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Ms. Katharine McNamara
Drinking Water Officer
Kamloops Public Health Unit
519 Columbia Street
Kamloops, BC, V2C 2T8
250 851-7410
Email: katharine.mcnamara@interiorhealth.ca

Dear Ms. Katharine McNamara:

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

On behalf of the Kamloops Area Preservation Association ("KAPA"), we hereby request that you issue a Drinking Water Hazard Prevention Order to address the risks to drinking water posed by the proposed KGHMX Ajax Mining ("KAM") project.

Authority

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 a new report prepared by the experienced and highly respected hydrogeologist Dr. Gilles Wendling. His report clearly demonstrates that there is a "reason to believe" that the proposed mine poses "a significant risk of an imminent drinking water health hazard."[2]

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

- Aquifers downstream from the proposed mine site are used as sources of drinking water. He states:

  GW Solutions has identified that aquifers linked to Peterson Creek and Davidson Creek are used as sources of drinking water by residents.

  Peterson Creek and Davidson Creek aquifers are located downstream of mining activities proposed by KAM. Potential contaminants emanating from the components of the project may travel both with surface water and the groundwater. [3]

- The Peterson Creek drinking water aquifer has high vulnerability to contamination. The Wendling report states:

  The Peterson Creek Aquifer is rated by BC MoE as low development, high vulnerability and moderate productivity (Class IIIA). Its high vulnerability results from its proximity to the ground surface and its lack of confinement. Being immediately downgradient of the Ajax mine, it will be the first aquifer impacted by the discharge of poor quality effluents originating from the mine, should they occur.[4]

- A substantial number of people draw their drinking water from those aquifers. The Wendling report states:

  There are two community wells; one serving Knutsford Knoll development and the other serving the Kamloops RV Campground. Both wells are close to each other and they are located approximately 4 m from Peterson Creek.

  The Knutsford Knoll well supplies 41 modular homes/households and the Kamloops RV well supplies 100 fully-occupied RV campsites and tent camping

spots, nine mobile homes, one mosque and one private property (Schimpf property).

Furthermore, there are seven individual homes with wells completed in the Peterson Creek aquifer, further up creek toward the mine (KAPA, pers. communication).[5]

- The proposed Ajax mine operation would create many potential sources of water contamination. Citing the "Review of Predicted Water Contamination" done by Kevin Morin, Ph.D and P. Geo.[6], Dr. Wendling states:

> *According to Dr. Morin (March 2016), the potential sources of water contamination are the components of the Ajax site. These components include:*
>
> *a) waste-rock disposal dumps called "mine rock stockpile facilities";*
>
> *b) the low-grade-ore and medium-grade-ore stockpiles that will not be processed before the end of the operation and may, in effect, become additional waste-rock disposal dumps;*
>
> *c) the tailings disposal facility called the "tailings storage facility" or TSF;*
>
> *d) the waste-rock embankments of the TSF, which will contain a significant percentage of the total waste-rock and thus represent additional waste-rock disposal dumps;*
>
> *e) the open pit, which will fill with water after mining;*
>
> *f) the overburden stockpile and overburden spread across the proposed site during construction and operation; and*
>
> *g) several other components that will contain mined material or receive water from the mine site, including roads and ponds.*
>
> *Thus, there are many potential contaminant sources within the footprint of the proposed Ajax mine site.*[7]

- The Wendling Report describes potential Contaminant Pathways – pathways that mine contaminants could follow to reach receptors such as humans:

> *The contamination from the mine components would travel along pathways to reach receptors. The two groups of pathways at the proposed Ajax site that would allow contaminated water to migrate downstream are surface water and groundwater. Receptors* [including humans] *would have to be connected to sources through pathways carrying contamination from mine components to create adverse impacts, harm, or damage.*[8]

- Inadequate Assessment of Contaminant Pathways and Drinking Water Impacts. Unfortunately, to assess human health impacts, the proponent KGHM Ajax Mining Inc. (KAM) simply did a preliminary assessment of potential plume migration pathways and resulting contaminant concentrations in residential well 2.[9] Thus, KAM did studies to identify potential source of contamination and probable pathways, and projected anticipated concentrations of toxic elements reaching one drinking water source nearest KAM's proposed facilities. However, Dr. Wendling identifies numerous inadequacies in this key KAM assessment of drinking water risks. Dr. Wendling states:

> *GW Solutions has identified the following weaknesses in the KAM assessment of the risks of negative impacts to drinking water sources:*
>
> - *KAM has focused its study on the assessment of potentially negative impact on the nearest receptor from the closest potential source of contamination (the PCDP). KAM has not considered the cumulative effect of potential contaminants released by all the components of the proposed operation (i.e., waste-rock storage facilities, tailings storage facility, open pit, etc.). KAM has not quantified how the cumulative impact may affect the quality of the groundwater flowing through the bedrock aquifer, and through both the Peterson Creek and the Davidson Creek aquifers, which are both used as a source of drinking water.*
>
> - *The particle tracking simulation only considers advective transport (transport with the mean velocity of groundwater flow). Other transport phenomena such as dispersion, or the spreading of a plume that occurs due to mixing have not been considered; however, such models of contaminant transport could still bring water containing contaminants to RES-2 from*

the EMRSF and EMRSF pond, both located directly north of the PCDP.

- *KAM only considered seepage from PCDP to groundwater as a contamination pathway. KAM did not consider direct contaminated runoff from EMRSF toward Peterson Creek and groundwater-surface water interaction at the vicinity of Peterson Creek. Based on the water balance studies by KAM, Peterson Creek is the receptor of the runoff and shallow groundwater (interflow) downstream of the EMRSF, as indicated by KAM water balance flow charts presented in Figure 8 (pre-mining) and Figure 9 (during operation).*

- *KAM did not use the historical geochemical data during operation at the earlier Ajax mining operation for its assessment. It would be very important to assess whether the data indicates a degradation of the water quality downstream of the mine, due to the historical mining activities.*

- *KAM did not consider the seasonal fluctuation of the concentration of targeted parameters. KAM considered the average annual concentration. As an example, dissolved copper in the seep from waste-rock (WR) had an average value of 0.02 mg/L, but reached a maximum of 0.0637 mg/L (3 times higher than average). Higher concentrations during certain times of the year may result in certain parameters exceeding the drinking water guidelines.*

- *It is important to note that the drinking water quality guidelines are based on total metals (dissolved plus suspended, except for aluminum and iron). However, KAM's application (Appendices 3-A and 3-B) only considers and reports dissolved concentrations, which by definition will be equal or less than the total concentrations. Therefore, their assumption of the risk of exceeding the drinking water guidelines may be underestimated.*

- *KAM's particle tracking model is based on KAM's assessment of the groundwater flow in the study area. GW Solutions has observed that the hydrogeological knowledge of the mine site is limited; therefore, the reliability of the results provided by the particle tracking model is limited by the quality of the hydrogeological model used by KAM.* [10]

[emphasis underlining added]

- In sum, the proposed Ajax project will create a risk to water quality downhill from the project – but there has been no adequate assessment of that substantial risk to drinking water.

- The Wendling report details the consequence of this situation:

> *KAM has completed studies to identify potential sources of contamination, the probable pathways, and has projected anticipated concentrations of toxic elements reaching the drinking water source nearest to its proposed facilities. However, should KAM's assumptions and modeled results misrepresent how the water quality will be affected by the proposed operations (as presented above), there is a risk of negative impact to the drinking water quality and a resulting health hazard.*
>
> *In particular, the quality of the groundwater in the Peterson Creek Aquifer will likely deteriorate due to seepage from the EMRSF pond and PCDP, and the cumulative effect of the other components of the projects (i.e., waste-rock storage facilities, tailings storage facility, open pit, etc.).*
>
> *Therefore, the proposed mining activities will likely create health hazards by modifying the quality of the drinking water.*[11]
>
> [emphasis underlining added]

- The Wendling report concludes:

> *… this risk of contamination of the Peterson Creek Aquifer is not consistent with protecting stream health and aquatic environments… The risk of creating a contaminant groundwater plume resulting from the proposed mining activities will not "ensure that water stays healthy and secure for future generations of British Columbians"…*
>
> *This intentional release of potential contaminants into both the Peterson Creek and the Davidson Creek Aquifers fails to meet the objectives of British Columbia legislation.*

In summary, the Ajax mining project will likely create a substantial risk to actively used drinking water sources. Most troubling, careful and adequate *identification and assessment* of that risk has not been done, let alone *mitigated*.

For example, it is significant to note that -- even with the clearly inadequate assessment of potential contaminant pathways pointed out by Dr. Wendling -- the recently-released Federal/Provincial Assessment Report acknowledges that Ajax is predicted to increase arsenic concentration in groundwater in Knutsford. In response to concerns about arsenic raised by the City of Kamloops, the Assessment Report also acknowledges that increased arsenic in drinking water can increase cancer risks. [12]

Just how much more arsenic would be predicted in Knutsford ground water if more adequate assessment studies had actually been done?

In light of all of the above, there is clearly a "reason to believe that…there is a significant risk of an imminent drinking water health hazard". Therefore, we ask that you invoke the powers you possess under s. 25(1)(b) of the *Drinking Water Protection Act* to address such situations. We ask that you issue a Drinking Water Hazard Prevention Order to address the risks to drinking water posed by the proposed KGHMX Ajax mining project.

