

From:
To: [Environment Assessment Web Account](#)
Cc: [Minister_Env](#); [Premier](#); billhornemla@gmail.com; stopthefalliverquarry@gmail.com; tanya.ferrall@novascotia.ca
Subject: Goff's Quarry Expansion Project
Date: Thursday, September 06, 2018 12:10:25 PM
Attachments: [2016-02-09 - Waterways and wet Area Mapping - Minister DOE.pdf](#)
[2016-03-11 - Water Courses - KM DOE.pdf](#)
[2016-03-24 - Water Table - KM DOE.pdf](#)
[2016-04-20 - Wet Area Mapping UNB \(Attachment\) - KM DOE.pdf](#)
[2016-05-05 - Open letter to Minister Miller re wetland destruction response - MinMiller DOE - STFROG.pdf](#)
Importance: High

I am writing today to express my concerns about the proposed expansion of a quarry that the community has been against for almost 7 years now.

Our community has written many letters and provided a lot of reasons that this quarry should have never been approved in the first place, let alone expand.

Letters submitted to the Department of Environment through public consultation have gone unanswered which we, as the neighboring residences deserve answers.

We, in fact, should be regarded as stakeholders since it is us that are directly impacted and have been already with the quarry not even in normal operations yet. **This should be very concerning to your department and (NSE Investigator) has been notified of the multiple well and water problems in the community that have occurred since blasting began in November 2017.**

We warned NSE of the potential well issues with the 4 hectare quarry approval and were told by the proponent that nothing would happen like we are now experiencing - when does our government look out for us?

Our community has been struggling to protect ourselves from this proponent for years because of NSE's blatant favoring of this plan regardless of potential and (now real) impacts, and now many are spending thousands of dollars just to get back the clean drinking water that they had for over a decade. Last year, many spent hundreds prior to blasting to get baseline well tests because we expected well issues. Again I ask - when do we matter? Why is this quarry and the expansion matter more than us and environment where we all decided to live and raise our families?

We all chose this community for a reason and many would have bought elsewhere if they knew the MPS would be totally ignored and a quarry allowed in this very sensitive site.

We have had a multitude of concerns and I have outlined some of them below.

The effects on the nearby wells (already experiencing major problems);

Blasting within the close proximity to the Natural Gas Pipeline;

Blasting within the close proximity to Highway 102 (a nearby quarry had incidents that are very concerning);

Blasting under the water table and the bedrock that flows through the adjacent community;

The effect on the watershed and wetlands;
The effects on the Waverley Game Sanctuary;
Blasting in close proximity to the Halifax International Airport;
And the list goes on... and on...

Due to the controversy surrounding this quarry and the seriousness of the impacts, I request (and on behalf of our community) to have a public hearing on this expansion. I am a part of the Stop the Fall River Quarry Group and am also a member of the Community Liaison Committee so I have been quite involved on all aspects from day one. I have been tasked to relay concerns and hold the proponent accountable as best to my ability and I will continue to do so.

I am attaching a few of the letters that were sent into NSE which have never been discussed or answered.

To hold a public consultation where members of the public can voice their concerns seems to be just something that the company can check off as 'completed' without ever addressing anything.

This is very concerning to us as residents of Nova Scotia.

Public consultation is a waste of time if the concerns are ignored and suggests quite loudly that the approval of the proponents plan is what matters, regardless of what is at stake for the people and the environment.

I appreciate your time and would be happy to provide the rest of the letters that were submitted and ignored by NSE.

As I only have limited space I have chosen some letters that I feel are of particular importance to be addressed.

Sincerely,

Concerned Resident, Member of Stop the Fall River Quarry Group, Member of the CLC.



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Minister of Environment, Nova Scotia
PO Box 442
Halifax NS B3J 2P8

To the Honourable Margaret Miller,

Please use the following information in decision-making for the future of any application for a quarry in Goffs, near Fall River, Nova Scotia, and more specifically the application before you by Scotian Materials.



The above diagram was produced by layering the drawing of the quarry footprint (drawing obtained from www.scotianmaterials.ca), and a screen shot of the same area using the Provincial Landscape Viewer available through links from the Nova Scotia Environment website.¹ To produce the screen shot, I enabled the WAM (Wet Areas Mapping) Predicted Water Flow and the WAM Wetness Index layers, which are “facilitative decision-support tools.”² These layers in the landscape viewer were developed by an award-winning research center at University of New Brunswick (UNB) and are “a combination of technologies using Geographic Information Systems (GIS) processes and digital elevation models.”³ The project was paid for in part by Nova Scotia Environment. The WAM project was completed from 2005-2007 and it was updated in October, 2012. As per Nova Scotia Environment, these

¹<https://nsgj.novascotia.ca/plv/>

² <http://watershed.for.unb.ca/>

³ <http://watershed.for.unb.ca/>

tools “can also be used to help identify and predict where wetlands are likely to be located during the project planning phase.”⁴ According to UNB, these tools have shown to be extremely reliable.⁵

I aligned the two drawings using the location markers: 1) Highway 102; 2) Perrin Drive; 3) other features visible in the landscape. I then used the transparency tools and history brush tools in Adobe Photoshop to allow the wet areas and predicted water flow to be visible at the same time as the proposed quarry footprint. (The original images can be found in Appendix A.)

The diagram shows two areas in the footprint itself of predicted water flow (blue lines) and two areas that predict wetlands within the quarry footprint (pink colours; the darker pink represents “imperfect to poor” drainage, the light pink represents “moderately-well to imperfect). The size of the predicted wetlands in relation to the size of the footprint suggests that wetland areas in the footprint could be from 1/4 of the footprint to the full footprint. Even at 1/4 of the footprint, the disturbed portion of the wetlands themselves would be 1ha in size if the quarry footprint is 3.9ha in size. According to the Nova Scotia Wetland Conservation Policy, “If a wetland is part of a wetland complex (connected by obvious water flows to nearby wetlands), the overall size of the complex will be used to determine if the policy applies.” These predicted wetlands are connected by watercourses to hundreds of hectares of wetlands, watercourses and lakes, and they flow from the direction of above the proposed quarry footprint to below it, thus being necessarily disturbed.

Also note from the above drawing that wetlands and watercourses are not only in the planned footprint but are also indicated in the area of the planned road and planned crushing facility. There is a bog surrounding Preepers Pond that appears to be where the crushing machinery will be. Also, refer to Golder Associates’ letter dated July 21, 2015, from the 2015 application of Scotian Materials for a less-than-4ha quarry permit, which indicated knowledge of wetlands in these general areas and acknowledgement of the wetlands forming complexes. Also note that although Golder Associates stated there was a field assessment conducted, it does not state who conducted it. Golder Associates are not on the certified wetland delineator list provided by Nova Scotia Environment,⁶ nor do they list such certification on their website, and they are not an objective third party (see my previous letter sent January 27th 2015 showing they are more concerned with their clients cashflow, in some cases, than protecting the environment). Furthermore, it is well-known that flooding⁷ has occurred in Nova Scotia since the time of the field assessment and may have changed the landscape, and in particular may have created new wetlands. The provincial mapping of wetlands was completed 12 years ago in 2004,⁸ according to the website, and thus should not be considered accurate by employees of Nova Scotia Environment or proponents and their associates (do not confuse the older wetland mapping with the WAM tools described above, which have been shown to be extremely accurate). By Golder Associates’ admission in its July 21, 2015 letter to Nova Scotia Environment, an indicator plant for wetlands in Nova Scotia now grows throughout the property. This is suggestive that much of the property is wetlands.⁹

Thus it is a very reasonable conclusion that wetlands and watercourses exist within the proposed footprint and immediately adjacent to it.

⁴https://www.novascotia.ca/nse/wetland/docs/Nova_Scotia_Wetland_Conservation_Policy.pdf

⁵<http://www.unb.ca/fredericton/forestry/research/wetareamapping.html>

⁶<http://novascotia.ca/nse/wetland/docs/wetland.professional.resources.pdf>

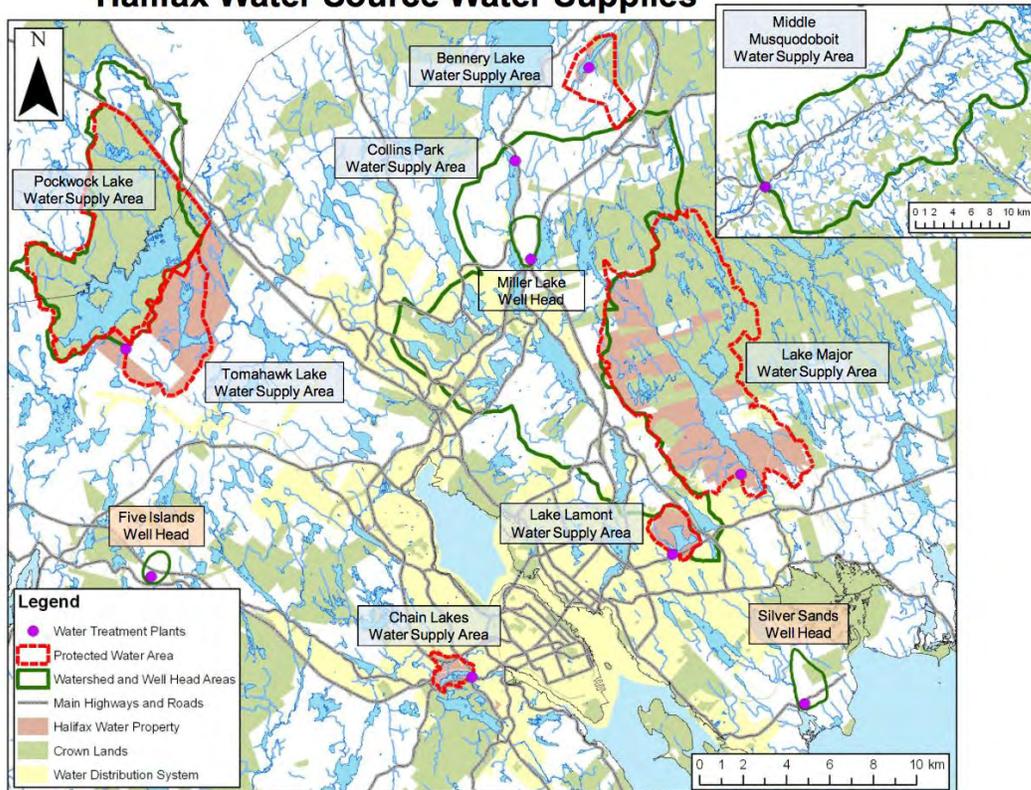
⁷ <http://www.cbc.ca/news/canada/nova-scotia/rainfall-amounts-across-nova-scotia-pass-130-mm-1.2869834>

⁸ <https://www.novascotia.ca/nse/wetland/>

⁹ “Trembling aspen” was noted by Golder Associates as growing throughout the property and is contained on Nova Scotia Environment’s Indicator Plant List for wetland identification purposes. The list can be obtained from <https://www.novascotia.ca/nse/wetland/indicator.plant.list.asp>.

As evidenced from the diagram below (retrieved from <http://www.halifax.ca/hrwc/documents/HWSourceWaterMapJan11.pdf>), and again by Golder Associates' admission in the July 21, 2015 letter, the proposed quarry location is in a designated Halifax watershed area. On the map below, the proposed quarry site is between the red outlined areas designating the Bennery Lake Water Supply Area and the Lake Major Water Supply area, within the green boundary that indicates watershed and well head areas, near the gray road (Highway 102).

Halifax Water Source Water Supplies



* This map is for informational purposes only and should not be used for legal, engineering, or surveying purposes.

Using the Provincial Landscape Viewer again, I traced the predicted watercourses that run through and adjacent to the proposed footprint. Note from the July 21, 2015 letter Golder Associates' admission that there are wetlands located downgrade from the proposed footprint. These wetlands flow into Holland Brook, then Soldier Lake. Water then flows (heavily at times, as I and anyone living in Miller Lake West can attest to) from Soldier Lake down through Tillman Brook to Miller Lake, where a well head exists. Miller Lake provides water to approximately 45 customers.¹⁰ In addition, watercourses eventually connect from Soldier Lake to wetlands, lakes, and watercourses in the Lake Major Protected Watershed Area (including Lake Major itself), the Waverley Game Sanctuary and the Waverley Salmon River Long Lake Wilderness Area. The Sanctuary is 5228.7 hectares and includes 360 hectares of wetlands.¹¹ Lake Major supplies water to the area formerly known as the city of Dartmouth. Dalhousie University researchers noted in 2014 that this watershed is among the highest in terms of being threatened.¹² Because the water flow appears to begin at wet areas in the proposed footprint, the predicted wetlands may be headwater wetlands which are "important for maintaining base stream flows and moderating peak flows and flooding."¹³

¹⁰ <https://www.halifax.ca/hrwc/GroundwaterPublicWaterSuppliesWHPAs.php>

¹¹ <http://novascotia.ca/natr/wildlife/habitats/sanctuaries/pdfs/waverley.pdf>

¹² http://earthsciences.dal.ca/www/PDFs/Final_Atlas_Mar_20_2014.pdf

¹³ <https://www.novascotia.ca/nse/wetland/docs/NovaWET.3.0.pdf>

The Federal Policy on Wetland Conservation¹⁴ defines "Wetlands of Significance to Canadians" as:

- (a) "exemplary" or "characteristic" of the wetlands dominant or rare within each of Canada's 20 wetland regions and the full range of wetland forms and types;
- (b) "strategic" or "essential" to meeting a goal or objective specific to a wetland function (e.g. a marsh essential to the maintenance of a migratory bird population). Wetlands are considered strategically significant for a variety of factors including... Water Quality – the wetland enhances water quality directly, in a related groundwater system, in a watershed in general, or in a domestic or other water source.

