

February 18, 2013

Dr. Charmaine Enns
Vancouver Island Health Authority
355 - 11th St.
Courtenay, B.C.
V9N 1S4

Dear Dr. Enns:

Re: Request that the Drinking Water Officer issue a Drinking Water Health Hazard Prevention Order regarding the proposed Raven Coal Project, pursuant to section 25 of the *Drinking Water Protection Act*

On behalf of CoalWatch Comox Valley Society, we hereby request that you issue a Drinking Water Hazard Prevention Order to address the risk to drinking water posed by the proposed Raven Underground Coal Project. Attached are letters supporting this request from Fanny Bay Waterworks District and Ships Point Improvement District, two water Districts potentially affected by the Project.

Section 25(1)(b) of the *Drinking Water Protection Act* (DWPA) authorizes you to issue an order if you have:

...reason to believe that...there is a significant risk of an imminent drinking water health hazard.¹

Attached, please find the latest report prepared by the experienced and highly respected hydro-geologist and engineer, Dr. Gilles Wendling. His report clearly demonstrates that there is "reason to believe" that the proposed coal mine poses "a significant risk of an imminent drinking water health hazard." Furthermore, Dr. Wendling's report shows that the currently proposed assessment process and monitoring program will not adequately address that risk.

As you will see, Dr. Wendling's report provides evidence that:

- The proposed Raven Project threatens to leach toxic heavy metals and other contaminants into groundwater and surface water sources of drinking water downhill from the Project. For example, Dr. Wendling states:

The proposed activities at surface, particularly the disposal of waste rock, will most likely generate Acid Rock Drainage (ARD). The effluents coming from the waste rock, combined with

the groundwater flow originating from the mined areas when the galleries are still at shallow depth, will supply poor quality water that will degrade the quality of the local streams. These waters will have a low pH and will most likely contain heavy metals (e.g. arsenic, cadmium). These streams are either used directly for drinking water source or connected to aquifers used as drinking water sources.²

The sources of drinking water at risk include the Ships Point Improvement District and the Fanny Bay Waterworks, among others.

- To make matters worse, Dr. Wendling says that the proponent's planned assessment and monitoring program for the project is "very weak" and is likely to not mitigate the risk adequately. He makes it clear that the plan by Raven is not adequate to safeguard drinking water.

Dr. Wendling has reviewed the final Application Information Requirement (AIR)/Environmental Impact Statement Guidelines document – the critically important document that governs the Raven Environmental Assessment process and identifies the issues the company must address and the information that it must provide. In his review, Dr. Wendling states:

...the lack of characterization and monitoring creates a high level of uncertainty that translates into a high level of risks of modifying the groundwater regime both in quantity and quality. In addition, GW Solutions' review of the Draft AIR document has not found any proposed adequate long-term monitoring and mitigative plans.³

Among other things, Wendling finds that the proposed water monitoring window is too short and the proposed program to characterize the groundwater regime is "utterly inadequate" -- covering less than one-tenth of the total spatial boundary, and ignoring likely key variables.⁴

Note that federal and provincial environmental assessment officials have failed to correct these fundamental flaws in approach, and the environmental assessment process is now proceeding with these fundamental flaws uncorrected. In fact, even the recommendations for assessment, characterization and monitoring made by the Provincial Government's own hydrogeologist (Section Head, Water Protection) – as well as from the BC Ministry of Environment (Water Stewardship Division), Natural Resources Canada, and even from your own agency -- have not been fully incorporated into the requirements of the current Environmental Assessment process.⁵

In summary, a coal mining project is being developed that will likely contaminate drinking water sources -- and the proposed assessment and monitoring program is inadequate to

adequately mitigate this risk to drinking water. Clearly there is “reason to believe that...there is a significant risk of an imminent drinking water health hazard.”

As you will see below, the hazard is likely to not be temporary, but long-term -- if not permanent -- in nature.

Dr. Wendling’s expert opinion speaks for itself, and we ask you to seriously consider it. In addition, we submit that Dr. Wendling’s report is of urgent concern in light of:

- the specifics of the Raven Project Proposal, and
- the mining industry’s troubling track record of polluting ground and surface water.

THE RAVEN COAL PROJECT

Mining often contaminates nearby waters. Despite efforts to mitigate, monitor, and prevent the release of contaminants to surface and groundwater, water quality near active and abandoned mine sites frequently contains unacceptable levels of toxic heavy metals.⁶

The mining process exposes and excavates large quantities of rock. When rocks containing sulphide minerals are exposed to air and water, sulphuric acid is formed, which can leach toxic metals from the rock, including arsenic⁷, cadmium⁸, chromium, copper, lead, mercury, selenium and zinc.⁹ When this process -- called Acid Rock Drainage (ARD) or Acid Mine Drainage (AMD) -- occurs on a large scale during mining, it can create one of the most serious environmental dangers associated with the industry.¹⁰ This is the key danger that Dr. Wendling has identified.

Typically, the sulphuric acid and toxic metals from ARD is carried off the mine site by rainwater or surface drainage and into nearby streams, rivers, lakes and groundwater. As the ARD seeps into the surrounding environment it degrades water quality -- and can devastate fish and aquatic habitat and threaten drinking water safety. The effect can be impossible to reverse, cost millions to treat and can continue for an extraordinarily long period.¹¹ Mines in Europe continue to leach toxic metals centuries after the mine was dug.

In the case of the Raven project, the proponent corporation estimates that the underground size of the proposed mine would be 7,660 acres (3,100 hectares).¹² During the life of the mine, the project would generate approximately 17.6 million tonnes of waste rock rejects that would be left at the site. The waste will be left on the surface in a massive waste rock pile at the mine site, about three kilometres from Fanny Bay.¹³

Laboratory analyses of two drill cores from the proponent’s exploration program have determined that 85 out of 135 samples of the rock formation overlying the coal deposit had high acid-generating potential. Nine out of 85 samples from the deeper coal-bearing formation were potentially acid-generating.¹⁴ Therefore, local residents who draw their water from groundwater and local streams have legitimate concerns about surface and groundwater quality impacts due to acid rock drainage. They fear:

- that seepage or failure of waste-impoundment reservoirs could lead to acidification of adjacent creeks and rivers;¹⁵ and
- that safe storage of wastes in tailings ponds requires stable and secure reservoirs, which can – and do – fail.

They are concerned about studies indicating that ground water quality decreases with depth in coal mining areas.¹⁶ They are also concerned that the aquifers around this proposed mine are generally classified as “highly vulnerable” to disturbance and pollution.¹⁷ Yet these aquifers have not been adequately mapped and assessed, to determine risk. As Dr. Wendling has previously stated:

“It is crucial to understand the close relationship between surface water and ground water...It is vitally important that a comprehensive mapping of aquifers throughout the region takes place before any decisions are made about whether or not to proceed with a coal mine....It is also very important that the effects of what is proposed for the dewatering of the mine be projected and modeled for the proposed duration of the operations and after closing of the mine. How will the mining modify the groundwater regime? How will the streams fed by groundwater be affected by mining? This needs to be assessed and understood prior to any approval to proceed.”¹⁸

However, it is now clear that this recommended comprehensive mapping of the aquifers and recommended modeling/assessment will not take place before the Raven mine begins operation. In June 2012, the Canadian Environmental Assessment Agency and the British Columbia Environmental Assessment Office approved the Application Information Requirements and Environment Impact Statement Guidelines (AIR/EISG) – the critical document that lists the issues the company has to address in the Environmental Assessment process, and governs the Environmental Assessment process. Unfortunately, under the approved AIR/EISG, the company will now be able to proceed through the Environmental Assessment process:

- without comprehensive aquifer mapping,
- without adequate conceptual modeling of the groundwater regime; and
- with a variety of other shortcomings enumerated in Dr. Wendling’s report.

The Environmental Assessment is proceeding in this flawed fashion, despite requests for such precautionary measures from Ships Point Improvement District (a community water supplier),¹⁹ the Comox Valley Regional District, and many others. The depth of public concern was reflected in November, 2012 when the Comox Valley Regional District noted that the Environmental Assessment process was not going to require such aquifer mapping -- and passed a motion opposing processing of the Raven project application until such mapping is done, and other measures are taken.²⁰ Similarly, Comox Town Council and the Courtenay City Council both passed motions to oppose the processing of the Raven application until the government conducts comprehensive mapping of the aquifers in potentially affected areas.²¹

However, the flawed federal/provincial environmental assessment process takes legal precedence -- and it proceeds apace towards final mine approval. This leads to grave concerns that the mine operations will soon commence that are likely to impact aquifers used by the surrounding communities for their potable water.

Dr. Wendling's new report clearly heightens the concern that drinking water supplies are threatened by this mine proposal. This concern must be taken seriously, particularly in light of the mining industry's remarkable record of polluting waters and water supplies, discussed below.