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

- The specifics of the Ajax mining project proposal, including the remarkable proximity of the large Ajax Mining project to urban Kamloops, and

- The mining industry's troubling track record of polluting ground and surface water.

BACKGROUND

The proposed Ajax mine project is vast. The mine has an expected capacity of 65,000 tonnes per day (tpd). It is an open pit copper/gold mine, with an estimated 23-year mine life producing copper/gold concentrate.[13] The operation will create massive quantities of exposed rock and ore. It will include the open mine pit, the tailings storage facility, waste rock embankments of the tailings facility, waste rock disposal dumps, ore stockpiles, etc.

Residents are concerned that water running through the pit, ore, tailings and waste rock will become contaminated with toxins. In fact, such water contamination is commonplace at mines. 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.[14]

In general, 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 arsenic[15], cadmium[16], chromium, copper, lead, mercury, selenium and zinc.[17] 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.[18]

It is common for the sulphuric acid and toxic metals from ARD to be 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 can degrade 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.[19] Mines in Europe continue to leach toxic metals centuries after the mine was dug.[20] Furthermore, although acid rock drainage is the most serious problem, even mine drainage from neutral, non-acidic rock can leach out heavy metals and create toxic water pollution.[21]

Thus, local Kamloops residents who currently draw their water from groundwater wells have legitimate concerns about surface and groundwater quality impacts due to acid rock drainage and other drainage from the mine site.

Their concerns are heightened by Dr. Wendling's troubling conclusions about the significant risks to drinking water quality posed by this project – and about the failure of KAM to perform adequate assessment of those risks at this site.

Yet the Environmental Assessment is proceeding in this flawed fashion, despite requests for additional precautionary measures from KAPA and other public interest groups. The flawed federal/provincial environmental assessment process takes legal precedence -- and it currently proceeds apace towards final mine approval. This leads to grave concerns that the mine operations will soon commence – operations that are likely to impact aquifers used by over 150 residents for their potable water.

The concerns raised about the safety of this drinking water must be taken seriously, particularly in light of the mining industry's remarkable record of polluting waters and water supplies, discussed below.

THE TROUBLING HISTORY OF MINING AND WATER POLLUTION

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 Brittania Mine near Squamish killed life in Brittania 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 mine[27], 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]

- 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.

- Similarly, copper from acid rock drainage generated by a Vancouver Island copper mine was a major cause of the disappearance of salmon runs from Jordan River for decades. After the Environmental Law Centre investigated, in 2016 Government ordered Teck Resources Inc. to prepare remediation plans for the mine, in an attempt to restore water quality and re-establish fish populations.[32]

- In recent years, 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 Dr. William Cullen of the University of British Columbia investigated whether arsenic from the mine was making it into the watershed.[33] After comprehensive and systematic sampling of lake sediments in the Quinsam watershed,[34] 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". [35]

  Note that arsenic in drinking water is considered one of the prominent environmental causes of cancer mortality in the world.[36] Arsenic is a highly toxic heavy metal with wide-ranging potential health hazards. Among other things, it is carcinogenic, mutagenic, and teratogenic.[37] Drinking arsenic-rich water may also be linked to diabetes, high blood pressure, and reproductive disorders.[38]

- Elevated levels of toxic cadmium were detected in fish from Buttle Lake on Vancouver Island, likely due to a nearby mine.[39]

SOME EXAMPLES OF HEALTH IMPACTS FROM MINE-CONTAMINATED WATER

South African scientists have cited acid mine drainage as the single most significant threat to South Africa's environment.[40] 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,[41] 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.[42]

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".[43] 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.

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.[44]

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, BC area (Wellington), noted that it is "generally understood that the influence of mine site abandonment has adverse effects on the quality of groundwater."[45]

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.[46] 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."[47] This is consistent with a US study that found that coal mine impacts on streams was associated with higher cancer mortality.[48]

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. [49]

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.[50] Another study found high rates of birth defects in mountaintop coal mining areas, perhaps linked to pollution from the mines.[51]

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.[52] 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.[53]

It is notable that elevated Selenium levels have also been found in BC's Elk River Valley, from upstream coal mining operations.[54] 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.[55] The BC Auditor General recently noted the continuing health threat posed by selenium released from Elk Valley mines, stating:

> *Despite the addition of water treatment facilities, the current permit levels of selenium are above the water quality guidelines set by BC to protect aquatic life, and for human health and safety. Selenium from both historical mining activities and the ongoing* [mine] *expansion is likely to continue to impact the environment far into the future.* [56]

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 supply. Like the ill-fated Mount Washington mine, the proposed Ajax Mining 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 local concerns are heightened by the evidence of health effects on people drinking ground water from mining areas elsewhere -- and by the numerous other instances where mines have impacted water and human health.

Taking into account:

- The specifics of the proposed Ajax Mining Project,
- The proximity of the project to urban Kamloops,
- The long, problematic history of mines contaminating water and water supplies, and
- Most important, Dr. Gilles Wendling's expert opinion,

we submit that operation of the Ajax 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 *Drinking Water Protection Act* to issue the Drinking Water Health Hazard Prevention Order requested.

Section 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".[57] 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 …*[58]

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.*[59]

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 full information and 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 cleanup 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.*[60]

Clearly, current conditions here indicate at least that much.

Such an interpretation of "imminent" as including *potential* future hazards (*e.g.*, arising from a mine which is well on its way to approval) is entirely consistent with the BC court decision in *Western Forest Products Inc. v. Sunshine Coast (Regional District)* 2007 BCSC 1508. At paragraphs 16-22 the BC Supreme Court considered ss. 63(1)(a) and (b) of the *Health Act* -- which use virtually the same wording as ss. 25(1)(a) and (b) of the *Drinking Water Protection Act*.[61]

The Court decided that the strikingly similar wording in the *Health Act* subsections gives health officials jurisdiction to issue an order if there is a "potential health hazard" – it does not have to be an existing health hazard. The Court stated:

> *Those public officials with medical or public health expertise have the ability to intervene and issue orders, where there is a risk of an imminent health hazard, i.e. where there is a potential health hazard.*[62]

The Court contrasted this power of health officials to issue orders for potential health hazards with the more limited power of local boards of health, who could only issue orders for *existing* health hazards. Significantly, the Court specifically noted the similarity of the *Health Act* provisions to s. 25(1)(a) and (b) of the *Drinking Water Protection Act*. Therefore, you have the jurisdiction to issue an order regarding a potential health hazard.

Finally, in considering issuance of an order, we ask you to give the highest consideration to the residents who use drinking water from the aquifers 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.*[63]

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

> *[a]ccess to safe drinking-water is essential to health, a basic human right…"*[64]

CONCLUSION

Significant sources of drinking water are located downhill from the proposed Ajax Mining 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, if you decline to issue such an Order, we request that you make urgent and pressing submissions to the officials conducting the environmental assessment of the Ajax mining project about the inadequacies of that assessment -- and the failure to identify and deal with the substantial risks to drinking water identified by Dr. Wendling.

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

Yours truly,

Anna Poezzhaeva, Law Student

Calvin Sandborn

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] See the attached report by Gilles Wendling, Ph.D., P. Eng., "Proposed Ajax Mine Site – Drinking Water Act – Section 25" ("Potential Impact of the Proposed Ajax Mine on the Drinking Water"), August 8, 2017, at page 20. Hereinafter referred to as the "Wendling report".

[3] See the Wendling report, attached at p. 20.

[4] See Wendling report, attached at p. 5.

[5] See Wendling report, attached at p. 5.

[6] "Ajax project Review - Review of Predicted Water Contamination", March 2016, Kevin A. Morin, Ph.D., P.Geo, cited in the Wendling report at p. 13.

[7] See Wendling report, attached at p. 13.

[8] See Wendling report, attached at p. 13.

[9] In support of its Human Health and Ecological Risk Assessment.

[10] See Wendling report, attached at pp. 16-17.

[11] See Wendling report, attached at p.20.

[12] See: *Ajax Mine Project: Joint Federal Comprehensive Study / Provincial Assessment Report*, August 2017. At p. 70 the Joint Report states: "The Agency and EAO note that Ajax is predicted to cause an increase in the concentration of arsenic in groundwater in Knutsford. While the predicted concentration (1.8 mg/L) is below the Canadian drinking water guideline (10 mg/L) and within average naturally occurring background arsenic levels in BC, the Agency and EAO note that the increase in concentration of this parameter in drinking water can increase the risk of developing cancer… "

[13] Wendling, Gilles, "Potential Impact of the Proposed Ajax Mine on the Drinking Water", August 8, 2017, at page 2.

[14] *What is Acid Mine Drainage?*, 2012, US Environmental Protection Agency, Online: 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.

[15] "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/environ/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.

[16] First Nations Environmental Health Innovation Network, *"Cadmium Fact Sheet"*, online: <http://www.fnehin.ca/uploads/docs/fs2-cadmium.pdf>, accessed July 7, 2010.

[17] 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.

[18] "Acid Rock Drainage is a natural process whereby sulphuric acid is produces 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.

[19] Safe Drinking Water Foundation, "Mining and Water Pollution", online: <http://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf>, accessed July 7, 2010.