Furthermore, this policy states:

The Federal Government will participate in and promote the establishment of a systematic and coordinated national network of secured wetlands to be achieved in cooperation with provincial and territorial governments and other stakeholders. Such an approach will lead to a comprehensive network of secured sites or complexes of exemplary and strategically important wetlands of significance to Canadians, together representing the full range of wetland functions and types.

Additionally, the Halifax Regional Water Commission Act¹⁵ states that:

25 (1) No person shall place or permit to escape upon any land adjacent to Pockwock, Tomahawk, Chain, Long, Major, LaMont and Topsail Lakes, and all lakes, ponds or other bodies of water tributary thereto, or any lake or tributary of such lake at any time forming part of the water system of the Regional Municipality, or upon any land or water forming part of the watershed of any one of such lakes, any matter or thing of an offensive or deleterious nature or calculated to impair the quality of the water for use for domestic purposes.

Finally, from the Environment Act, Nova Scotia:

52 (2) When deciding, pursuant to subsection (1), whether a proposed activity should proceed, the Minister shall take into consideration such matters as whether the proposed activity contravenes a policy of the Government or the Department, whether the location of the proposed activity is unacceptable or whether adverse effects from the proposed activity are unacceptable.

56(4) In environmentally sensitive areas, the terms and conditions of an approval may be more stringent, but may not be less stringent, than applicable terms and conditions provided in the regulations or standards adopted or incorporated by the Minister.

In conclusion, issuing a permit to a quarry in this proposed footprint without a proper Environmental Assessment and wetlands delineation by a certified, objective third party could allow grave environmental degradation of what has been called a resource more valuable than oil: water.¹⁶

Please consider these facts in your assessment of the application before you.

Sincerely,

¹⁴ <http://nawcc.wetlandnetwork.ca/Federal%20Policy%20on%20Wetland%20Conservation.pdf>

¹⁵ http://nslegislature.ca/legc/bills/60th_2nd/1st_read/b083.htm

¹⁶ <http://www.theglobeandmail.com/news/politics/in-globe-debate-leaders-ignore-canadas-most-precious-resource-water/article26442039/>

----- Forwarded Message -----

From: _____@yahoo.com>
To: Katherine M. MacLeod <katherine.m.macleod2@novascotia.ca>
Sent: Friday, March 11, 2016 4:46 PM
Subject: Scorian Materials application & photos of water flow

Hello Ms. MacLeod,

I did not receive acknowledgement of the last letter I sent (both by email and post), I do hope you've received it. The topic was acid rock drainage.

Regarding application 2016-095664, I recently visited the public road to the south of the proposed quarry footprint (Perrin Dr). It was approximately 5 days after the last rainfall. Please have a look at the photos below. The more obvious watercourse is one which the proponent has mapped and I faced toward the site for this photo. The other two photos show that water drains in several other areas from the proposed site to nearby Holland Brook. I am facing away from the site for these photos. This provides preliminary support for the WAM diagram I provided in an earlier letter and these areas of drainage are not indicated in the proponent's diagrams. I hope to provide you with more information on this issue but in the interim thought I would pass this along.

Sincerely,







Katherine MacLeod
Nova Scotia Department of Environment
Western Region
136 Exhibition Street
Kentville, NS B4N 4E5

Dear Ms. Katherine MacLeod,

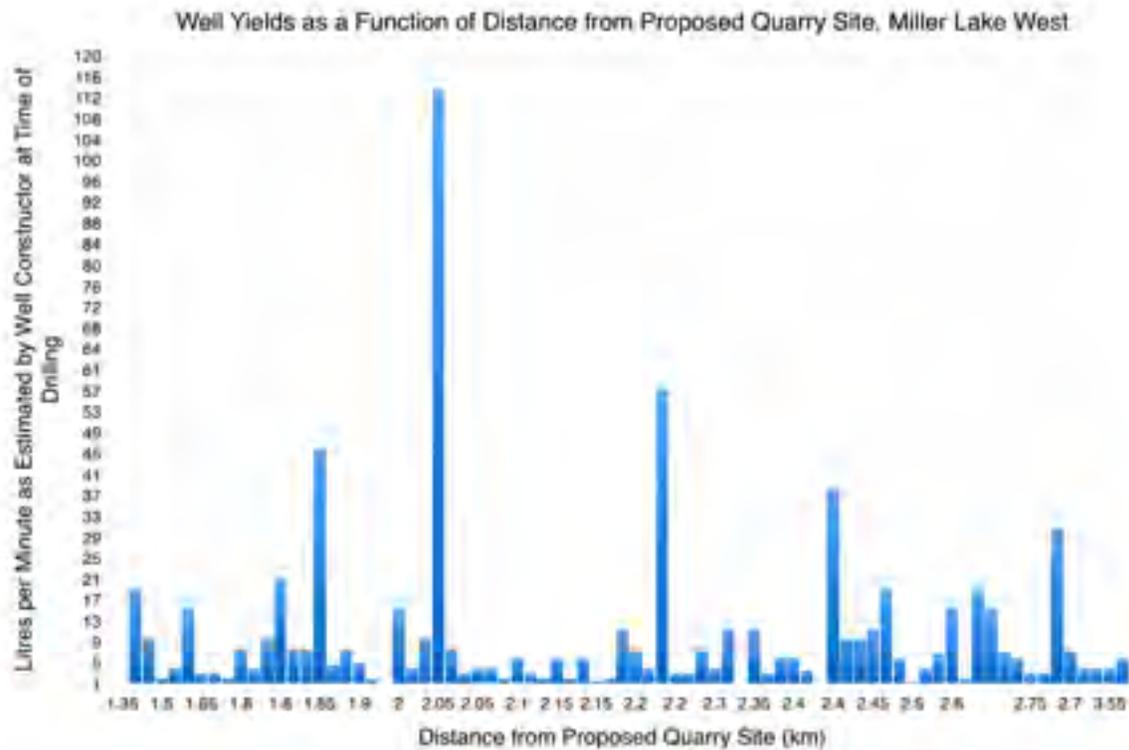
We are writing today to address what we see as important issues surrounding quarrying near residential neighbourhoods with well water supply and within a watershed that provides municipal water. We ask that you take these items into consideration when deciding the fate of the “Goffs Quarry” or “Fall River Quarry” proposed by Scotian Materials. We have included links for the information we researched so that you may research these same crucial factors yourself. Personally speaking, at my own home we have had to drill three wells on our property. The first two, 125 feet and 225 feet deep respectively, had inadequate water supply and were full of aluminum and manganese. These wells are now concreted up as per written advice from Dept. of Environment. Our third well is 400 feet deep and initially produced approximately 1 cup per minute. As a result we had to install a cistern in our basement. After spending yet more money on hydro-blasting, it now produces 4 gallons per minute. Needless to say, we are totally opposed to anything that may put this well, or others, at risk.

Local Area Sources: Low Water Quantity

In June of 2011, the same year that the proposed quarry was first discussed, a Fall River Community Planning Group Meeting was held to discuss proposals for multi-unit dwellings to provide adequate housing for seniors. However, a major stumbling block was the issue of water and septic services. The Committee noted that they couldn't make commitments to allow increased density in Fall River because a recent watershed study “tells us that the **groundwater table of the area is under a high degree of stress** and there is a need of extension of water services to various areas in the Fall River area and Windsor Junction of Wellington” (Fall River Community Planning Group Meeting, June 2011, retrieved from <https://www.halifax.ca/VisionHRM/FallRiver/documents/CPGMeeting06June2011.pdf>).

The Nova Scotia Department of Natural Resources has also noted that Fall River's water sources are stressed: “In some areas, **especially Fall River**, the protective till cover is thin and **these areas should be highlighted for aquifer protection**” (DNR, 2011, retrieved from http://novascotia.ca/natr/meb/data/pubs/cs/cs_me_2011-002.pdf). Natural Resources also noted that, “Most of the province is underlain by bedrock aquifers where groundwater movement is controlled by fracture flow. These aquifers are **sensitive to small changes in water level** because they **can result in the dewatering of critical groundwater-producing fractures. Local scale sustainability issues appear to be emerging** in areas of medium to high density suburban unserviced growth that rely on these types of aquifers for water supply (e.g. **Halifax suburbs**)” (emphasis added, retrieved from http://novascotia.ca/natr/meb/data/mg/ofi/pdf/ofi_2010-002_dp.pdf).

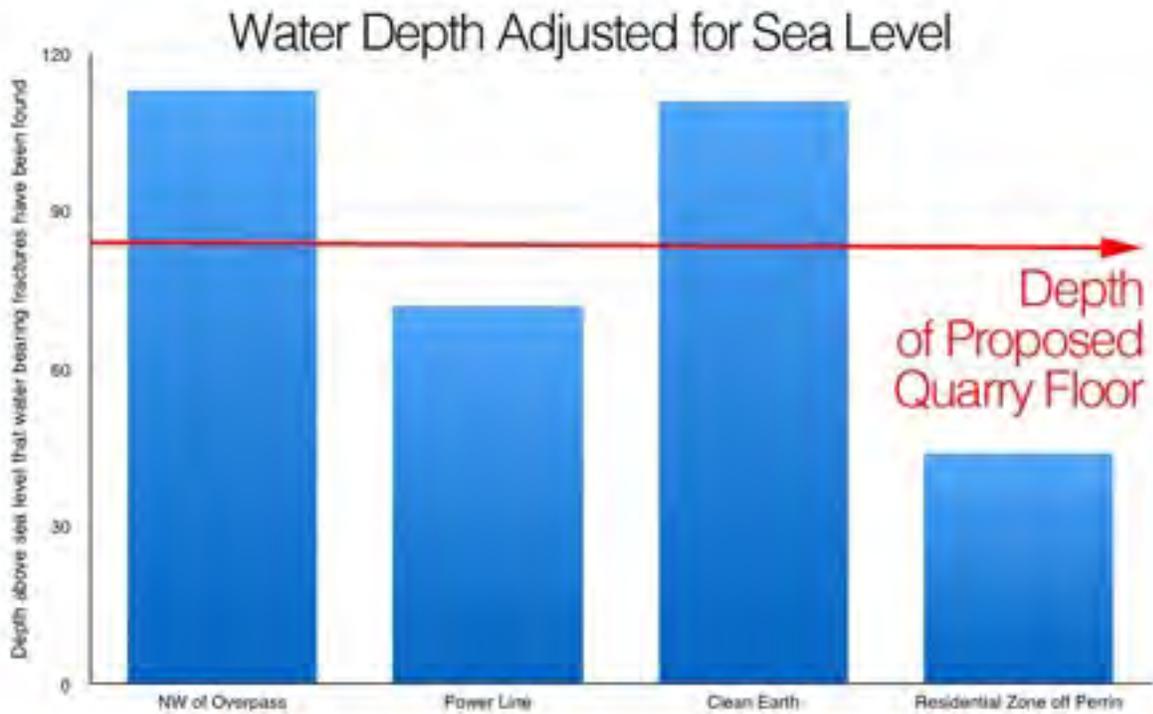
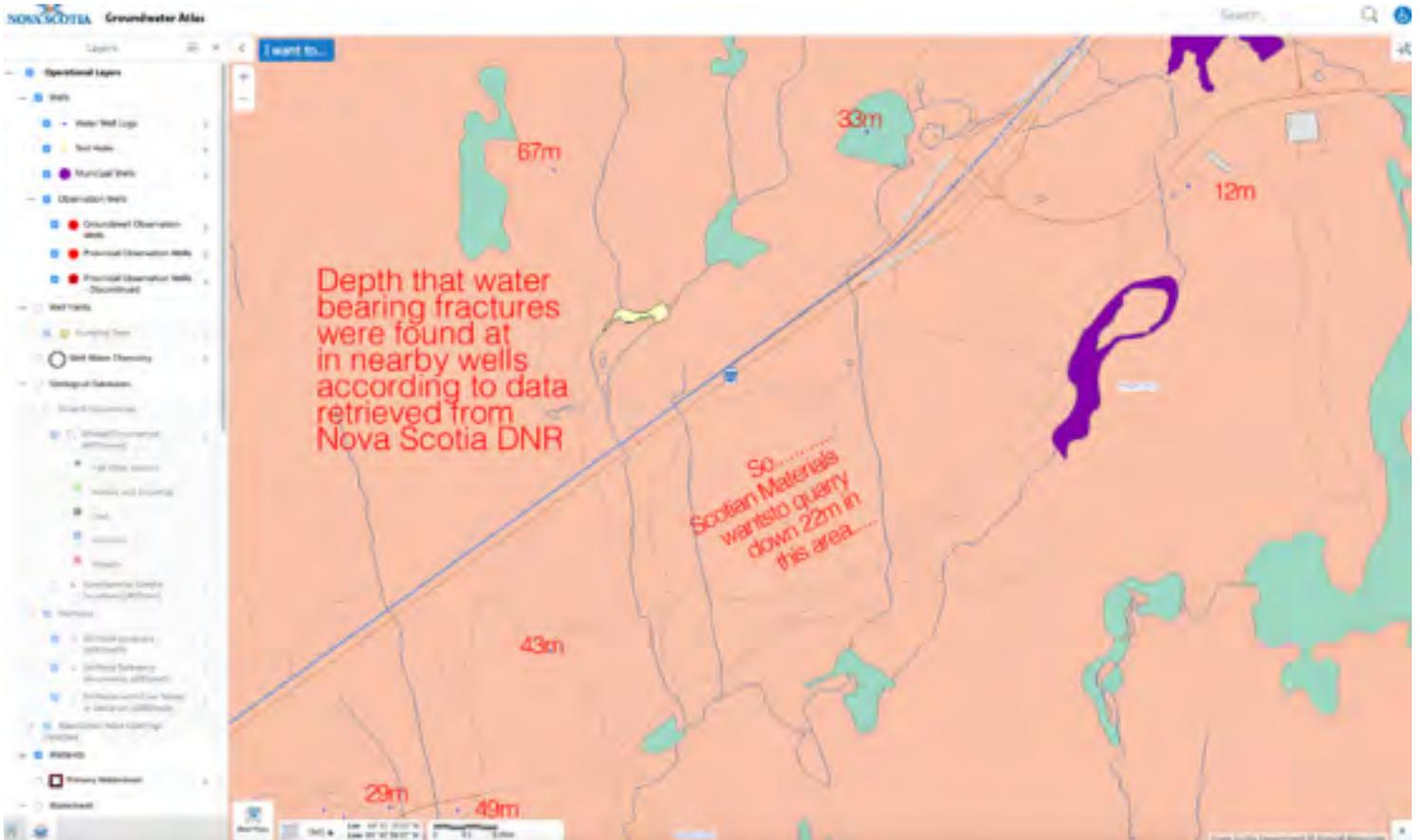
An examination of the well database for the area (which is incomplete and in some cases incorrect) gave the following results with respect to well yields:



It is particularly noticeable that **the vast majority of wells** in the area closest to the proposed quarry (Perrin, Preakness, Mornington, Oakbank, Delray, Sanctuary, also those referred to by Scotian Materials in the application) do not yield the recommended amount of water flow. The recommended yield is **18-20 litres per minute** according to Nova Scotia Environment (<http://novascotia.ca/nse/water/docs/WellWaterBooklet6.pdf>), and **not** 9 litres per minute as Scotian Materials stated in the application.

With well depths varying between 200 and 500 feet it's difficult to say where the deep aquifer is located or if there is a shallow aquifer based on these logs alone. However, using the information from the Nova Scotia Groundwater Atlas (<https://fletcher.novascotia.ca/DNRViewer/?viewer=Groundwater>), water well logs retrieved from those closest to the site paint a different picture (**see figure on next page**). The data from the closest wells on all sides of the proposed footprint show that there are **water bearing fractures at depths of 12 to 67m**. Given that the application contains no information about any wells on the proponent's property or other measurements about the water table, how would Nova Scotia Environment know if they are quarrying below the water table when the quarry floor, proposed at 22m deep, is so close to the depths at which water bearing fractures were found at adjacent properties?

We decided to examine the distance to sea level of these properties. From this very basic modelling, using information from the DNR maps, **it appears to me that it is very likely indeed that Scotian Materials will in fact be quarrying below the water table or into a shallow aquifer (see figure on next page)**. We would suggest that at minimum Nova Scotia Environment request that Scotian Materials provides the information they are relying on to know that they are quarrying above the water table (although we would prefer of course to see government-based scientific research be the determiner).



Some of our neighbours have let us know that the well logs are not entirely accurate nor up to date. Five neighbours in Fall River have reported requiring hydro-fracking which increased their yield only marginally in some cases. At least two had to drill deeper. Four have run dry. One put in a cistern. One reported a pH of 4.2. One reported silt in valves and a punctured pressure tank bladder when there was blasting nearby for residential homes. Several reported not being in the database or the database being incorrect. Many report having to keep an eye on water usage. We would suggest from the information provided above that the application for “Goffs Quarry” is far from complete when it comes to data about water supply, aquifers and the water table.

Local Area Sources: Low Water Quality

Although Scotian Materials in the application states that the water of the nearest residents meets the guidelines for drinking water, again they have not presented fulsome information. The Nova Scotia Environment Groundwater Observation Well Network reports (<http://www.novascotia.ca/nse/groundwater/groundwaternetwork.asp>) show that since the beginning of monitoring in Fall River, the water has had a **pH of 6** (acidic, likely due to damage from past acid-rock drainage), and the water has been higher than desirable in **iron and manganese**. The most recent report shows it to be cloudy (high turbidity or suspended sediments). The watershed research conducted in 1979 shows that in the Collins Park watershed (the smaller watershed area within which the proposed site is contained), 63% of the wells were **contaminated with arsenic** in 1976, and we believe the threshold has changed since that time, so this is likely underestimated. This research noted that the Goldenville formation (the rock that Scotian Materials proposes to blast) is made up of approximately **10% slate** (which is acid-generating and will lower the pH) and is “considered as **the host rock for arsenic** in the Waverley area and other parts of the province” (https://novascotia.ca/nse/groundwater/docs/GroundwaterResourceReport_Hants2.pdf). This is the same report Scotian Materials cites when they discuss the water being of acceptable standards.

With the fragility (both in quantity and quality) of the water source for the neighbouring community in mind, we will now turn to potential impacts that quarries can have on well water resources.

Some Far-reaching Effects of Quarrying on Water

There have been disastrous effects of quarrying on well water. We have only skimmed the surface in researching the well water problems that have occurred, for we wanted to focus on Scotian Materials’ argument that the nearest residential wells are too far to be impacted by blasting. So we researched far-reaching effects of quarrying on wells. They exist, and they’re not nice. For instance, in Wisconsin in 1995, a hole drilled into the quarry floor unexpectedly hit a water-bearing zone of rock which was under artesian pressure and the water flowed between different fractures even after it was plugged (<http://info.ngwa.org/GWOL/pdf/990264876.PDF>). At least 24 wells were impacted with a **40’ drop in water level**, and wells **more than 4800 feet from the quarry** were affected. Although sealing the hole corrected the problem, the writers of the research note that this was very lucky, and it is possible that sealing the fracture zone could have “permanently damaged the aquifer” (<http://info.ngwa.org/GWOL/pdf/990264876.PDF> p. 113). Furthermore, if the fracture zone had been ruptured by blasting instead of punctured, it may not have been possible to seal and additional wells could have been affected. The researchers also note that monitoring the aquifer was effective at detecting gradual changes in aquifer conditions but **would not prevent a rapid decline**.

An aquifer in the Prairie du Chien area around a quarry was profoundly affected by **dewatering**; the adjacent **wetlands were drained and the water table was altered**. In another area the lower aquifer now **discharges into the upper aquifer** instead of being recharged by it. (Sometimes the best water is found deeper or shallower so this is of concern when water mixes.) Ground water pumping in another location lowered the ground waters and **allowed water to flow from a river into the upper aquifer**

rather than the opposite direction. In yet another area approximately **90% of the flow in the basin is now routed through the quarry itself** (all from <http://files.dnr.state.mn.us/publications/waters/hdraulic-impacts-of-quarries.pdf>).

Other possibilities are: 1) the **opening up of fractures**, which causes ground water levels to lower because storage or porosity is increased; 2) fractures either **clogged by fines or recompressed**; 3) well **sloughing or collapse**; 4) residual **nitrate**s introduced into the ground water system (all from <http://www.osmre.gov/resources/blasting/docs/WaterWells/HawkinsBlastingWells2000.pdf>).

In Melrose quarry in Ontario, a **pop-up** (buckling of rock strata caused by stress) occurred in 1994. The risk of future pop-ups caused considerable concern from residents and decision-makers due to low-yield wells and fear that the deep aquifer water, which was not potable, would reach the shallow aquifer (<http://www.canlii.org/en/on/onert/doc/2015/2015canlii59648/2015canlii59648.html?searchUrlHash=AAAAAQAVZG9tZXN0aWMgd2VsbHMgcXVhcnJ5AAAAAAE&resultIndex=1>).

Although the proponent argues the proposed site is over 1km away from residential wells and therefore blasting will not impact our wells or water, this argument is very obviously faulty. The reports briefly summarized above show that quarrying at the proposed site can impact the deep aquifer that our wells depend on in the following ways, by:

- clogging it with gravel, rocks sediment and impeding the flow or recharge;
- introducing silt, metals, arsenic or acid from the rock above into the deep aquifer either through existing fractures (pathways) with the shallower aquifer or by constructing new pathways;
- causing pop-ups or buckling of rock below the deep aquifer which can block off water supply or water recharge;
- puncturing and releasing water from the aquifer;
- reversing the natural cycling pathways of water between wetlands, brooks, lakes, which causes contamination of the water as it now cycles through the open quarry;
- opening up fractures near the quarry which causes the water to remain stored and not travel to the deeper aquifers near the residences;
- introducing nitrates from blasting chemicals into the aquifers;
- allowing the groundwater, with its high concentration of iron and low pH, to enter the aquifer from which the wells retrieve water;
- causing well sloughing and collapse.

What this means for the 2016 Application for Goffs Quarry

A hydrogeologist providing evidence in Citizens Against Melrose Quarry v. Ontario (Environment and Climate Change), 2015, stated that “applications for new quarries **rely on estimates and modeling data... mathematical models are generally used for new quarries to predict their zone of influence**” (<http://www.canlii.org/en/on/onert/doc/2015/2015canlii59648/2015canlii59648.html?searchUrlHash=AAAAAQAVZG9tZXN0aWMgd2VsbHMgcXVhcnJ5AAAAAAE&resultIndex=1>). Halifax has **guidelines for assessment of groundwater** for developers applying for subdivision approval (<http://www.halifax.ca/regionalplanning/documents/050837-FinalGuidelinesPublishedOct27.06.pdf>). Although the proponent appears to have circumvented Halifax approval in this case, Nova Scotia Environment could at minimum require similar research in order to identify and minimize the impact of the quarry on nearby residential wells.

We have seen it noted that water accumulation on the quarry floor makes it unsafe to undertake quarry operations (e.g., <http://www.canlii.org/en/on/onert/doc/2015/2015canlii59648/2015canlii59648.html?searchUrlHash=AAAAAQAVZG9tZXN0aWMgd2VsbHMgcXVhcnJ5AAAAAAE&resultIndex=1>). Considering that the proposed quarry footprint is downgrade from multiple wetland areas, it is located at the

headwater areas for Soldier Lake, and Halifax receives between 1000 to 2000mm of rain annually (<http://halifax.weatherstats.ca/metrics/precipitation.html>), we question how the quarry will operate without dewatering or pumping the water out **on a constant basis**. In addition it seems important to consider **where** the water will “re-enter the natural environment” as Scotian Materials put it in their application (p.7).

If the water is not pumped out constantly, several issues are related to allowing **open water** to sit on the floor of the quarry. First, it makes any kind of **spill much more difficult to contain**. Second, research has found that “The water surfacing in the quarry is significantly affected by the surface air temperature, changing the **thermal regime**” (<http://files.dnr.state.mn.us/publications/waters/hdraulic-impacts-of-quarries.pdf>). Warmer water can have effects on cold-water fish, bacteria, and algae of nearby waters fed by the location of the reintroduction. Third, water is not what you want near **explosives**, as we will explain.

Nitrates are Produced by Blasting

One of the most troubling parts of this application, with respect to clean water, is the **wastewater** that Scotian Materials proposes to introduce into the “natural environment” (p.7, 2016 application). Mixed into the water that Scotian Materials will allow to “re-enter the natural environment” (p.7, 2016 application) will be a sludge of sediments and nitrates. The blasting explosives Scotian Materials proposes to use (through Dyno Nobel) are **emulsions that include 20-30% nitrates by weight**. Because the nitrates are water soluble, they are protected by oils until the blast occurs. After the blasting they will be released and will mix with the water in the “settling pond.”

According to what the Canadian federal government says about how nitrates react in the environment, nitrates are unlikely to be reabsorbed at the proposed site of the quarry, which will be exposed rock. Instead they will be carried by wastewater and rainwater away from the site, toward Holland Brook. “The amount of rainwater, the depth of the water table, the presence of organic material and other physicochemical properties are important determinants of the fate of nitrate in soil (WHO, 2007). Most nitrate reduction in the soil occurs through plant uptake and utilization, whereas surplus nitrates readily leach into groundwater. The nitrate ion is negatively charged and does not adsorb to clay minerals or organic matter in soils unless they have a significant anion exchange capacity, which is uncommon in Canada. Generally, it is assumed that nitrate will not adsorb to soil particles and will have a high potential for mobility (Environment Canada, 2003; WHO, 2007)” (<http://healthycanadians.gc.ca/publications/healthy-living-vie-saine/water-nitrate-nitrite-eau/index-eng.php?page=3>). This is likely why Scotian Materials proposes to dump the wastewater into a “vegetated area” (likely a wetland area), however as described there will likely be far too much water and the nitrates will be carried away.

