundwater Potential Evaluation for the Hullcar Area*, Township of Spallumcheen, BC. 2006 at pg 5 ("the Golder Report") Online: <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=16678>

measuring near the maximum nitrate limit considered safe.[7] In total approximately 250 people draw water from this aquifer which is tainted with nitrates.[8]

The public health risks of drinking water high in nitrates are well-known and fully documented in scientific literature. High nitrate levels in drinking water are associated with potentially fatal "blue baby" syndrome, cancer, thyroid dysfunction, and impacts on those with compromised immune systems.[9] The health risks of nitrates have been explicitly recognized by Interior Health, which issued a Water Quality Advisory for residents who may draw water from the Hullcar Aquifer.[10] The Water Quality Advisory has remained in place for nearly two years, impacting hundreds of residents in the Hullcar Valley.[11]

You clearly have jurisdiction to address this health hazard by ordering a moratorium on the application of liquid manure effluent onto the field of concern.

Under s. 25 (3)(d) of the Act, an order may require the person to whom it is directed to:

> *(d)"…do or cease to do any other thing, if this is reasonably necessary to control, abate, stop, remedy or prevent the drinking water health hazard…"* [12]

[7] See Appendix B. Note that according to Steele Springs Waterworks District data, there are 3 private domestic wells serving 6 homes (about 14 people) near the SSWD source that have high nitrate levels. Two of these wells have been tested monthly by the Minstry of Environment, so that MoE have their own data but have not released this government data to the Waterworks District. Three other wells (irrigation) near the SSWD source also have high nitrate levels. All of these 6 wells draw from Aquifer # 103. (Personal communication, Brian Upper, Steele Springs Waterworks District, January 8, 2016).

[8] Steele Springs Waterworks District provides drinking water to 53 households, including about 150 people. See Appendix C. According to the Golder Report (above), 46 private wells draw from the Hullcar aquifer. In total, Brian Upper of Steele Springs Waterworks District estimates over 250 residents depend upon the aquifer for their water supply. (Personal communication, Brian Upper, January 8, 2016.)

[9] See Part 2 for more details

[10] Corneil, Trevor MD. "Water Quality Advisory for Residents Who May Draw Water from the Hullcar Aquifer in Spallumcheen." Letter to Current Residents. 14 July 2013. Kelowna Health Unit, Kelowna British Columbia, (see: Appendix J)

[11] Approximately 150 Steele Spring users and 46 private wells draw from the Hullcar aquifer (see above).

[12] Section 25 (3) reads: The order must be served on the person to whom it is directed and may require that person, at the person's own expense, to do one or more of the following: (d) acquire, construct or carry out any works or do or cease to do any other thing, if this is reasonably necessary to control, abate, stop, remedy or prevent the drinking water health hazard…

This letter will demonstrate that an order to stop all applications of effluent to the field of concern is "reasonably necessary" to *abate* and *remedy* the current health hazard and *prevent* a future hazard.

In this letter, we catalogue the substantial evidence that the application of liquid effluent by HS Jansen and Sons to a 210-acre field sitting above the Hullcar aquifer is a probable cause of the present nitrate contamination. In light of that, a moratorium order is "reasonably necessary" to remediate the water quality of the Hullcar aquifer so that it can again become a safe drinking water source for the residents of the Hullcar Valley.

Almost two years ago, the Ministry of Environment recognized the link between the field effluent and the contaminated water supply by issuing a compliance order to the farm, limiting effluent applications on the field.[13] However, that order's inadequate restrictions allowed continued effluent applications and have failed to remediate the contamination of the aquifer. Due to characteristics of the field's soil and the aquifer upon which it sits, we make the argument below that a full moratorium on effluent applications is necessary for nitrate concentrations in Steele Springs to return to safe levels.

This letter will proceed by first outlining the history of the contamination of the Hullcar aquifer. Part 2 and Part 3 will outline the prerequisite elements of issuing a Drinking Water Hazard Abatement and Prevention Order and demonstrate that the facts of the case meet the statutory requirements for such an order. Finally, Part 4 will address how the issuance of an order is consistent with the current legislative framework and policies governing aquifer and drinking water protection.

Part 1: Background

1.1 History of Steele Springs 1981-2014

The following is our understanding of the history of this issue.

Aquifer #103 ("the Hullcar aquifer") provides drinking water to approximately 250 residents in the Hullcar Valley region, near Armstrong, BC, through private wells and the Steele Springs Waterworks District[14]. The source of Steele Springs Waterworks

[13] See: Appendix C.

[14] Steele Springs provides drinking water to 53 households, including about 150 people. See Appendix C. According to the Golder Report (above), 46 private wells draw from the Hullcar aquifer. In total Brian Upper of Steele Springs Waterworks District estimates over 250 residents depend upon the aquifer for their water supply. (Personal communication, Brian Upper, January 8, 2016.)

District is a group of discharge springs from the aquifer that surface in the Steele Springs Valley. Water from the aquifer then flows into Deep Creek, which eventually discharges into Okanagan Lake.

Steele Springs Waterworks District has supplied drinking water to residents of the Hullcar Valley since 1923; however, in the past 20 years, two spikes in nitrates concentrations have occurred. Both are believed to have been caused by the application of organic fertilizer to the field of concern, which sits directly above the Hullcar aquifer.

The characteristics of the field of concern in relation to the Hullcar aquifer make the application of effluent vulnerable to the leaching of nitrogen. The field is located less than a kilometer up gradient of the Steele Springs source[15]. The aquifer is shallow, and well logs close to the field of concern indicate static levels to be approximately 12.2 meters,[16] with a soil composition of sand, dry sand, gravel and sandy till, all of which have high hydraulic conductivities.[17]

In 1981, Doug Regehr opened a confined feeding operation on the field of concern. It is believed that as many as 5,000 animals were housed on the property in summer months. In 1990, nitrogen levels at the Steele Springs Waterworks District source were recorded as 5.2 ppm; in 1994 at 3.83 ppm, and in July 1997 reached 6.58ppm.[18] In 1998, the CFO was closed and the farmer began growing alfalfa. Nitrogen levels in the aquifer peaked in March 2001 at 9.50 ppm, and steadily fell over the next 7 years to a low of 1.3ppm in September 2008.[19]

In 2002, Doug Regehr sold 210 acres of the field of concern to HS Jansen and Sons. In 2007, HS Jansen and Sons opened a large (approximately 1000 cow) dairy operation on the property[20]. It has been described as the largest dairy operation in the Okanagan and as the only one to use a flush barn system, which separates manure into a solid and liquid portion. The liquid portion is stored in lagoons and is eventually sprayed onto the field of concern, which sits adjacent to the dairy operation.

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[15] Steele Springs Waterworks District. Letter to HS Jansen and Sons Dairy Farm. April 22, 2009. Armstrong, British Columbia. (see: Appendix H); Compliance Order pg 2 (See: Appendix C)

[16] Email November 3rd, 2015 from Brian Upper, Steele Springs Waterworks District.

[17] Compliance Order 76600-20 Armstrong, pg 2 (See: Appendix C).

[18] See: Appendix A. Note that Steele Springs Waterworks District recently retrieved a 1990 test showing a 5.2 ppm level reading that is not reflected in Appendix A. Two other 1990 readings were apparently similar. (Personal communication, Brian Upper, Steele Springs Waterworks District, January 8, 2016.)

[19] See: Appendix A

[20] Email December 6, 2015, from Brian Upper, Steele Springs Waterworks District.

When HS Jansen and Sons opened their operation in 2007, nitrate levels at Steele Springs measured below 4ppm.[21]From 2007 to March 2014, it is believed that HS Jansen and Sons applied high volumes of manure effluent to the field of concern, and at times, after September 1st to bare land.[22] It is likely that as a result of these practices, especially practices in 2012 and 2013, nitrate levels in the aquifer markedly increased.[23]

1.2: 2014-present: nitrate contamination and the issuance of the compliance order:

In February 2014, nitrate levels in Steele Springs reached 8.56 ppm.[24] In response, on March 6, MOE issued a compliance order, finding reasonable grounds to believe that HS Jansen and Sons Farm Ltd. had contravened water pollution sections (sections 13 and 14) of the Agricultural Waste Control Regulations ("AWCR").[25] In its reasons for issuing the compliance order, MOE cited an application of effluent in the Fall 2013, where 20,000 US gallons/acre of liquid effluent was applied by the farm to the field of concern. Given the concentration of nitrogen in the effluent, MOE found that the application greatly exceeded the nitrogen needs of the future corn crop to be planted in the spring.[26]

In the compliance order, HS Jansen Farms was ordered to cease further nutrient applications to the field of concern. Under the order, additional liquid effluent was only to be applied with written authorization from MOE. Further, MOE wrote that, "the recommended application rate must also consider nitrate levels in Steele Springs. Based on data available to us at this time, applications exceeding 200 to 220 kg/hectare/year would be considered excessive by a number of other jurisdictions as well as the Environmental Farm Plan Reference Guide Recommendations." (underlined for emphasis).

In March 2014, nitrate levels in Steele Springs reached 10.1 ppm, exceeding the Canada-Wide drinking water limit of 10ppm. Interior Health issued a water quality advisory that remains in effect today.[27]

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[21] See: Appendix A

[22] Letter to HS Jansen and Sons, from Steele Springs Waterworks District. April 22, 2009 (See Appendix H); Compliance Order 76600-20 Armstrong (See Appendix C)

[23] See: Appendix A. Brian Upper of Steele Springs Waterworks District has further information on the specific practices in 2012 and 2013.

[24] See: Appendix A

[25] Compliance Order 76600-20 Armstrong (See: Appendix C)

[26] Compliance Order 76600-20 Armstrong, at pg 3 (See: Appendix C)

[27] Gregory, Brian (Environmental Health Officer), "RE: Water Quality Advisory concerning Nitrates for Steele Springs Waterworks District" Letter to Steele Springs Waterworks District, April, 1, 2015. Interior Health (See: Appendix I)

After the compliance order, all 210 acres of the field of concern were planted with alfalfa, a crop capable of removing large quantities of nitrogen from soil. However, since issuing the compliance letter, MOE has authorized the application of liquid effluent on four occasions. Remarkably, the 2014 authorizations approved application of approximately 231 kg/hectare/year of nitrogen to the field of concern[28] -- exceeding the amount cited in the Ministry's own March 2014 compliance order as likely being excessive.

The following is a summary of the four applications of liquid effluent authorized by MOE *after* the March 2014 compliance order was issued:[29]

> July 15, 2014: MOE authorized the application of 12,000US gallons per acre of effluent based on concentration of 8.1pounds nitrogen/1000 gallons, or 97.2 pounds of nitrogen/acre. It is important to note that the available nitrogen measured in the 0-12inch and 12-24 inch depths of the soil was not reported or apparently considered in this decision.
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> August 27, 2014: MOE authorized the application of 12,000 US gallons per acre of effluent based on a manure concentration of 9.1 pounds of nitrogen/1000 gallons[30] or 109.2 pounds of nitrogen/acre. Again, the available nitrogen measured in the 0-12inch and 12-24 inch depths of the soil was not reported or apparently considered in this decision.
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> July 15, 2015: MOE authorized the application of 6000 US gallons/acre of effluent or 67 pounds of nitrogen/acre to be added to the 0-12 inch depth of soil. Soil samples showed 40 pounds of available nitrogen in first 0-12inches of topsoil. It is important to note that pre-existing nitrogen levels in the 12-24 inch profile were not reported or apparently considered in the decision.
>
> August 31, 2015: MOE authorized application of 6000 US gallons/acre, or 47 pounds of nitrogen/acre to be added to the 0-12inch soil depth. Although soil samples showed 60 pounds/acre of available nitrogen in 0-12inches of topsoil and 20 pounds/acre of available nitrogen in 12-24 inch depth, the MOE decision

[28] 2014 effluent applications amount to 206.4 pounds of nitrogen/acre, or, approximately 231.3 kilograms/hectare. Compare this amount with the Compliance Order, p. 5, paragraph (1), which says 200-220 kg/ha/year would be excessive.

[29] See Appendix D-G

[30] Telephone Conversation, Brian Upper and Doug MacFarlane (Qualified Professional), September 24, 2014

did not report or apparently consider the pre-existing nitrogen level in the 12-24 inch profile.[31]

It is important to note that both of the summer 2014 authorizations to apply effluent were made *after* nitrate readings in the Steele Springs Waterworks District water supply had exceeded the safe level – the May-August 2014 readings of >12 ppm substantially exceeded the 10 ppm safe level. It is also worth noting that the original compliance order articulated an objective of reducing nitrates in Steele Springs to 6 ppm -- yet the December 2015 reading of 12.5 ppm is still *double* that objective.[32]

Part 2: Is there "reason to believe a drinking water health hazard exists"?

Section 25(1)(a) of the Act authorizes you to issue an order if you have "reason to believe a drinking water health hazard exists."[33] A "drinking water health hazard" is defined under the Act as[34]:

(a) *a condition or thing in relation to drinking water that does or is likely to*
(i) endanger the public health, or
(ii) prevent or hinder the prevention or suppression of disease…

There is clearly sufficient evidence to meet the 'reason to believe a drinking water health hazard exists' standard set out under s. 25 (1) (a) of the Act. It is incontrovertible that high nitrate levels in drinking water is a "condition" likely to "endanger public health." Since March 2014 nitrate concentrations in Steele Springs, a drinking water source, have generally exceeded the maximum safe level set out in the Guidelines for

[31] Brian Upper of Steele Springs Waterworks District has more details on the lack of MOE consideration of the nitrogen in the 12-24 inch profile.
[32] See Appendix A for the May-August, 2014 measurements of >12 ppm, and for the December 2015 measurement. See Appendix C, p. 5 where the compliance order stated: "A report of the QP's findings, recommendations and conclusions relative to mitigating nitrate levels to less than 6 mg/L [ppm] in Steele Springs must be submitted to the Director…"
[33] Section 25 reads: **25** (1) A drinking water officer may make an order under this section if the drinking water officer has reason to believe that (a) a drinking water health hazard exists, or (b) there is a significant risk of an imminent drinking water health hazard. Drinking Water Protection Act, SBC 2001, Ch 9
[34] Section 1 "drinking water health hazard" reads: "drinking water health hazard" means (a) a condition or thing in relation to drinking water that does or is likely to (i) endanger the public health, or (ii) prevent or hinder the suppression of disease. Drinking Water Protection Act, SBC 2001, Ch 9

Canadian Drinking Water.[35] Thus, the present nitrate contamination of Steele Springs falls within the definition of a "drinking water health hazard" outlined in ss. 1 (a)(i) (and perhaps under other subsections as well[36]).