MINING AND WATER POLLUTION: A TROUBLING HISTORY

Numerous existing and closed mines in BC still leak acid rock drainage (aka acid mine drainage). The 1993 *BC State of the Environment Report* concluded that mine-related ARD was "one of the main sources of chemical threats to groundwater quality" in the province.²² It has been estimated that cleaning up existing acid-generating mines in Canada would cost billions of dollars.²³

Examples of ARD polluting waters near BC mines include:

- The acid rock drainage at the underground Britannia Mine near Squamish killed life in Britannia Creek,²⁴ and seriously polluted adjacent coastal waters, affecting millions of juvenile salmon from the Squamish Estuary. Salmon placed in cages off Britannia Creek died in less than 48 hours.²⁵ An Environment Canada expert once described Britannia Mine as the single largest point source of metal pollution in North America.²⁶ Finally, in 2006, \$30 million was invested in a water treatment centre to treat the pollution from the former copper mine²⁷, but treatment will have to continue indefinitely.
- The Equity Silver mine near Houston, BC operated from 1980-1994 at the head of the Bulkley River watershed -- one of BC's most valuable salmon fisheries. Toxic ARD from this mine flowed into the watershed, leading to construction of a partial containment system in 1982. However, further contamination issues arose, and in 1983 the company pleaded guilty to destruction of fish habitat. More extensive cleanup facilities have been constructed, but they may now need to be maintained for centuries.²⁸ The company was required to post a bond (now \$25 million) for maintenance of measures to deal with the ARD problem, in perpetuity.²⁹

Acid Rock Drainage has already seriously affected mid-Vancouver Island water bodies:

- The open-pit copper mine on Mount Washington only disturbed 13 hectares and operated for just four years before it was abandoned in 1967. Yet pollution from the mine utterly devastated the multi-million dollar fishery in the Tsolum River.

Historically, the river supported a thriving fishery. Peak spawning returns were large: 100,000 pink salmon, 15,000 coho salmon, 11,000 chum salmon, and 3500 steelhead. Yet, by 1995 there were virtually no returns, primarily because of ARD pollution from the mine. From a drinking water point of view, it is notable that as of 1995 the Tsolum River was still licensed for 9 domestic water licenses and 23 irrigation licenses.³⁰

Finally, in 2008, the Provincial governments committed \$4.5 million toward measures to address Tsolum River water quality issues resulting from 40 years of ARD.³¹ Long-term efforts are aiming to rebuild lost and degraded stocks and habitats. However, proper containment at the source -- and continuing ARD contamination -- remain pressing challenges.

- Recently studies have found high arsenic levels in lake sediments downstream of Vancouver Island's only operating coal mine, Quinsam Coal Mine near Campbell River. In 2010 the Canadian Water Network released a study directed by Dr. William Cullen of the University of British Columbia that investigated whether arsenic from the mine was making it into the watershed.³² After comprehensive and systematic sampling of lake sediments in the Quinsam watershed,³³ the study found highly elevated levels of arsenic, iron and manganese. Arsenic levels were well above acceptable standards set by the *Contaminated Sites Regulation* -- in some places as much as 30 times above provincial guidelines. The study found that "arsenic concentrations are elevated in Long Lake as a result of acid rock drainage and other chemical process[es] associated with mine waste".³⁴

Note that arsenic in drinking water is considered one of the prominent environmental causes of cancer mortality in the world.³⁵ Arsenic is a highly toxic heavy metal with wide-ranging potential health hazards. Among other things, it is carcinogenic, mutagenic, and teratogenic.³⁶ Drinking arsenic-rich water may also be linked to diabetes, high blood pressure, and reproductive disorders.³⁷

EXAMPLES OF HEALTH IMPACTS FROM MINE-CONTAMINATED WATER

Effects from Historic Vancouver Island Coal Mines and Mines Elsewhere

Scientific studies of coal mine regions have indicated adverse health effects from increased mineral levels in ground and well water. A study of the public health effects of abandoned coal mines in the Nanaimo area (Wellington), noted that it is "generally understood that the influence of mine site abandonment has adverse effects on the quality of groundwater."³⁸

A related University of Victoria study compared health outcomes in two Vancouver Island communities in a former coal mining area -- analyzing the presence in drinking water of mineral elements associated with coal mining. Disease and ill health were more common in South Wellington, where residents draw their drinking water from wells than in Cinnabar,

where residents use piped water from Nanaimo. High levels of total dissolved solids and total coliform, aluminum, antimony, cadmium, iron, lead, selenium, sodium and thallium were found in the well water. The author concluded that each of these elements had been linked to various diseases and disorders and may be predictive of the ill health in South Wellington.³⁹ The author of the study concluded, "These results support the case that the water source in South Wellington is a contributing factor to the ill health observed in that area."⁴⁰ This is consistent with a US study that found that coal mine impacts on streams was associated with higher cancer mortality.⁴¹

In the US central Appalachia region, mountaintop coal mining has contaminated local waters with a variety of heavy metals and other pollutants. Researchers have repeatedly found elevated levels of heavy metals and other pollutants downstream of the mines. Ground water samples collected from domestic wells in mining areas have exceeded drinking water standards for arsenic, lead, barium, beryllium, selenium, iron, manganese, aluminum and zinc.⁴²

One study in this coal mining region found that nearly half of the samples from private wells had detectable arsenic, and, the incidence of arsenic-related cancers was found to be high.⁴³ Another study found high rates of birth defects in mountaintop coal mining areas, perhaps linked to pollution from the mines.⁴⁴

In 2000, an Alberta Provincial Health Officer triggered a health advisory in response to discoveries of high levels of selenium discovered downstream of coal mines, and launched a risk investigation. Water discharged from coal mines had been found to contain levels of Selenium exceeding the Canadian Water Quality Guidelines.⁴⁵ Numerous other substances have adversely affected groundwater quality near coal mines in Alberta. Nitrate, iron, fluoride, sulphide, sodium and alkalinity levels all exceeded the recommended daily guidelines for drinking water.⁴⁶

It's notable that elevated Selenium levels have also been found in BC's Elk River Valley, from upstream coal mining operations.⁴⁷ It should be noted that skin cancer, pancreatic cancer, nervous system and digestive system disruption, loss of hair and nails, and serious liver damage have been attributed to high selenium intake.⁴⁸

South African scientists have cited acid mine drainage as the single most significant threat to South Africa's environment.⁴⁹ Studies have found the groundwater in the mining district of Johannesburg to contain elevated concentrations of heavy metals. Scientists continue to investigate the links between health and the contaminated water supply,⁵⁰ and there is much concern over the safety of the water supply in river systems passing through or originating in the mining district. In the Limpopo River basin, arsenic contamination from gold mining poses a "serious health threat" to those who use surface water for drinking water.⁵¹

Itai-itai (ouch, ouch) disease is a cautionary tale from Japan. Dr. **Hamilton** of Dartmouth describes *itai itai* as "an important reminder of the potential impact of environmental pollution on human health".⁵² One of Japan's four major pollution diseases, *itai itai* is a painful skeletal

condition resulting from weak and deformed bones. The disease was caused by mining -- mines released cadmium into river basins, where it found its way into drinking water, fish and irrigated crops.

Finally, it is suspected that First Nations people near the Pinchi Lake, British Columbia may have suffered from neurological damage caused by contamination from a local mercury mine.⁵³

ISSUING AN ORDER UNDER SECTION 25 OF THE DRINKING WATER PROTECTION ACT

The evidence in this case indicates a significant risk of serious and irreversible harm to drinking water supplies. Like the ill-fated Mount Washington mine, the proposed Raven Coal Project may only operate for a few years. However, residents will be drinking local water for centuries. There are substantial concerns about what could happen in the long term.

These concerns are heightened by the evidence of health effects on people drinking ground water from the coal mining areas outside of Nanaimo -- and by the numerous other instances where mines have impacted water and human health.

Taking into account:

- the specifics of the proposed Raven Coal Project;
- the history of mine contamination of water and water supplies; and
- Dr. Wendling's expert opinion attached,

we submit that operation of the coal mine is likely to create "a significant risk of an imminent drinking water health hazard." Therefore, you have the authority under s. 25(1)(b) of the Act to issue the Drinking Water Health Hazard Prevention Order requested.

S. 8 of the *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".⁵⁴ Clearly, the overriding object of the *Drinking Water Protection Act* is evident from its title: to *protect* drinking water, which inherently requires preventative action whenever significant risk is identified.

Indeed, the fundamental object of the *Drinking Water Protection Act* is to ensure preventative action to protect drinking water from potential risk -- and avoid tragedies like the Walkerton incident that killed seven, sickened 2500 -- and led to the creation of this very *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 ...*⁵⁵

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.*⁵⁶

In this case, there can be no doubt that there is a significant risk of a drinking water health hazard. However, some might question whether that risk is sufficiently "imminent". We have discussed above why the risk is both likely and pressing -- since the current Environmental Assessment process is not adequately addressing the risk and the project is proceeding apace towards approval without proper safeguards.

We urge you to interpret the word "imminent" as that word has been interpreted in US federal contaminated sites legislation. That law requires that persons clean up sites that present an "imminent and substantial endangerment" to health or environment. Courts have decided:

*There need not be an emergency in order for there to be an "imminent" endangerment. Rather, it has been found that even though the harm may not be realized for years in the future, an endangerment is "imminent" if the current conditions indicate that there may be a future risk of harm.*⁵⁷

Clearly, current conditions here indicate at least that much.