We thought it was important to look at the amount of nitrates Scotian Materials proposes to dump. Because the nitrates make up 20-30% of the explosives by weight, and the blast plan is now available, calculations are possible. Given the blasting plan in the 2016 application,

20,000 - 30,000 tonne blast - 75 kgs per delay x 121 holes

50,000 blast - 213 kgs per delay x 102 holes

1800 - 6500 kgs of nitrates per blast occurrence

So how much of these chemicals will “re-enter the natural environment?” Sources (such as <http://pdf.library.laurentian.ca/medb/conf/Sudbury95/GroundSurfaceWater/GSW16.PDF> and http://66.212.167.146/MelancthonMegaQuarry/pdfs/Assessment_ANFO_Environment-Jan-2010.pdf) state somewhere between 5 to 15% of the nitrates from explosives will end up in wastewater. The amount depends on the safe handling, amount of explosives undetonated (often 10-20% according to <http://pdf.library.laurentian.ca/medb/conf/Sudbury95/GroundSurfaceWater/GSW16.PDF>), and the humidity and water in the blast holes. As we’ve described earlier, the proposed site of the quarry is not expected to be dry. It’s at the headwaters for Soldier Lake, as described by Scotian Materials it is surrounded by wetlands and on site visits it was described as having ground seeps and standing water. And the proposal now includes two settling ponds within the footprint and spraying this water on the rock piles. So it seems likely that any explosives waste will ultimately end up in wastewater, and that a large portion may end up being wasted due to humidity levels. Based on the amount of nitrates per blast calculated above,

5% of 1800kg is 90kg of nitrates

15% of 6500kg is 975kg of nitrates

At least four times a year, Scotian Materials proposes to release directly into water ninety to a thousand kilograms of nitrates. Released directly into water the nitrates will dissolve, then be sprayed on piles of aggregate, and ultimately be released into ground where they will run off and into Holland Brook. (Holland Brook may already be affected from iron deposits near Exit 5A on the opposite side of Highway 102, for information see https://gesner.novascotia.ca/modb/queryView/singlereport.aspx?Occ_number=D13-014.) From there it will travel to Soldier Lake, then Miller Lake, and so on and so on, into the protected areas and the municipal water areas nearby. Miller Lake itself is a public drinking water supply and contains a well head. Nitrates must be less than **10mg/L in drinking water** (<http://novascotia.ca/nse/water/docs/WellWaterBooklet3.pdf>). The criteria for nitrates concentration for the protection of **aquatic life is 13-16mg/L**, and for ammonia it is 10-40 mg/L (http://66.212.167.146/MelancthonMegaQuarry/pdfs/Assessment_ANFO_Environment-Jan-2010.pdf). According to research on mine effluents, concentrations of nitrates in the waste water vary widely but are well above the threshold for aquatic life or drinking water, **from 25-300mg/L** (http://66.212.167.146/MelancthonMegaQuarry/pdfs/Assessment_ANFO_Environment-Jan-2010.pdf).

Because of increased use of nitrates in fertilizers and industrial uses, this is a topic that has generated much interest from Environment Canada, Health Canada, Nova Scotia Environment, and the Canadian Forces, among others. Nitrates encourage **algal blooms** (<https://www.ec.gc.ca/eaudouce-freshwater/default.asp?lang=En&n=0A77A85E-1&printfullpage=true>) and **poison fish** (<http://www.ec.gc.ca/inrenwri/default.asp?lang=En&n=1EDF83E1-1>). Health Canada has established drinking water guidelines (<http://healthy Canadians.gc.ca/publications/healthy-living-vie-saine/water-nitrate-nitrite-eau/index-eng.php>) and has studied the effects on humans. Nova Scotia Environment is responsible for a Well Water Nitrate Monitoring Program in Kings County (<https://novascotia.ca/nse/groundwater/docs/WellWaterNitrateMonitoringProgram-2012Report.pdf>). The Canadian Forces are concerned about the explosives they use in the field and the “high solubility of ammonium nitrate (AN) that could represent a potential threat to the environment...The leaching of nitrates from the explosive occurs rapidly, 25% of nitrates being lost after a six-minute exposure and 50% after a one-hour exposure.” (http://66.212.167.146/MelancthonMegaQuarry/pdfs/Assessment_ANFO_Environment-Jan-2010.pdf)

We hope that Nova Scotia Environment will take note that the explosives used are a crucial piece to study in an industrial application, because, “the use of ANFO near bodies of water is not recommended by the Institute of Makers of Explosives, which stipulates that No use of ammonium nitrate-fuel oil mixtures occurs in or near water due to the production of toxic byproducts (ammonia) (Wright and

Hopky, 1998)" (http://66.212.167.146/MelancthonMegaQuarry/pdfs/Assessment_ANFO_Environment-Jan-2010.pdf, p. 4). The particular explosive to be used, as per the 2016 application, is Dyno Nobel's TITAN® XL1000. This shows the emulsions will be comprised of Ammonium nitrate, calcium nitrate, sodium nitrate and diesel fuels. The MSDS can be found at: <http://www.dynonobel.com/%7E/media/Files/Dyno/ResourceHub/Safety%20Data%20Sheets/North%20America/1052%20Bulk%20Emulsion.pdf>, and it shows that these chemicals are toxic cancer-causing agents that by the MSDS sheet itself, from **Dyno Nobel's website itself, should not be released into the environment.** Surely there is some expectation that a proponent and its consultants and agents ensure that there is a system in place to ensure no environmental contamination?

Environmental Track Record

We ask that Nova Scotia Environment take this portion of the application seriously and consider carefully the parties employed. A very superficial Google search resulted in enough infractions to introduce serious doubt that extreme caution and care are always used by Dyno Nobel when it comes to environmental protection. In 2009, "Dyno Nobel pleaded guilty to four charges under the Ontario Water Resources Act for environmental infractions related to a 2006 spill of storm water that likely included ammonia into the St. Lawrence River. The company was ordered to pay \$175,000 in fines" (<http://www.thewhig.com/2010/04/27/dyno-nobel-maitland-faces-another-setback>). "A smaller leak resulted in a \$17,000 EPA fine in 2009, with the agency saying that Dyno Nobel failed to notify emergency responders about the leak for 11 hours. Later in 2010, the Oregon Occupational Safety and Health Division also found five "serious" violations at the plant related to processes surrounding anhydrous ammonia storage and other problems, fining Dyno Nobel \$3,120" (http://www.oregonlive.com/environment/index.ssf/2013/04/oregons_largest_fertilizer_pla.html). Also in 2010, Dyno Nobel disposed of illegal wastewater into an open pit and pleaded guilty to "depositing, or causing, permitting or arranging for the deposit of waste into land or land covered by water" and was fined \$110,000 (<https://ohsinsider.com/wp-content/uploads/2015/08/ECI-Dec10.pdf>). In 2011, "Dyno Nobel, Inc has agreed to settle a series of alleged violations of the Clean Air Act at the company's Cheyenne plant for \$110,900" (<https://yosemite.epa.gov/opa/admpress.nsf/6427a6b7538955c585257359003f0230/a8f5ecb84ef0740d852578ca0073d5d5!OpenDocument&Start=5&Count=5&Expand=5.1>). Also in 2011, "because of Dyno Nobel's West Virginia Code violations, Dyno Nobel shall be assessed a civil administrative penalty of four thousand eight hundred seventy dollars (\$4,870) to be paid to the West Virginia Department of Environmental Protection for deposit in the Water Quality Management Fund" (<http://www.dep.wv.gov/pio/Documents/Revised%20Dyno%20Nobel.pdf>). In 2012, "the Oregon Department of Environmental Quality issued a \$2,400 penalty to Dyno Nobel Inc. for failure to comply with conditions of its wastewater discharge permit for its fertilizer manufacturing facility in Deer Island in Columbia County" (<https://www.highbeam.com/doc/1G1-300449431.html>). In 2013, "Dyno Nobel Inc., has agreed to pay a \$257,167 civil penalty to settle alleged violations of the Clean Air Act (CAA), Emergency Planning and Community Right-to-Know Act (EPCRA), and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at its facilities in the cities of Louisiana and Carthage, Mo" (<https://yosemite.epa.gov/opa/admpress.nsf/d0cf6618525a9efb85257359003fb69d/bb8f7f53a92100f685257c08005ddd86!OpenDocument>). Dyno Nobel's parent company Incitec Pivot was recently fined \$30,000 for allowing fertilizer to enter a river (<http://www.epa.nsw.gov.au/epamedia/EPAMedia16012101.htm>) and an infamous trail derailment in January 2016 that spilled acid cost the company \$14 million (<http://www.theage.com.au/business/incitec-profit-hit-by-train-derailment-20160105-gm03ku.html>). This is in addition to a major fly rock accident in Halifax in 2003 (<http://www.cbc.ca/news/canada/nova-scotia/company-handed-50k-fine-for-blast-1.553281> which mentions in particular the "blasting expert" that Scotian Materials allowed to represent them at the public consultation).

Contingency Plan

It is the responsibility of Nova Scotia Environment to research the issue of nitrate release and require at minimum **wastewater treatment**. Beyond that, although Scotian Materials suggests they will monitor water levels and quality, they mention **suspended sediments only**, and there is no guarantee without understanding the underlying aquifers that they will **intersect the flow** in the area, nor will they receive any warning of a rapid change in water quantity, with a monitoring well. They plan to test acid-draining rock **only “if found”** (p.11). Scotian Materials has **not** collected **baseline data** from nearby residents on **flow rate or water quality**. Their reliance on incomplete or incorrect data from the well logs database, and attending to only **one** nearby neighbourhood means Nova Scotia Environment has not been presented with the full picture. There are homes in Fall River that are just as close as some houses on Perrin Drive. Scotian Materials has not submitted water or soil tests to Nova Scotia Environment to establish environmental **baselines near the site**. They refer to “studies” on the environment and wildlife in their application but those have not been presented to Nova Scotia Environment. They have not considered any of the topics brought forth in this letter in their **contingency plan**. One paragraph in the entire application offers the promise that Scotian will repair or replace the domestic supply adversely affected in quantity or quality for potable water, and another paragraph mentions bottled water. The nearby residents have reason to be concerned about this promise when replacing the water supply for all of the nearby homes would cost millions of dollars and the promise made in the application, it is not even included in the contingency plan, and it is not likely to be legally binding, especially after Scotian Materials closes its offices, and particularly **without baseline data** to prove we were impacted. In fact, if they’re still around to take to court, Scotian Materials will likely point to the same research that we have presented here, showing that our water supply was never very great. Finally, Scotian Materials has completely **ignored the topic of waste** produced from explosives use. In fact, they refused to provide details on their blasting plan until this time. They clearly do not consider the wastewater that their operation will produce, nor have they included in their contingency plan what will happen if their wastewater treatment fails.

We rely on water daily for more than just drinking. We wash our dishes and take showers, flush our toilets, water our dogs and cats, wash our cars and our laundry and water our plants and gardens. We use it to wash floors and clean counter tops, wash our hands and cook with it. We wash our faces, bathe our children, and brush our teeth with it. Scotian Materials treats water and our reliance on it very flippantly when they quickly brush off legitimate concerns and offer bottled water for some cloudy water we might receive. What about wells that stop working for days or years, or water that’s acidic, full of staining-iron, full of arsenic, or full of nitrates. What then? Will they pay our municipal water, hospital bills, life insurance, funeral costs, water treatments, clothing bills, new washers and dryers, hotel stays, moving costs, new houses? All of the research taken together shows these are very real risks, and these are things that have happened in the past, even with quarries a kilometre away or more. The contingency plan in the 2016 application addresses none of these things and if the contingency plan and baseline data continue to be lacking, Nova Scotia Environment will have removed any right we will have to recourse.

A hydrogeologist providing evidence in *Citizens Against Melrose Quarry v. Ontario (Environment and Climate Change)*, 2015, stated that a “contingency plan existed to address any unforeseen interference with existing uses and water uses” (<http://www.canlii.org/en/on/onert/doc/2015/2015canlii59648/2015canlii59648.html?searchUrlHash=AAAAAQAVZG9tZXN0aWMgd2VsbHMgcXVhcnJ5AAAAAAE&resultIndex=1>). The tribunal in this case required that the contingency plan’s **triggers** be **accessible, understandable**, provide **certainty** as to when they were applicable, and should address **well users and the ecosystem**. A large amount of research went into the decision to allow the quarry to continue operations. Triggers are impossible to include without baseline data.

Given the grade (downwards from the quarry to Miller Lake West, which Scotian Materials notes themselves in the 2016 application), we have concerns that the water of Miller Lake West may be recharged by water in the area of the proposed quarry and given the low yields of the wells in the area, the possibility of blasting in the area of the quarry disturbing the aquifer is too high a risk to take. The fact that the discharge of dangerous waste into the natural environment is being considered at all, when this area is surrounded by watershed wetlands, is honestly beyond our comprehension at this point. Our wells are not functioning well, our water is already damaged, and this project is just plain too risky to even think about. Scotian Materials and Northern Construction and their consultants can supply all of the information they want. **They cannot reassure us that these things won't happen just by saying they won't happen and by calling us NIMBY's and saying we are Fear-Mongering.** They can't see beneath the earth, they can't predict what blasting will do because this is not an exact science, and **they haven't even provided the modelling and the contingency plan that they should have.** Nor do any of the parties involved have clean track-records, so forgive us if we do not feel reassured when in one line they tell us our water supply will be OK. As our neighbours have submitted previously to your offices, Scotian Materials has misrepresented important data on every aspect of this application. We have to ask **why** they haven't supplied modelling regarding the aquifers and water table, **why** they haven't submitted a contingency plan that provides for water supply, and **how** it has come to pass that they decided on a depth of 22m (a change from their last application)? As residents and observers we find it shocking that this proposal would be entertained on land it's not zoned for and in a sensitive area as it is. Please put this project to rest and let Mr. MacPherson and the Belangers from Grand Falls know that it's just too risky. We can't even build homes for our seniors because of the limited water supply. The airport is spending a million a year to treat the water from acid rock drainage. Tell them, just tell them— it's just too risky.