It is well accepted that the consumption of drinking water high in nitrates can cause potentially fatal methemoglobinemia (blue baby syndrome) in infants.[37] In adults, current studies suggest an association between consumption of nitrates in drinking water and cancer and thyroid dysfunction. Consumption of nitrates may negatively affect thyroid hormone production in pregnant women, which could impact foetal development.[38] It is for these reasons that the 10ppm has been set under the Guidelines for Canadian Drinking Water Quality as the maximum acceptable concentration (MAC) of nitrates in drinking water. The Guidelines are established by the Federal-Provincial-Territorial Committee on Drinking Water (CDW) and published by Health Canada. In order for a contaminant such as nitrate to be listed under the guidelines, the CDW must find that "exposure to the contaminant could lead to adverse health effects in humans."[39] This is established based on current, published scientific research, related to health effects associated with each contaminant and exposure levels.

Furthermore, compelling evidence of the drinking water health hazard is found in the decision of Interior Health to issue a *Water Quality Advisory* in 2014 – an Advisory still in effect. In a letter to Steele Spring Waterworks District, Interior Health explicitly acknowledges the danger to public health posed by the consumption of water from the affected well sites:[40]

> "High nitrate levels are a health concern for infants less than 3 months and can also increase the risk of stomach cancer in adults. Interior Health is advising that pregnant women, babies under 6 months of age, the elderly (in general terms, those over 65 years of age) and individuals with weakened immune system, or

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[35] Note: With the exception of a 4 month period between June-September 2015 where measurements were slightly below 10ppm

[36] The impacts of nitrates on immune compromised people may also qualify as a "drinking water health hazard" under the definition of that term in s. 1 of the Act, subsection (a)(ii).

[37] Health Canada, *Guideline for Canadian Drinking Water Quality: Guideline Technical Document-Nitrate and Nitrite*. (Ottawa: Health Canada, 2004) at pg 1

[38] Health Canada, *Guideline for Canadian Drinking Water Quality: Guideline Technical Document-Nitrate and Nitrite*. (Ottawa: Health Canada, 2004) at pg 1

[39] Health Canada. *Guidelines for Canadian Drinking Water Quality-Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch*. (Ottawa: Health Canada, 2014)

[40] Corneil, Trevor MD. "Water Quality Advisory for Residents Who May Draw Water from the Hullcar Aquifer in Spallumcheen." Letter to Current Residents. 14 July 2014. Kelowna Health Unit, Kelowna British Columbia, (see: Appendix J)

chronic heart, lung, and blood conditions should take precautions and use alternative source of water (e.g. bottled water) at this time. An alternative source of water should be used to mix infant formula for infants less than 6 months of age."

Notably, Interior Health suggests that the health concerns of consuming water with high nitrate concentrations are elevated for those with weakened immune systems. As such, the potential impacts of nitrates on immune compromised individuals may also qualify as a health hazard under ss. (a)(ii) of the Act.

In sum, you clearly have reason to believe that a drinking water health hazard exists, and you have the jurisdiction to issue a section 25 order.

Part 3: What can the order require? What is "Reasonably necessary to control, abate, stop, remedy or prevent the drinking water health hazard…"?

As per s. 25 (3) of the Act, the Drinking Water Hazard Abatement and Prevention order may require the person to whom it is directed to *abate the hazard* or "acquire, construct, or carry out any works or *do or cease to do any other thing, if this is reasonably necessary to control, abate, stop, remedy, or prevent the drinking water health hazard."*[41] [Emphasis added]

This part of our submission argues that a full moratorium on the application of effluent to the field of concern is "reasonably necessary" to abate and remedy the drinking water health hazard. The application of effluent to the field of concern is a probable cause of the present contamination of the Hullcar aquifer. Given the characteristics of the field of concern and Hullcar aquifer, and the failure of the current Ministry of

[41] S. 25(3) reads: (3) The order must be served on the person to whom it is directed and may require that person, at the person's own expense, to do one or more of the following: (a) provide to the drinking water officer information, as requested by the drinking water officer, relating to the conditions or things that resulted in or contributed to the drinking water health hazard or risk; (b) undertake investigations, tests, surveys and any other action the drinking water officer considers necessary to assess and determine how to address or prevent the drinking water health hazard, and report the results to the officer; (c) abate the drinking water health hazard;(d) acquire, construct or carry out any works or do or cease to do any other thing, if this is reasonably necessary to control, abate, stop, remedy or prevent the drinking water health hazard;(e) adjust, repair or alter any works to the extent reasonably necessary to control, abate, stop or prevent the drinking water health hazard;(f) give public notice in a manner approved by the drinking water officer or in accordance with the directions of the drinking water officer;(g) prepare and implement a hazard remediation plan or hazard prevention plan acceptable to the drinking water officer.

Environment compliance order to remedy the contamination, a full moratorium on the application of effluent to the field of concern is a reasonably necessary action.

3.1: Causation -- What cause of the hazard needs to be addressed? Does the order need to stop HS Jansen and Sons' effluent applications?

There is substantial evidence that the effluent applications are a cause of the hazard, and that they must be stopped. As discussed in Part 1, the soil properties and static water level of aquifer 103 below of the field of concern pose an inherent risk of groundwater contamination when effluent is applied in excess of crop needs. There is evidence that HS Jansen and Sons applied excess liquid effluent to the fields in the years leading up to the 2014 compliance order. In a 2009 letter to HS Jansen and Sons Farm, trustees of the Steele Springs Waterworks district outlined concerns about the following reported farm practices.[42]

1) Excessive applications of manure effluent.

2) Application of manure effluent outside the recommended timeframe for the Okanagan region.

3) Inadequate safety measures to prevent the cross-contamination of manure effluent from underground pipes connected to wells.

4) The application of manure effluent in close proximity to Deep Creek

In the 2014 compliance order, MOE confirmed the first and second concerns articulated by Steele Springs Waterworks District: on at least one occasion, MOE found that HS Jansen and Sons had applied manure effluent greatly exceeding the possible uptake of nitrogen by a cornfield (discussed in Part 1). In addition, the effluent had been applied in the fall to a bare field. According to the reference for Environmental Farm Plans, no manure should be applied to any field in the interior of BC from September thru March unless a cover crop has been planted.[43]

Perhaps most important, the very nature of the compliance order identifies the effluent applications of HS Jansen and Sons Farm as a probable source of the contamination. MOE cites the spike in nitrate concentrations in Steele Springs as reason for the

[42] Steele Springs Waterworks District. Letter to HS Jansen and Sons Dairy Farm. April 22, 2009. Armstrong, British Columbia. (See: Appendix H)

[43] Compliance Order 76600-20 Armstrong at pp. 2-4 (See: Appendix C)

imposition for the order restricting effluent applications -- and held that there were reasonable grounds to believe that HS Jansen and Sons had contravened water pollution provisions (sections 13 and 14 of the Agricultural Waste Control Regulations). Notably, the order specifically underlined the following provision as being likely contravened:

> "S. 14 Agricultural wastes must not be applied…(e) at rates of application that exceed the amount required for crop growth if runoff or escape of agricultural waste causes pollution of a watercourse or groundwater, or goes beyond the farm boundary"[44]

Nitrate measurements conducted by Steele Springs Waterworks District from private wells in the Hullcar aquifer also suggest that HS Jansen and Sons Farms is a source of the contamination of Steele Springs. Groundwater in the Hullcar aquifer is believed to flow from the N/NW to S/SE direction.[45] Measurements from private wells up gradient of HS Jansen and Sons show no signs of nitrate contamination.[46] In contrast, nitrate measurements from private wells at, or down gradient, of the field of concern have nitrate levels measuring near or exceeding 10ppm.[47] In December 2015 and January 2016 nitrate levels of water from Steele Springs, down gradient of the field of concern, registered above 12 ppm.[48]

Finally, graphs depicting the nitrate contamination indicate a probable cause-effect relationship between the Jansen effluent applications and nitrates in the water supplies.[49] There have been two periods of high nitrate concentrations in the Hullcar aquifer; both follow periods where high volumes of animal waste were applied to the field of concern. As demonstrated in Figure 1, the second spike in nitrates follows the opening of HS Jansens and Sons dairy operation in 2007. It is our understanding that no other industrial agricultural operation in the Hullcar Valley has opened or significantly changed its operations since 2007.

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[44] Compliance Order 76600-20 Armstrong at pg 4 (See: Appendix C)
[45] Golder Associates Ltd, *Groundwater Potential Evaluation for the Hullcar Area*, Township of Spallumcheen, BC. 2006. Online: <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=16678>
[46] In 2015, measurements from well sites A, C, H, and V, recorded nitrate levels below 0.1ppm (See: Appendix B). These well sites are all up gradient of the field of concern (See: Figure 2)
[47] In 2015, measurements from wells 2, 8, and 9 recorded nitrate concentrations near or above 10ppm (See: Appendix B). These well sites are adjacent to or down gradient of the field of concern (See: Figure 2)
[48] In December 2015 the level was 12.5 (see Appendix A) and on January 7, 2016 the level was 12.8 (personal communication, Brian Upper of the Steele Springs Waterworks District).
[49] See: Figure 1 in Appendix A.

3.2 Necessity of ordering a full moratorium on effluent applications

Since issuing the compliance letter, MOE has authorized the application of liquid effluent on four subsequent occasions (described in Part 1). Despite the public health interest at stake in making these authorizations, MOE has refused to provide information regarding the evidence and studies used to determine the appropriate application rate of effluent in the 2014 and 2015 authorizations when requested by the Environmental Law Centre. Without access to the references used to estimate alfalfa nitrogen uptake, Qualified Professional reports, or soil sampling information, it is difficult to make conclusive and detailed observations on the effect of these applications on the concentration of nitrates found in the Hullcar aquifer. That being said, the following conclusions may be drawn supporting the necessity of a full moratorium on the application of manure effluent to the field of concern.

First, from the information provided in the authorization letters, it appears that the alfalfa crop is not taking up all the nitrogen from even the reduced applications of effluent. Between the applications of manure effluent in July and August 2015, nitrogen in the 0-12inchs of soil increased from 40 to 60lbs/acre (See: Appendices F and G). This suggests that the alfalfa is not taking up all the nitrogen from the effluent and that nitrogen has been added to the soil in excess of crop needs. Nitrogen that is not taken up by the alfalfa may be leaching into the water table, given the high hydraulic conductivity of the soil.

It is our understanding that the application of manure effluent to the field of concern is driven primarily by a need to dispose of excess waste from the dairy operation, not just crop management needs.[50] Our preliminary research indicates that alfalfa does not generally require the addition of nitrogen for healthy growth.[51] Alfalfa has the capacity to remove large amounts of nitrogen from soil; however, alfalfa will fix its own nitrogen from the atmosphere absent the addition of manure.[52] Moreover, high concentrations of

[50] It has been reported that HS Jansen and Sons Farm is a very large dairy operation with approximately 1000 cows. At a meeting with Ministry of Health, Ministry of Environment Staff, and Steele Springs Waterworks District in June 2014, Qualified Professional Doug MacFarlane is purported to have expressed that the Jansen Farm nutrient management plan prioritized the disposal of excess manure (Email, Al Price (Vice-Chairman, Steele Springs Waterworks District) to Mary Polak, February 5, 2015)
[51] Koenig, R., *et al*., *Fertilizer Management for Alfalfa.* Online: Utah State University Cooperative Extension < https://extension.usu.edu/files/publications/publication/AG-FG-_01.pdf>. Disposing of animal waste 'in modest quantities' may be a common practice in alfalfa/ grass mix fields, but is a very uncommon practice in pure alfalfa stands such as in the field of concern, according to Brian Upper.
[52] Sullivan, M., et al, (2015) *Fertilizing with Biosolids.* Online: Oregon State University Extention Catalog. < https://catalog.extension.oregonstate.edu/pnw508>

nitrates in alfalfa harvests can cause toxicity when used as hay or silage for dairy cows.[53] We submit that while the utilization of the nitrogen uptake potential of alfalfa as a means of disposing animal waste is sometimes done, **any** application of effluent at this time is unreasonable given the current nitrate concentration in Steele Springs and the inherent risks associated with this particular field. Additionally, it is our understanding that HS Jansen and Sons Farm has acquired a substantial amount of acreage where liquid effluent can be spread in lieu of the field of concern.[54] In the circumstances, it is manifestly unreasonable that a field with high hydraulic conductivity, shallow soil, sitting within close proximity of a drinking water utility's source continue to be used as a waste disposal site.

Second, it has been nearly two years since MOE issued the compliance order, limiting the ability of HS Jansen and Sons to apply effluent to the field of concern. In those two years, nitrate levels have measured near or above the 10ppm maximum acceptable limit set out by the Guidelines for Canadian Drinking Water Quality. Indeed, December 2015 and January tests from Steele Springs measured nitrate concentrations at over 12 ppm – more than double the goal of 6 ppm articulated in the original compliance order.[55] The very fact that the qualified compliance order that allowed further effluent applications has failed to remediate the contamination of Steele Springs supports the argument that more must now be done. An order establishing a complete and permanent moratorium on effluent applications is now "reasonably necessary to control, abate, stop, remedy and prevent the drinking water health hazard."

In addition, a moratorium on the application of effluent to the field of concern is reasonably necessary to prevent possible contamination of *other* drinking water sources in the region. The Ministry of Health has suggested in correspondence to the Steele Springs Waterworks district that, "[Steele Springs Waterworks District] should consider using an alternative source that does not carry the same risk of contamination as [unconfined aquifer #103]."[56] However, there is troubling evidence that the contamination might not remain isolated in the Hullcar aquifer #103, if the effluent applications continue.

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[53] Adams, R., *et al*., Prevention and Control of Nitrate Toxicity in Cattle. 2012. Department of Dairy and Animal Science, The Pennsylvania State University, Online: < http://extension.psu.edu/animals/dairy/nutrition/forages/mycotoxins-nitrates-and-other-toxicity-problems/prevention-and-control-of-nitrate-toxicity-in-cattle>

[54] Email, December 6, 2015, from Brian Upper, Steele Springs Waterworks District.

[55] See footnote 48 for the December and January readings. The objective of 6 ppm is articulated in the compliance order, Appendix C, p. 5.