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

*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.*⁵⁸

Similarly, the World Health Organization (WHO) has recognized that:

*[a]ccess to safe drinking-water is essential to health, a basic human right...*⁵⁹

Significant sources of drinking water are located downhill from the proposed Raven Coal Project. Those sources must be protected. In light of the significant risks to those drinking

water sources that we have outlined above, we ask you to issue a Drinking Water Health Hazard Prevention Order.

In the alternative, should a hazard prevention order not be issued, we request that you make a submission to the Public Health Officer asking that a recommendation be made that a Drinking Water Protection Plan for the areas at risk from the Raven Coal Project be developed, under s. 31 of the *Drinking Water Protection Act*.

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

Yours truly,

"Megan Seiling"

Megan Seiling, Law Student



Calvin Sandborn, Lawyer
Legal Director

¹ Section 25 (1) of the *Drinking Water Protection Act* states:

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.

² Dr. Gilles Wendling, *RE: Proposed Raven Compliance Coal Mine, Drinking Water Act*, December 14, 2012, p. 6 (see report attached to this submission).

³ *ibid*, p. 1 (see attached report).

⁴ *ibid*, p. 10 (see attached report).

⁵ For example, the provincial hydrogeologist stated that the Regional Study Area (RSA) “used for the assessment of potential impacts for the groundwater (hydrogeology and groundwater quality) is not adequate” and needs to be expanded, and in MFLNRO-5 the provincial hydrogeologist states that “the hydrogeological characterization program ... appears to be limited to the mine site. ... the proposed data collection program is inadequate and that new dedicated monitoring wells both near the mine site and in an expanded RSA should be added. “ In its reply, the proponent failed to adequately revise the original RSA. See *Draft Application Information Requirements/Environmental Impact Statement - Working Group Issues Tracking Tables, May 2011* http://a100.gov.bc.ca/appsdata/epic/html/deploy/epic_document_351_33358.html at MFLNRO-1 to 10 on pages 83 & 84 in the PDF, specifically at MFLNRO-4 & 5. For further comments on adequacy of the proponent’s approach, type “aquifer” with the search tool on the Tracking Tables document to identify comments made by Water Protection, BC Ministry of Environment (Water Stewardship Division), Natural Resources Canada, and Vancouver Island Health Authority.

⁶ *What is Acid Mine Drainage?*, 2012, US Environmental Protection Agency, Online:

[http://www.sosbluewaters.org/epa-what-is-acid-mine-drainage\[1\].pdf](http://www.sosbluewaters.org/epa-what-is-acid-mine-drainage[1].pdf)

accessed January, 2013. Also see: *Acid Mine Drainage Prediction: Technical Document*, United States EPA, December 1994, online:

<http://water.epa.gov/polwaste/nps/upload/amd.pdf>, accessed January 29th, 2013, at page 1-2.

⁷ “Health Canada and the International Agency for Research on Cancer consider arsenic a human cancer-causing agent.” Health Canada, “Arsenic in Drinking Water”, online: <<http://www.hc-sc.gc.ca/hl-vs/iyh-vsv/enviro/arsenic-eng.php>>, accessed July 27, 2010. See also: First Nations Environmental Health Innovation Network, “*Arsenic Fact Sheet*”, online: <http://landkeepers.ca/images/uploads/reports/ARSENIC_FS_FNEHIN.pdf>, accessed July 7, 2010.

⁸ First Nations Environmental Health Innovation Network, “*Cadmium Fact Sheet*”, online:

<<http://www.fnehin.ca/uploads/docs/fs2-cadmium.pdf>>, accessed July 7, 2010.

⁹ Depending on the composition of the waste rock. See MiningWatch, “EMCBC Mining and the Environmental Primer: Acid Mine Drainage”, March 31, 2006, online: <<http://www.miningwatch.ca/en/emcbc-mining-and-environment-primer-acid-mine-drainage>>, accessed July 7, 2010.

First Nations Environmental Health Innovation Network, “*Acid Mine Drainage (AMD) Fact Sheet*”, online:

<http://www.focs.ca/reports/Catface_info_pkg/Acid%20Mine%20Drainage--FNEHIN.pdf>, accessed July 7, 2010.

¹⁰ “Acid Rock Drainage is a natural process whereby sulphuric acid is produced when sulphides in rocks are exposed to air and water.” First Nations Environmental Health Innovation Network, “*Acid Mine Drainage (AMD) Fact Sheet*”, online: <http://www.focs.ca/reports/Catface_info_pkg/Acid%20Mine%20Drainage--FNEHIN.pdf>, accessed July 7, 2010.

¹¹ Safe Drinking Water Foundation, “Mining and Water Pollution”, online:

<<http://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf>>, accessed July 7, 2010.

¹² Compliance Coal Corporation, “Raven Underground Coal Project: Facts”, June 15, 2010, online: <

http://www.theravenproject.ca/all_files/The%20Raven%20Underground%20Coal%20Project%20-%20Fact%20Sheet%20June%202010-20100616-110307.pdf>, accessed July 28, 2010.

¹³ The figure of 17.6 million tons (MT) of waste rock is derived from the *May 2011 Project Description for the Raven Underground Coal Mine Project*, sections 2.2.2-2.2.3. The *Description* estimates 1.9 MT average raw coal per year,

and 0.8 MT of clean coal per year. Thus, the average waste rock per year would be 1.1 MT per year times 16 year life span = 17.6 MT of waste rock.

¹⁴ The proponent's consultant reported that rock samples from 2 drill cores in the Raven tenure showed a high proportion of samples (85 of 135 samples) from the overlying Trent Formation to have high acid-generating potential, while a lower proportion (9 of 85) of samples from the Comox Formation, where the commercial coal seams lie, were highly acid-generating. AMEC Earth and Environmental, February 2010. Raven Underground Coal Project. Draft Work Plan for Environmental Studies. Version 2.2, pp. 13-14.

¹⁵ Andrew Findlay, "Coal clouds Comox Valley's green future", *Georgia Straight*, April 22, 2010, online: <<http://www.straight.com/article-318942/vancouver/coal-clouds-green-future>>, accessed July 27, 2010. Also see: Gilles Wendling, "Groundwater and Surface Water Interaction on Lower Englishman River", online: <<http://www.mvihes.bc.ca/erwrp>>, accessed August 12, 2010.

¹⁶ "Previous studies have shown that in coal mining areas, the quality of groundwater decreases with depth. In Alberta, numerous substances have adversely effected the quality of groundwater near coal mines. Nitrate, iron, fluoride, sulphide, sodium and alkalinity levels all exceeded the recommended daily guidelines for drinking water. A study of the Estevan valley aquifer in Saskatchewan also showed incongruously high levels of iron. In 1961, iron levels in this aquifer were measured at 2.1 mg/L. According to this study; these levels were seen to indicate potential problems, as they are well above the drinking water standard for iron, which have been set by WLAP at 0.3mg/L." – from Karla Biagioni, "The Public Health Effects of Abandoned Coal Mine Workings on Residents in South Wellington, Nanaimo" in Martin J. Bunch, V. Madha Suresh and T. Vasantha Kumaran, eds., *Proceedings of the Third International Conference on Environment and Health, Chennai, India, 15-17 December, 2003*. Chennai: Department of Geography, University of Madras and faculty of Environmental Studies, York University, pp. 23-31.

¹⁷ A vulnerability mapping project of Island water initiated in 2006 and published in 2010 shows that the area around the proposed mine is generally classified as highly vulnerable and much of the area remains unmapped: Vancouver Island Water Resource Vulnerability Mapping Project, online: <http://web.viu.ca/groundwater/web.mala.bc.ca_files/News/Apr2010.htm>, accessed July 19, 2010. P. Newton and A. Gilchrist, "Technical Summary of Intrinsic Vulnerability Mapping Methods for Vancouver Island: Vancouver Island Water Resources Vulnerability Mapping Project – Phase 2", Vancouver Island University, Nanaimo, BC, April 16, 2010, online: <http://web.viu.ca/groundwater/PDF/VI_DRASTIC_Summary_Phase2_2010.pdf>, accessed July 19, 2010.

The Vancouver Island Water Resources (Aquifer) Vulnerability Mapping Project was aimed at producing maps to characterize the vulnerability of aquifers to contamination. The research study analyzed the susceptibility of water quality to hazards associated with human activities and land use. Using GIS technology, it is designed to support decision-making in future land use planning, and the development of groundwater protection policies and guidelines. Hydro-geologist Pat Lapcevic from the Ministry of Environment in Nanaimo was the project manager of this collaborative effort that involves the Ministry of the Environment, Vancouver Island Health Authority, Natural Resources Canada, Vancouver Island University (formerly Malaspina University College), the Regional Districts of both the Cowichan Valley and Nanaimo, the Islands Trusts, and the Ministry of Health. The mapping provides the best estimate of intrinsic aquifer vulnerability given the resources available to complete the analysis. It provides a basis for making land-use decisions that account for regional aquifer vulnerability. However, in many instances more detailed hydrogeological studies will be required to better characterize and confirm the results of this study. This is particularly relevant for areas where high vulnerability ratings have been assigned that could limit potential land-use.