Sincerely,

Stop The Fall River Quarry Group

(original signed)

April 20, 2016

Katherine MacLeod
Nova Scotia Environment
136 Exhibition St
Kentville NS B4N 4E5

To: Katherine MacLeod, Nova Scotia Environment

Re: Research from Forest Watershed Research Center, of University of New Brunswick, and excavation of the proposed site, relevant to the Goffs Quarry proposal

Earlier this year, I wrote two letters to Nova Scotia Environment regarding the Wet Areas Mapping in opposition to the proposed Goffs Quarry. My specific concern was that there may be wetlands within the proposed footprint that had not been disclosed to Nova Scotia Environment. I also contacted the Forest Watershed Research Center (FWRC) of University of New Brunswick to determine if they could provide further detail on the Wet Areas Mapping of the property proposed for use as the Goffs Quarry. Specifically, the Wet Areas Mapping presented in my earlier letters was based on Digital Elevation Mapping and I asked the Center if they were able to provide the more reliable LiDAR (Light Detection and Ranging) mapping. I contacted this group because they were listed as the creators of the Wet Areas Mapping layer of the Nova Scotia Landscape viewer,¹ which is available on the Nova Scotia government website.

Included in this letter is a technical analysis of the watershed and water flow patterns based on data that is much more reliable than what is available from the Nova Scotia government interactive maps at the present time (nor does the Department of Natural Resources of Nova Scotia have LiDAR-based Wet Areas Mapping²). Imagery and comments from the Forest Watershed Research Center have been summarized and are presented here to assist with the decision making. Any opinions expressed are my own and are not meant to represent the Forest Watershed Research Center or University of New Brunswick. Geographical Information System data was obtained for surface topography through LiDAR (from Open Data, Halifax Business Intelligence & Data Services), as well as culvert locations, roads and trails, and property

¹ <https://nsgi.novascotia.ca/plv/>

² according to personal communication with DNR, NS staff, March 29, 2016.

boundaries (from GeoNova). Each layer created essentially a more reliable map. (Please see the award-winning Forest Watershed Research Center's website for further information on technique and accuracy: <http://watershed.for.unb.ca>.) Culvert locations and stream crossings were confirmed by field GPS mapping along the portion of Perrin Drive south of the proposed site.

Please keep in mind that the LiDAR data were obtained in 2007 and it has recently been discovered that the site was excavated in an area of approximately 12.6ha (see Google Maps image, Figure 1, with area calculation). Thus, runoff, sedimentation, and flow patterns may have changed due to soil exposure and loss of vegetation. In addition, the surface topography may have changed. As Scotian Materials has submitted with their application, the site contained an abundance of phreatophytic plants in wet areas. Now that 12.6ha of the property has been cut and excavated, some of it in wet areas, it can be expected that this will impact the amount of water present in the site as well as the interaction between water, soil, and sediment loads in runoff. It is expected that further study will necessarily be required. Nonetheless, I present these research findings as they are important for understanding the flow patterns of water through the site, which is crucial when predicting what impacts the proposed quarry would have on nearby lakes and watercourses, as well as on the wildlife and public drinking water areas surrounding the site.

Please see Figure 2 which shows the quarry-containing watershed and five other watersheds that lead into a 1ha wetland south of the proposed quarry (labeled "A" in the image). Two additional watersheds join this small wetland towards Soldiers Lake. The numbers show the hectares for each of the watersheds as outlined. Notice that the extended quarry footprint (the 11.8ha excavated area) now extends into two basin areas instead of the previous one. The overall suspended solids dilution factor for the water flowing from the two quarry-containing watersheds can be expected to be about 10^3 on account of the other inflow areas, and these streams themselves are habitat areas for fish and other wildlife. In addition, the wetland labeled "A" is located on Crown land. Holland Brook (the watercourse leading from the pond to wetland "A" in the large dark green watershed) and Soldier Lake are popular recreational fishing spots known to have trout and bass.⁴ In addition, the last records of catches from the Nova Scotia government

³ Forest Watershed Research Center, personal communication April 12, 2016.

⁴ e.g., adjoining Tillman Brook and fish species: <http://www.thelaker.ca/stories.asp?id=7212> Soldier Lake and fish species: <https://data.novascotia.ca/Fishing-and-Aquaculture/Nova-Scotia-Freshwater-Fish-Species-Distribution-R/jgyj-d4fh>

website show the American Eel lives in Soldier Lake.⁵ The American Eel is considered Threatened, Special Concern or a Species at Risk, depending on the document consulted and the location, and its status is currently under review.⁶ The suspended solid concentration emerging from the wetland toward Soldier Lake will depend on whether this wetland is overtopped or not, but will not change further en route to Soldier Lake except for a <10% additional dilution, provided that there are no sediment-releasing developments within the adjoining 41 ha sized watershed.⁷ Please also see Figure 3 which shows the Wet Areas Mapping for this area and indicates that water from this wetland flows towards Soldier Lake to the south.

Most of the water that enters the watersheds surrounding the quarry through precipitation and pumping water will flow toward Soldier Lake. According to the industrial application, the till at this location is quite thin (e.g, <50cm), and hydrological modelling (see below) predicts that other than a quarter to a third of annual precipitation which evaporates and transpires, much of the rest will flow towards Soldier Lake. Only a small amount likely enters the below-surface bedrock aquifers as long as the bedrock conditions remain impervious. Forest vegetation takes up large quantities of water during the summer, and plays an important role in protecting against soil erosion and allowing ground water recharge.⁸ Now that the forest has been cleared on 12.6ha of land, there will likely be much more biologically unfiltered water remaining within the area of the proposed footprint. Wetlands help to keep sediment from entering watercourses in general. However, wetlands can be overtopped especially when small during high flow events. Recent flooding caused provincially mapped wetlands at a nearby location (Perrin Dr. at Sanctuary Court) to become submerged, as seen in the photo in Figure 4 taken on December 11, 2014. High flow events in January 2016 caused driveways to wash out on nearby Preakness Crescent.

Stream beds also become scoured during high flow events. Surface runoff is always possible when soils are saturated with water and streams are already bankful. Soil erosion and runoff is more likely when forested land is cleared,⁹ and accelerates when mineral soils are exposed.

⁵ <https://data.novascotia.ca/Fishing-and-Aquaculture/Nova-Scotia-Freshwater-Fish-Species-Distribution-R/jgyj-d4fh>

⁶ http://www.sararegistry.gc.ca/species/speciesDetails_e.cfm?sid=891

⁷ Forest Watershed Research Center, personal communication April 12, 2016.

⁸ http://plants.usda.gov/plantguide/pdf/cs_potr5.pdf

⁹ [http://www1.agric.gov.ab.ca/\\$department/deptdocs.nsf/all/agdex3489](http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/agdex3489)

The Nova Scotia Pit and Quarry Guidelines¹⁰ state:

V. LIQUID EFFLUENT DISCHARGE LEVELS

(1) All storm runoff from the operating site and all liquid effluents resulting from the operation shall be collected and treated to meet the following suspended solids concentrations prior to discharge into a watercourse or beyond the property boundaries:

(a) maximum suspended solids concentration in an grab sample - 50 mg/l;

(b) maximum arithmetic monthly average suspended solids concentration - 25 mg/l.

Considered together, the geographical location and hydrology of the site, along with the clearing of 12.6ha by excavation, present great challenges to designing a quarry able to meet the Pit and Quarry Guidelines for suspended sediment. These guidelines, when not properly accommodated, likely lead to sediment suspension and runoff events that may exceed the guidelines limits and during quarry operations. This may have already taken place during the recent excavation operations at the quarry. In terms of sediment filtering, Wetland “A” in Figure 2, which is beyond the property boundaries, may already have accommodated some to the sediment release prior into Soldier Lake but it does not occur in compliance with the Pit and Quarry Guidelines for: reduced 1) effluent introduction into nearby watercourses; and 2) into watercourses beyond the property owned by Scotian Materials.

As stated previously, the watershed map shows that water runs through a 1ha wetland before entering Soldier Lake. Miller Lake then receives water directly from Soldier Lake and exits towards Lake Thomas which carries the water northward to Fletcher’s Lake, and so on, until it reaches the Bay of Fundy. Miller Lake serves 50 customers with drinking water and currently removes arsenic from the water; Lake Fletcher serves 83 customers with drinking water.¹¹ The wetlands in theory would help to prevent sediment from entering Soldier Lake and adjoining watercourses, however this may not always be the case under varying conditions, and will not be the case for all contaminants, as will be discussed.

Figure 5 presents a current ten-year record of daily weather conditions, and modelled snowpack, frost depth, soil temperature and stream discharge for the Halifax Stanfield International Airport (model calibrations: Pockwock Watershed area, c/o FWRC). It shows a high frequency of freeze-thaw cycles. During times of high precipitation and snowmelt events, there will likely be a high discharge and sediment loss, especially in areas that contain exposed

¹⁰ https://www.novascotia.ca/nse/issues/docs/Pit_and_Quarry_Guidelines.pdf

¹¹ http://www.halifax.ca/hrwc/TreatmentFacilities.php#Collins_Park_WTP

soil. To further compound the problem, soil thawing softens the soil and leads to poor soil trafficability.

Although wetlands between the proposed site and Soldier Lake may under optimal conditions assist in preventing sediment from entering the lake and reduce further runoff problems by slowing down the flow rate and evaporating some of the water, wetlands do not evaporate as much water as forests. Thus, clearing particular parts of the 12.6ha, which have not been cleared in the history of Google Earth images (since 2003), nor in the history of Nova Scotia government aerial photos (since 1964),¹² means there will necessarily be a change in water conditions on the property: more water will flow towards Wetland “A” (Figures 2 and 3) due to the gradient and lack of absorbing factors (e.g., vegetation). Allowing quarry operations will mean removing further soil and vegetation, and will expose impervious substrates, which create more surface runoff (Fisheries and Oceans Canada, 2006).¹³ Precipitation, which previously flowed laterally from the area of the proposed footprint to help recharge wetlands and lakes, will no longer do so due to the presence of an open pit, adding further stress to nearby ecological features.¹⁴ Lack of knowledge of the location of the wastewater pumped out of the quarry, sprayed on the rock piles, and eventually reintroduced into “the natural environment”¹⁵ means it is impossible at this time to predict the effects of water displacement. However, wetland overtopping, contamination of waterways and flooding should all be considered and become evident in the quarry design.

In addition, explosive compounds containing nitrates produce highly mobile nitrate ions that are not readily absorbed by wetlands or soils, except during growing seasons due to biological uptake and denitrification. This means any nitrates released from blasting into nearby waters will likely reach Soldier Lake, particularly outside of the growing season and during high-flow events. As submitted previously by our group, 90 to 1000kg of nitrates per blast can be expected to enter the wastewater from the quarry based on current research and the 2016 application information, which specifies the type and amount of blasting explosives to be used.

¹² <https://gis8.nsgc.gov.ns.ca/esrimap/esrimap.dll?name=DataLocator&cmd=0&t=5330999&b=4728598&l=169676&r=915634&nt=0&nb=0&nl=0&nr=0&action=overview&X=0&Y=0&ind=0&objid=0&DIon=True&NDIon=False&PIon=False&la=&hPid=0&pb=&sz=1&ind=25&searchType=pn&sl=&st=pn&County=&zR=2&il=25>

¹³ <http://www.dfo-mpo.gc.ca/library/321286.pdf>

¹⁴ https://www.novascotia.ca/nse/ea/black-point-quarry/part-0-final-summary-report_english.pdf

¹⁵ 2016 Application for Goffs Quarry, p. 7.

Phosphorous is also delivered to surface waters from cleared land, particularly from bare soils and phosphate-bearing rock. Excess nitrates and phosphorous can result in abundant aquatic plants, algal blooms, and less desirable species such as invasive species and toxic bacteria (Environment Canada, 2015).¹⁶ According to Fisheries and Oceans Canada, the removal of riparian vegetation can change an oligotrophic ecosystem to a eutrophic ecosystem¹⁷ where aquatic plants and algae can eventually ‘choke’ a lake by causing a cycle of absorbing heat from the sun, losing oxygen to decaying plants, causing fish kills and creating undrinkable water.¹⁸ Environment Canada continues to monitor phosphorous data and in some cases create protection plans.¹⁹

A Fisheries and Oceans Canada (2006) document entitled **Ecological Restoration of Degraded Aquatic Habitats: A Watershed Approach** states:

*Eutrophication is often the result of human activities within the watershed. The activities often involve importation or creation of nutrients or waste products, physical manipulations of the watershed that remove its assimilative capacity by infilling or draining wetlands, and increasing opportunities for non-point source pollution. These actions are often justified on the basis of economic considerations and convenience for the people and governments.*²⁰

Fisheries and Oceans Canada also summarized the negative effects of silt on fish habitat, including smothering of fish eggs, loss of spawning areas, gill abrasion, lowered chance of catching food due to reduced visibility, decrease in benthic invertebrate productivity, and increased turbidity. The solutions suggested in this document are to reduce effluent pollution at the point of entry, to control runoff to watercourses, and to protect and enhance wetlands. As for the Goffs Quarry proposal, it is not apparent how the design addresses the prevention of the issues, including the draining wetlands and increased pollution through sediment and dissolved substances.