[56] Terry Lake, Minister of Health. Letter to Mayor of the Township of Spallumcheen. August 14, 2014, See: Appendix

It is our understanding that the Hullcar aquifer #103 may have connectivity with several proximate aquifers in the region. In particular, Hullcar aquifer #103 sits above confined aquifer #102, which has been suggested as a potential alternative water source for well users on the Hullcar aquifer.[57] The two aquifers are separated by a relatively contiguous till deposit. However, there is one point east of Deep Creek (and potentially down gradient of the field of concern) where there is a very small confining layer between the aquifers and communication and mixing of waters may be possible.[58] Indeed, recent tests have shown nitrate levels as high as 2.55 ppm in aquifer #102, and have measured turbidity exceeding the maximum level set by Guidelines for Canadian Drinking Water, raising concerns about its suitability as an alternative water source.[59] (High turbidity is a public health issue as particles can harbor microorganisms, protecting them from treatment mechanisms, and can entrap heavy metals and biocides.[60])

In addition, the Hullcar aquifer may also have hydraulic communication with proximal aquifers 104, 106, and 355.[61] Thus, it could be risky to decline a ban on effluent applications on the assumption that alternative sources of groundwater may be available. Nitrates from the Hullcar aquifer could eventually enter proximate aquifers, potentially contaminating both present and future sources of the Hullcar Valley's drinking water. Instead, the *source* of the nitrates should be addressed.

Even if hydrological testing eventually established that there is a low risk of nitrates permeating into other aquifers, the availability of alternative ground water sources is a profoundly unsound rationale for allowing contamination of an unconfined aquifer drinking water supply. Such an approach would be contrary to the Province's recent initiatives and statutory reforms intended to protect groundwater, including the recent *Water Sustainability Act* that was explicitly enacted for the purpose of protecting BC's surface and groundwater.

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[57] Golder Associates Ltd, *Groundwater Potential Evaluation for the Hullcar Area*, Township of Spallumcheen, BC. 2006 at pg 5 ("the Golder Report") Online: <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=16678>

[58] Golder Associates Ltd, *Groundwater Potential Evaluation for the Hullcar Area*, Township of Spallumcheen, BC. 2006 at pg 5 ("the Golder Report") Online: <https://a100.gov.bc.ca/pub/acat/public/viewReport.do?reportId=16678>

[59] See Appendix L

[60] Health Canada. *Guidelines for Canadian Drinking Water Quality-Summary Table. Water and Air Quality Bureau, Healthy Environments and Consumer Safety Branch*. (Ottawa: Health Canada, 2014)

[61] Neilson-Welch, L, and Allen, DM, *Groundwater and Hydrological Conditions in the Okanagan Basin, British Columbia. A State-of-the-Basin Report*, 2007 at appendix two.

It is important to note that in a report developed by MOE in order to address water sustainability issues and the Auditor General's criticism that "groundwater is not being protected from depletion and contamination,"[62] both aquifers #102 and #103 were cited as being of local priority to the Okanagan region by reason of their significance to the community and ecosystems [63] Ground water is a precious resource and should not be destroyed lightly. A recent *Nature Geoscience* study suggests that groundwater should be considered a non-renewable resource because only 6% of the world's groundwater is replenished within 50 years.[64] The droughts experienced throughout the province in the summer of 2015 underscore the vulnerability of British Columbia to water shortages as a result of changing climate and growing population. We don't have such a surplus of water that we can cavalierly write off existing drinking water supplies.

Part 4: Conclusion -- <u>ISSUING AN ORDER UNDER SECTION 25 OF THE DRINKING WATER PROTECTION ACT</u>

The evidence in this case indicates that:

- there is "reason to believe that a serious drinking water health hazard exists", and
- an order for a moratorium on effluent application is "reasonably necessary" to control, abate, stop, remedy or prevent the hazard.

Therefore, under sections 25(1) and 25(3)(d) of the Act, you clearly have jurisdiction to address the health hazard by ordering a full moratorium on the application of effluent onto the field of concern.

Section 8 of the BC *Interpretation Act* requires you to interpret your powers under s. 25 using, "such large, fair and liberal construction and interpretation as best ensures the attainment of its objects." The issuance of a drinking water protection order in the present circumstances is consistent with the object of the BC legislature in enacting the *Drinking Water Protection Act*. The Act was created in response to the Walkerton

[62] Office of the Auditor General of British Columbia, *An Audit of the Management of Groundwater Resources in British Columbia*, 2010, p. 2.
[63] Ministry of the Environment. *List of British Columbia's 20 Priority Areas for Aquifer Characterization.* 2012. EcoCat: The Ecological Reports Catalogue
[64] Gleeson, T., *et al, The Global Volume and Distribution of Modern Groundwater*, 2014, Nature Geoscience, Advance Online Publication

tragedy, where E.coli contamination from agricultural runoff killed seven and sickened 2300 people[65]. The fundamental object of the Act is to ensure the safety of British Columbia's drinking water and protect groundwater sources from contamination. The *Drinking Water Protection Act*, delegates you the responsibility for protecting groundwater in relation to public health.[66] It is therefore consistent with the intent of the legislature that you utilize the powers under the Act and order a full moratorium on the application of effluent to the field of concern.

Indeed, the fundamental object of the *Drinking Water Protection Act* is to ensure preventative action to protect drinking water from potential risk. The Act's purpose is to avoid tragedies like Walkerton, which directly inspired the *Act.* Justice O'Connor's findings at the Walkerton Inquiry are particularly pertinent to the decision before you:

> *"drinking water sources should be protected by developing watershed-based source protection plans. Source protection plans should be required for all watersheds in Ontario". "… the first barrier to the contamination of drinking water involves protecting the sources of drinking water …*[67]

In considering your jurisdiction to act, please note the decision of the Supreme Court of Canada in Spray-Tech v. Hudson, [2001] 2 S.C.R. 241 where Madame Justice L'Heureux-Dube stated that laws should be interpreted in light of the Precautionary Principle:

> *Environmental measures must anticipate, prevent and attack the causes of environmental degradation. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.*[68]

Finally, in considering issuance of an order, we ask you to give the highest consideration to the residents who use drinking water from the Hullcar aquifer. Nothing is of more fundamental importance than safe drinking water. As the United Nations Committee on Economic, Cultural and Social Rights has declared:

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[65] O'Connor, DR, Part One: A Summary Report of the Walkerton Inquiry. 2002. Ontario Online: Ministry of the Attorney General.

[66] "How Groundwater is Protected in BC," Online: Province of British Columbia <http://www2.gov.bc.ca/gov/content/environment/air-land-water/water/water-quality/drinking-water-quality/how-drinking-water-is-protected-in-bc>

[67] O'Connor, D.R., 2002, "Part Two: Report of the Walkerton Inquiry, A Strategy for Safe Drinking Water", The Walkerton Inquiry, Queen's Printer for Ontario, Toronto, at pp. 18 and 3.

[68] *Environmental Law: Cases and Materials*, M. Doell and C. Tollefson, 2009, p. 170.

> *Water is fundamental for life and health. The human right to water is indispensable for leading a healthy life in human dignity. It is a pre-requisite to the realization of all other human rights.*[69]

Similarly, the World Health Organization (WHO) has recognized that "*[a]ccess to safe drinking-water is essential to health, a basic human right…*"[70]

In this case, significant sources of drinking water are at stake. Those sources must be protected.

Therefore, in light of the significant risks to drinking water outlined above, we ask you to issue a Drinking Water Health Hazard Abatement and Prevention Order, ordering a complete and permanent moratorium on effluent applications on the field of concern.

Based on the evidence above, you clearly have "reason to believe that a drinking water health hazard exists", and therefore have jurisdiction to issue an order under s. 25(1)(a) of the Act. And you have clear jurisdiction to address that health hazard by ordering a moratorium on the application of effluent. Under s. 25(3)(d) of the Act, a moratorium order is "reasonably necessary" in the current circumstances to *abate* and *remedy* the drinking water health hazard, and *prevent* a future hazard.

Furthermore, to prevent effluent applications on other H. S. Jansen and Sons farm lands from potentially creating new risks to aquifer #103 and other drinking water sources, the order should require the effective development and full implementation of a Nutrient Management Plan for *all* lands farmed by H.S. Jansen and Sons – a Plan which should strictly adhere to the Agricultural Waste Control Regulation.

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[69] Online <http://www.who.int/mediacentre/news/releases/pr91/en/>

[70] *Guidelines for Drinking-water Quality*, 2008, The World Health Organization, 3rd ed: v.1, online: http://www.who.int/water_sanitation_health/dwq/GDWPRecomdrev1and2.pdf, accessed October 12, 2012.

If you have any questions about these matters, please feel free to contact us.

Yours truly,

Rachel Gutman, Law Student

Calvin Sandborn, Lawyer; Legal Director

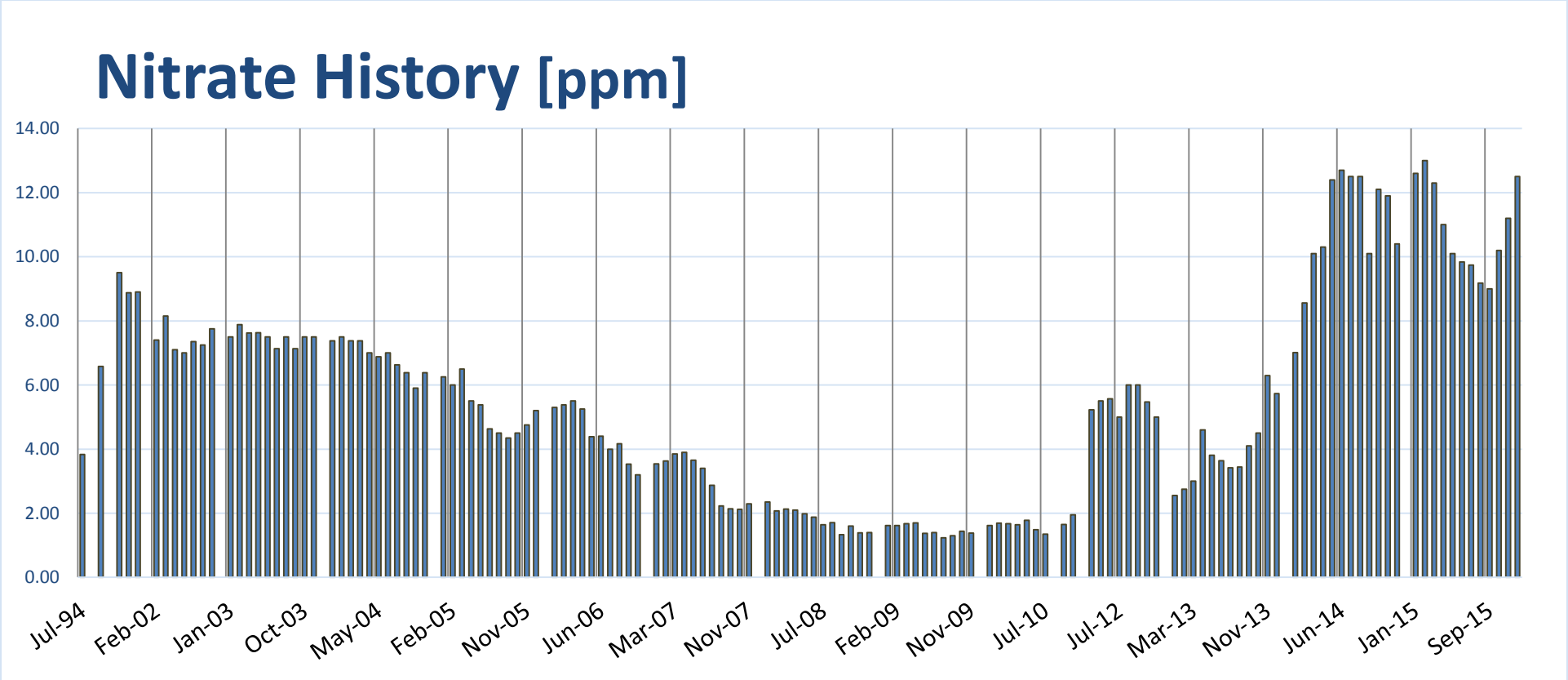
Appendix A: Monthly Nitrate Concentrations (ppm), Steele Springs Waterworks District

Source: Steele Springs Waterworks District

	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec
1994							3.83					
1997							6.58					
2001			9.50 8.88	8.90								
2002		7.40	8.15				7.10	7.00	7.35	7.25	7.75	
2003	7.50	7.88	7.62	7.63	7.50		7.13	7.50	7.13	7.50	7.50	
2004	7.38	7.50	7.38 7.38	7.00	6.88	7.00	6.63		6.38	5.90	6.38	
2005	6.25	6.00	6.50		5.50	5.38		4.63	4.50 4.35	4.50	4.75	5.20
2006	5.30	5.38	5.50	5.25	4.39	4.40	4.00		4.17		3.53	3.20
2007	3.54	3.63	3.85	3.90	3.65	3.40	2.87	2.23	2.14	2.12	2.29	
2008	2.35	2.07	2.13	2.10	1.98	1.88	1.64	1.71	1.33	1.60	1.39	1.40
2009	1.62	1.62	1.67	1.70	1.37	1.40		1.23	1.30		1.44 1.38	
2010	1.62	1.69 1.67	1.64	1.78		1.49	1.35					
2011			1.65						1.95			
2012				5.23	5.50	5.57	5.00		6.00	6.00	5.47	5.00
2013	2.55	2.75	3.00	4.60	3.81	3.64	3.42	3.44	4.10	4.50	6.29	5.73
2014	7.01	8.56	10.10	10.30	12.40	12.70	12.50	12.50	10.10	12.10	11.90	10.40
2015	12.60	13.00	12.30	11.00	10.10	9.84	9.74	9.18	9.00	10.20	11.20	12.50

Figure 1: Nitrate concentration (ppm) Steele Springs Waterworks District

Source: Steele Springs Waterworks District-graph data from Appendix A



Appendix B: Private Well Measurements –Hullcar Aquifer

Source: Steele Springs Waterworks District

Date	Site	Owner[1]	Collected	Lab	Nitrate (mg/L)	Depth (m)	Static ()	Yield ()	Fasl ()	Drill Date
2009										
Sept	A		MoE	Maxxam	<.002	40	20	50	1680	Aug '92
	C		MoE	Maxxam	<.002	78	16	50	1690	Aug. '88
	E		MoE	Maxxam	<.002	100	30?	80	1682	
	H		MoE	Maxxam	5.57	50			1697	
2010										
Nov	A		MoE	Maxxam	<.002	40	20	50	1680	
	C		MoE	Maxxam	<.002					
	E		MoE	Maxxam	<.002					
	H		MoE	Maxxam	<.002			65?		July '09
2012										
March	A		MoE	Maxxam	<.002					
	C		MoE	Maxxam	<.002					
	E		MoE	Maxxam	<.002					
	H		MoE	Maxxam	<.002					
July	11		BU	Caro	0.101	311	283	150	1694	Aug. '10
Dec 3	2		BU	Caro	1.15	86		35	1682	Sept. '10
2013										
Jan 15	10		BU	Caro	0.058	118	42		1696	
	F		BU	Caro	<.01	74	40	35	1696	
	A		BU	Caro	<.01					
	B		BU	Caro	<.01	70			1698	
Feb 6	E		M. Paull	Caro	<.01					
	C		BU	Carp	<.01					
	D		BU	Caro	<.01	58			1693	
March 8	J		BU	Caro	<.01	118			1696	
May 1	7		BU	Caro	1.55	W.Well			1516	