[20] For example, the *Global Acid Rock Drainage Guide* cites a mine in Spain created in the Roman era that still actively releases such drainage http://www.gardguide.com/index.php?title=Summary. Similarly, a mine in the UK that has been releasing such drainage for 2,000 years is described at: http://sciencelearn.org.nz/News-Events/Latest-News/News-Archive/2009-News-archive/Environmental-best-practice-mining. Ancient Scandinavian mines also continue to pollute ecosystems there. See, for example: Per Angelstam, "Learning About the History of Landscape Use for the Future: Consequences for Ecological and Social Systems in Swedish Bergslagen," (*Ambio* March 10, 2013) online: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3593034/

[21] Neutral metal leaching occurs in a non-acid environment, and can release selenium, molybdenum, arsenic, cadmium, copper, nickel, mercury, zinc, uranium, antimony, chromium, manganese, iron and sulphate. Stantec Consulting Ltd., *Mine Effluent Neutral Drainage: Review of Water Quality Issues in Neutral pH Drainage: Examples and Emerging Priorities for the Mining Industry in Canada*. (MEND, Report 10.1., 2004) Executive Summary.

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centre/media-release-files/quinsam-coal-mine-letter-to-director, accessed October 8, 2012.

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Kamloops Area Preservation Association (KAPA)

(Via email)

Attention: Paula Pick

Re: Proposed Ajax Mine Site- Drinking Water Act- Section 25

GW Solutions Inc. (GW Solutions) is pleased to present the following letter-report summarizing some comments on the potential impacts of the proposed **Ajax Mine Project**, based on the review of available information and GW Solutions understanding of the hydrogeological conditions at the vicinity of the proposed mine site.

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.*

1 BACKGROUND

KGHM Ajax Mining Inc. (KAM) is proposing to develop, construct, operate, close, decommission, and reclaim the proposed Ajax Project (The Project). The Project is a nominal 65,000 tonnes per day (tpd) open pit copper/gold mine, with an estimated 23-year mine life producing copper/gold concentrate.

The Project is located in the South-Central Interior of British Columbia (BC), south of the city of Kamloops, within the Thompson-Nicola Regional District. The proposed Project is partially located on a historical mine site and mining activities in the immediate project area began in 1989. Previously mined areas on site include the partially backfilled Ajax East open pit and the two Ajax West open pits, and two reclaimed waste rock piles.

The Project consists of an open pit mine, on-site ore processing facilities, a tailings storage facility (TSF), mine rock storage facilities (MRSFs), water management facilities, including seepage collection ponds, and a diversion system to convey water from Jacko Lake around the site and back to a new Peterson Creek Downstream Pond, low-grade and medium-grade ore and overburden stockpiles, ancillary facilities, mine haul roads, sewage and waste management facilities, a 4-km access road between the Project and Highway 5, a 15-km pipeline for water supply connecting to the existing New Afton facilities, a 5.3-km natural gas pipeline connecting to the Fortis system near Knutsford, and a 10-km power line connecting the Project site to the BC Hydro transmission line corridor. The Project facilities and plan are shown in Figure 1.

Ore will be processed on site through a conventional crushing, grinding, and flotation process to produce a copper/gold concentrate.

GW Solutions has been retained by the Kamloops Area Preservation Association (KAPA) to provide an assessment of potential contamination migration pathways and resulting contaminant concentrations in some private domestic wells in support of the application for a Drinking Water Hazard Abatement and Prevention Order under section 25 of the Drinking Water Protection Act.

The objectives of GW Solutions' work have been to assess whether the proposed Ajax mine poses a significant risk of creating a drinking water health hazard for people drawing their drinking water from the aquifer adjacent to the mine site.

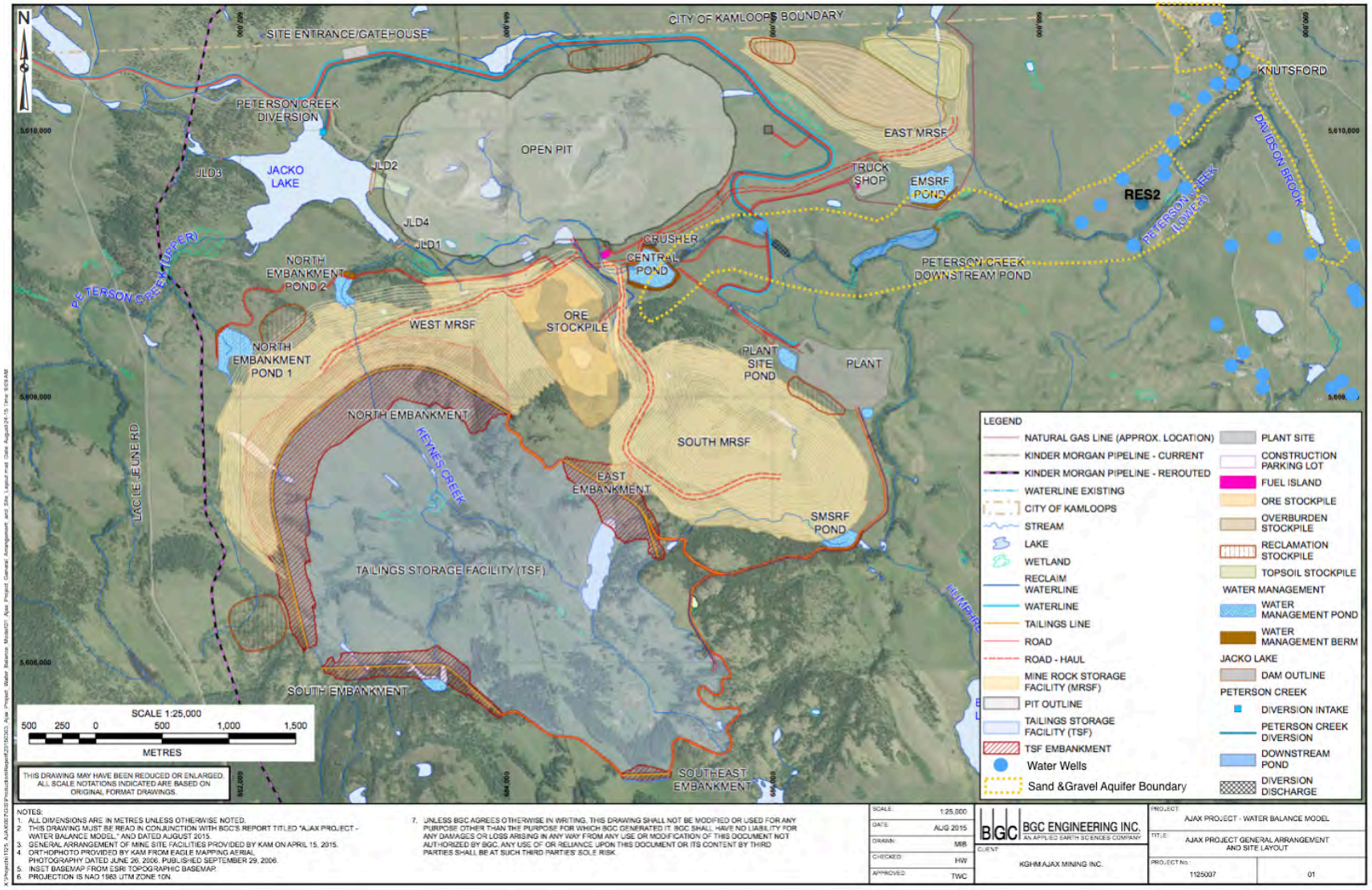

Figure 1: Ajax project facilities and development areas presented by KAM – Aquifer boundaries and water well locations (blue dots) added by GW Solutions

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2 SCOPE

As part of GW Solutions' assessment, the following tasks have been completed:

- List/confirm locations of all the wells from the mine site through Knutsford and estimate the number of people relying on these wells for drinking water sources, KAPA assisted with this inventory task;
- Identification of the aquifers used for sources of drinking water;
- Review KGHM relevant reports submitted as part of their Ajax Project Application and describing their proposed activities as well as review KGHM's assessment of the risks to drinking water along Peterson Creek;
- Definition of health hazards due to proposed mining activities; and
- Identification of gaps and weaknesses in completed studies.

3 INFORMATION SOURCES

During the study, GW Solutions accessed the following sources of data:

- BC Wells Database;
- BC Aquifer Mapping;
- Ajax application and its Appendices by KGHM and its consultant BGC Engineering Inc.;
- Ajax Project Review - Review of predicted water contamination by Minesite Drainage Assessment Group, Kevin A. Morin, Ph.D., P.Geo.;
- Review of KGHM Ajax Project EA Application by GW Solutions, Gilles Wendling, Ph.D., P.Eng.; and
- Technical Peer Review Proposed Ajax Mine by SLR Consulting (Canada) Ltd.

4 DRINKING WATER USERS

There are two community wells; one serving Knutsford Knoll development and the other serving the Kamloops RV Campground. Both wells are close to each other and they are located approximately 4 m from Peterson Creek.

The Knutsford Knoll well supplies 41 modular homes/households and the Kamloops RV well supplies 100 fully-occupied RV campsites and tent camping spots, nine mobile homes, one mosque and one private property (Schimpf property).

Furthermore, there are seven individual homes with wells completed in the Peterson Creek aquifer, further up creek toward the mine (KAPA, pers. communication).