¹⁶ <https://www.ec.gc.ca/eaudouce-freshwater/default.asp?lang=En&n=0A77A85E-1&printfullpage=true>

¹⁷ <http://www.dfo-mpo.gc.ca/library/321286.pdf>

¹⁸ <https://www.ec.gc.ca/grandslacs-greatlakes/default.asp?lang=En&n=6201FD24-1>
<https://www.ec.gc.ca/eaudouce-freshwater/default.asp?lang=En&n=0A77A85E-1&printfullpage=true>

¹⁹ <https://www.ec.gc.ca/eaudouce-freshwater/default.asp?lang=En&n=0A77A85E-1&offset=3&toc=show>

²⁰ <http://www.dfo-mpo.gc.ca/library/321286.pdf>

In addition to contamination from excess sediment and nitrates, there is the issue of soluble substances naturally occurring in the Goldenville Formation rock. As stated in other letters to Nova Scotia Environment, the Goldenville Formation can contain elements such as lead and arsenopyrite,²¹ and yet Scotian Materials has presented no evidence (e.g., no core tests to the depth of 22m within the proposed footprint showing acid generation or other substances) that this is not the case for the rock proposed to be quarried. The Nova Scotia government website contains a document that states Goldenville Formation is considered to be the “host rock for arsenic,”²² and water from the adjoining Miller Lake is being treated for arsenic.²³ This, therefore, is an obvious concern. As submitted in a previous letter regarding this issue, Arnold (2004) found that rock in the Goldenville-Halifax Transition Zone, while falling below the threshold for being considered acid-generating itself, and while being of neutral pH itself, still has the potential to lower the pH of freshwater to as low as 3.9,²⁴ i.e., a level at which fish are killed and undesirable species of plankton and mosses begin to grow.²⁵ Water tests conducted in February 2016 on Holland Brook, south of the proposed site, show the pH to be at 4.5. Last published tests of pH values of Soldier Lake and Miller Lake recorded the pH values at 4.5 and 5.6.²⁶

Figures 4 and 5 present images of flow patterns produced from LiDAR Digital Elevation Mapping (1m resolution) by the Forest Watershed Research Center. These images show how water is predicted to drain along the surface. The blue or white areas may or may not be seen in the field, depending on the weather. The wet areas and drainage are predicted based on the lay of the land according to topography of the land, wetlands and lakes. How the quarry operations would affect the drainage of the wet areas depends on quarry footprint size and slope, substrate permeability, and quarry depth. In addition, the placement of quarry footprint requires maintenance of setbacks from the watercourses and wetlands. According to the Golder Associates report and the surface images, the current footprint does not have the required

²¹ <https://journals.lib.unb.ca/index.php/ag/article/view/atlgeol.2011.008/20517>

²² https://novascotia.ca/nse/groundwater/docs/GroundwaterResourceReport_Hants2.pdf

²³ http://www.halifax.ca/hrwc/TreatmentFacilities.php#Collins_Park_WTP

²⁴ http://earthsciences.dal.ca/aboutus/publications/theses/BSc/ES_2004_BSc_Arnold_Jennifer.pdf

²⁵ <http://www.lenntech.com/aquatic/acids-alkalis.htm>

²⁶ <http://novascotia.ca/nse/surface.water/docs/AcidityInLakesCV.pdf>
<http://novascotia.ca/nse/surface.water/lakesurveyprogram.asp>

setbacks from the watercourse to the northeast of the proposed footprint, and may not have the required setback from the Golder-identified wetland to the northwest.

This particular wetland, approximately 1.4ha in size, was included in a wetland monitoring plan which was acknowledged and agreed upon by Scotian Materials and Nova Scotia Environment. This monitoring plan was also referred to in the current (January 2016) application, in which it states that the wetlands were delineated again between September and October 2015 and the previous wetland mapping was confirmed (Golder Associates Industrial Approval Application for Goffs Quarry, p. 12). A new wetland map was submitted with the 2016 application showing mostly the same wetlands as in all other wetland mappings associated with this proposal, and it is dated December 22, 2015. This new map removed the wetland to the south of the site and gave the other wetlands slightly different shapes, providing further evidence that the site was revisited and remapped. The current application also noted that there was “increased saturation (i.e., flooding) due to clearing activities in the vicinity of the Project” (Golder Associates Industrial Approval Application for Goffs Quarry, p. 12), and that clearing took place in October, 2015 (Golder Associates Industrial Approval Application for Goffs Quarry, p. 7). The Scotian Materials website also currently shows acknowledgement that the site was cleared and that wetlands were being monitored. Please see Appendices A, B, C, and D for ease of reference. As noted in my April 8th letter, the excavation of the 12.6ha of land, including all or part of two or more wetlands, took place between July 13, 2015 and September 5, 2015, according to Google Earth image dates, which is prior to approval of the previous application (which occurred September 15, 2015). All of this is in direct contradiction to the dates and information given in the 2016 application as well as several sections of the Act including S.32(1) which states no work will commence without approval. As per the Nova Scotia Environment Act and related regulations, excavation of topsoil over 1ha and wetland and watercourse alteration also require approval by the minister. As to be expected, flooding the two excavated wetlands (WL3 and WL4 on the application maps) are flooding, and thus the concerns of this letter are partially confirmed by the proponent.

Figure 9 shows a three dimensional image of the proposed site with the same overlay of predicted water flow. The yellow line signifies the excavated and cleared areas, the red the most recent footprint, and the magenta is the second footprint proposed. This image gives a visual representation of how the land is sloped to the southwest, away from the highway. The Nova Scotia Transportation and Infrastructure Renewal gravel pit (built between 1964 and 1974 according to aerial images, 30-40 years before the nearby residential neighbourhood of Miller Lake West, which was built after 2003) is already present on the property and is visible south of

the highway. Figure 10 shows closer images of the same maps with added “hill-shading” to show visually the depressions of the land. The top one uses the Google Earth background to show the current state of forest clearing and excavation while the hill-shading depicts the depressions as they existed in 2007. These images present the DEM-derived wet areas (shaded blue) and flow channels (white lines) as these would have existed in 2007. Re-doing LiDAR DEM scanning would reveal how this pattern may have already changed, thereby affecting stream flow directions and amounts.

The Forest Watershed Research Center also overlaid the footprint using coordinates provided in the application and the map of wetlands delineated by Golder Associates (Figure 11). This map shows the wetlands identified by Golder Associates (coloured blue) are overtop of the flow channels predicted by the research Center’s modelling results (white lines). With the coordinates being used, the proposed footprint is located in a slightly different spot than shown by the maps submitted by Scotian Materials, and the drainage shown by the white lines intersecting the footprint starts further into the proposed footprint, causing increased concern about disrupting the drainage pattern that was in existence. When water is pumped from the settling ponds the place of discharge may be overloaded and result in further runoff.

The Forest Watershed Research Center also mapped the nearby wells in the area which showed water-bearing fractures at depths higher than their final well depths. These depths were used to estimate the depth of the water table. As adjusted by elevation, the data shows in Figure 12 that it is possible the planned quarry depth of 22m will mean Scotian Materials will be quarrying below the water table, particularly given the shallow depth of water table at well point D. Table 1 is the table of data used in this mapping. This causes further concern about the effects on nearby residential wells of quarrying below the water table. There is a lack of factual information (e.g., well data from within the proposed footprint) in the 2016 application of the proposed quarry on how the quarry floor will remain above the water tables that feed the wells. In addition, the inter-relationship of groundwater and fractures in the underlying bedrock are unknown and thus the wastewater presents unknown risk to the water quality in the nearby residential wells.

Recommendations/ concerns:

- Quarry design and operations planning should involve careful hydro-functional watershed planning, using latest planning, visualization and assessment tools.

- This report has identified gaps, especially in view of the available LiDAR DEM coverage for Halifax that can be used for determining flow direction, flow accumulation, depression locations, and estimating flow rates and sediment loads.
- Of concern is the shifting footprint of the quarry, and how this shifting will affect the movement of sediments, now identified to occur along two streams (east and west), both flowing south towards a small 1ha wetland prior to entering Soldier Lake.
- This shifting also extended northward beyond a natural depression, which contained a recognizable wetland as reported (Golders report), and also contains a flow channel flanked by wet areas, as derived from the 2007 LiDAR DEM scan.
- Golder Associates located and identified several wetlands of varying size within the area of concern. Their locations and approximate extent are functionally confirmed by the LiDAR-DEM based flow channel and wet area derivations.
- Concerns about potential ground water contamination continue, especially in the absence of bedrock permeability data, and lack of knowledge in terms of blasting depth and fracturing of underlying bedrock layers.
- Accumulating information for careful consideration by the public like our group is still far from easy, likely due to poor internal and external communication links and related awareness levels between departments.

I cannot close this letter without discussing the ethical side of this proposal. At minimum, and beyond the issue of enforcement and restoration of the wetland area that has been excavated, Nova Scotia Environment should seriously consider whether to accept the proposal as is. For that purpose, the Google Earth image from September 5, 2015 should be given close attention. The edges are clearly cut in a defined shape. The shape is similar (and yet obviously much larger) to the various footprints submitted in past applications. This alteration should require a full Environmental Assessment in compliance to the law under the Environment Act of Nova Scotia.

Furthermore, as submitted in my previous letter, the areas most heavily excavated were the wet areas of the property (see Figure 10). Nova Scotia Environment should consider that this excavation may have been a vernal pool, a watering area for overwintering deer, a pond, a brook, and/or a spawning area for fish in addition to acting as a filter for precipitation draining toward Soldier Lake. As the Google Earth image and the application shows, this area was wet during the dry season. According to the Environment Act,²⁷ "watercourse" means:

²⁷ <http://nslegislature.ca/legc/statutes/environment.pdf>

(i) the bed and shore of every river, stream, lake, creek, pond, spring, lagoon or other natural body of water, and the water therein, within the jurisdiction of the Province, whether it contains water or not.

Hence, alterations of watercourses and wetlands, starting work prior to approval, and excavation of topsoil are all activities requiring approval by Nova Scotia Environment.

Referring to my neighbour's complaint in October of 2012, it is clear that modifications near Wetland "A" had been made to watercourse banks. Please see in Figure 13 a photo showing landscaping material found in April 2016 near Wetland "A". It is not normal to find landscaping material in a natural environment. Knowing now about water drainage from the site, this is now highly relevant, and also suggests repeated alterations. Multiple letters and charts have been submitted in the past 4.5 years showing similar contradictions and disregard for regulations, and inaccuracies in the quarry design applications.

Considered together, I ask that Nova Scotia Environment consider this information given that the current application requires a review and a decision in view of S.158 of the Act. With all of the information including (i) the contraventions in the application and (ii) considering the negative effects on the environment, wildlife in protected areas and on crown land, the safety of nearby residents and their drinking water, I submit that public interest cannot possibly be met by this the existing quarry proposal. The benefit is meagre, the necessity does not exist, and the risks are high. As per the Environment Act,²⁸ Nova Scotia:

52 (1) Where the Minister is of the opinion that a proposed activity should not proceed because it is not in the public interest having regard to the purpose of this Act, the Minister may, at any time, decide that no approval be issued in respect of the proposed activity if notice is given to the proponent, together with reasons.

Yours sincerely,

for Stop the Fall River Quarry Group

²⁸ <http://nslegislature.ca/legc/statutes/environment.pdf>

Figure 1. Google Maps image (date September 5, 2015) and measurements, with conversion to hectares, showing size of cleared and excavated areas.



Figure 2. Watersheds (sizes marked in hectares) draining to wetland “A,” south of proposed quarry site (footprint in red; FWRC).