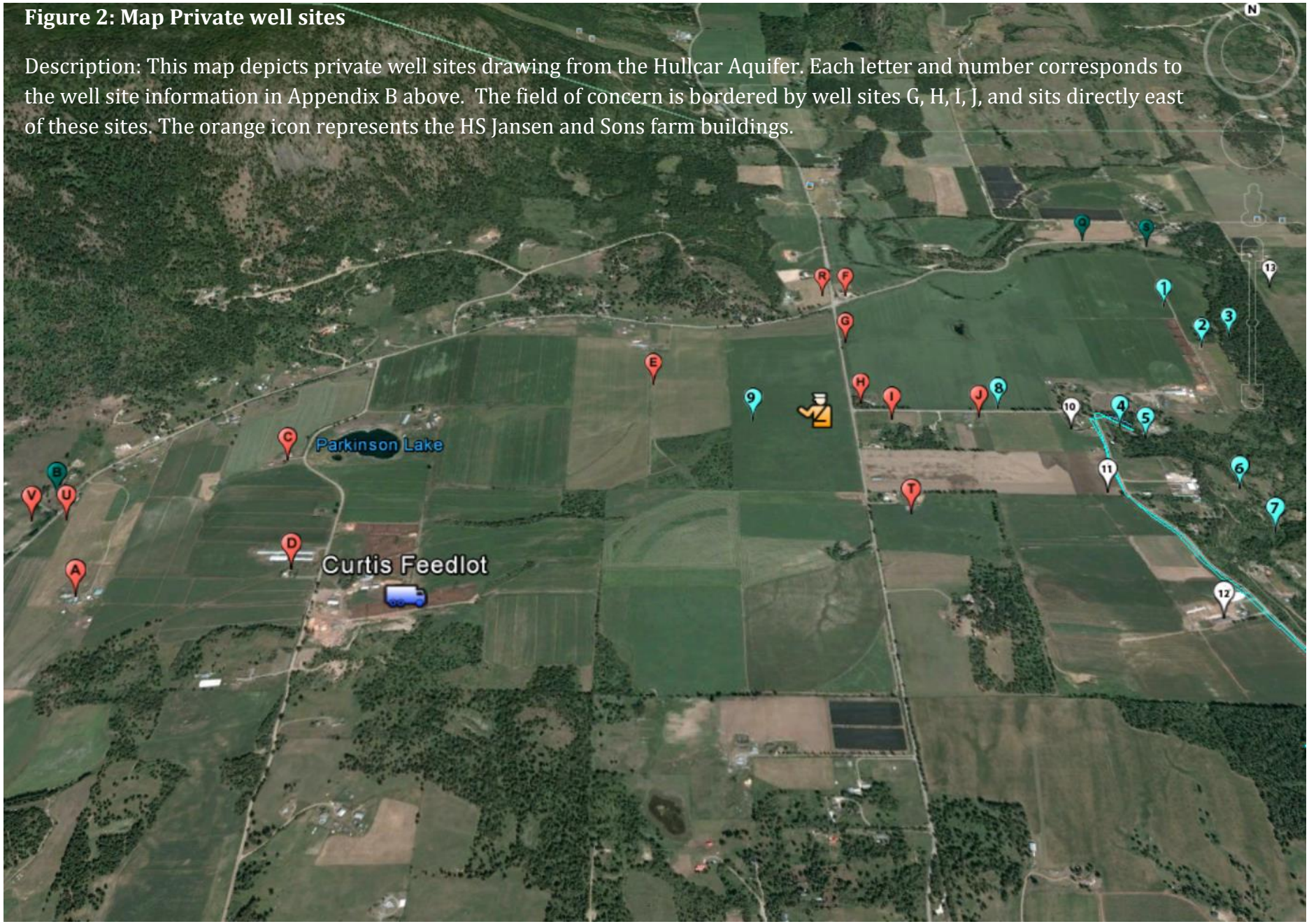
[1] Owner information removed for confidentiality purposes

2014										
Jan 29	H		BU	Caro	<.01	75			1697	
	T		BU	Caro	<.01	95			1692	
	2		BU	Caro	4.08	86	45		1682	
Feb 21	14		BU	Caro	<.01	100	80	20	1699	
	15		BU	Caro	<.01	280	110		1693	
	7		BU	Caro	2.45	W.Well				
	10		BU	Caro	<.01		42			
	S		BU	Caro	<.01	W.Well			1675	
	F		BU	Caro	<.01					
April 9	D		BU	Caro	<.01					
	C		BU	Caro	<.01					
	G		BU	Caro	<.01	85			1678	
	2		BU	Caro	8.04		45			
May 20	6		BU	Caro	2.41	W.Well			1549	
July 14	H		BU	Caro	<.01					
	2		BU	Caro	7.23					
Aug 13	U		C.M.	Caro	<.01	70			1690	
	V		S.B.	Caro	<.01	70	20		1700	
Dec 17	Q		J.N.	Caro	<.01	130			1712	
	6		R.R.	Caro	5.01	W.Well			1549	
2015										
July	A		FLNRO	Maxxam	<.002					
	C		FLNRO	Maxxam	<.002					
	H		FLNRO	Maxxam	<.002					
March 19	V		S.B.	Caro	0.049		20			
March 26	2		MoE	Maxxam	9.03					
Dec. 20	8[2]		PD	Caro	11	75			1670	
	9[2]		PD	Caro	9.2	?			1695	
	12		PD	Caro	1.5	300			1685	

[2] Sites 8 and 9 represent irrigation wells

Figure 2: Map Private well sites

Description: This map depicts private well sites drawing from the Hullcar Aquifer. Each letter and number corresponds to the well site information in Appendix B above. The field of concern is bordered by well sites G, H, I, J, and sits directly east of these sites. The orange icon represents the HS Jansen and Sons farm buildings.



BRITISH COLUMBIA

March 6, 2014 File: 76600-20 Armstrong

HAND DELIVERED

H.S. Jansen and Sons Farm Ltd
5063 Knob Hill Road
Armstrong, BC V0E 1B4

Attention: Dale Jansen, Director

COMPLIANCE ORDER

Re: Manure application concern in the vicinity of Steele Springs on Schubert Road.

Background

On January 21, 2014, M. Reiner Sr. Environmental Protection Officer attended Steele Springs, a drinking water supply source for approximately 150 residents, and the Jansen Dairy Farm on Knob Hill Road in Armstrong, BC to follow up on a report of unusual trend in nitrate levels detected in Steele Springs.

The information available to M. Reiner prior to this visit and gathered on and after January 21, 2014 is as follows.

1) H.S. Jansen & Sons Farm Ltd (henceforth "the Farm") has an Environmental Farm Plan.

2) Steele Springs originates from shallow un-confined aquifer in the area as per information provided by a ground water hydrologist with FLNRO in Penticton and documented in this report.
http://a100.gov.bc.ca/appsdata/acat/documents/r16678/Hullcar_groundwater_potential_eval_1249498672243_f7ea0679b44b73003fe49801dfed50cd9361baff77bae58099224e4b1d15397e.pdf

   A large portion of this un-confined aquifer is under the field of concern shown below.

Ministry of Environment
Environmental Protection Division
Kootenay and Okanagan Regions
102 Industrial Place
Penticton BC V2A 7C8
Telephone: (250) 490-8200
Facsimile: (250) 490-2231

Well logs also indicate the upper 50 to 100 ft of soils in and around the field are: Sand, Dry Sand and Gravel and Sandy till, all of which typically have high hydraulic conductivities i.e. groundwater in such soils can typically move horizontally at a rate of about 2 m/day.

3) The results of most recent water samples collected from Steele Springs during December 2013 and January 2014 and analyzed for nitrates show that nitrates have risen to significantly higher levels this fall and winter as compared to the levels detected in previous years. The previous winters saw nitrate levels peak at 5 to 6 mg/L in October and November and drop as the year progressed. This winter's results exceeded 6.5 mg/L in early January. Subsequent results from later samples collected in January show nitrate levels increased to 7.8 mg/L (Enclosure 1 encompasses the last 18 months or so of Steele Springs data). The undersigned also sampled Steel Springs on January 21, 2014 and that sample was analyzed by another accredited laboratory. That sample showed 8.8 mg/L for Nitrate as N (Enclosure 2). The Canada-Wide drinking water limit for Nitrate is 10 mg/L as N.

4) A director for Jansen Farms indicated to M. Reiner on January 21, 2014 and in subsequent communications that in the fall of 2013, 20,000 gallons/acre of liquid manure was applied by the Farm staff to a field located immediately up gradient of Steel Springs. The Farm director also stated that there was no cover crop on that field and the application was intended to supply 120 lb of Nitrogen/acre (equivalent to 120 kg of Nitrogen/hectare) for a corn crop that will be planted in spring of 2014.

5) M. Reiner assessed the Farm Director's statements against the Reference Guide for Environmental Farm Plans. That assessment has determined that liquid manure slurries from Dairy cattle likely contain 1.6 Kg of nitrogen per cubic meter (m^3) of slurry as per Table 6.7 of the Reference Guide.

Table 6.7 Assumed Annual Manure Nitrogen Excretion Values and Manure Nitrogen Concentrations in Storage for Various Animal Types★

Type of Animal		Use with Worksheet #4, Box 3	Use with Worksheet #5, Box 3
		Assumed Annual Manure N Excretion (kg N/animal)	Average Manure N Concentration (kg N/m^3)
Beef Cattle	Cows and Bred Heifers	73	3.4
	Feeder 340 to 500 kg	52	3.4
	Yearling 230 to 340 kg	35	3.4
	Calves 50 to 230 kg	17	3.4
Dairy Cattle	Milking cow including associated replacements	200	1.6 (watery) 2.8 (medium slurry) 4.0 (thick slurry)

Even when one uses 1 kg of N /m^3 of liquid manure, the amount of manure applied appears to be in excess of 120 lb of N/acre or 120 kg of N/hectare application. i.e.

20,000 Gallons/acre approximately equals 190 m^3/hectare of manure

Using 1 kg of Nitrogen/m^3 of manure indicates the application rate may have been as high as 190 kg of N/ hectare.

Table 6.10 of the Reference Guide (attached) further suggests that no manure, at all, should be applied to any fields in the interior of BC from September thru to the end of March unless a cover crop is in place.

Table 6.10 Percentage Manure to Apply at Various Times of the Year in Interior Regions

Crop	Typical Annual Nitrogen Uptake [a] (kg N/ha)	Suggested Manure Application as a Percentage of Annual Crop Uptake [b]				
		Feb & March	April & May	June to Aug	Sept & Oct	Nov to Jan
Perennial Grass [c]	200 to 400	up to 5 %	up to 100 %	up to 75 %	up to 50 %	0 %
Silage Corn	150 to 200	0 %	up to 100 %	20 %	0 %	0 %
Cereals (Spring Planted)	50 to 150	0 %	up to 100 %	0 %	0 %	0 %
Cereals (Fall Planted)	50 to 150	up to 5 % [d]	up to 100 %	up to 100 %	0 %	0 %
Berries, Tree Fruits and Grapes	50 to 100 [e]	0 %	up to 100 %	0 % [f]	0 %	0 %
Vegetables	80 to 185 [e]	0 %	up to 100 %	up to 100 %	0 %	0 %
Cover Crop [g]						
Emerged before Aug 15	100 to 140	0 %	0 %	up to 60 %	up to 100 %	0 %
Emerged before Sept 1	40 to 60	0 %	0 %	0 %	up to 100 %	0 %

[a] For high yielding crop – better estimates of actual uptake can be obtained by completing a Nutrient Management Plan
[b] Maximum total nitrogen (from manure and chemical fertilizer) applied to the soil not to exceed the crop's annual uptake (i.e., the sum of percent applied for each time period through the year not to exceed 100%).
[c] For grass legume mixes reduce the application of nitrogen in proportion to legume content
[d] Feb & March application in the year following planting
[e] Maximum nitrogen application depends on crop type (i.e. raspberries vs. blueberries or potatoes vs. broccoli)
[f] For new plantings up to 100% of that year's nutrient need
[g] Includes relay crops – post-harvest nitrate test should be below 20 µg/g (0-30 cm) if fertilizing a fall-planted cover crop

6) the Agricultural Waste Control Regulation states:

13 *Agricultural waste must not be applied to the land if, due to meteorological, topographical or soil conditions or the rate of application, runoff or the escape of agricultural waste causes pollution of a watercourse or groundwater.*

14 *Agricultural wastes must not be applied*

(a) on frozen land,

(b) in diverting winds,

(c) on areas having standing water,

(d) on saturated soils, or

(e) at rates of application that exceed the amount required for crop growth,

if runoff or escape of agricultural waste causes pollution of a watercourse or groundwater, or goes beyond the farm boundary.

Compliance Order:
Based on the above information, relative to sections 13 and 14 of the Agricultural Waste Control Regulation, I have reasonable grounds to believe that the Farm has contravened of the sections 13 and 14 of the Agricultural Waste Control Regulation.

Under section 112 of *Environmental Management Act*, when an inspector has reasonable grounds to believe a contravention has occurred, the inspector may order a person to do anything the officer considers necessary to stop the contravention *or prevent another contravention.*

Therefore, pursuant to *section 112 of the Environmental Management Act,* I hereby order, H.S. Jansen & Sons Farm Ltd to comply with the followings:

1) Cease any further nutrient (manure or fertilizer) applications to the field of concern identified above in the 2014 calendar year. Additional applications of nutrients may only be considered if deemed necessary based on sampling conducted by and recommendations provided by a Qualified Professional. The application of additional nutrients also requires the approval of the director in writing prior to the application of additional nutrients. The recommended application rate must also consider nitrate levels in Steele Springs. Based on data available to us at this time, applications exceeding 200 to 220 kg/ hectare /year would be considered excessive by a number of other jurisdictions as well as the Environmental Farm Plan Reference Guide Recommendations

2) Retain a Qualified Professional to compile and fully assess the Farm's recent nutrient application rates for the field of concern and their potential linkages to nitrate levels in Steel Springs for the past three years. This assessment would include review of available manure, soil and groundwater sampling results, crop rotation patterns, and manure application rates for the last three years. In addition, the Qualified Professional should conduct additional soil and groundwater sampling as necessary to determine present soil nitrogen levels in the in the 0-6, 6-12 and 12 to 24 inch soil horizons prior to March 10, 2014 and again in mid to late April. A report of the QP's findings, recommendations and conclusions relative to mitigating nitrate levels to less than 6 mg/L in Steel Springs must be submitted to the Director by no later than **July 15, 2014.**

3) Develop and submit a comprehensive nutrient management plan for the approval of the director using a Qualified Professional for the entire farm in keeping with the recommendations in the Environmental Farm Plan Reference Guide and specifically including:

   a) a detailed contingency plan to deal with unforeseen incidents which result in the farm entering or finishing any given growing season with 20% more nutrients than normally expected.

   b) a monitoring plan for soils, surface waters and groundwater on and around the farm and the lands it farms.