Figure 1 presents the location of these wells relative to the proposed Ajax mine site.

5 AQUIFERS USED FOR SOURCES OF DRINKING WATER

According to the British Columbia Ministry of Environment (BC MoE), three aquifers have been mapped in the study area (Figure 2 and Figure 3).

5.1 The Peterson Creek Aquifer

The Peterson Creek Aquifer is a 2 km^2 sand and gravel aquifer located south of the proposed mine site along Peterson Creek. It is up to 80 m thick with sand and gravel units interpreted to be glaciofluvial in origin interbedded with glaciolacustrine silt and clay lenses.

The Peterson Creek Aquifer may be recharged by both the underlying Sugarloaf Hill Bedrock Aquifer and from groundwater flow in the overlying quaternary materials. Infiltration from precipitation, Peterson Creek surface water interaction, snowmelt and anthropogenic irrigation also contribute to the recharge of the aquifer.

The Peterson Creek Aquifer is rated by BC MoE as low development, high vulnerability and moderate productivity (Class IIIA). Its high vulnerability results from its proximity to the ground surface and its lack of confinement. Being immediately downgradient of the Ajax mine, it will be the first aquifer impacted by the discharge of poor quality effluents originating from the mine, should they occur.

5.2 The Davidson Creek Aquifer

The Davidson Creek Aquifer is approximately 1 km^2 in area and located west of the proposed mine site along Peterson Creek and Davidson Brook. It consists of up to 18 m thick sand and gravel units of glaciofluvial origin overlaid by thin till and clayey layers. The Davidson Creek Aquifer is confined and overlies the Knutsford Bedrock Aquifer.

The Davidson Creek Aquifer may be recharged by the underlying Knutsford Bedrock Aquifer and Peterson Creek. Infiltration from precipitation, snowmelt and anthropogenic irrigation also contribute to its recharge.

The Davidson Creek Aquifer is rated by BC MoE as low development, moderate vulnerability and moderate productivity (Class IIB).

5.3 Sugarloaf Hill Bedrock Aquifer

The Sugarloaf Hill Bedrock Aquifer is approximately 65 km^2 in area and located southwest of Kamloops. The lithology of this aquifer is Coast Intrusion- Iron Mask Batholith.

The Sugarloaf Hill Bedrock Aquifer is rated by BC MoE as low development, moderate vulnerability and low productivity (Class IIIB).

Figure 2 and Figure 3 show the extent of the existing aquifers within the study area, existing private domestic wells and the community water supply wells completed in Peterson Creek and Davidson Creek Aquifers.

Figure 4 presents the piezometric contours (i.e., water table elevation) and the direction of the groundwater in the aquifers. The contours are drawn based on measured groundwater levels reported by KGHM.

A bedrock outcrop separates the Peterson Creek aquifer from the Davidson Creek aquifer. Figure 5 and Figure 6 illustrate the surficial geology and the bedrock geology of the study area, respectively. A system of faults has been mapped in the bedrock; therefore, although the aquifers are separated, the faulted/fractured bedrock likely acts as a conduit, linking the two aquifers and allowing the movement of groundwater from the Peterson Creek aquifer to the Davidson Creek aquifer.

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.

Very little has been done to characterize the recharge mechanisms and recharge zones of the aquifers used for drinking water in the study area. The first and second mechanisms described above most likely apply.

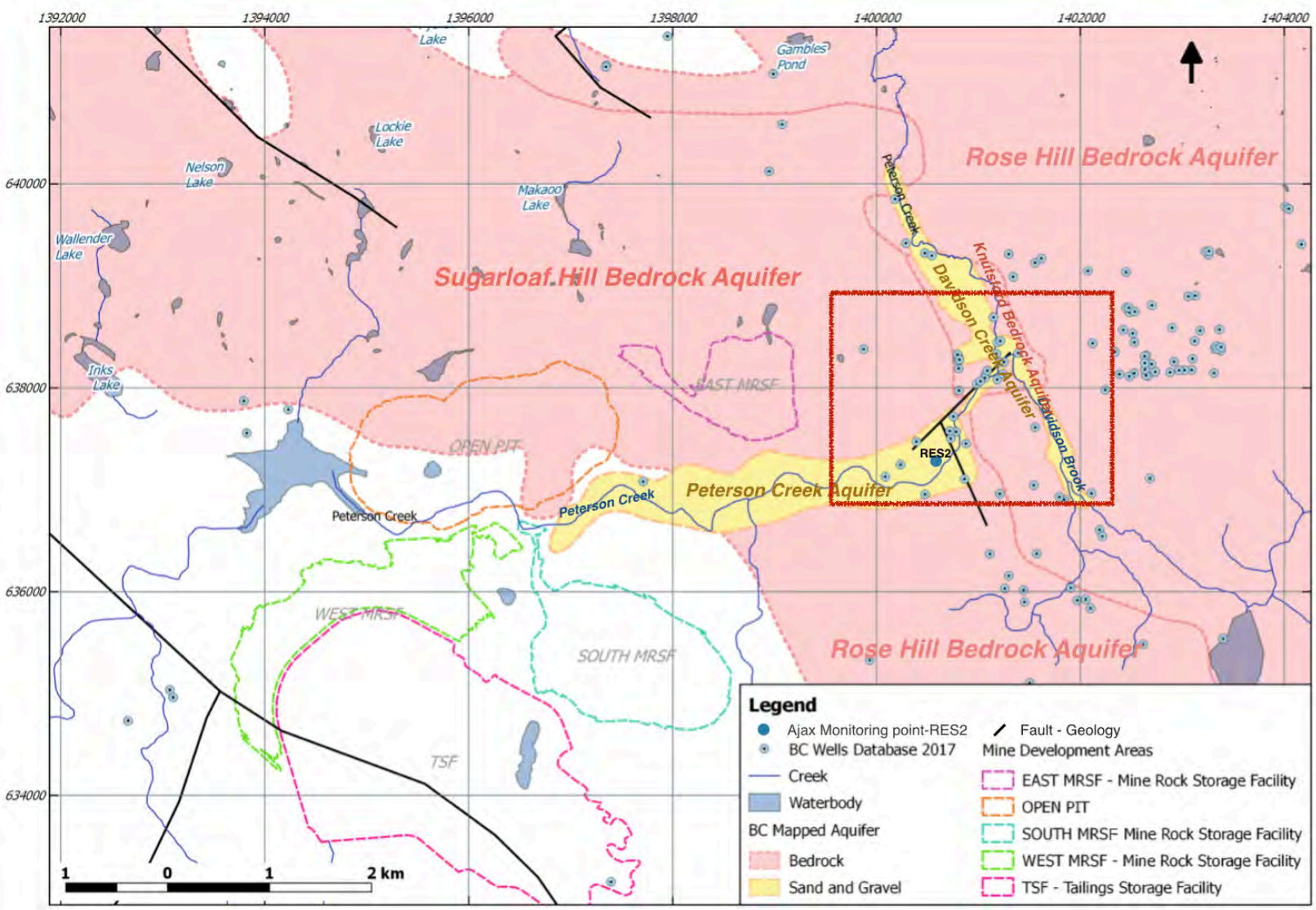

Figure 2: Existing aquifers within study area (red rectangle shows area presented in Figure 3)

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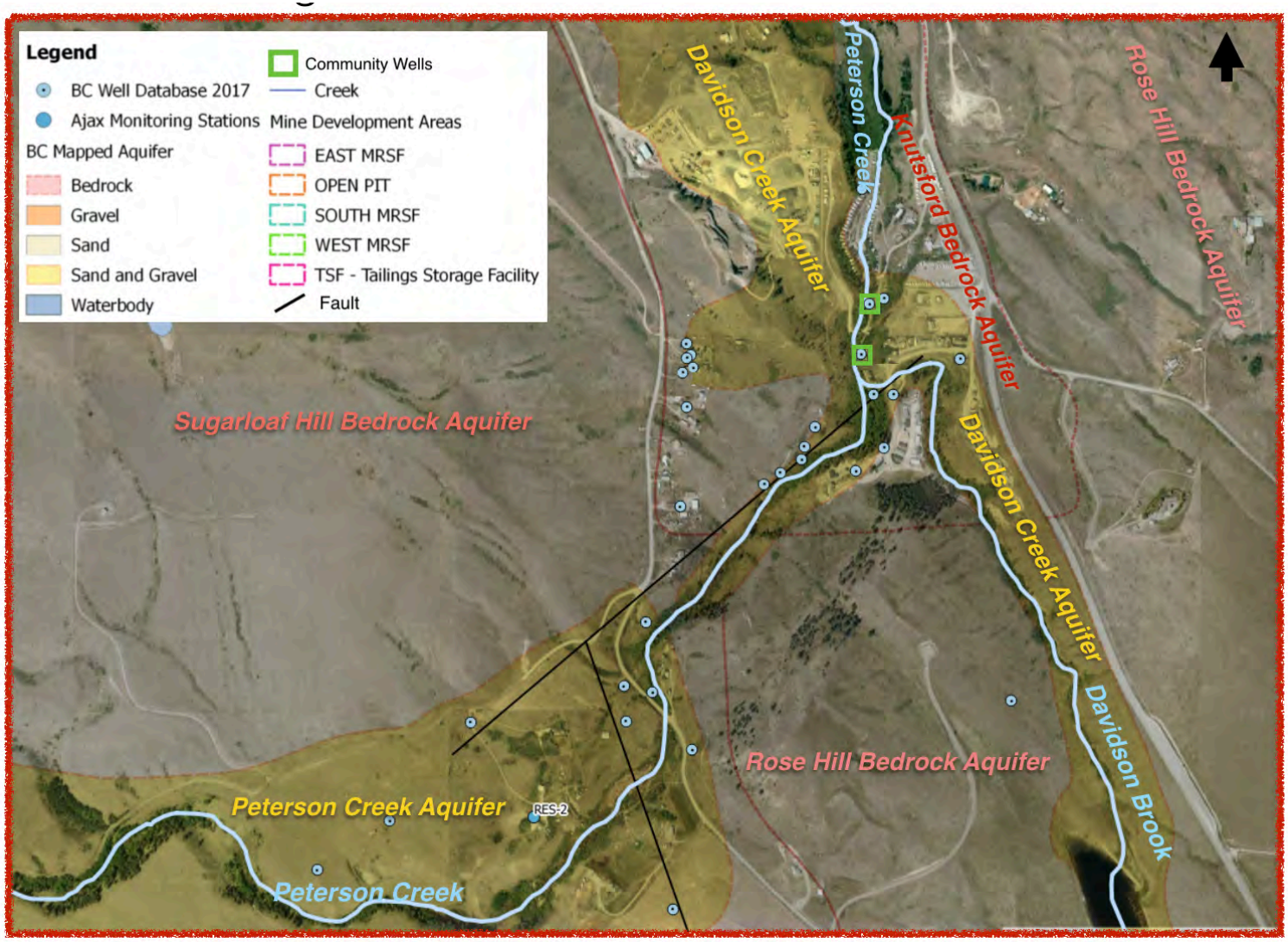