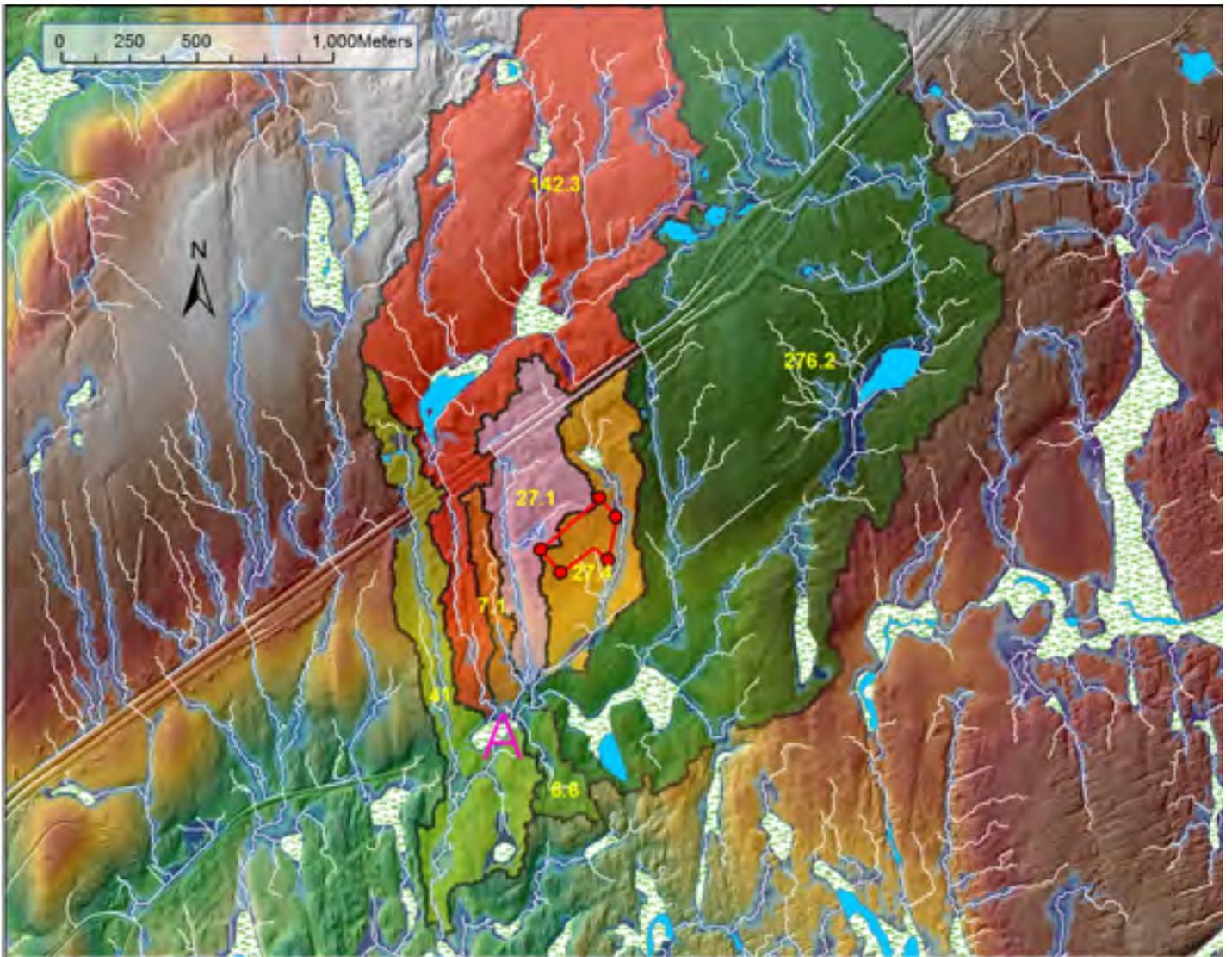


Figure 3. Wetland "A" LiDAR Digital Elevation Mapping showing wet areas and flow channels (FWRC).

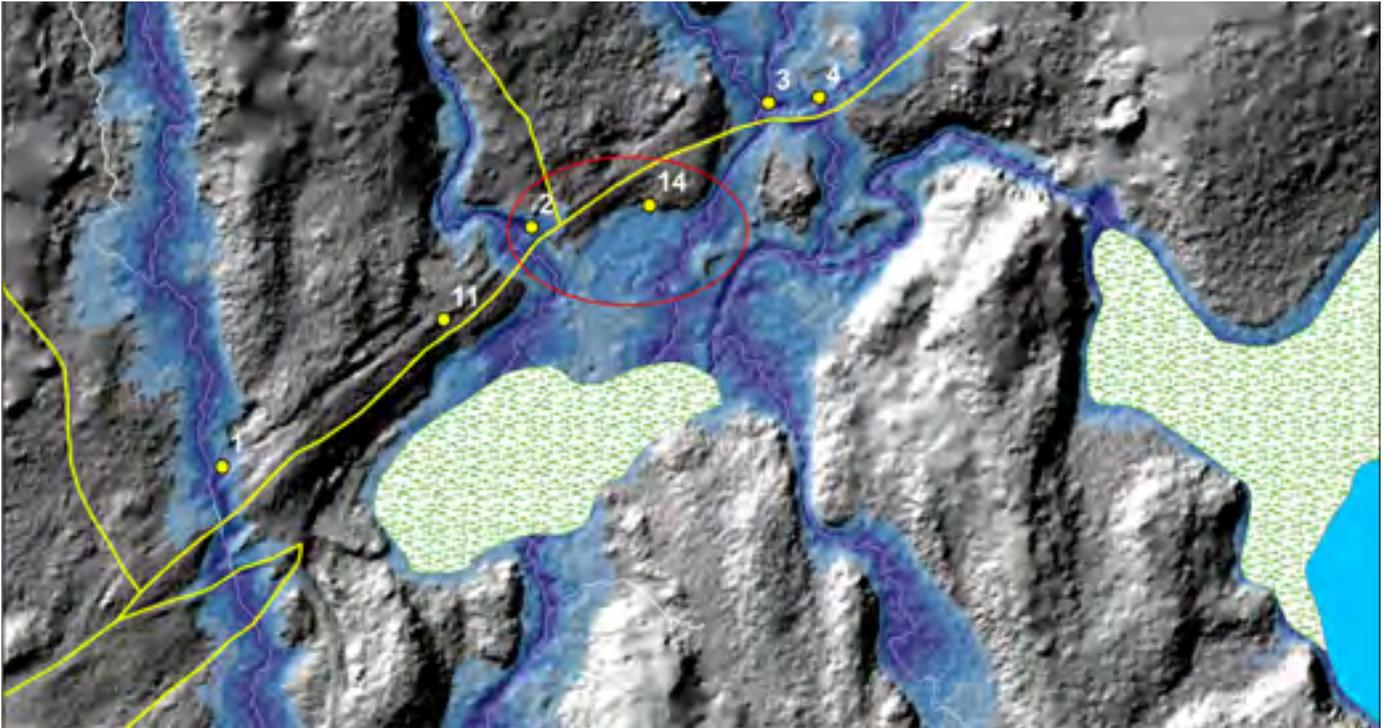


Figure 4. Submerged wetlands (provincially mapped) at the nearby location Soldier Lake opposite Perrin Drive and Sanctuary Court, December 11, 2014 (writer's photo).

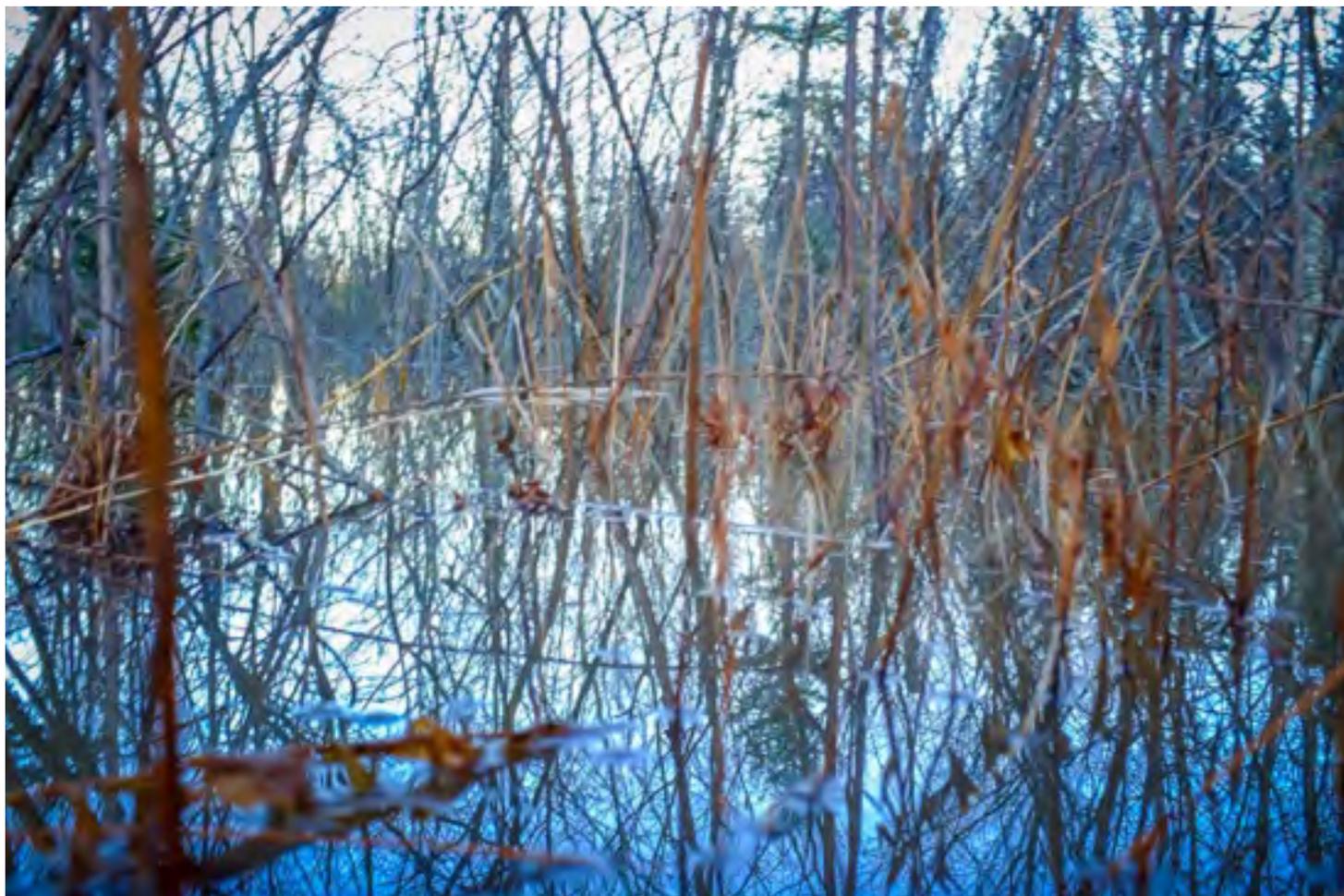


Figure 5. Weather, Stream Discharge, Snowpack, Frost Depth and Soil Temperatures for Halifax Airport, 2006-present (FWRC).