   The submission of these plans is required on or before **September 1, 2014** and the plan should consider the findings and recommendations from the assessment in requirement #2 above.

4) Submit an annual summary on and before February 28, of 2015, 2016 and 2017 calendar years, fully documenting the nutrient content of the manure applied the previous year, the nutrients applied to each specific field and when, as well the results of soil, surface water and groundwater sampling as per the comprehensive nutrient management plan.

Right to Appeal:
This decision and the specific conditions it contains may be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act*. An appeal must be delivered within 30 days from the date that notice of this decision is given. For further information, please contact the Environmental Appeal Board at (250) 387-3464.

This compliance order and the associated requirements are without prejudice to whatever enforcement action the Conservation Officer Service may be considering in response to this incident at the present time or in the event that nitrate levels exceed the 10 mg/L as N drinking water limit.

Should H.S. Jansen and Sons require further information or clarification, please contact M. Reiner or S. Barlas at 250-490-8200.

Yours truly,

M Reiner

Mike Reiner. P.Ag.
Sr. Environmental Protection Officer

MR/ch

Cc: Janelle Kwan Interior Health, Vernon BC.
J Lockwood – COS Supervisor N. Okanagan
G Tegart – Agriculture, Vernon

Enclosure 1 (emailed separately on Feb 24, 2014)

nitrates.pdf

Enclosure 2

Maxxam

Maxxam Job #: B405523
Report Date: 2014/01/29

MINISTRY OF ENVIRONMENT

Site Location: E296210 STEEL SPRING OFF SCHUBERT R
Sampler Initials: MR

RESULTS OF CHEMICAL ANALYSES OF WATER

Maxxam ID		IM8758		
Sampling Date		2014/01/21 16:00		
COC#		50206387		
	UNITS	REG/1	RDL	QC Batch
Field Parameters				
Sample End Date	N/A	20140121	0	7358854
Sample End Time	N/A	16:00	0	7358854
Sample Start Date	N/A	20140121	0	7358854
Sample Start Time	N/A	16:00	0	7358854
Temperature at Arrival	C	1		7358850
Calculated Parameters				
Filter and HNO3 Preservation	N/A	LAB	N/A	7358597
Nitrate (N)	mg/L	6.80	0.020	7358852
Misc. Inorganics				
Dissolved Hardness (CaCO3)	mg/L	368	0.50	7358400
Anions				
Dissolved Chloride (Cl)	mg/L	16	0.50	7362000
Nutrients				
Total Kjeldahl Nitrogen (Calc)	mg/L	<0.20	0.20	7358855
Nitrate plus Nitrite (N)	mg/L	6.80	0.020	7358914
Nitrite (N)	mg/L	<0.0020	0.0020	7359201
Total Nitrogen (N)	mg/L	6.48	0.20	7359231
Physical Properties				
Conductivity	uS/cm	716	1.0	7359214

ELEMENTS BY ATOMIC SPECTROSCOPY (WATER)

Maxxam ID		IM8758		
Sampling Date		2014/01/21 16:00		
COC#		50206387		
	UNITS	REG/1	RDL	QC Batch
Dissolved Metals by ICPMS				
Dissolved Sodium (Na)	mg/L	11.0	0.050	7358401

N/A = Not Applicable
RDL = Reportable Detection Limit

Appendix D: Effluent Authorization July 15, 2014

July 15, 2014 File: 76600-20/Armstrong

H.S. Jansen and Sons Farm Ltd.
5063 Knob Hill Road
Armstrong, BC V0E 1B4

Attention: Dale Jansen, Director

Re: REVISION for Nutrient Application Authorized April 16 under Section 112 Compliance Order – Issued to H.S. Jansen and Sons Farm Ltd March 6, 2014

On April 16, 2014, pursuant to Compliance Order (our file 76600-20/Armstrong) Section 1 issued on March 6, 2014, the application of dairy effluent was authorized to be applied after the first and second cuts of alfalfa at a rate of 15,000 US Gallons/acre to the field in question.

After a review of the most recent manure concentration analysis (8.1 lbs per 1000 gal) received by A&L Canada Laboratories on July 10, 2014, the Qualified Professional (QP) for Jansen Dairy, Doug Macfarlane, has recommended a lower application rate of 12,000 US Gallons/acre.

The Ministry of Environment is requiring that the QP supervise the application process to ensure flows are not exceeded. The method of calculating the flow for this application may be achieved by installing an hour meter on the manure pump or by installing a GPS data logger in the tractor. All flow rates and conversion calculations must be supplied within 7 days of the nutrient application being completed. Additional soil samples at depths of 12", 24" and 36" are required to be taken from the same locations of earlier sampling and must be conducted within 24 hours of the nutrient application being completed. These results must be submitted as soon as available. If, at any time during the nutrient application process, moisture sensors detect an increase in moisture content at the three foot sensor ALL nutrient and irrigation applications must cease.

The second nutrient application originally authorized in the April 16, 2014 is hereby rescinded. If approval for an additional nutrient application after the second cut is requested, it will be considered based on all available data and current manure analysis at that time.

All other terms and conditions of the Compliance Order 76600-20/Armstrong dated March 6, 2014 remain in effect. This decision may also be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act.* An appeal must be delivered 30 days from the date that the notice of this decision is given. For further information, please contact the Environmental Appeal Board at 250-387-3464.

Ministry of Environment
Environmental Protection Division
Compliance Section
102 Industrial Place
Penticton BC V2A 7C8
Telephone: (250) 490-8200
Facsimile: (250) 490-2231

If you have any question regarding this authorization, please contact Stephanie Little at 250-490-8258 or the undersigned at 250-371-6267.

Yours truly,

Jason Bourgeois, LL.B., M.Sc.
for Director
Environmental Management Act

CC: Janelle Kwan, Interior Health
Jennifer Jacobsen, Interior Health
Brian Upper, Steele Springs Waterworks

Appendix E: Effluent Authorization August 27, 2014

August 27, 2014 File: 76600-20/Armstrong

H.S. Jansen and Sons Farm Ltd.
5063 Knob Hill Road
Armstrong, BC V0E 1B4

Attention: Dale Jansen, Director

Re: Authorization for Nutrient Application Under Section 112 Compliance Order – Issued to H.S. Jansen and Sons Farm Ltd August 27, 2014

This letter is in response to the email request dated August 26th, 2014 submitted by Doug Macfarlane, CCA, acting as the qualified professional on your behalf. Pursuant to Compliance Order (our file 76600-20/Armstrong) Section 1 issued on March 6, 2014, I hereby authorize the application of additional nutrients to the field in question in accordance with the submitted nutrient management plan and based on the most recent soil and manure analysis results. The rate of application being approved is 12,000 US Gallons/acre.

Soil moisture monitoring and additional soil samples at depths of 12", 24" and 36" are required to be taken from the same locations of earlier sampling and must be conducted within 24 hours of the nutrient application being completed. These results must be submitted as soon as available. If, at any time during the nutrient application process, moisture sensors detect an increase in moisture content at the three foot sensor ALL nutrient and irrigation applications must cease. ***This is the final diary effluent application that will be approved for 2014 to the field in question.***

All other terms and conditions of the Compliance Order 76600-20/Armstrong dated March 6, 2014 remain in effect. This one-time authorization does not constitute approval by any other agency with jurisdiction over this matter. This decision may also be appealed to the Environmental Appeal Board in accordance with Part 8 of the *Environmental Management Act.* An appeal must be delivered 30 days from the date that the notice of this decision is given. For further information, please contact the Environmental Appeal Board at 250-387-3464.

If you have any question regarding this authorization, please contact Stephanie Little at 250-490-8258 or the undersigned at 250-371-6267.

Yours truly,

Ministry of Environment
Environmental Protection Division
Compliance Section
102 Industrial Place
Penticton BC V2A 7C8
Telephone: (250) 490-8200
Facsimile: (250) 490-2231

Jason Bourgeois, LL.B., M.Sc.
for Director
Environmental Management Act

Appendix F: Effluent Authorization July, 2015

July 15, 2015 File: 76600-20 Armstrong

VIA EMAIL

H.S. Jansen and Sons Farm Ltd.
5063 Knob Hill Road
Armstrong, BC V0E 1B4

jsfl@telus.net

Dear Mr. Jansen, Director:

Re: Request to apply manure on the field under Compliance Order dated March 6, 2014

This letter is in response to the email request made July 13, 2015 to apply manure to the field owned and operated by H.S. Jansen and Sons described as the "field of concern" in the Compliance Order dated March 6, 2014. On June 12, 2015 a request to apply 8,000 gallons per acre was denied on the basis of aquifer protection and satisfactory levels of available nitrogen in the soil. It was also expressed that future applications would be considered based on the most recent analysis after each cut.

A request to apply 8,400 gallons was made via email on July 13, 2015. This amount was reduced to 6,000 gallons on July 15, 2015 to adjust for the most recent manure analysis completed on July 7, 2015.

A review of the most recent soil analysis from the field of concern was reviewed with the Ministry of Agriculture and the following interpretations were made;

- According to the data provided it is anticipated that the alfalfa crop would extract 64 lb of nitrogen per ton, therefore, anticipating a yield of approximately 1.6 ton per acre, the crop would need approximately 100 lbs of nitrogen.
- The most recent soil analysis indicates the field currently has approximately 40 lbs of available nitrogen in the 0-12" soil profile, almost half of what was available in June of 2015.
- The email dated July 15, 2015 requested 6,000 gallons per acre which would add an additional 67 lbs of plant-available N per acre (a small buffer).

Ministry of Environment Monitoring, Compliance and Stewardship Environmental Protection Division
Mailing Address: 102 Industrial Place Penticton BC V2A 7C8
Telephone: 250-490-8200 Facsimile: 250-490-2231 Website: www.gov.bc.ca/env

Based on the provided information a one time application of 6,000 gallons per acre is approved with the following provisions;

- Ensure soil and manure analysis are completed (no more than five days prior to cut) and submitted as soon as possible after the next cut.
- Include protein and yield results based on second cut tissue analysis.
- Continue judicious use of watering pre and post application, retain a record of the dates, time and duration of watering and supply moisture monitoring results upon request.
- Provide a detailed description on how the application rate approved was achieved and not exceeded.
- Provide an up to date version of the nutrient management plan within 30 days that includes; adjustments for the most recent soil and manure analysis, a volume estimate of the current level of manure effluent remaining in lagoon storage and applications made to the whole farm to date.
- Provide soil analysis (historical to current) data separated by field (Hullcar and Dougs) and reported in available pounds per acre (as opposed to parts per million).

Based on the expertise of the qualified professional and assessment by Ministry staff we believe that this approved application rate will remain protective of the aquifer based on all analysis provided. Any further applications will require a separate and additional approval and will only be considered if all of the above requirements are met.

A person who fails to comply with a provision of EMA may be found guilty of an offence and could be liable, on summary conviction, to a penalty, or to be assessed an Administrative Penalty as determined by the Director. For your reference, EMA and all related and pertinent British Columbia Laws can be found at http://www.bclaws.ca/ .

If you have any questions please contact the undersigned at Stephanie.Little@gov.bc.ca or at (250) 490-8258.

Yours truly,

Stephanie Little
Environmental Protection Officer
Compliance Section

cc:

Jason Bourgeois, Section Head, Compliance Section	Jason.Bourgeois@gov.bc.ca
Cassandra Caunce, Director, Compliance Section	Cassandra.Caunce@gov.bc.ca
Greg Tegart, Regional Manager, Ministry of Agriculture	Greg.Tegart@gov.bc.ca
Doug MacFarlane, Emerald Bay Ag Services	dougmacf@shaw.ca

Appendix G: Effluent Authorization August 31, 2015

August 31, 2015 File: 76600-20 Armstrong

VIA EMAIL

H.S. Jansen and Sons Farm Ltd.
5063 Knob Hill Road
Armstrong, BC V0E 1B4

jsfl@telus.net

Dear Mr. Jansen, Director:

Re: Request to apply manure on the field under Compliance Order dated March 6, 2014

This letter is in response to the email request made August 27, 2015 to authorize the application of 6,000 gallons per acre of manure effluent to the field owned and operated by H.S. Jansen and Sons described as the "field of concern" in the Compliance Order dated March 6, 2014.

This application rate request is based on soil analysis, manure analysis, moisture monitoring and protein analysis. A review of this analysis from the field of concern was reviewed with the Ministry of Agriculture and the following interpretations were made;

- According to the data provided, it is anticipated that the alfalfa crop would extract 65 lb of nitrogen per ton, therefore, anticipating a yield of approximately 1.6 ton per acre, the crop would need approximately 100 lbs of nitrogen.
- The most recent soil analysis indicates the field currently has approximately 60 lbs of available nitrogen in the 0-12" soil profile.
- The email dated August 27, 2015 requested 6,000 gallons per acre which would add an additional 47 lbs of plant-available N per acre bringing the total plant-available N per acre to 107 in the 0-12" zone.

Based on the provided information a one time application of **6,000** gallons per acre is approved with the following provisions;

- Notify the Ministry of Environment 24 hrs prior to commencing the spread (via email)
- Ensure the application duration is consistent with the calculated flow rates and no overlapping during spreading occurs.

Ministry of Environment
Monitoring, Compliance and Stewardship
Environmental Protection Division
Mailing Address:
102 Industrial Place
Penticton BC V2A 7C8
Telephone: 250-490-8200
Facsimile: 250-490-2231
Website: www.gov.bc.ca/env

- Ensure soil analysis is completed immediately after manure application and forward upon receipt.
- Include protein and yield results.
- Continue judicious use of watering pre and post application, retain a record of the dates, time and duration of watering and supply moisture monitoring results upon request.