¹⁸ "Growth strategy raises more concerns about mine", *Comox Valley Record*, June 22, 2010, online: <http://www.bclocalnews.com/vancouver_island_north/comoxvalleyrecord/news/96911719.html>, accessed July 13, 2010.

¹⁹ Letter to Compliance Coal Mine Re: The AIR for the Raven Underground Coal Mine proposal, June 21, 2011, from Ships Point Improvement District Board of Trustees.

²⁰ Comox Valley Regional District Minutes at: http://www.comoxvalleyrd.ca/section_rdb/default.aspx?MeetingID=1414&PrinterVersion=0&DocumentTypeID=2&AgendaDeadline=11/22/2012%204:25:04%20PM

²¹ See the *Comox Valley Record*, January 25, 2013 and the minutes of the February 4, 2013 Courtenay City Council meeting.

²² State of the Environment Report for British Columbia, 1993, pp.29-31, online

<http://www.elp.gov.bc.ca/soe/reports/enviro_trends1993.pdf>, accessed August 8, 2010. Also see: "Acid Mine Drainage: Mining and Water Pollution Issues in BC", 2000, Environmental Mining Council of British Columbia, online:

http://dwb4.unl.edu/Chem/CHEM869R/CHEM869RLinks/emcbc.miningwatch.org/emcbc/library/amd_water.htm#2, accessed October 20, 2012, at p.1.

²³ The cost was estimated at between \$2-5 billion in 1994. See *Financial Post*, November 17, 1994.

²⁴ Glenn Bohn, "Metals Pour into Howe Sound From Old Mine," *Vancouver Sun*, May 31, 1997, p. A16.

²⁵ Fisheries and Oceans Canada - Karen L. Barry, Jeffrey A. Grout, Colin D. Levings, Bruce H. Nidle, and G. Elizabeth Piercey, "Impacts of acid mine drainage on juvenile salmonids in an estuary near Britannia Beach in Howe Sound, British Columbia", *Can. J. Fish. Aquat. Sci.* 57: 2032–2043 (2000), online: <<http://article.pubs.nrc-cnrc.gc.ca/ppv/RPViewDoc?issn=1205-7533&volume=57&issue=10&startPage=2032>> , accessed August 8, 2010.

²⁶ "Potent bacteria utilized to harvest metal while cleaning water from Britannia mine: Researchers hope to profit from mine pollution clean-up by harvesting metals", Author: Munro, Margaret *Vancouver Sun* June 13, 1996, p. A.1.

²⁷ *Wikipedia*, online: <http://en.wikipedia.org/wiki/Britannia_Beach,_British_Columbia>

²⁸ *Acid Mine Drainage: Mining and Water Pollution Issues in BC*, online:

<<http://www.protectfishlake.ca/media/amd.pdf>>, Environmental Mining Council of BC, 1998 at p. 14, accessed August 8, 2010.

²⁹ *Acid Mine Drainage: Mining and Water Pollution Issues in BC, Environmental Mining Council of BC*, 1998, online: <http://www.protectfishlake.ca/media/amd.pdf>, accessed September 28, 2012, at p. 20 *et al.*

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ATTACHMENT



December 14, 2012
11-10

Coalwatch
(via email)

Attention: John Snyder, President

Re: **Proposed Raven Compliance Coal Mine –
Drinking Water Act – Section 25**

GW Solutions Inc (GW Solutions) is providing some comments on the potential impacts of the proposed **Raven Underground Coal Project**, based on the review of available information and GW Solutions understanding of the hydrogeological conditions on the East Coast of Vancouver Island.

This letter particularly focuses on the potential impacts on drinking water. According to Section 25 of the BC Drinking Water Protection Act:

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.

It appears that Compliance Energy has minimized or omitted the consequences associated with the risks of modification of both the surface water and groundwater regimes due to the proposed mining activities with the objective to reduce the effort required to adequately and sufficiently characterize the movement of both the surface water and the groundwater, pre, during and post mining, in this very complex region. As a result, the lack of characterisation and monitoring creates a high level of uncertainty that translates into a high level of risks of modifying the groundwater regime both in quantity and quality. In addition, GW Solutions' review of the Draft AIR document has not found any proposed adequate long-term monitoring and mitigative plans.

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Drinking water users

Groundwater is used for a source of drinking water both by private and public water systems. Figure 1 shows the location of mapped aquifers, according to information presently available through BC Water Atlas. Figure 2 shows the location of water wells in the area and Figure 3 shows the locations of public systems located near the proposed mine. The area outlined in red is the footprint of the Raven Coal Property Tenure.

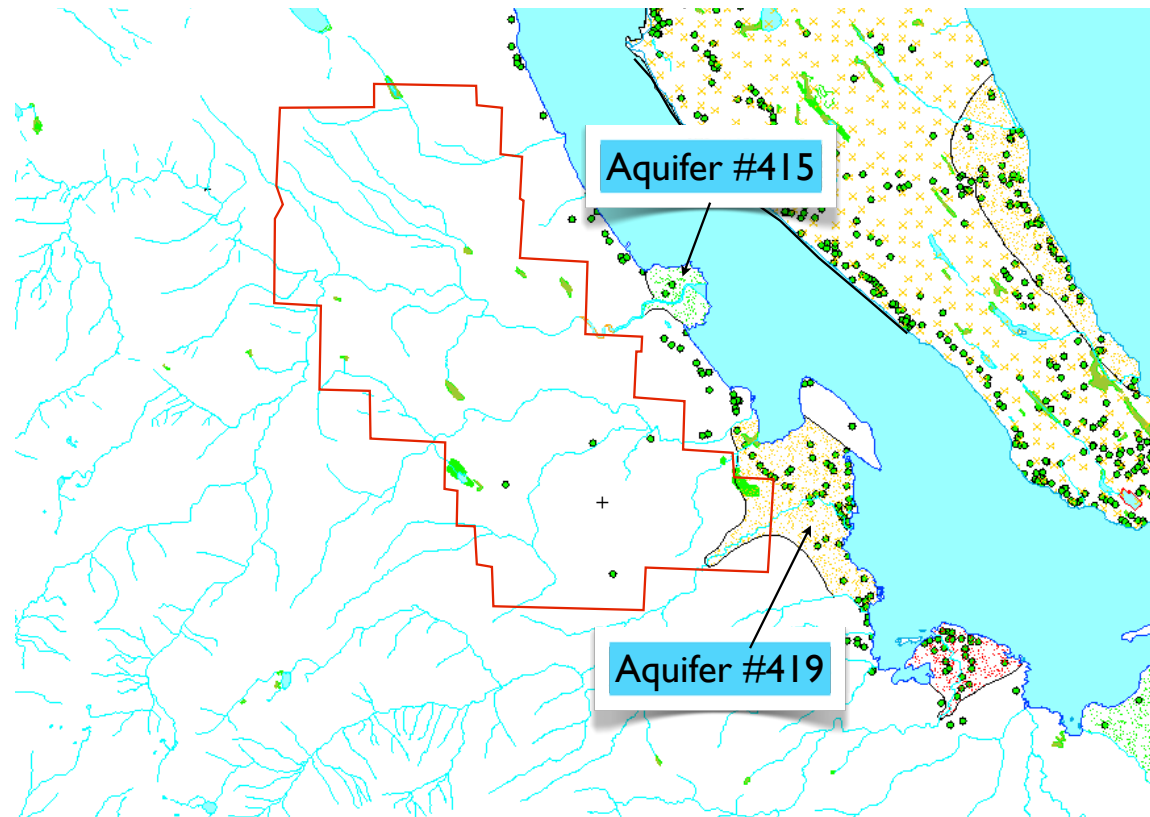


Figure 1 : Location of mapped aquifers (According to BC Water Atlas, December, 2012).

Note: the delineation and characterisation of aquifers is data based, at the time the mapping was completed (i.e. an absence of mapped aquifer does not mean that there is no aquifer or no groundwater, but that there is an insufficient dataset to locate, delineate, and characterize aquifers at the time mapping for the region was completed).