Figure 3: Mapped aquifers and water wells

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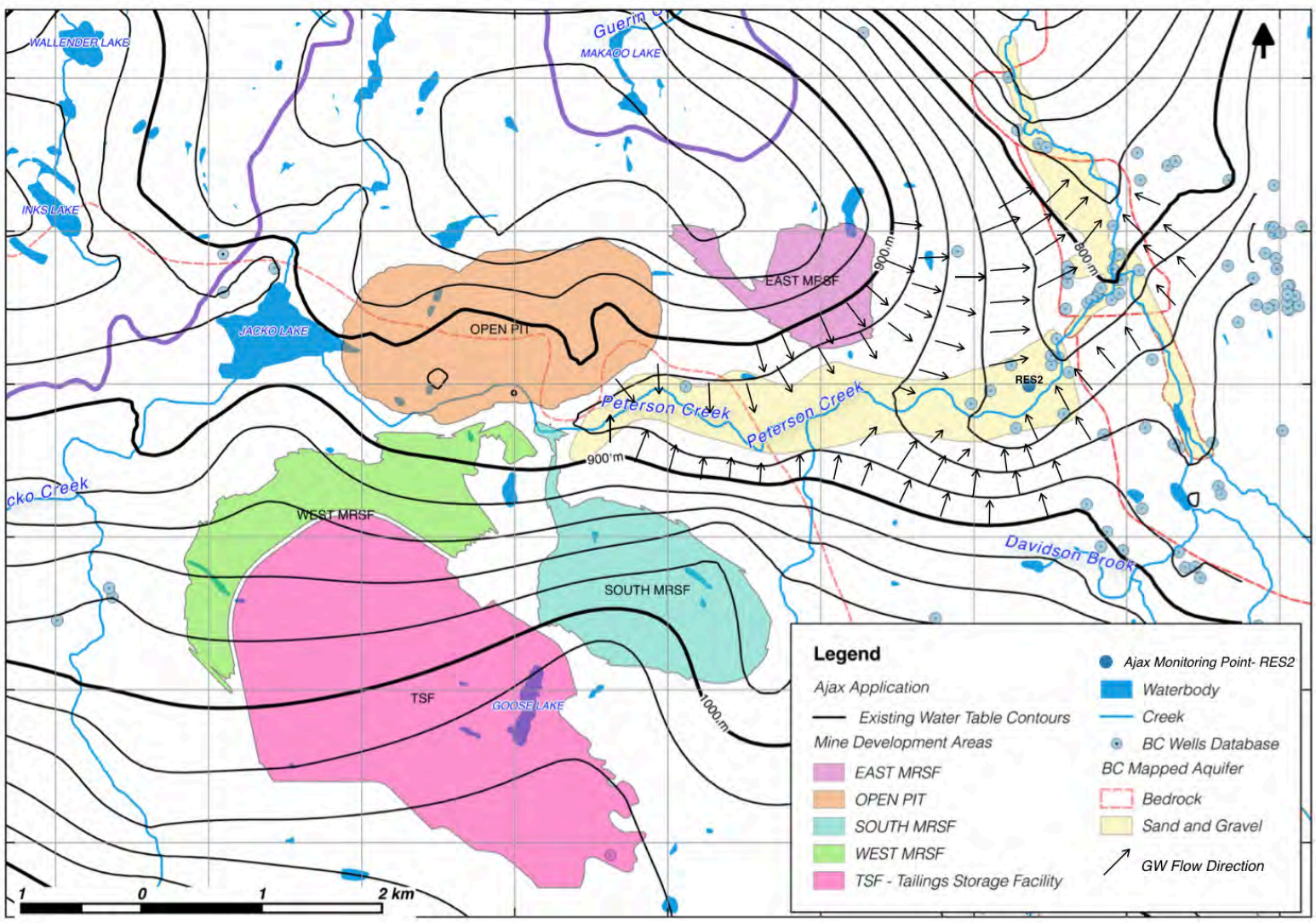

Figure 4: Piezometric contours and estimated direction of the groundwater flow based on groundwater levels reported by KAM

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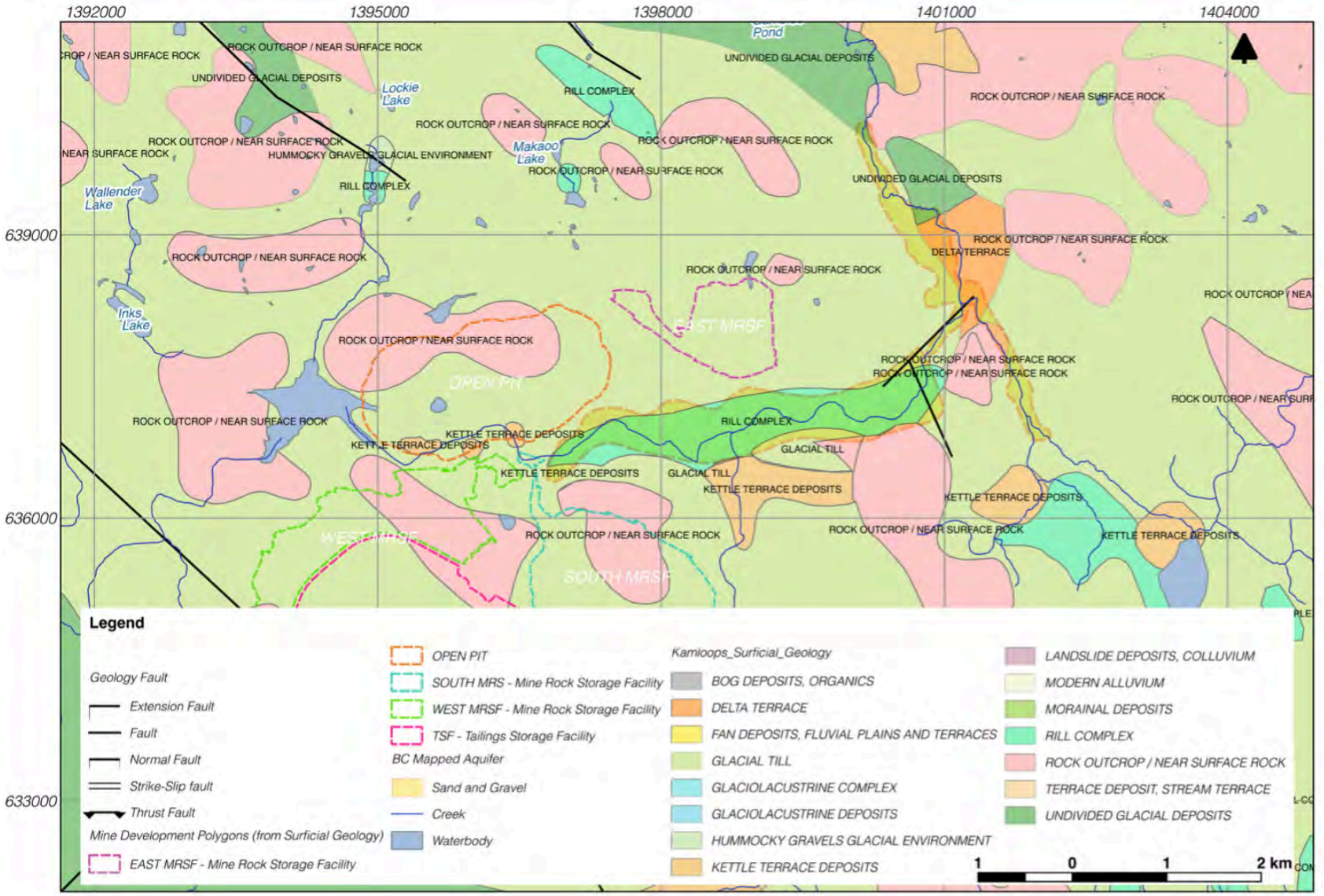