Based on the expertise of the qualified professional and assessment by Ministry staff we believe that this approved application rate will remain protective of the aquifer based on all analysis provided. Any further applications will require a separate and additional approval and will only be considered if all of the above requirements are met.

A person who fails to comply with a provision of EMA may be found guilty of an offence and could be liable, on summary conviction, to a penalty, or to be assessed an Administrative Penalty as determined by the Director. For your reference, EMA and all related and pertinent British Columbia Laws can be found at http://www.bclaws.ca/ .

If you have any questions please contact the undersigned at Stephanie.Little@gov.bc.ca or at (250) 490-8258.

Yours truly,

Stephanie Little
Environmental Protection Officer
Compliance Section

cc:

Jason Bourgeois, Section Head, Compliance Section	Jason.Bourgeois@gov.bc.ca
Cassandra Caunce, Director, Compliance Section	Cassandra.Caunce@gov.bc.ca
Greg Tegart, Regional Manager, Ministry of Agriculture	Greg.Tegart@gov.bc.ca
Doug MacFarlane, Emerald Bay Ag Services	dougmacf@shaw.ca

Appendix H: Letter to HS Jansen and Sons, from Steele Springs Waterworks District, April 22, 2009

H.S. Jansen and Sons Dairy Farm
5063 Knob Hill Rd.
Armstrong, B.C. V0E 1B4

Steele Springs Waterworks District
P.O. Box 231
Armstrong, B.C. V0E 1B0

Dear Dale, Andrew and Harold Jansen,

April 22, 2009

We, the trustees of Steele Springs Waterworks District, are in charge of managing the 'water district' for 53 recipient households in Spallumcheen. Steele Springs has provided good quality water to households and small farms since incorporation in 1923. Our spring outlet is located in a small valley, about 50 meters directly east of the ninety-degree corner at the north end of Schubert Rd. The aquifer, which supplies our spring, courses in a southerly direction through gravel and sand under your 300 acre field to the north of Schubert Rd. Additionally, the aquifer is 'unconfined' and is thus vulnerable to contamination by pollutants from above. Needless to say, we rely on this quality water source and are very determined to protect it from pollution. We support farming and are aware of the importance of the use of manure from the animals on a dairy farm to fertilize the growing crops used to feed these same animals. However, after observing your manure application methods for a crop season, we have four major concerns.

First, we refer to the rate of manure application. In the B.C. Agriculture Waste Control Regulation, manure applications are to meet but not exceed the crop nutrient uptake. In order to achieve this goal; 'Nutrient Management Plans (NMP's)' have been devised by the 'Environmental Farm Plan' agricultural experts. The aim is to reduce the risk of water and air pollution and to prevent farmers from losing valuable manure nutrients. In our case, we are primarily concerned about contamination of the aquifer by nitrate nitrogen and fecal coliforms. Over fertilization with manure results in excess nitrate in the soil, which can percolate down, eventually contaminating the aquifer. The plants want it but we do not! To properly carry out an NMP, manure tests, soil tests and calibration of spreading equipment is recommended. We acknowledge that calibration is challenging when drawing from lagoons and when using 'umbilical systems' and hose reel irrigation guns' but with innovation it can be done. We are aware that you have an NMP and a workbook to help plan your own manure applications but do you have an impartial agricultural advisor to oversee the plan and it's implementation? We applaud you for having a 'plan' but are you honestly following the recommendations? The farm sign at your Open House clearly said "Environmental Farm Plan". As far back as 1993, the 'Environmental Guidelines for Dairy Producers In British Columbia' was produced in cooperation with the B.C. Federation of Agriculture and the Dairy Industry of B.C. It was published as a practical guide and an environmental safe guard. Following this guide's recommendations and considering the type of crops grown on the Jansen farm, you would need more than one acre of cropland for every adult cow's manure. And this manure needs to be spread evenly. For a 1,000 cow farm, you need at least 1,000 acres. Your home farm, allowing for creek setbacks and buildings has approximately 400 cropland acres on which to spread manure. How did you ever get this farm approved for 1,000

cows plus the equivalent young stock and dry cows? You obviously need additional land that is closer than the piece in Lavington. If we can help in the search, let us know.

Our second concern is the timing of manure applications. For example, manure is normally spread on fields before an annual crop such as corn is planted but not after the harvest, unless a 'catch crop' is planted early enough in the fall to utilize the nutrients from the applied manure. In the 'Interior Region' manure is not to be applied on bare land after September first. Did you adhere to this requirement? This is clearly spelled out in the 'environmental farm plan reference guide' and in the 1993 publication. Also recommended is the incorporation by disking within 24 hours after manure is applied to bare land in the spring to reduce waste of the ammonium form of nitrogen and to reduce odours. I believe your immediate neighbours would be grateful if you incorporated after application. And you would save nitrogen costs.

Thirdly, underground pipelines that were previously used to carry water to irrigation equipment have been used during the last crop season to carry manure 'effluent' from your lagoons to the 'umbilical system' and to the 'hose reel guns' for application on fields. Just recently we were appalled to learn that these pipelines were directly connected to wells. We understand that the only protection against 'effluent' being forced directly into the wells were plugs at the top of the wells. Are these fail-safe mechanisms such as double check valves, which are recommended by the Ministry of Agriculture and Lands? Water samples taken from each of the wells by the 'health inspector' from the Interior Health Authority and tested for nitrate and fecal coliforms would provide evidence that contamination did or did not happen. Having them tested would be a goodwill gesture to your neighbours who are sharing the aquifers. It is our understanding that you are now putting in a new separate pipeline just for manure effluent so that the old line can be used for irrigation. Congratulations for providing this safe guard even though a season late. We suggest that you check to see if manure is still in these underground lines. If it is, you are obligated to use manure spreading setbacks rather than water irrigation setbacks when irrigating via these lines to land near the 'Deep Creek'.

This leads to our fourth concern. In both guidelines previously mentioned, it is stated that 'manure application should not occur within 5 metres of the top of the bank or slope leading to a wet ditch or a wet watercourse'. In several locations you have been spreading manure much closer than recommended to the Deep Creek.

We live on and among farms and we support agriculture. We realize that you need to fertilize your crops with the valuable nutrients in manure. Large farms are often established to gain the advantage of the 'economy of scale' for their owners. However, with a large agricultural enterprise such as yours comes a very large responsibility to protect the surrounding environment from degradation by your farm operations. We kindly request that you use proper (careful) rather than improper (careless) management practices in regard to the environment, for your benefit as well as those around you. Not surprisingly there will be some commitment of your farm to prevent this environmental damage. Sometimes government grants can be obtained to offset these costs. But these expenditures will be much cheaper than lawsuits. A water disaster like the one that

occurred in Walkerton, Ontario in the year 2000 is something that no one wants to see duplicated here in Spallumcheen. Over 100 people, among them a few elderly, use our system. We are determined to keep our spring water free from contamination, indefinitely. Proactively taking soil samples from your fields and testing in the spring and fall will reveal whether the nitrate levels in the soil are higher than necessary for the next crop. This information is invaluable to the NMP that you are using to plan your fertilization.

We approach you now because some of our information has been revealed rather recently. Waiting until rising nitrate levels and/or increasing fecal coliform counts show up in our raw water is not an option. Contamination of this type may take years to naturally recover if recovery is even possible. If the levels indicate that our water is unsafe we could be shut down. If this happens, it will be a direct indicator of careless manure application, and or direct contamination of the aquifer. An event such as this will not be taken lightly. If your farm operation is found responsible, are you prepared to compensate all of the users on our system? It is our desire to keep you aware of our position so that you can plan accordingly. We wish you success in your farming endeavour and also desire to keep our relationship with you cordial.

The Trustees of Steele Springs Waterworks District

Frank Gates

Raymond Hitt

George Kocsis (Vice Chairman)

Brian Upper (Chairman)

Copies to:

- Casey Neathway – Public Health Authority
- Kevin Murphy – Agrologist – Ministry of Agriculture and Lands
- Skye Thomson – Groundwater Specialist – Ministry of the Environment – HYDROLOGIST
- Gerri Huggins – Groundwater Specialist – Ministry of the Environment
- Mayor Will Hansma and Spallumcheen Council
- Colin Mayes – Member of Parliament
- George Abbot – M.L.A.
- Mr. And Mrs. H.S. Jansen

Appendix I: Letter to Steele Springs Waterworks District, Brian Gregory (Interior Health) April 1, 2015

Interior Health

April 1, 2015

Steele Springs Waterworks District
c/o Brian Upper (Trustee)
4570 Schubert Road
Spallumcheen BC V0E 1B4

Dear Mr. Brian Upper:

RE: Water Quality Advisory concerning Nitrates for Steele Springs Waterworks District

As requested, I am sending this letter for clarification of the Water Quality Advisory that was issued on March 18, 2014 on the recommendations of Janelle Kwan (Environmental Health Officer, Interior Health). I support the decision to issue this Water Quality Advisory pertaining to the Steele Springs Waterworks District. Recent sampling (2014-2015) of your water source has shown nitrate levels that are just above maximum acceptable levels as set out in the Guidelines for Canadian Drinking Water Quality. Your spring water source (identified as BC Well Tag 9293) is located in the shallow unconfined aquifer identified as Hullcar Aquifer 103 and this aquifer has been categorized as "vulnerable".

High nitrate levels are a health concern for infants less than 3 months in age and can also increase the risk of stomach cancer in adults. Interior Health is advising that pregnant women, babies under 6 months of age, the elderly (in general terms, those over 65 years of age) and individuals with weakened immune systems, or chronic heart, lung and blood conditions should take precautions and use an alternative source of water (e.g. bottled water) at this time. An alternative source of water should be used to mix infant formula for infants less than 6 months of age.

Exposure to high levels of nitrates reduces the amount of oxygen in the blood. This condition is called methemoglobinemia. Babies under 6 months are particularly at risk from drinking water high in nitrates. In severe cases, this can cause an infant to turn a grey-blue colour, mainly around the eyes and mouth due to the lack of oxygen in their blood. Babies should never be fed water or infant formula mixed with water high in nitrates (if possible, infants should be breastfed).

Interior Health (IHA) and the Ministry of Environment are aware and involved in investigating the source of the nitrates. Together with the operator of your water system, we are monitoring ground water nitrate levels and will provide further updates as more information and monitoring results become available. Additionally, the Trustees of Steele Springs Waterworks District are sampling and testing the source water every month.

The residents using the Steele Springs Waterworks District water supply system and other residents who draw water from the Hullcar Aquifers, were sent a similar Water Quality Advisory by Dr. Trevor Corneil (Medical Health Officer, Interior Health) on July 14, 2014.

If you have further questions about nitrates and your health, please contact your family physician. If you have questions regarding this letter or why this Water Quality Advisory was issued, please contact Brian Upper (Trustee, Steele Springs Waterworks District) or Brian Gregory (Environmental Health Officer, IHA) at 250-833-4170.

Further information on nitrates in drinking water is available at the following web sites:
http://www.healthlinkbc.ca/healthfiles/hfile05a.stm (BC Ministry of Health)
http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/nitrate_nitrite/index-eng.php (Health Canada)

Bus. 250) 833-4170 Fax (250) 833-4117
Email: brian.gregory@interiorhealth.ca
Web: interiorhealth.ca

HEALTH PROTECTION
Less Risk ~ Better Health

Salmon Arm Health Centre
PO Box 627 851 16th St. NE
Salmon Arm, BC V1E 4N7

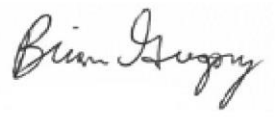
Regarding the Water Quality Advisory (WQA) pertaining to the Steele Springs Waterworks District, please note that boiling the water will not remove the nitrates (the Steele Springs WQA is not related to microorganisms).

Please ensure that copies of this letter are distributed and/or made available to all water users of this water supply system.

I hope this helps clarify the health concerns related to the Water Quality Advisory issued on the recommendations of Interior Health and for distribution by the Steele Springs Waterworks District.

If you have any further questions, don't hesitate to contact me at 250-833-4170.

Sincerely,



Brian Gregory
Environmental Health Officer

BG/bg

cc: Rob Birtles, Team Leader, Small Water Systems, Health Protection, IHA
Janelle Kwan, Environmental Health Officer, Health Protection, IHA
Dr. Trevor Corneil, Medical Health Officer, IHA

Att. Dr. Trevor Corneil's letter: "Water Quality Advisory for Residents who may draw water from the Hullcar Aquifer in Spallumcheen" dated July 14, 2014

Appendix J: Letter to Current Residents who may draw water from the Hullcar aquifer, Trevor Corneil., MD (Interior Health), July, 14, 2014

Interior Health

July 14, 2014

Dear Current Resident,

RE: Water Quality Advisory for Residents who may draw water from the Hullcar Aquifer in Spallmacheen

---

The purpose of this letter is to notify you that the shallow Aquifer located in your area is showing high levels of Nitrates. Recent nitrate sampling has shown that current nitrate levels are just above acceptable levels as set out by the Guidelines for Canadian Drinking Water Quality. High nitrate levels are a health concern for infants less than 3 months in age and can also increase the risk of stomach cancer for adults.

Interior Health is advising that pregnant women, babies under 6 months of age, the elderly, and individuals with weakened immune systems, or chronic heart, lung and blood conditions should take precautions and use an alternative source of water (ex. bottled water) at this time. For bottle fed infants, use an alternate source of water to mix infant formula for infants less than 6 months of age.

Interior Health and the Ministry of Environment are aware and involved in investigating the source of the nitrates. We are currently monitoring ground water nitrate levels and will provide further updates as more information and monitoring results become available.

Nitrate levels throughout the aquifer may vary; therefore it is recommended that individuals test their water (this applies to wells and surface water sources). Interior Health is unable to pay for testing of private wells, but we are more than happy to assist with interpretation. If you require assistance interpreting your result please contact Janelle at the number below. Testing for Nitrates can be arranged through **Caro Analytical services in Kelowna (250) 765-9646.**

... /2

Kelowna Health Unit
1340 Ellis Street
Kelowna BC V1Y 9N1
Web: interiorhealth.ca

Trevor Corneil, MD FRCPC
Medical Health Officer
Telephone: (250) 868-7849 Fax: (250) 868-7826
E-Mail: trevor.corneil@interiorhealth.ca

If you have further questions regarding Nitrates and your health, please contact your family physician. If you have any questions regarding this notice please contact Janelle Kwan (Environmental Health Officer) at (250) 549-5758.