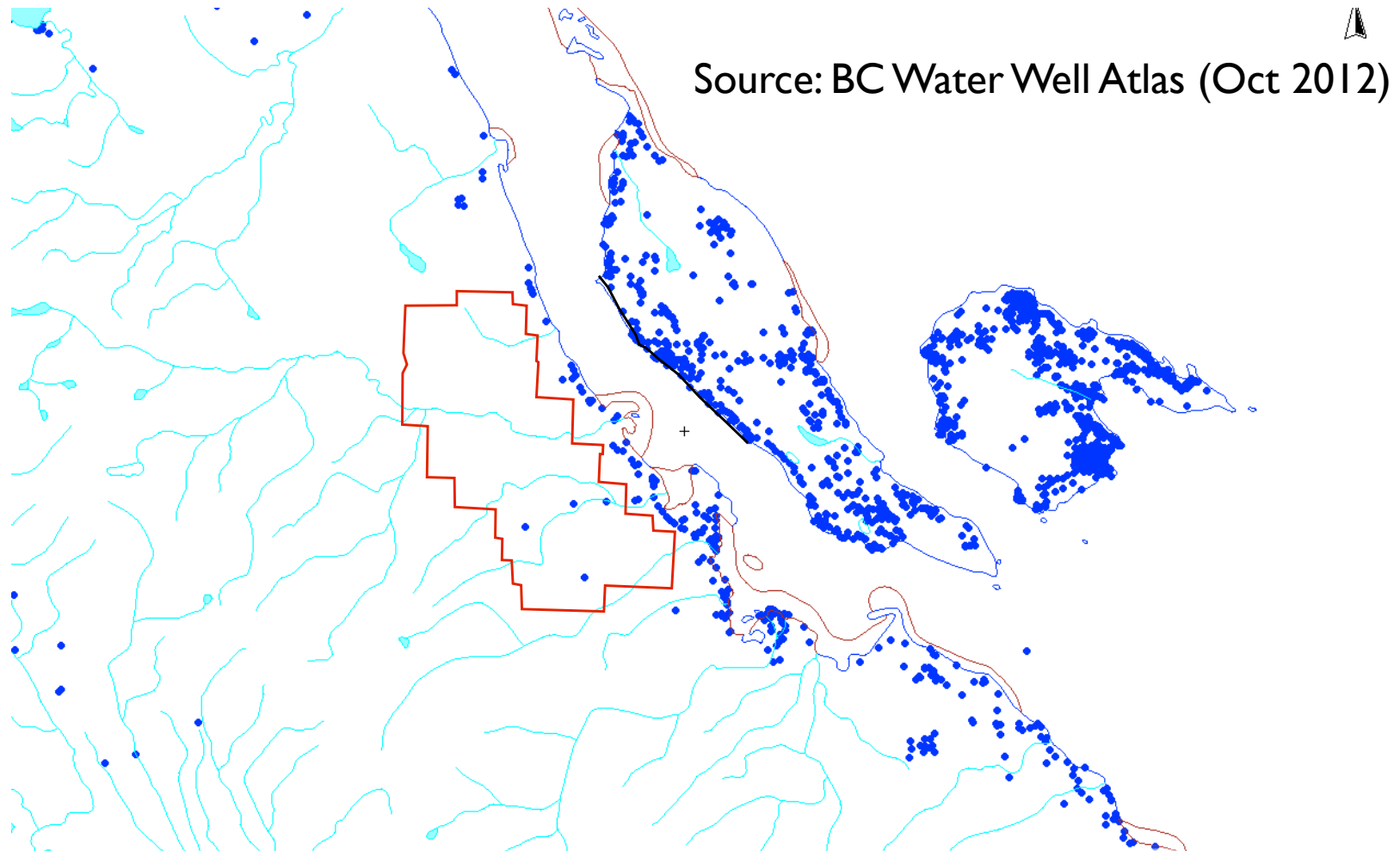


Figure 2: Location of drinking water wells (Source BC Water Atlas – note: more wells may actually be present due to limitation of database, e.g. historical voluntary reporting of well records)

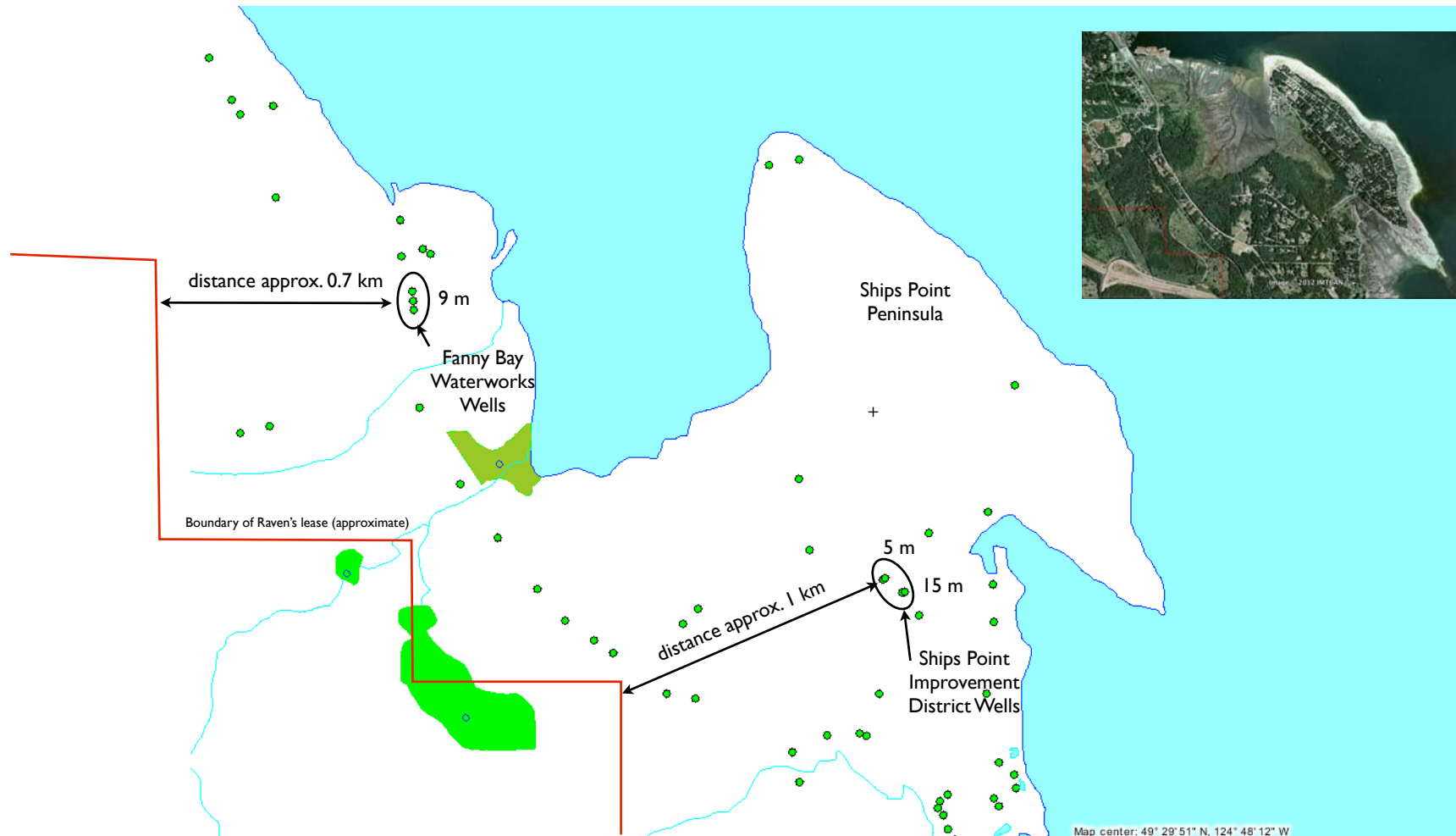


Figure 3: Location of water wells near Fanny Bay and Ships Point Peninsula
Note the Fanny Bay Waterworks and the Ship's Point Improvement District wells
(5 m, 9 m, and 15 m refer to reported completion depth of wells)

Aquifers used for sources of drinking water

Both shallow overburden aquifers and bedrock aquifers are used for drinking water in the area. Figure 4 shows the locations of the wells completed into the bedrock aquifers.