Figure 5: Surficial geology of study area (Source: BC Geological Survey, Open file 1992-13)

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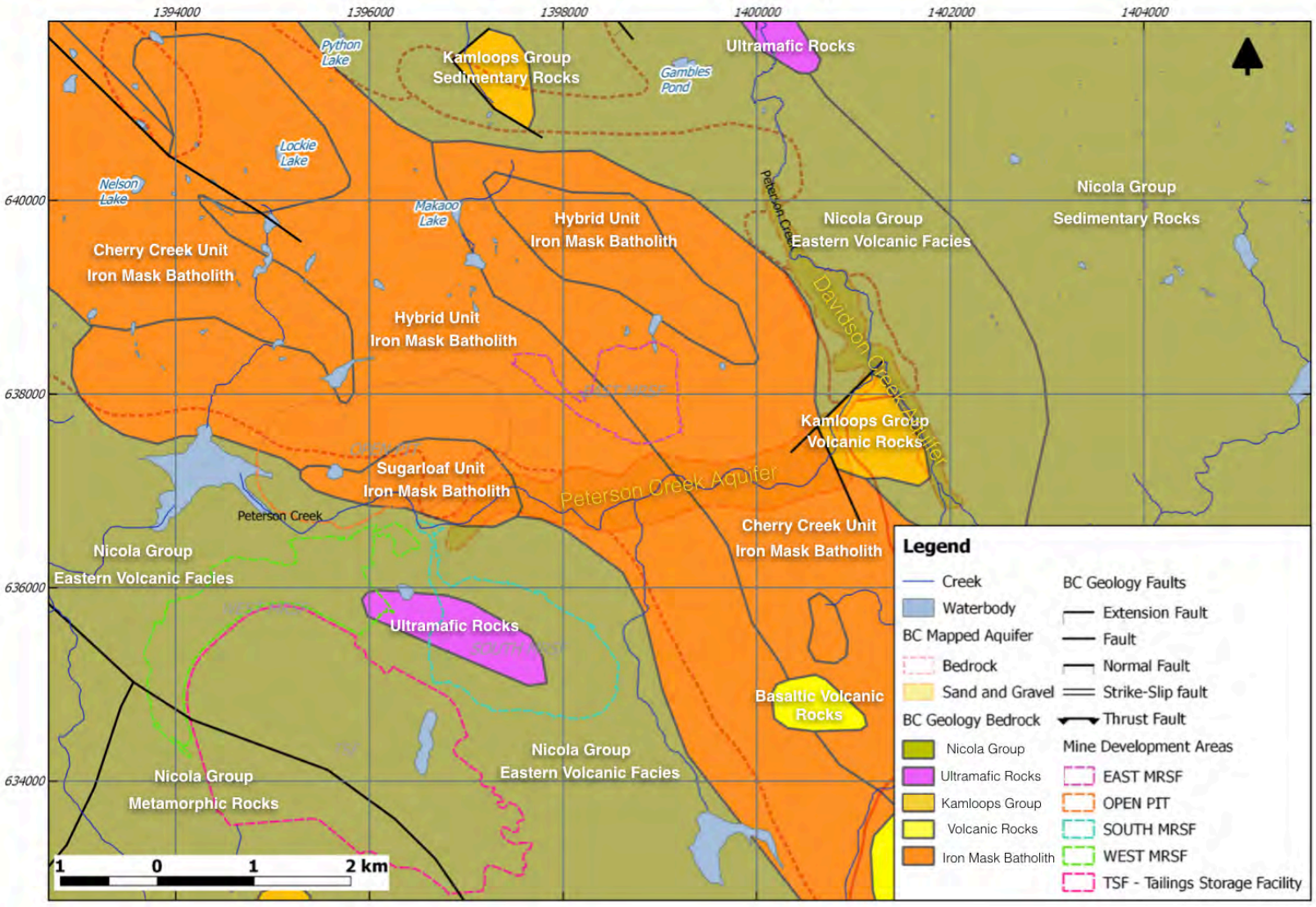

Figure 6: Bedrock geology of study area (Source: Cui et al 2015)

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6 REVIEW KGHM RELEVANT REPORTS AND RISK ASSESSMENT FOR DRINKING WATER ALONG PETERSON CREEK

6.1 Sources of Contamination

According to Dr. Morin (March 2016), the potential sources of water contamination are the components of the Ajax site. These components include:

a) waste-rock disposal dumps called “mine rock stockpile facilities”;

b) the low-grade-ore and medium-grade-ore stockpiles that will not be processed before the end of the operation and may, in effect, become additional waste-rock disposal dumps;

c) the tailings disposal facility called the “tailings storage facility” or TSF;

d) the waste-rock embankments of the TSF, which will contain a significant percentage of the total waste-rock and thus represent additional waste-rock disposal dumps;

e) the open pit, which will fill with water after mining;

f) the overburden stockpile and overburden spread across the proposed site during construction and operation; and

g) several other components that will contain mined material or receive water from the mine site, including roads and ponds.

Thus, there are many potential contaminant sources within the footprint of the proposed Ajax mine site.

6.2 Contaminant Pathways

The contamination from the mine components would travel along pathways to reach receptors. The two groups of pathways at the proposed Ajax site that would allow contaminated water to migrate downstream are surface water and groundwater. Receptors would have to be connected to sources through pathways carrying contamination from mine components to create adverse impacts, harm, or damage. The Ajax EIS recognizes two groups of receptors for contaminated water: humans (Chapter 10 - Ajax Application, addresses “potential health effects”) and a collective “environment” for everything else (Chapter 6-Ajax Application, addresses “potential environmental effects”).

6.3 KAM Results

In its application, KAM provides a preliminary assessment of potential plume migration pathways and resulting contaminant concentrations in residential well 2 (RES-2) in support of the Human Health and Ecological Risk Assessment. In its assessment, KAM assumed that RES-2 is the nearest residential well downgradient from the Ajax mining infrastructure and interprets this well to be completed within the Peterson Creek Aquifer. To assess the potential source areas that may contribute seepage water to well RES-2, forward and reverse particle tracking simulations were performed using MODFLOW-SURFACT groundwater flow model. Figure 7 shows the result of the groundwater simulation completed by KAM.

Maximum relative concentrations determined from either continuous source or pulse-source analytical models were then used to determine estimates of contaminant concentrations in RES-2. Maximum source concentration values for the EMRSF and PCDP were then used to estimate concentrations at, or in the vicinity of, RES-2 should seepage from EMRSF, EMRSF pond or PCDP occur. According to the model, the "worst case" scenario corresponds to particles migrating from Peterson Creek Downstream Pond (PCDP).

KAM's assessment of potential plume migration pathways to residential well 2 (RES-2) using particle tracking simulations of groundwater flow model showed that only particles leaving PCDP reached RES-2; particles migrating from the EMRSF and EMRSF pond passed just north of RES-2 by approximately 50 to 150 m.

A comparison of estimated maximum seepage concentrations in RES-2 to BC Ministry of Environment 30-day average and maximum drinking water guidelines and Health Canada drinking water quality guidelines reveals that no exceedances are expected from seepage only. Calculated total concentrations (i.e., seepage + background concentrations) at RES-2 indicate that aesthetic objectives for sulphate and iron, 500 mg/L and 0.3 mg/L respectively, may be exceeded at RES-2 with a projected total concentration of 1050 mg/L for sulfate and 0.323 mg/L for iron. KAM states the baseline concentrations in RES-2 for sulphate and iron are above the aesthetic objectives at 1010 mg/L, and 0.314 mg/L to begin with.