Further information on Nitrates in drinking water please see attached go to:
http://www.healthlinkbc.ca/healthfiles/hfile05a.stm

http://www.hc-sc.gc.ca/ewh-semt/alt_formats/hecs-sesc/pdf/pubs/water-eau/nitrate_nitrite/nitrate_nitrite-eng.pdf"

Yours sincerely,

Dr. Trevor Corneil, FRCPC
Medical Health Officer

TC/ls

Appendix K: Letter to Mayor of the Township of Spallumcheen, August 15, 2014, from Terry Lake (Minister of Health)

INFORMATION
RECEIVE & FILE

Sept. 8/14 Council Agenda			✓
I/C Agenda			
Cite Agenda			
Public Table			
CAO/Rao	✓	CFO	
JCO		PWM	
DEV SVS		BLDG INS	
FILE	✓	OTHER	

AUG 17 2014

BRITISH COLUMBIA

RECEIVED
AUG 15 2014
SPALLUMCHEEN

1012097

Her Worship Janice Brown
Mayor of the Township of Spallumcheen
4144 Spallumcheen Way
Spallumcheen BC V0E 1B6

Dear Mayor Brown:

Thank you for your letter of May 26, 2014, regarding local concerns raised to your town council on the potentially negative impacts of agricultural land use on ground water.

Although the *Farm Practices Protection (Right to Farm) Act* permits odour, noise, dust or other disturbances associated with normal farm practices, agricultural operations must also be in compliance with the *Public Health Act*, *Drinking Water Protection Act*, *Integrated Pest Management Act*, *Environmental Management Act*, and their associated regulations. This includes the Agricultural Waste Control Regulation (and its Code of Agricultural Practice for Waste Management), the Organic Matter Recycling Regulation, and the Code of Practice for Soil Amendments. Associated with these latter two regulations is a guidance document prepared by the Ministry of Environment entitled *Land Application Guidelines for the Organic Matter Recycling Regulation and the Soil Amendment Code of Practice*. Agricultural waste application on land is required to be done in such a way that pollution does not occur.

Aquifer protection is the responsibility of the Ministry of Environment, and the Ministry of Health fully supports their role in monitoring activities that may result in contamination. All of the regulations and policies listed above are intended to help prevent contamination of both surface and ground water. We encourage the Township of Spallumcheen and Interior Health to continue working with the Ministry of Agriculture and the Ministry of Environment to ensure that local farmers comply with the relevant legislation that is in place to protect water sources.

Under the *Drinking Water Protection Act*, a Drinking Water Officer can respond to public complaints regarding the suspected contamination of a drinking water source. If a Drinking Water Officer feels that an investigation is warranted, there would be no conflict with the *Farm Practices Protection (Right to Farm) Act*, as the act clearly does not permit the pollution of ground or surface water. At the same time, water suppliers must be aware of and manage the inherent risks of their chosen water supply and the level of treatment necessary to mitigate these risks. The best approach to ensure delivering the safest drinking water begins with collecting water from the cleanest source possible.

...2

SEP 0 8 2014
REGULAR COUNCIL MEETING
ITEM: 8 (b)(i)

Ministry of Health
Office of the Minister
~~Mailing Address~~:
PO Box 9050 Stn Prov Govt
Victoria BC V8W 9E2
Location:
Parliament Buildings
Victoria

The Ministry of Health's understanding is that the Steele Springs Water District water source has historically experienced cycles of elevated nitrates, suggesting that the ground water feeding the spring is shallow and highly vulnerable to contamination. Prior to the recent increase in nitrate concentrations, Interior Health communicated to the Water District that they should consider using an alternative water source that does not carry the same risk of contamination as their current spring source. Interior Health has also been in contact with the Ministry of Environment, and I understand that they are working together with two farms in the area towards better management.

The Ministry of Health fully supports the ongoing collaboration that has been established among Interior Health, the Ministries of Agriculture and Environment, your township, the water supply system operators, and the agricultural operators in the area to help ensure that drinking water sources are protected from contamination.

Sincerely,

Terry Lake
Minister

pc: Honourable Norm Letnick, Minister of Agriculture
Ms. Janelle Kwan, Environmental Health Officer, Vernon Health Centre
Interior Health Authority

Appendix L: Well Sample from Aquifer #102

CARO ANALYTICAL SERVICES

CERTIFICATE OF ANALYSIS

REPORTED TO	Mountain View Electric Ltd. PO Box 467- 1009 Belvedere Street ENDERBY, BC V0E 1V0	**TEL** **FAX**	(250) 838-6455 (250) 838-6732
ATTENTION	Pat Doorn	**WORK ORDER**	5040196
PO NUMBER		**RECEIVED / TEMP**	Apr-02-15 15:40 / 10°C
PROJECT	Steele Springs Water District	**REPORTED**	Apr-13-15
PROJECT INFO	Potential New Water Source	**COC NUMBER**	B29584

General Comments:

CARO Analytical Services employs methods which are conducted according to procedures accepted by appropriate regulatory agencies, and/or are conducted in accordance with recognized professional standards using accepted testing methodologies and quality control efforts, except where otherwise agreed to by the client.

The results in this report apply to the samples analyzed in accordance with the Chain of Custody or Sample Requisition document. This analytical report must be reproduced in its entirety. CARO is not responsible for any loss or damage resulting directly or indirectly from error or omission in the conduct of testing. Liability is limited to the cost of analysis. Samples will be disposed of 30 days after the test report has been issued unless otherwise agreed to in writing.

Authorized By: **Ed Hoppe, B.Sc., P.Chem.**
Division Manager, Kelowna

Please contact CARO if more information is needed or to provide feedback on our services.

Locations:

#110 4011 Viking Way
Richmond, BC V6V 2K9
Tel: 604-279-1499 Fax: 604-279-1599

#102 3677 Highway 97N
Kelowna, BC V1X 5C3
Tel: 250-765-9646 Fax: 250-765-3893

17225 109 Avenue
Edmonton, AB T5S 1H7
Tel: 780-489-9100 Fax: 780-489-9700

www.caro.ca

CARO ANALYTICAL SERVICES

ANALYSIS INFORMATION

REPORTED TO Mountain View Electric Ltd.
PROJECT Steele Springs Water District

WORK ORDER 5040196
REPORTED Apr-13-15

Analysis Description	Method Reference	Technique	Location
Alkalinity (Total)	APHA 2320 B	Titration with H2SO4 to pH 4.5	Kelowna
Anions in Water by IC	APHA 4110 B	Ion Chromatography with Chemical Suppression of Eluent Conductivity	Kelowna
Background Colonies (MF)	APHA 9222	Membrane Filtration / Membrane Filtration	Kelowna
Carbon, Total Organic in Water	APHA 5310 B	High Temperature Combustion, Infrared CO2 Detection	Kelowna
Colour, True	APHA 2120 C	Spectrophotometry (456 nm)	Kelowna
Conductivity in Water	APHA 2510 B	Conductivity Meter	Kelowna
Cyanide, Total in Liquids	APHA 4500-CN- C / APHA 4500-CN- E	Distillation / Colorimetry	Kelowna
E. coli (Partition)	APHA 9222 G	Membrane Filtration / Membrane Filtration	Kelowna
Hardness (as CaCO3)	APHA 2340 B	Calculation	N/A
Langelier Index	APHA 2330 B	Calculation	N/A
Mercury, total by CVAFS	EPA 245.7*	BrCl2 Oxidation / Cold Vapor Atomic Fluorescence Spectrometry (CVAFS)	Richmond
pH in Water	APHA 4500-H+ B	Electrometry	Kelowna
Solids, Total Dissolved	APHA 1030 E	Calculation	N/A
Temperature (lab)	APHA 2550 B	Thermometer	Kelowna
Total Ammonia-N in Water	APHA 4500-NH3 G*	Automated Colorimetry (Phenate)	Kelowna
Total Coliforms (by Endo)	APHA 9222 B	Membrane Filtration / Membrane Filtration	Kelowna
Total Kjeldahl Nitrogen in Water	EPA 351.2*	Sulfuric Acid Digestion, Automated Colorimetry	Kelowna
Total Recoverable Metals	APHA 3030E* / APHA 3125 B	HNO3+HCl Hot Block Digestion / Inductively Coupled Plasma Mass Spectrometry (ICP-MS)	Richmond
Total Sulfide in Water	APHA 4500-S2 D	Colorimetry (Methylene Blue)	Edmonton
Transmissivity at 254 nm	APHA 5910 B	Ultraviolet Absorption	Kelowna
Turbidity	APHA 2130 B	Nephelometry	Kelowna

Note: An asterisk in the Method Reference indicates that the CARO method has been modified from the reference method

Method Reference Descriptions:

APHA	Standard Methods for the Examination of Water and Wastewater, 22nd Edition, American Public Health Association/American Water Works Association/Water Environment Federation
EPA	United States Environmental Protection Agency Test Methods

Glossary of Terms:

MRL	Method Reporting Limit
<	Less than the Reported Detection Limit (RDL) - the RDL may be higher than the MRL due to various factors such as dilutions, limited sample volume, high moisture, or interferences
AO	Aesthetic objective
MAC	Maximum acceptable concentration (health based)
OG	Operational guideline (treated water)
% T	Percent Transmittance
°C	Degrees Celcius
CFU/100 mL	Colony Forming Units per 100 millilitres
CU	Colour Units (referenced against a platinum cobalt standard)
mg/L	Milligrams per litre
NTU	Nephelometric Turbidity Units
pH units	pH < 7 = acidic, ph > 7 = basic
µS/cm	Microsiemens per centimetre

CARO ANALYTICAL SERVICES

ANALYSIS INFORMATION

REPORTED TO	Mountain View Electric Ltd.	**WORK ORDER**	5040196
PROJECT	Steele Springs Water District	**REPORTED**	Apr-13-15

Standards / Guidelines Referenced in this Report:

Guidelines for Canadian Drinking Water Quality (Oct 2014)

Website: http://www.hc-sc.gc.ca/ewh-semt/alt_formats/pdf/pubs/water-eau/sum_guide-res_recom/sum_guide-res_recom-eng.pdf

Note: In some cases, the values displayed on the report represent the lowest guideline and are to be verified by the end user

CARO ANALYTICAL SERVICES

SAMPLE ANALYTICAL DATA

REPORTED TO	Mountain View Electric Ltd.	**WORK ORDER**	5040196
PROJECT	Steele Springs Water District	**REPORTED**	Apr-13-15

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: Aarista Lands Inc 6" Well (5040196-01) [Water] Sampled: Apr-02-15 14:08							PRES
Anions							
Chloride	**15.5**	AO ≤ 250	0.10	mg/L	N/A	Apr-02-15	
Fluoride	**0.23**	MAC = 1.5	0.10	mg/L	N/A	Apr-02-15	
Nitrate as N	**2.55**	MAC = 10	0.010	mg/L	N/A	Apr-02-15	
Nitrite as N	< 0.010	MAC = 1	0.010	mg/L	N/A	Apr-02-15	
Sulfate	**116**	AO ≤ 500	1.0	mg/L	N/A	Apr-02-15	
General Parameters							
Alkalinity, Total as CaCO3	**260**	N/A	1	mg/L	N/A	Apr-07-15	
Carbon, Total Organic	**1.3**	N/A	0.5	mg/L	N/A	Apr-07-15	
Colour, True	< 5	AO ≤ 15	5	CU	N/A	Apr-03-15	
Conductivity (EC)	**752**	N/A	2	µS/cm	N/A	Apr-07-15	
Cyanide, Total	< 0.010	MAC = 0.2	0.010	mg/L	Apr-07-15	Apr-09-15	
Ammonia as N, Total	**0.045**	N/A	0.020	mg/L	N/A	Apr-07-15	
Nitrogen, Total Kjeldahl	**0.19**	N/A	0.05	mg/L	Apr-02-15	Apr-08-15	
pH	**7.97**	6.5-8.5	0.01	pH units	N/A	Apr-07-15	HT2
Sulfide, total	< 0.05	N/A	0.05	mg/L	N/A	Apr-10-15	HT1
Temperature	**22**	N/A		°C	N/A	Apr-07-15	HT2
Turbidity	**0.7**	OG < 0.1	0.1	NTU	N/A	Apr-02-15	
UV Transmittance @ 254nm	**95.7**	N/A	0.1	% T	N/A	Apr-02-15	
Calculated Parameters							
Aggresiveness Index	**13.0**	N/A		-	N/A	Apr-13-15	
Hardness, Total (Total as CaCO3)	**409**	N/A	5.0	mg/L	N/A	N/A	
Langelier Index	**1.1**	N/A	-5.0	-	N/A	Apr-13-15	
Nitrogen, Organic	**0.15**	N/A	0.05	mg/L	N/A	N/A	
Solids, Total Dissolved	**468**	AO ≤ 500	10.0	mg/L	N/A	N/A	
Total Recoverable Metals							
Aluminum, total	< 0.05	OG < 0.1	0.05	mg/L	Apr-09-15	Apr-10-15	
Antimony, total	< 0.001	MAC = 0.006	0.001	mg/L	Apr-09-15	Apr-10-15	
Arsenic, total	< 0.005	MAC = 0.01	0.005	mg/L	Apr-09-15	Apr-10-15	
Barium, total	< 0.05	MAC = 1	0.05	mg/L	Apr-09-15	Apr-10-15	
Beryllium, total	< 0.001	N/A	0.001	mg/L	Apr-09-15	Apr-10-15	
Boron, total	< 0.04	MAC = 5	0.04	mg/L	Apr-09-15	Apr-10-15	
Cadmium, total	< 0.0001	MAC = 0.005	0.0001	mg/L	Apr-09-15	Apr-10-15	
Calcium, total	**132**	N/A	2.0	mg/L	Apr-09-15	Apr-10-15	
Chromium, total	< 0.005	MAC = 0.05	0.005	mg/L	Apr-09-15	Apr-10-15	
Cobalt, total	< 0.0005	N/A	0.0005	mg/L	Apr-09-15	Apr-10-15	
Copper, total	**0.002**	AO ≤ 1	0.002	mg/L	Apr-09-15	Apr-10-15	
Iron, total	< 0.10	AO ≤ 0.3	0.10	mg/L	Apr-09-15	Apr-10-15	
Lead, total	< 0.001	MAC = 0.01	0.001	mg/L	Apr-09-15	Apr-10-15	
Magnesium, total	**19.1**	N/A	0.1	mg/L	Apr-09-15	Apr-10-15	
Manganese, total	< 0.002	AO ≤ 0.05	0.002	mg/L	Apr-09-15	Apr-10-15	
Mercury, total	< 0.00002	MAC = 0.001	0.00002	mg/L	Apr-08-15	Apr-10-15	
Molybdenum, total	**0.002**	N/A	0.001	mg/L	Apr-09-15	Apr-10-15	
Nickel, total	< 0.002	N/A	0.002	mg/L	Apr-09-15	Apr-10-15	
Phosphorus, total	< 0.2	N/A	0.2	mg/L	Apr-09-15	Apr-10-15	