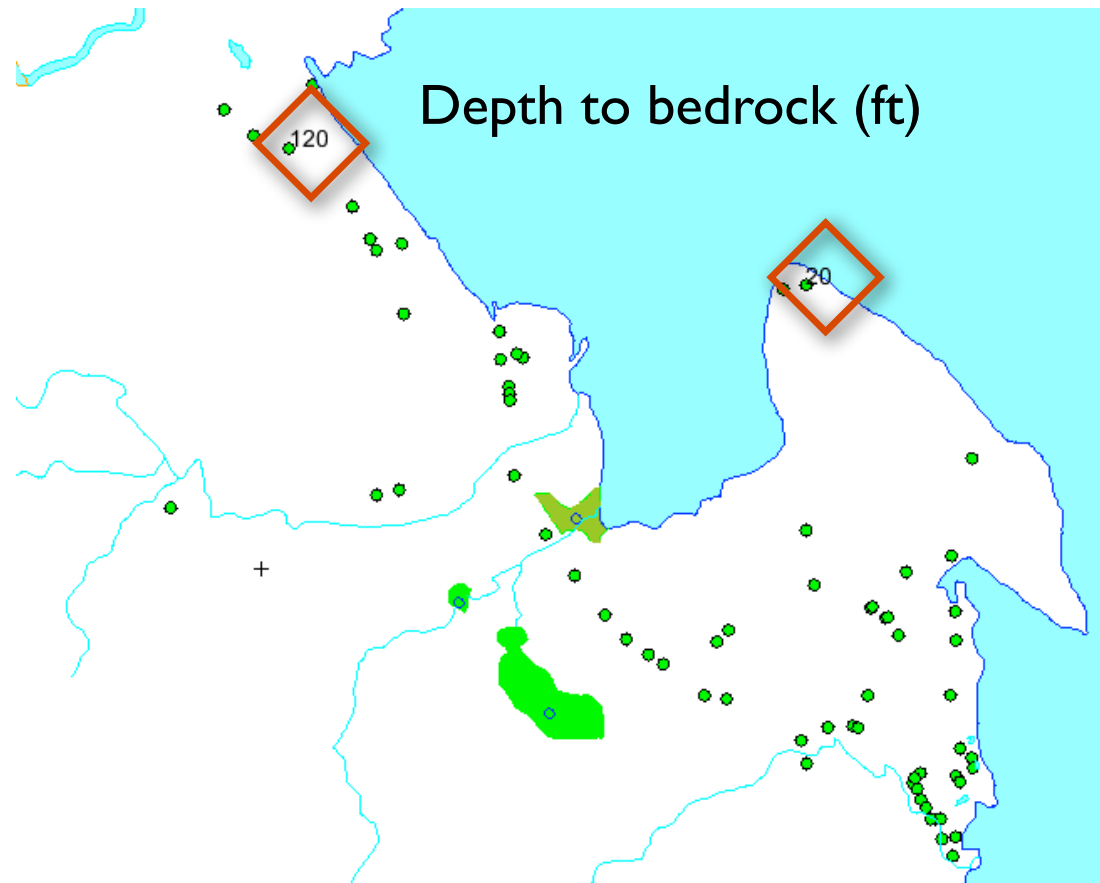


Figure 4: Location of bedrock wells (red diamond indicates depth to bedrock from surface in feet)

Aquifer recharge

In general, the recharge mechanism of aquifers is complex and will typically include three components:

1. The vertical (downward) component associated with infiltration of precipitation;
2. The lateral component associated with contact with other aquifers or surface water bodies; and
3. The vertical (upward) component associated with vertical hydraulic gradients between aquifers located at different depths. This can occur between overburden aquifers and deeper bedrock aquifers, as observed at several locations on the East Coast of Vancouver Island.

Recharge of the aquifers in the study area

Very little has been done to characterize the recharge mechanisms and recharge zones of the aquifers used for drinking water in the study area. Hydrogeological studies have not been conducted by provincial or federal agencies. The review of the AIR/EIA confirms this lack of knowledge. The three mechanisms above described most likely apply. They are represented by the blue arrows in Figure 5.

Health hazard due to proposed mining activities

The proposed mining activities will most likely create health hazards by modifying the quality of the drinking water due to the following reasons:

1. Degradation of the quality of the lateral recharge of aquifers used as a source of drinking water (case #1 in Figure 5). The proposed activities at surface, particularly the disposal of waste rock, will most likely generate Acid Rock Drainage (ARD). The effluents coming from the waste rock, combined with the groundwater flow originating from the mined areas when the galleries are still at shallow depth, will supply poor quality water that will degrade the quality of the local streams. These waters will have a low pH and will most likely contain heavy metals (e.g. arsenic, cadmium). These streams are either used directly for drinking water source or connected to aquifers used as drinking water sources.

2. Degradation of the quality of the groundwater recharging the aquifers used as a source of drinking water, as described in the following scenarios:
- Increased flux of poor quality native groundwater (case #2 in Figure 5): there is most likely a connection between the bedrock aquifer(s) and the overburden aquifers, as it is being discovered for many overburden aquifers located along the east coast of central Vancouver Island. There, groundwater flows from the top of ridges and recharge zones at high elevations in watersheds and discharges at the base of the overburden aquifers located near the coast, at lower elevations. The proposed mining activities will most likely result in an augmentation of the upward vertical flux of groundwater traveling in bedrock aquifers because the subsurface is going to be disturbed. A highly fractured zone will be created during and immediately post mining. New fractures are going to be created in the bedrock and existing fractures will be altered. The fractured bedrock will be more conductive and will increase the groundwater flow. It is understood that poor quality (saline groundwater) has been encountered in the bedrock, at the proposed mining depths (Table 7-2, Compliance Energy Corporation – Raven Coal project – Summary of Groundwater Salinity Analyses,). As a result, a flux of poor quality groundwater is expected to discharge to the shallow overburden aquifers. This will deteriorate the quality of the groundwater in these drinking water aquifers.
 - Flux of new poor quality groundwater (case #3 in Figure 5): The proposed mining plan will result in large cavities in the bedrock. These cavities and highly fractured bedrock in the surrounding areas will be fully saturated after mining is completed. Geochemical reactions will take place and promote the mobilization of heavy metals in the groundwater. In addition, the network of fractures allowing the movement of groundwater will be more largely developed after mining because fractures that were not connected will become connected through the creation of large cavities (mined areas) resulting into a larger flux of poor quality groundwater discharging to the overburden aquifers or reaching bedrock wells (case #4 in Figure 5).