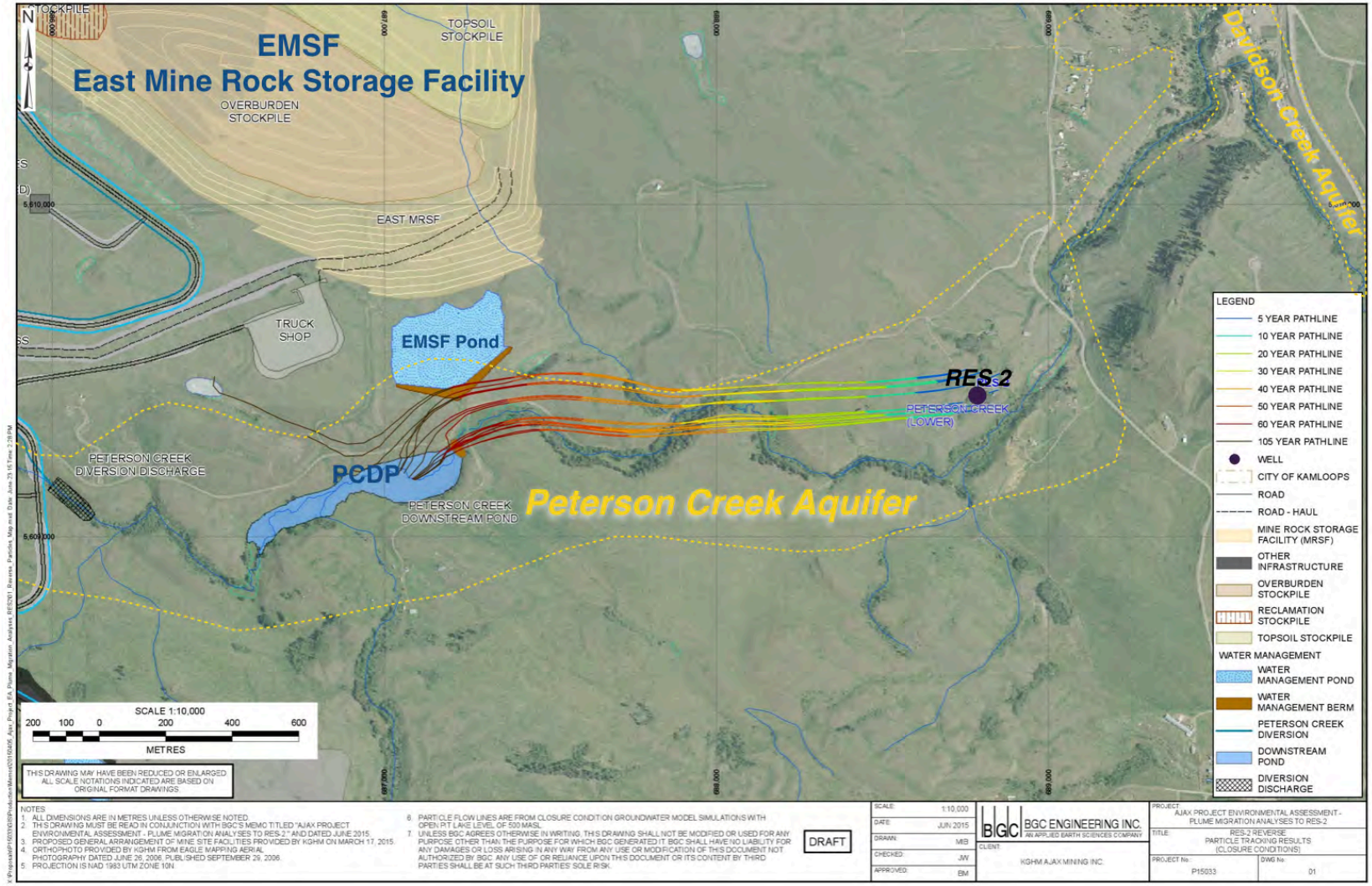

Figure 7: Result of the Groundwater Simulation- Particle tracking completed by KAM (Modified from KAM)

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6.4 KAM Limitations and Weaknesses

GW Solutions has identified the following weaknesses in the KAM assessment of the risks of negative impacts to drinking water sources:

- KAM has focused its study on the assessment of potentially negative impact on the nearest receptor from the closest potential source of contamination (the PCDP). KAM has not considered the cumulative effect of potential contaminants released by all the components of the proposed operation (i.e., waste-rock storage facilities, tailings storage facility, open pit, etc.). KAM has not quantified how the cumulative impact may affect the quality of the groundwater flowing through the bedrock aquifer, and through both the Peterson Creek and the Davidson Creek aquifers, which are both used as a source of drinking water.

- The particle tracking simulation only considers advective transport (transport with the mean velocity of groundwater flow). Other transport phenomena such as dispersion, or the spreading of a plume that occurs due to mixing have not been considered; however, such models of contaminant transport could still bring water containing contaminants to RES-2 from the EMRSF and EMRSF pond, both located directly north of the PCDP.

- KAM only considered seepage from PCDP to groundwater as a contamination pathway. KAM did not consider direct contaminated runoff from EMRSF toward Peterson Creek and groundwater-surface water interaction at the vicinity of Peterson Creek. Based on the water balance studies by KAM, Peterson Creek is the receptor of the runoff and shallow groundwater (interflow) downstream of the EMRSF, as indicated by KAM water balance flow charts presented in Figure 8 (pre-mining) and Figure 9 (during operation).

- KAM did not use the historical geochemical data during operation at the earlier Ajax mining operation for its assessment. It would be very important to assess whether the data indicates a degradation of the water quality downstream of the mine, due to the historical mining activities.

- KAM did not consider the seasonal fluctuation of the concentration of targeted parameters. KAM considered the average annual concentration. As an example, dissolved copper in the seep from waste-rock (WR) had an average value of 0.02 mg/L, but reached a maximum of 0.0637 mg/L (3 times higher than average). Higher concentrations during certain times of the year may result in certain parameters exceeding the drinking water guidelines.

- It is important to note that the drinking water quality guidelines are based on total metals (dissolved plus suspended, except for aluminum and iron). However, KAM's application (Appendices 3-A and 3-B) only considers and reports dissolved concentrations, which by definition will be equal or less than the total concentrations. Therefore, their assumption of the risk of exceeding the drinking water guidelines may be underestimated.

- KAM's particle tracking model is based on KAM's assessment of the groundwater flow in the study area. GW Solutions has observed that the hydrogeological knowledge of the mine site is limited[1]; therefore, the reliability of the results provided by the particle tracking model is limited by the quality of the hydrogeological model used by KAM.

[1] Review completed in separate studies.

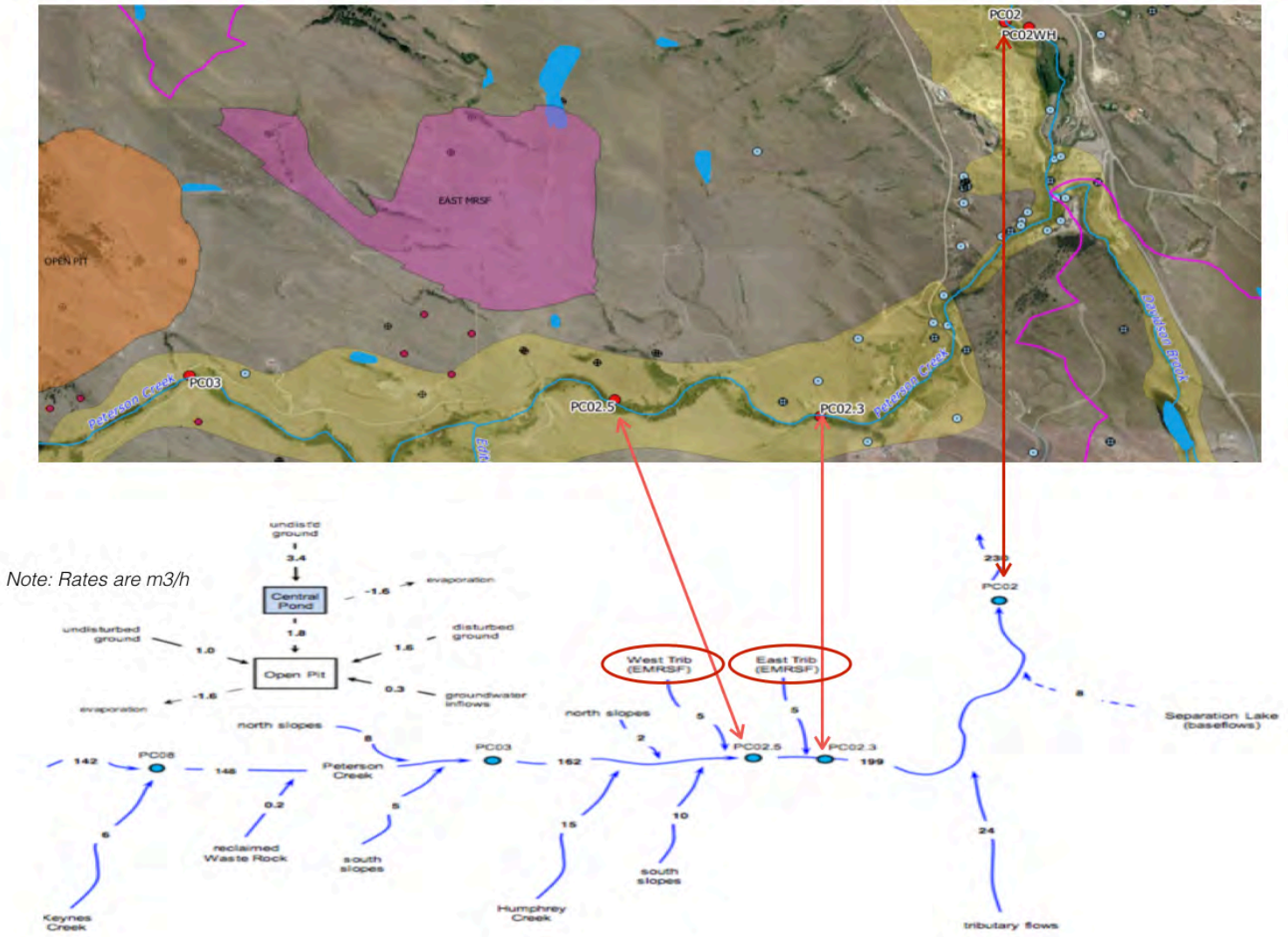

Figure 8: Water balance flowchart for existing conditions (Modified from KAM)