CARO ANALYTICAL SERVICES

SAMPLE ANALYTICAL DATA

REPORTED TO	Mountain View Electric Ltd.	**WORK ORDER**	5040196
PROJECT	Steele Springs Water District	**REPORTED**	Apr-13-15

Analyte	Result / *Recovery*	Standard / Guideline	MRL / *Limits*	Units	Prepared	Analyzed	Notes
Sample ID: Aarista Lands Inc 6" Well (5040196-01) [Water] Sampled: Apr-02-15 14:08, Continued							PRES
Total Recoverable Metals, Continued							
Potassium, total	**5.3**	N/A	0.2	mg/L	Apr-09-15	Apr-10-15	
Selenium, total	< 0.005	MAC = 0.05	0.005	mg/L	Apr-09-15	Apr-10-15	
Silicon, total	**12**	N/A	5	mg/L	Apr-09-15	Apr-10-15	
Silver, total	< 0.0005	N/A	0.0005	mg/L	Apr-09-15	Apr-10-15	
Sodium, total	**10.1**	AO ≤ 200	0.2	mg/L	Apr-09-15	Apr-10-15	
Uranium, total	**0.0020**	MAC = 0.02	0.0002	mg/L	Apr-09-15	Apr-10-15	
Vanadium, total	< 0.01	N/A	0.01	mg/L	Apr-09-15	Apr-10-15	
Zinc, total	< 0.04	AO ≤ 5	0.04	mg/L	Apr-09-15	Apr-10-15	
Microbiological Parameters							
Coliforms, Total	**3**	MAC = None Detected	1	CFU/100 mL	Apr-02-15	Apr-03-15	
Background Colonies	< 1	N/A	1	CFU/100 mL	Apr-02-15	Apr-03-15	
E. coli	< 1	MAC = None Detected	1	CFU/100 mL	Apr-02-15	Apr-03-15	

Sample / Analysis Qualifiers:

HT1	The sample was prepared / analyzed past the recommended holding time.
HT2	The 15 minute recommended holding time (from sampling to analysis) has been exceeded - field analysis is recommended.
PRES	Sample has been preserved for Sulfide, TOC in the laboratory and the holding time has been extended.

Appendix M: Letters of Support and Concern

THE CORPORATION OF THE TOWNSHIP OF SPALLUMCHEEN

4144 Spallumcheen Way, Spallumcheen, BC V0E 1B6
Phone: 250-546-3013 • Fax: 250-546-8878 • Toll Free: 1-866-546-3013
Email: mail@spallumcheentwp.bc.ca • Website: www.spallumcheentwp.bc.ca

January 27th, 2016

Environmental Law Centre
University of Victoria
Murray & Anne Fraser Building
Victoria, BC V8W 2Y2

Attention: Mr. Calvin Sandborn,
Lawyer; Legal Director

Re: Request that the Drinking Water Officer issue a Drinking Water Hazard Abatement and Prevention Order regarding the contamination of unconfined Hullcar aquifer #103, pursuant to Section 25 of the *Drinking Water Protection Act*.

The Steele Springs Water District (SSWD) and Hullcar aquifer #103 are located in the Township of Spallumcheen (Township). Township Council is very familiar with the issues and concerns about the high nitrate levels in the SSWD potable water supply and Hullcar aquifer #103.

The Ministry of Environment issued a Compliance Order, dated March 6th, 2014, to H.S. Jansen and Sons Farm Ltd. due to concerns about the application of manure in the vicinity of Steele Springs and high nitrate levels.

Two Water Quality Advisories were issued in 2014 because there were high nitrate levels above 10 ppm in the SSWD potable water supply and Hullcar aquifer #103.

The Township is also aware of the efforts of residents and property owners affected by the high nitrate levels, including the SSWD and the Save Hullcar Aquifer Team (SHAT), to work to remediate this situation.

Over the past two years, Township Council has been communicating its concerns, and the concern of its residents, to the Ministers of Environment, Agricultural and Health. Township Council has supported a moratorium on the spraying of effluent by H.S. Jansen and Sons Farm Ltd. on the field adjacent to Steele Springs until the nitrate levels have dropped below 3 ppm. Township Council also requested that the Ministry of Environment undertake a comprehensive nitrate testing program (water and soil) for Hullcar aquifer #103.

The results of nitrate testing by the Steele Springs Water District (SSWD) and the Ministry of the Environment indicates that nitrate levels remain high, but decreased from 13.00 ppm in February 2015. to 9.00 ppm in September 2015. This trend seemed to show that the efforts of the Ministry of the Environment and H.S. Jansen and Sons Farm Ltd. were reducing the nitrate levels. However, the nitrate levels have increased since September 2015 to12.50 ppm in December 2015.

Unfortunately the compliance order and work to date by the Provincial Ministries, H.S. Jansen and Sons Farm Ltd., SSWD, SHAT, Township and others has not reduced the nitrate levels in the SSWD potable water supply and Hullcar aquifer #103.

Therefore Township Council supports the request of the Environmental Law Center, on behalf of SHAT, that the Drinking Water Officer issue a Drinking Water Hazard Abatement and Prevention Order regarding the contamination of unconfined Hullcar aquifer #103, pursuant to Section 25 of the *Drinking Water Protection Act*.

Township Council is hopeful that the issuance of the Drinking Water Hazard Abatement and Prevention Order will be an important action towards reducing the nitrates to a safe level in Hullcar aquifer #103.

Please contact the undersigned or Corey Paiement, Chief Administrative Officer, if you have any questions about the foregoing.

Yours truly,

Janice Brown

Janice Brown
Mayor

City of Armstrong

3570 Bridge Street | PO Box 40 | Armstrong, BC V0E 1B0
P 250.546.3023 | F 250.546.3710 | info@cityofarmstrong.bc.ca

OFFICE OF THE MAYOR

January 28, 2016

Mr. Calvin Sandborn
Environmental Law Centre
Murray and Anne Fraser Building
University of Victoria
PO Box 1700, Stn CSC
Victoria, BC V8W 2Y2

Dear Mr. Sandborn,

Re: Request for Letter of Support for Drinking Water Protection

On behalf of the Council of the City of Armstrong, I am writing to support the efforts of the Save Hullcar Acquifer Team (SHAT) for the protection of the Hullcar acquifers which provide drinking water to approximately 300 people.

The City of Armstrong is not directly involved nor impacted by the complex contamination issues that have been ongoing for a number of years for the affected Hullcar residents. While we are not in a position to advocate for a particular action, we do support strongly the need for the Province to address this urgent situation immediately. Those residents are relying on the government and regulating bodies to enforce the requirements of the *Drinking Water Protection Act*.

Local governments, corporations and businesses are held to very high standards and industrial agriculture should also maintain these standards. The City's spray irrigation program, in operation for over twenty-five years, follows very onerous guidelines.

The urgency to address water quality issues continues. We encourage the regulators to get down to the business of finding and enforcing the solution that will ensure potable water for that community of residents.

Yours very truly,

Chris Pieper
Mayor

CP/ms
cc: Armstrong Council

January 26, 2016

Calvin Sandborn
Environmental Law Centre
Murray and Anne Fraser Building
University of Victoria
P.O. Box 1700, Stn CSC
Victoria, B.C., V8W 2Y2

Re: **Request for a Drinking Water Hazard and Abatement Order on behalf of Save the Hullcar Aquifer Team**

Dear Mr. Sandborn,

We have been informed by the Save the Hullcar Aquifer Team of the water quality issues facing 250 individuals who obtain their drinking water from the Steele Springs Waterworks District and from private wells in the Hullcar Valley near Armstrong, BC. We are aware that since March 2014, groundwater users of Hullcar Aquifer #103 have been subject to a water quality advisory owing to nitrate concentrations approaching or exceeding the drinking water quality guideline of 10 mg/L. Application of liquid manure effluent on a nearby dairy farm operated by HS Jansen and Sons has been identified as a probable source of nitrate contamination to the aquifer, and has prompted the Save the Hullcar Aquifer Team to request that the local Drinking Water Officer issue a Drinking Water Hazard and Abatement and Prevention Order under the *Drinking Water Protection Act.*

Our Association represents approximately 300 tradesmen, consultants, and other professionals working in the groundwater industry. We feel strongly that groundwater resources should be protected and that every individual has a right to safe drinking water, as our health and livelihoods depend on it. At the same time, we strive to promote and encourage harmony and co-operation between our members and government agencies. For this reason, and given our limited understanding of all of the scientific, political, and regulatory details of this case, we abstain from advocating for a particular course of action against a particular individual at this time.

Instead, we ask that regulatory officials make it an immediate priority to carefully consider the Order request and take further action to remedy this situation. We have learned elsewhere in the Province that nitrate contamination, if left unchecked, can spread extensively through an aquifer and persist for decades (e.g. Abbotsford-Sumas and Grand Forks aquifers). As each aquifer is unique in its hydrogeological and land use setting, it is logical that a unique set of agricultural best management practices may be required to protect that aquifer. Regulatory enforcement measures taken to date should be critically reviewed in consideration of nitrate concentration trends in the Hullcar Aquifer until the right 'balance point' is reached between nutrient loading and maintenance of potable groundwater quality.

The fact that nitrate concentrations in the Hullcar Aquifer have spiked then decreased in the past suggests that this situation can be remedied. We urge all who are directly involved to do their part in finding and implementing the right solution so that this may ultimately prove to be an example of sustainable resource management in the region.

Respectfully submitted,

Kathy Tixier, PEng.
GENERAL MANAGER
BC Groundwater Association

Steele Springs Water District
Box 231
Armstrong, B.C. V0E 1B0

January 7, 2016

To: Calvin Sandborn,

Environmental Law Centre,
Murray and Anne Fraser Building,
University of Victoria,
P.O. Box 1700, Stn CSC,
Victoria, B.C., V8W 2Y2

Dear Mr. Sandborn,

Over the past four years, the water quality of the source water of Steele Springs Waterworks District (SSWD) has deteriorated due to nearby agricultural activity. The Steele Springs, which discharge from the Hullcar Aquifer #103, are the source water of the SSWD. As of March of 2014 Interior Health has placed Steele Springs's 160 users on a Water Quality Advisory because the nitrate nitrogen level in our source water has been above the Maximum Allowable Concentration of 10 mg/Litre since that time. Additionally, private well owners in the Hullcar Valley that also draw water from the Hullcar Aquifer #103 have been warned by Interior Health that the contamination that has been detected in the Aquifer Water could affect their water sources. So far, six wells located in aquifer #103 near our source, have high nitrate levels. At least 150 people access potable water from the private wells in the Hullcar Valley.

So far the Senior Government Ministries of Health, Environment and Agriculture, although aware of the problem for these four years, have not individually or collectively conducted any effective intervention to reduce or remediate the contamination. On behalf of the Board of Trustees of Steele Springs Waterworks District, I am writing in support of the initiative of the Save the Hullcar Aquifer Team to seek the help of the Environmental Law Clinic to assist in achieving a satisfactory resolution to the problem as specified in the succeeding paragraph.

The Board of Trustees of Steele Springs Waterworks District support the request that the Drinking Water Officer issue a Drinking Water Hazard Abatement and Prevention Order regarding the contamination of unconfined Hullcar aquifer # 103, an important source of drinking water, pursuant to section 25 of the Drinking Water Protection Act. Specifically, we request that you order a complete and permanent moratorium on the application of liquid effluent on a 210 acre field owned by H.S. Jansen and Sons Farm Ltd. ("field of concern"), a probable source of contamination.

3

Steele Springs Water District
Box 231
Armstrong, B.C. V0E 1B0

Respectfully submitted,

B. A. Upper

Brian Upper Chairman of the Board of Trustees of Steele Springs Waterworks District

Authorized by Trustees Loyde Berkholtz, Mike Paull, Murray Todd and Darcy Gordon

Shuswap Environmental Action Society

January 10, 2016

Calvin Sandborn,
Legal Director,
Environmental Law Centre,
Murray and Anne Fraser Building,
University of Victoria
P.O. Box 1700 STN CSC
Victoria, BC, Canada, V8W 2Y2

Dear Mr. Sandborn,

The Shuswap Environmental Action Society was incorporated as a non-profit society in 1989 with a mission to study environmental issues, to inform the public about environmental problems and solutions, to coordinate activities and share information with other local, provincial, and national environmental organizations, and to take actions to improve our local environment. Our membership covers the whole region, with more than 130 regular members and in excess of 100 lifetime members.

Since its inception, SEAS has helped create more than 25,000 hectares of new Provincial Parks for the Shuswap region, helped develop two land use plans that have improved management of natural resources in the Shuswap, organized numerous public forums on topics such as climate change, water, forestry and food safety, participated in numerous provincial environmental and forestry processes and been the catalyst for the Shuswap Watershed Project, a collaborative educational imitative to raise public awareness, along with many other activities.

For the most part, the focus of our activities has been confined to the Shuswap region. One of the groups we were instrumental in getting off the ground is the Shuswap Watershed Alliance, a coalition of organizations committed to protecting all the values of the watershed.

But over the last couple of years we have become aware of the situation of our neighbors to the south of us in the Hullcar Valley which we can't ignore, in which about 150 people are directly impacted by a drinking water advisory because of nitrates in the Steele Springs drinking water over the 10 ppm in the Canadian Drinking Water Guidelines. Private wells in the Hullcar Valley are also threatened with nitrate contamination, involving another 150 people. Water is synonymous with the Shuswap, as everyone uses and relies on the lake water for recreation, agriculture, homes and gardens and drinking water. It is no less critical a resource in the Hullcar area, and everywhere else in the world.

In July 2010 the United Nations agreed to a new resolution declaring the human right to "safe and clean drinking water and sanitation".

The Shuswap Environmental Action Society supports the request of the Save Hullcar Aquifer Team and the Environmental Law Centre that the Drinking Water Officer issue a Drinking Water Hazard Abatement and Prevention Order regarding the contamination of unconfined Hullcar aquifer #103, pursuant to section 25 of the Drinking Water Protection Act.

The Hullcar Aquifers are the headwaters for the entire water system of the Okanagan Valley and beyond. They must be protected, and we wish you every success in accomplishing that goal.

Sincerely,

Jim Cooperman, President,
Shuswap Environmental Action Society
1497 Lee Creek Drive
Lee Creek, B.C., V0E 1M4