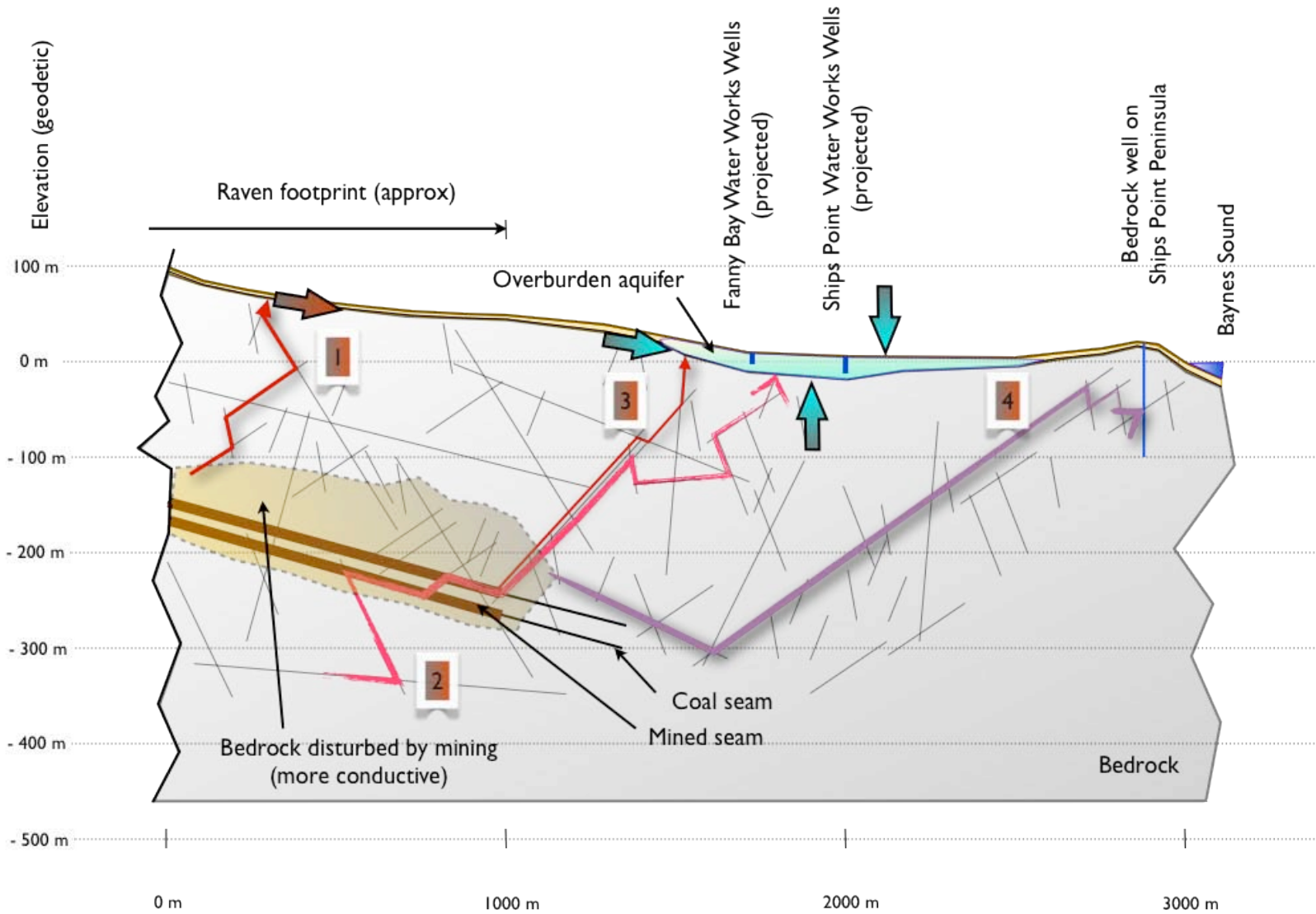


Figure 5: Conceptual groundwater flow near proposed Raven Mine



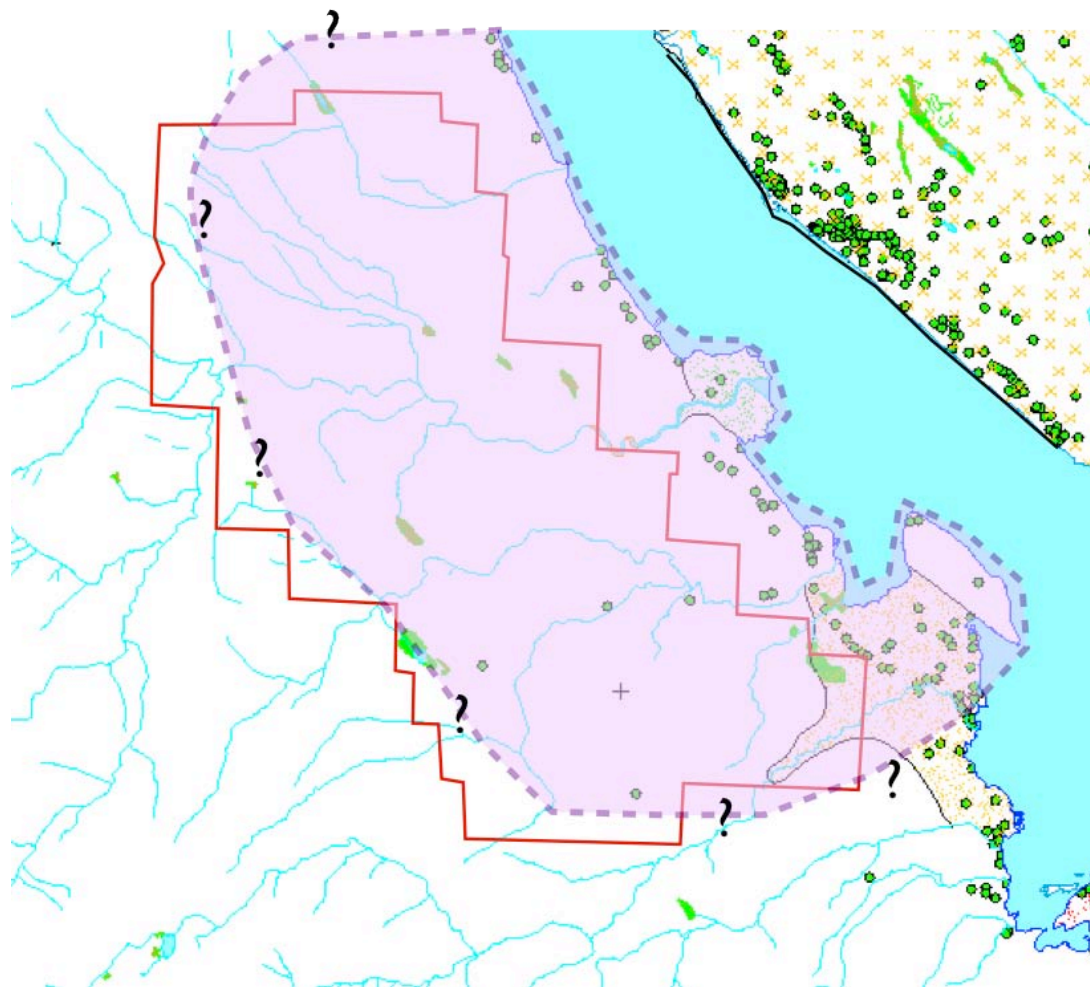


Figure 6: Estimated area where surface water and groundwater regime could be modified due to proposed mining activities

Figure 6 indicates the estimated area (shaded in purple) where both the surface water and the groundwater regimes will likely be modified by the proposed mining activities.

Deficiencies in proposed assessment and monitoring programs

GW Solutions has completed a review of the ***Raven Underground Coal Project – Application Information Requirement (AIR) / Environmental Impact Assessment Statement Guidelines*** dated June 2012. This June 2012 document is presented in Appendix

1. Specific to the proposed assessment and monitoring program, GW Solutions has identified the following main deficiencies:

- The proposed program to characterize the groundwater regime is utterly inadequate (a total of 5 monitoring wells, and 3 test wells in one corner of the property). It will provide information about the characteristics of the various units in the subsurface within a very small spatial area (less than 1/10th of the total spatial boundary). Projecting what has been observed in a small portion of the site over the whole area poses the risk of describing a groundwater regime in a way that completely excludes the effects of heterogeneity, fracture zones, etc., which are very highly expected over a total spatial area of that size.
- The proposed monitoring window from October 2009 to February 2010 is too short. Background data should cover several wet and dry seasons in order to adequately characterize the seasonality of the groundwater fluctuation and the interaction between groundwater and surface water.

In addition, in the reviewed June 2012 AIR document, both the hydrology program and the hydrogeology program refer to events that will take place in the future when referring to 2009 and 2010. It appears that the AIR program predominantly replicates what was proposed prior to 2009. Therefore, most of the comments and critiques expressed during the Draft AIR review process (in 2011) have NOT been taken into account and the AIR guidelines proposed for the Environmental Assessment have not been adjusted to address multiple and clearly expressed concerns and recommendations.

In summary, the plan proposed by Raven is very weak to a) describe the groundwater regime prior to the proposed mining activities and b) describe how the groundwater regime is going to be modified during and after the proposed mining activities.

Information to be collected to confirm or refute the risk of health hazards

Prior to any mining, the following will have to be done to confirm that there will be no drinking water health hazards:

1. A proper and adequate assessment of the recharge mechanisms of both the overburden and the bedrock aquifers used for drinking water supply within the area proposed for hydrogeological investigation (area proposed by Compliance in the AIR document). This will require the installation of a network of monitoring wells completed at various depths in all the aquifers between the proposed zones to be mined and the wells or surface water intakes used for drinking water. This will have to be done at a scale large enough to include the whole length of the coast where drinking water supplies could be affected.



2. A proper and adequate description of how the proposed mining will modify the groundwater regime along the mined corridors and horizons, between the mined horizons and the top of the bedrock, and in the overburden aquifers, both in quantity and quality.

Closure

This document was produced following the review of information available to date (June 2012 AIR document). GW Solutions was pleased to provide this document. If you have any questions, please contact me.

Yours truly,

GW Solutions Inc.



Gilles Wendling, Ph.D., P.Eng.
President

Appendices

- Appendix 1: GW Solutions Inc. - Proposed Raven Compliance Coal Mine – Air Review – Hydrogeology, dated July 5, 2012
- Appendix 2: GW Solutions Inc. Reports – General Conditions



References:

Raven Underground Coal Project – Application Information Requirement (AIR) / Environmental Impact Assessment Statement Guidelines

Pincock, Allen & Holt, Technical Report on the Raven Underground Coal Project, Comox Valley, British Columbia, June 8, 2011



Appendix 1





July 5, 2012
11-10

Coalwatch
(via email)

Attention: John Snyder, President

Re: **Proposed Raven Compliance Coal Mine – AIR Review - Hydrogeology**

Dr Gilles Wendling from GW Solutions has completed a review of the **Raven Underground Coal Project – Application Information Requirement (AIR) / Environmental Impact Assessment Statement Guidelines** dated June 2012. GW Solutions expresses the following critique and comments:

Hydrogeology

- The table describing the groundwater Valued Components (Table 5.3.1, p 71) simplifies too much the identified issues and lacks in defining the interaction with proposed Raven Project activities (e.g., the mined galleries will significantly and permanently modify the groundwater regime within the footprint of the whole property and beyond), and this is not sufficiently identified in the rationale.
- The proposed spatial boundary (Figure 5.3.1, page 73) should extent further to the west to the top of the ridge and should also include the portion of the foreshore where groundwater discharges to Baynes Sound.
- For the groundwater quality assessment, it is imperative that the spatial boundaries include the foreshore and the area where groundwater discharges to Baynes Sound, due to the potential impact the deterioration of groundwater quality could have on the activities being conducted in Baynes Sound (e.g., the shellfish industry).
- The proposed program to characterize the groundwater regime is utterly inadequate (a total of 5 monitoring wells, and 3 test wells in one corner of the property). It will provide information about the characteristics of the various units in the subsurface within a very small spatial area (less than 1/10th of the total spatial boundary). Projecting what has been observed in a small portion of the site over the whole area poses the risk of describing a groundwater regime in a way that completely exclude the effects of heterogeneity, fracture zones, etc, which are very highly expected over a total spatial area of that size.
- The proposed monitoring window from October 2009 to February 2010 is too short. Background data should cover several wet and dry seasons in order to adequately characterize the seasonality of the groundwater fluctuation and the interaction between groundwater and surface water.