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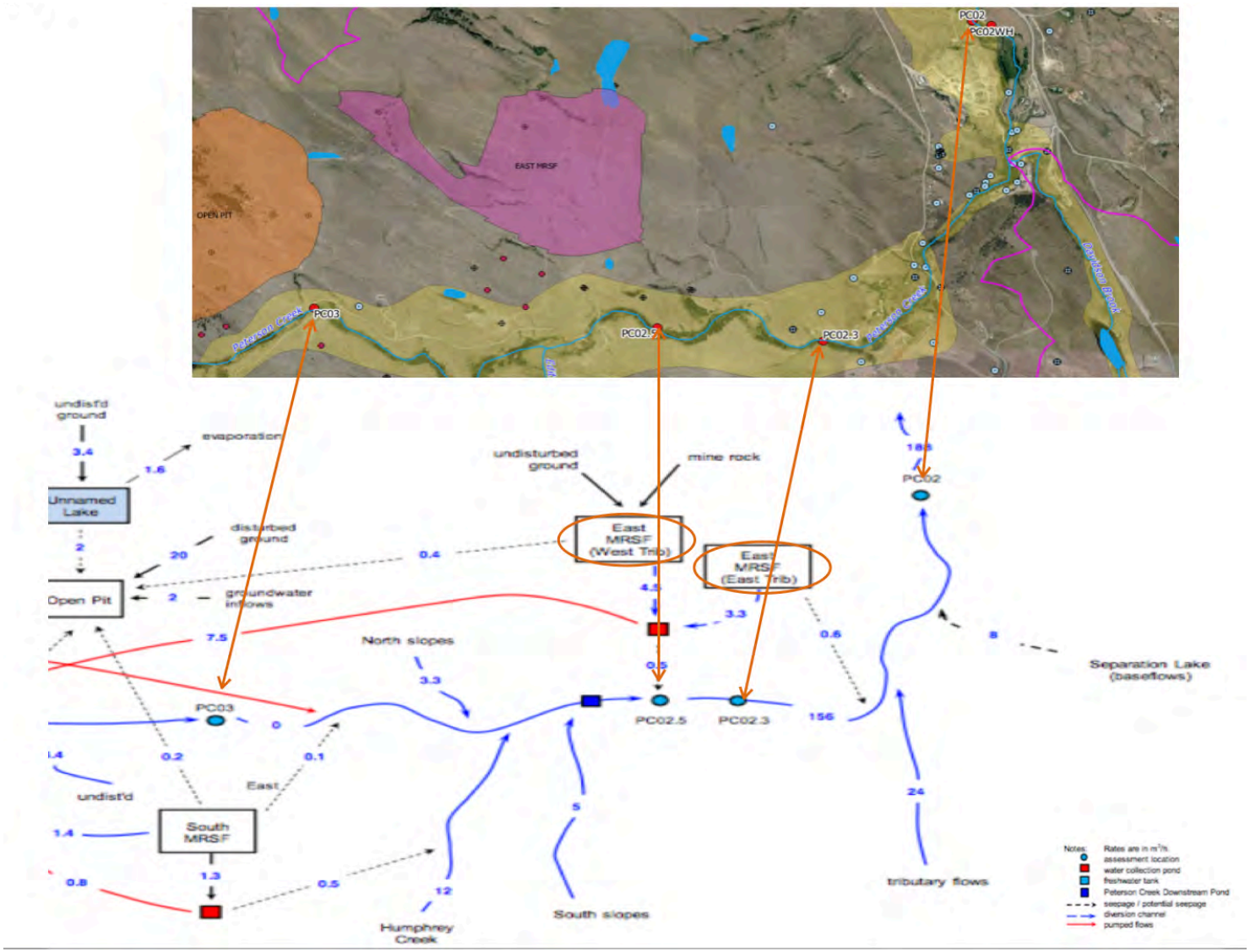

Figure 9: Water balance flowchart during operation (Modified from KAM)

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7 HEALTH HAZARDS DUE TO PROPOSED MINING ACTIVITIES

GW Solutions has identified that aquifers linked to Peterson Creek and Davidson Creek are used as sources of drinking water by residents.

Peterson Creek and Davidson Creek aquifers are located downstream of mining activities proposed by KAM. Potential contaminants emanating from the components of the project may travel both with surface water and the groundwater.

KAM has completed studies to identify potential sources of contamination, the probable pathways, and has projected anticipated concentrations of toxic elements reaching the drinking water source nearest to its proposed facilities. However, should KAM's assumptions and modeled results misrepresent how the water quality will be affected by the proposed operations (as presented above), there is a risk of negative impact to the drinking water quality and a resulting health hazard.

In particular, the quality of the groundwater in the Peterson Creek Aquifer will likely deteriorate due to seepage from the EMRSF pond and PCDP, and the cumulative effect of the other components of the projects (i.e., waste-rock storage facilities, tailings storage facility, open pit, etc.).

Therefore, the proposed mining activities will likely create health hazards by modifying the quality of the drinking water.

8 CONCLUSIONS

Considering British Columbia's Water Sustainability Act, this risk of contamination of the Peterson Creek Aquifer is not consistent with protecting stream health and aquatic environments, nor with conservation and efficiency of water. The risk of creating a contaminant groundwater plume resulting from the proposed mining activities will not "ensure that water stays healthy and secure for future generations of British Columbians".

Also, the Groundwater Protection Regulation calls for:

- ensuring activities related to well water and groundwater are undertaken in an environmentally safe manner;
- securing a safe and healthy groundwater resource and reducing risk of degradation of water quality and depletion of aquifers;
- increased public confidence in groundwater resources;
- improved integrity and safety of wells and community drinking water supplies (consumer protection);
- a system of ground water protection that is efficient and accountable, and
- enhanced protection of aquatic ecosystems dependent on ground water.

This intentional release of potential contaminants into both the Peterson Creek and the Davidson Creek Aquifers fails to meet the objectives of British Columbia legislation.

9 STUDY LIMITATIONS

This document was prepared for the exclusive use of the Kamloops Area Preservation Association. The inferences concerning the data, site and receiving environment conditions contained in this document are based on information obtained during investigations conducted at the site by GW Solutions and others, and are based solely on the condition of the site at the time of the site studies. Soil, surface water and groundwater conditions may vary with location, depth, time, sampling methodology, analytical techniques and other factors.

In evaluating the subject study area and water quality data, GW Solutions has relied in good faith on information provided. The factual data, interpretations and recommendations pertain to a specific project as described in this document, based on the information obtained during the assessment by GW Solutions on the dates cited in the document, and are not applicable to any other project or site location. GW Solutions accepts no responsibility for any deficiency or inaccuracy contained in this document as a result of reliance on the aforementioned information.

The findings and conclusions documented in this document have been prepared for the specific application to this project, and have been developed in a manner consistent with that level of care normally exercised by hydrogeologists currently practicing under similar conditions in the jurisdiction.

GW Solutions makes no other warranty, expressed or implied and assumes no liability with respect to the use of the information contained in this document at the subject site, or any other site, for other than its intended purpose. Any use which a third party makes of this document, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. GW Solutions accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or action based on this document. All third parties relying on this document do so at their own risk. Electronic media is susceptible to unauthorized modification, deterioration and incompatibility and therefore no party can rely upon the electronic media versions of GW Solutions' document or other work product. GW Solutions is not responsible for any unauthorized use or modifications of this document.

GW Solutions makes no other representation whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this document, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein.

If new information is discovered during future work, including excavations, sampling, soil boring, predictive geochemistry or other investigations, GW Solutions should be requested to re-evaluate the conclusions of this document and to provide amendments, as required, prior to any reliance upon the information presented herein. The validity of this document is

affected by any change of site conditions, purpose, development plans or significant delay from the date of this document in initiating or completing the project.

The produced graphs, images, and maps, have been generated to visualize results and assist in presenting information in a spatial and temporal context. The conclusions and recommendations presented in this document are based on the review of information available at the time the work was completed, and within the time and budget limitations of the scope of work.

The Kamloops Area Preservation Association may rely on the information contained in this memorandum subject to the above limitations.

10 CLOSURE

Conclusions and recommendations presented herein are based on available information at the time of the study. The work has been carried out in accordance with generally accepted engineering practice. No other warranty is made, either expressed or implied. Engineering judgement has been applied in producing this letter-report.

This letter report was prepared by personnel with professional experience in the fields covered. Reference should be made to the General Conditions and Limitations attached in Appendix 1.

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

Yours truly,

GW Solutions Inc.

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

11 REFERENCES

1. Ajax Project- Environmental Assessment Certificate- Application/Environmental Impact Statement for a Comprehensive Study, September 2015, KGHM Ajax Mining Inc.

2. Ajax project Review - Review of Predicted Water Contamination, March 2016, Kevin A. Morin, Ph.D., P.Geo.

3. BC Wells Database 2017

4. BC Mapped Aquifers

5. BC Digital Bedrock Geology Map, Cui et al 2015, BC Geological Survey, Open file 2015-2

6. Terrain Mapping (TER) Polygon, BC Geological Survey, Open file 1992-13

APPENDIX 1

GW SOLUTIONS INC. GENERAL CONDITIONS AND LIMITATIONS

This report incorporates and is subject to these "General Conditions and Limitations".

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.