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11-10

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July, 2012

- It is essential that the results of the environmental assessment be based on studies and actual data collected on site and not based on assumptions and studies from other sites.
- The potential present and long term consequences of having both a conceptual model that does not represent the local groundwater regime and a numerical model based on very weak assumptions on describing the present groundwater regime and how it would be modified by the proposed mining activities are the following:
 1. The volume of groundwater traveling in the subsurface is possibly under or overestimated.
 2. The velocity of the movement of groundwater is possibly under or overestimated.
 3. The volume of groundwater to be removed from the subsurface during mining is poorly estimated. This may result in the inadequate operation of equipment and infrastructure (e.g., ponds) designed to handle a certain volume of water or discharge rate.
 4. If more groundwater has to be extracted than anticipated, this may result in an increased reduction of flow rates in streams due to groundwater surface water interaction, or increased erosion in streams downstream of discharge points.
 5. Mining and the creation of deep highly permeable galleries will modify the pathway of the groundwater movement, its velocity, and the volume of groundwater moving in the subsurface. In addition the quality of the groundwater will be modified. This will result in unpredicted modification of both the recharge and discharge zones in whole watersheds / sub-watersheds, with unpredicted modification of the biota (fauna an flora) at surface.
 6. Modification of the groundwater regime (both in quality and quantity) during and post mining activities will modify the interaction between the bedrock aquifers and the overburden aquifers. It will affect the aquifers used for water supply in an unpredicted way.
 7. Modification of the groundwater regime (both in quality and quantity) during and post mining activities will modify the discharge of groundwater along the foreshore into Baynes Sound. This will result in unpredicted modification of the biota (fauna an flora) in the marine environment along the shores.

Hydrology

- The table describing the hydrology and water quality Valued Components (Table 5.4.1, p 81) simplifies too much the identified issues and lacks in defining the interaction with proposed Raven Project activities (e.g., the mined galleries will significantly and permanently modify the groundwater regime within the footprint of the whole property and beyond, and this will have an effect on the hydrology in the area). The table limits the potential affected areas to Cowie Creek and Cougar Smith Creek watersheds. It should include all the watersheds and sub-watersheds in the spatial boundary.
- The local and regional study areas should not be limited to the Cowie Creek Watershed (Section 5.4.1.1, p. 82). Failure to do so will prevent the assessment of streams in watersheds that will be modified due the global modification of the groundwater and surface water dynamic.



- Conducting the hydrology study only in Cowie creek and adjacent Cougar Smith Creek (for water quality) is too limitative. Assuming that other streams in the potentially impacted area will be similar is too simplistic and not representative of the reality. As a consequence, the assessment of the effects the proposed project will have on the streams will be poor. Similarly, the risk identification, the future monitoring, and the proposed remediation plan will be inadequate. This will jeopardize the sustainability of these streams and their associated ecosystems.

In the reviewed June 2012 AIR document, both the hydrology program and the hydrogeology program refer to events that will take place in the future when referring to 2009 and 2010. It appears that the AIR program predominantly replicates what was proposed prior to 2009. Therefore, most of the comments and critiques expressed during the Draft AIR review process have NOT been taken into account and the AIR guidelines proposed for the Environmental Assessment have not been adjusted to address multiple and clearly expressed concerns and recommendations.

Closure

Based on the review completed by GW Solutions of the June 2012 AIR document, it appears that Compliance will not use methodologies and tools adapted to the hydrogeological and hydrological aspects of the project to be assessed. In addition, the majority of the comments, concerns, and recommendations expressed during the Draft AIR public comment period (including those expressed by professionals and several levels of governments) have not been taken into account. Therefore, the environmental assessment will not be thorough and rigorous, if completed as proposed in the June 2012 AIR document.

GW Solutions was pleased to provide this document. If you have any questions, please contact me.

Yours truly,

GW Solutions Inc.



Gilles Wendling, Ph.D., P.Eng.
President



Appendix 2



GW Solutions Inc. Reports – General Conditions

This report incorporates and is subject to these “General Conditions”.

1.0 USE OF REPORT

This report pertains to a specific area, a specific site, a specific development, and a specific scope of work. It is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site or proposed development would necessitate a supplementary investigation and assessment. This report and the assessments and recommendations contained in it are intended for the sole use of GW SOLUTIONS's client. GW SOLUTIONS does not accept any responsibility for the accuracy of any of the data, the analysis or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than GW SOLUTIONS's client unless otherwise authorized in writing by GW SOLUTIONS. Any unauthorized use of the report is at the sole risk of the user. This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of GW SOLUTIONS. Additional copies of the report, if required, may be obtained upon request.

2.0 LIMITATIONS OF REPORT

This report is based solely on the conditions which existed within the study area or on site at the time of GW SOLUTIONS's investigation. The client, and any other parties using this report with the express written consent of the client and GW SOLUTIONS, acknowledge that conditions affecting the environmental assessment of the site can vary with time and that the conclusions and recommendations set out in this report are time sensitive. The client, and any other party using this report with the express written consent of the client and GW SOLUTIONS, also acknowledge that the conclusions and recommendations set out in this report are based on limited observations and testing on the area or subject site and that conditions may vary across the site which, in turn, could affect the conclusions and recommendations made. The client acknowledges that GW SOLUTIONS is neither qualified to, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the client.

2.1 Information Provided to GW SOLUTIONS by Others

During the performance of the work and the preparation of this report, GW SOLUTIONS may have relied on information provided by persons other than the client. While GW SOLUTIONS endeavours to verify the accuracy of such information when instructed to do so by the client, GW SOLUTIONS accepts no responsibility for the accuracy or the reliability of such information which may affect the report.



3.0 LIMITATION OF LIABILITY

The client recognizes that property containing contaminants and hazardous wastes creates a high risk of claims brought by third parties arising out of the presence of those materials. In consideration of these risks, and in consideration of GW SOLUTIONS providing the services requested, the client agrees that GW SOLUTIONS's liability to the client, with respect to any issues relating to contaminants or other hazardous wastes located on the subject site shall be limited as follows:

(1) With respect to any claims brought against GW SOLUTIONS by the client arising out of the provision or failure to provide services hereunder shall be limited to the amount of fees paid by the client to GW SOLUTIONS under this Agreement, whether the action is based on breach of contract or tort;

(2) With respect to claims brought by third parties arising out of the presence of contaminants or hazardous wastes on the subject site, the client agrees to indemnify, defend and hold harmless GW SOLUTIONS from and against any and all claim or claims, action or actions, demands, damages, penalties, fines, losses, costs and expenses of every nature and kind whatsoever, including solicitor-client costs, arising or alleged to arise either in whole or part out of services provided by GW SOLUTIONS, whether the claim be brought against GW SOLUTIONS for breach of contract or tort.

4.0 JOB SITE SAFETY

GW SOLUTIONS is only responsible for the activities of its employees on the job site and is not responsible for the supervision of any other persons whatsoever. The presence of GW SOLUTIONS personnel on site shall not be construed in any way to relieve the client or any other persons on site from their responsibility for job site safety.

5.0 DISCLOSURE OF INFORMATION BY CLIENT

The client agrees to fully cooperate with GW SOLUTIONS with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site. The client acknowledges that in order for GW SOLUTIONS to properly provide the service, GW SOLUTIONS is relying upon the full disclosure and accuracy of any such information.

6.0 STANDARD OF CARE

Services performed by GW SOLUTIONS for this report have been conducted in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Engineering judgement has been applied in developing the conclusions and/or recommendations provided in this report. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of this report.



7.0 EMERGENCY PROCEDURES

The client undertakes to inform GW SOLUTIONS of all hazardous conditions, or possible hazardous conditions which are known to it. The client recognizes that the activities of GW SOLUTIONS may uncover previously unknown hazardous materials or conditions and that such discovery may result in the necessity to undertake emergency procedures to protect GW SOLUTIONS employees, other persons and the environment. These procedures may involve additional costs outside of any budgets previously agreed upon. The client agrees to pay GW SOLUTIONS for any expenses incurred as a result of such discoveries and to compensate GW SOLUTIONS through payment of additional fees and expenses for time spent by GW SOLUTIONS to deal with the consequences of such discoveries.

8.0 NOTIFICATION OF AUTHORITIES

The client acknowledges that in certain instances the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the client agrees that notification to such bodies or persons as required may be done by GW SOLUTIONS in its reasonably exercised discretion.

9.0 OWNERSHIP OF INSTRUMENTS OF SERVICE

The client acknowledges that all reports, plans, and data generated by GW SOLUTIONS during the performance of the work and other documents prepared by GW SOLUTIONS are considered its professional work product and shall remain the copyright property of GW SOLUTIONS.

10.0 ALTERNATE REPORT FORMAT

Where GW SOLUTIONS submits both electronic file and hard copy versions of reports, drawings and other project-related documents and deliverables (collectively termed GW SOLUTIONS's instruments of professional service), the Client agrees that only the signed and sealed hard copy versions shall be considered final and legally binding. The hard copy versions submitted by GW SOLUTIONS shall be the original documents for record and working purposes, and, in the event of a dispute or discrepancies, the hard copy versions shall govern over the electronic versions. Furthermore, the Client agrees and waives all future right of dispute that the original hard copy signed version archived by GW SOLUTIONS shall be deemed to be the overall original for the Project. The Client agrees that both electronic file and hard copy versions of GW SOLUTIONS's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, be altered by any party except GW SOLUTIONS. The Client warrants that GW SOLUTIONS's instruments of professional service will be used only and exactly as submitted by GW SOLUTIONS. The Client recognizes and agrees that electronic files submitted by GW SOLUTIONS have been prepared and submitted using specific software and hardware systems. GW SOLUTIONS makes no representation about the compatibility of these files with the Client's current or future software and hardware systems.