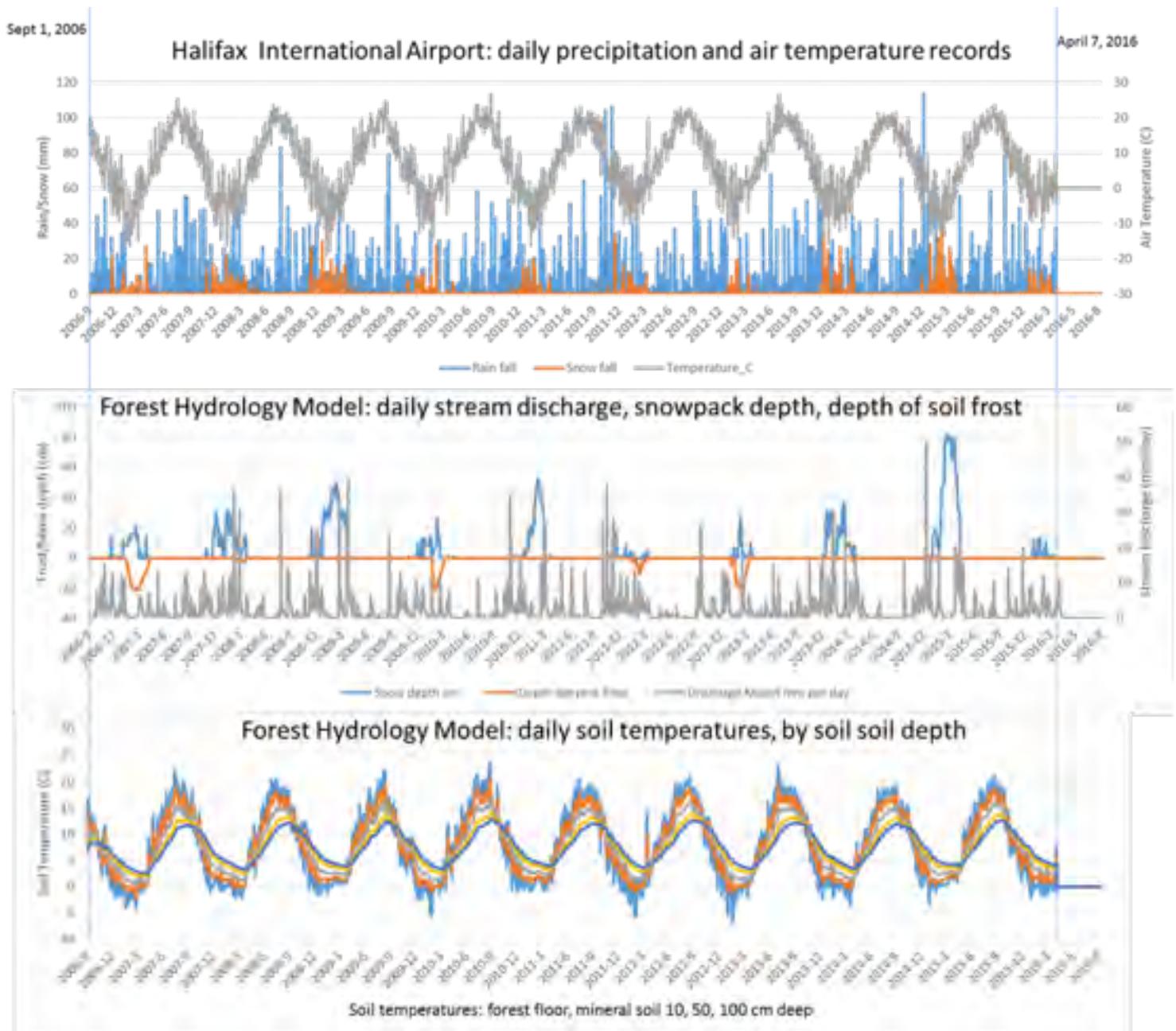
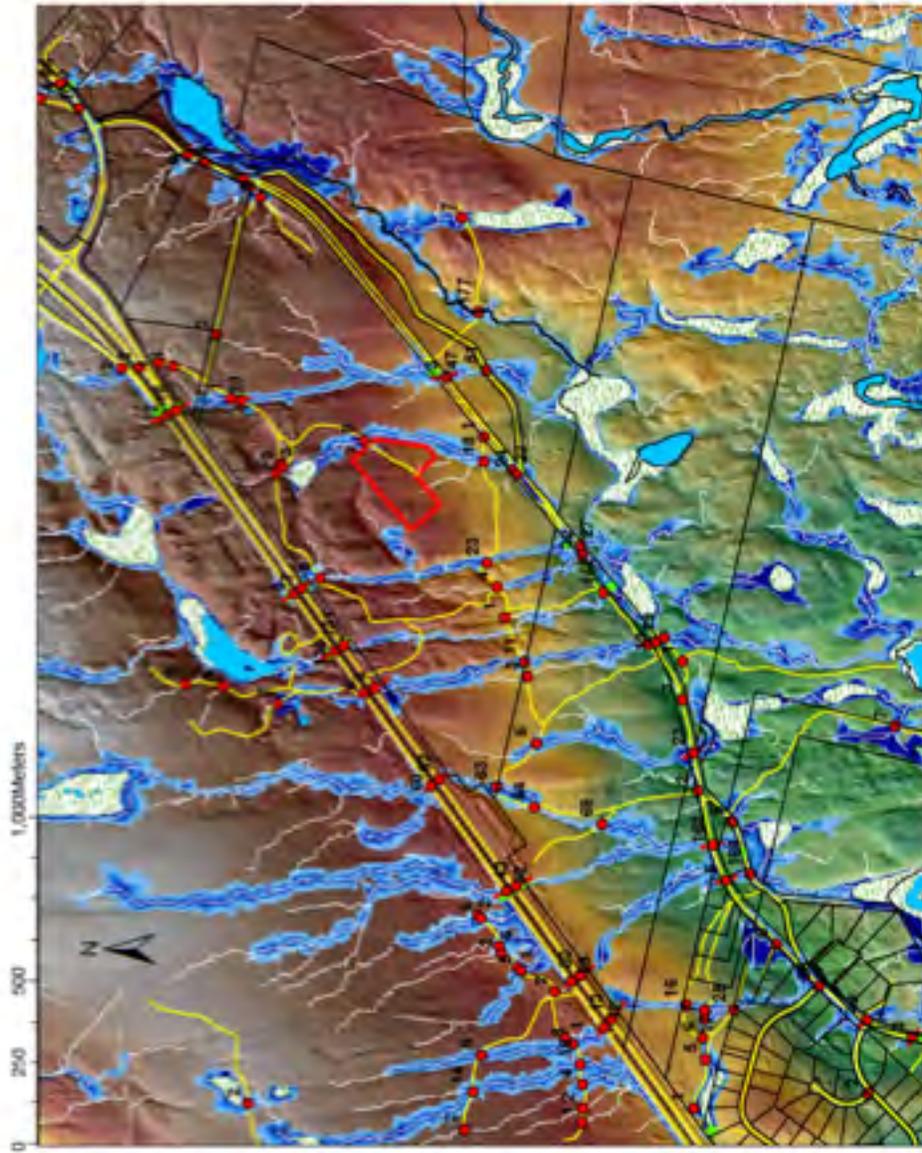
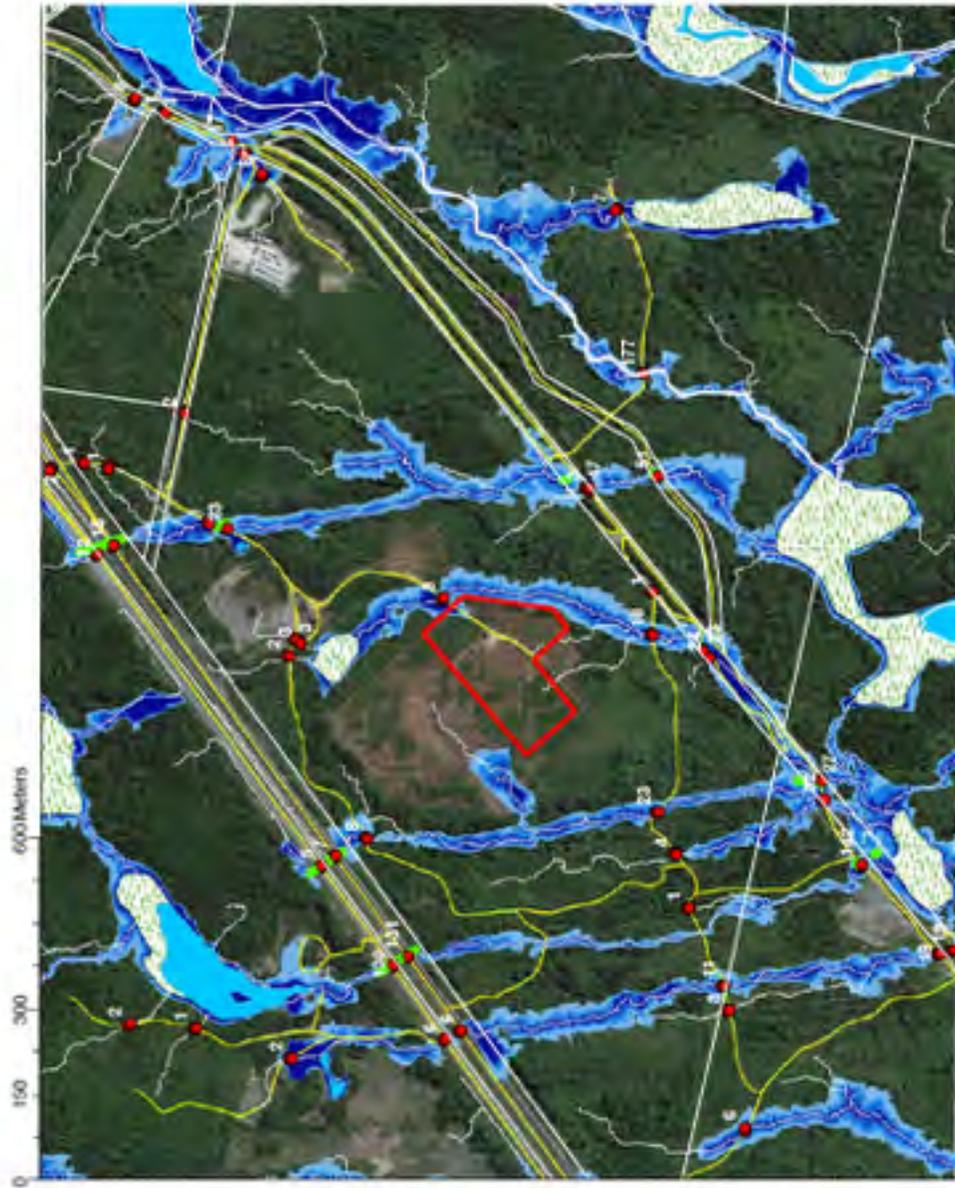


Figure 6. LiDAR Digital Elevation Mapping surrounding proposed Goffs Quarry footprint, showing wet areas and flow channels (FWRC).



- Yellow lines: roads
- Black lines: property lines
- White lines: DEM-derived flow channels requiring a minimum of 1 ha upslope water-contributing area
- Blue shading: cartographic depth to water, 0 (dark blue) to 1 m (light blue); generally correspond to soil drainage from very wet to moderately wet (end of summer condition), starts with DEM-derived flow channels requiring a minimum of 4 ha upslope water-contributing area
- Blue polygons: lakes, pools
- White polygons stippled green: wetlands
- Red dots: road/trail stream crossings
- Numbers: watershed area in ha above road/trail stream crossing dots, in ha
- Green dots [sometimes overlaid by red dots]: NS recognized culvert locations
- Background: hill-shaded DEM, elevations increasing from light green to dark brown

Figure 7. Wet areas and flow channels surrounding Goffs Quarry proposed footprint, viewed on Google Earth Image (FWRC).



Yellow lines: roads

Black lines: property lines

White lines: DEM-derived flow channels requiring a minimum of 1 ha upslope water-contributing area

Blue shading: cartographic depth to water
0 (dark blue) to 1 m (light blue); generally correspond to soil drainage from very wet to moderately well (end of summer condition). Starts with DEM-derived flow channels requiring a minimum of 4 ha upslope water-contributing area

Blue polygons: lakes, pools

White polygons stippled green: wetlands

Red dots: road/trail stream crossings

Numbers: watershed area in ha above road/trail stream crossing dots, in ha

Green dots (sometimes overlaid by red dots): NS recognized culvert locations

Background: Google earth image

Figure 8. Excavated areas (yellow thin line), proposed footprint (red), previous footprint (magenta), laid over Golder Associates wetlands map (wetlands are shaded blue), also showing flow channels derived from LiDAR DEM (white lines) (Forest Watershed Research Center).

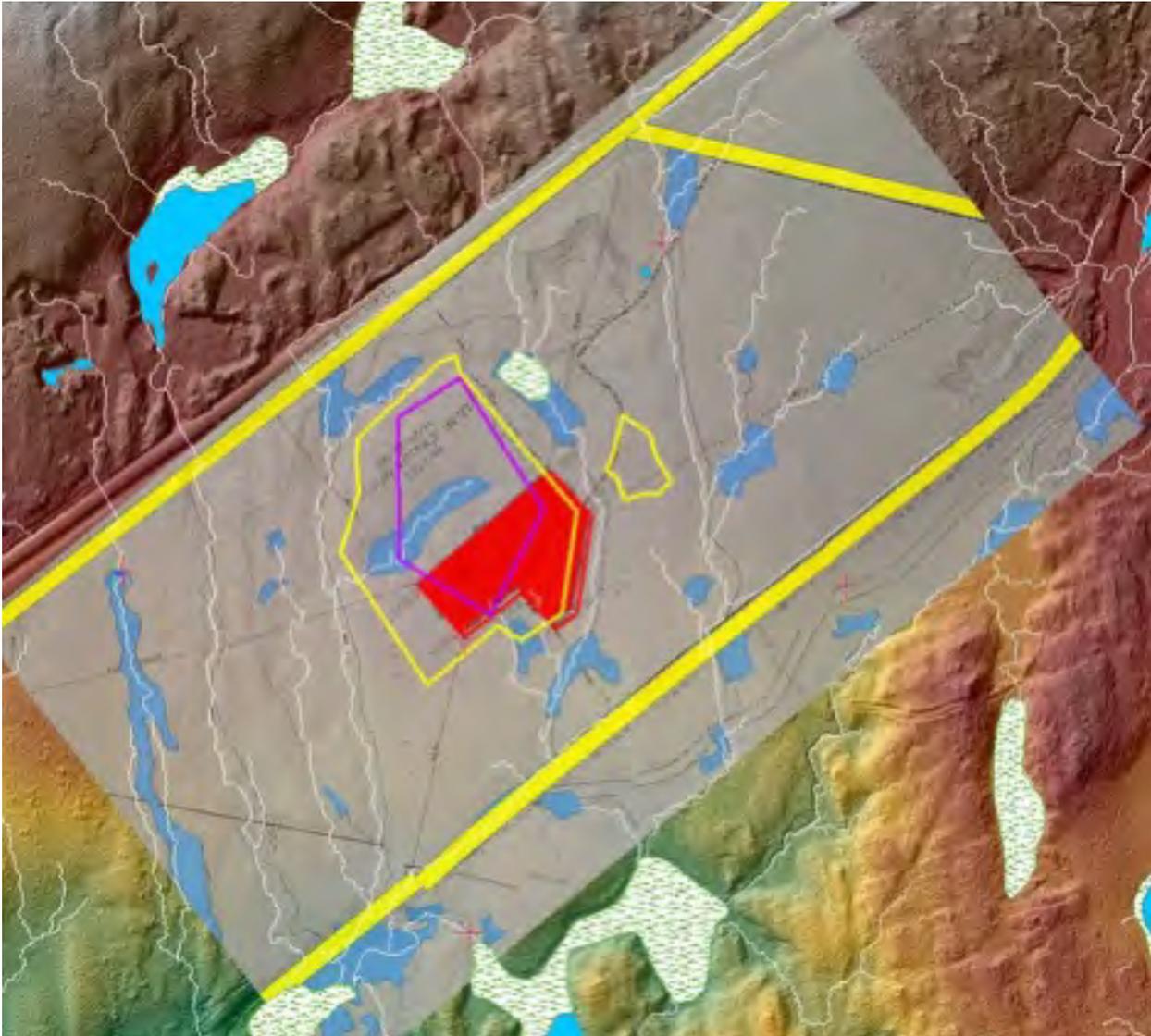


Figure 9. Three-dimensional image showing grade, water drainage, excavated footprint (yellow line), footprint in current application (red line) and previous footprint (available on Scotian Materials website; magenta line) (FWRC).

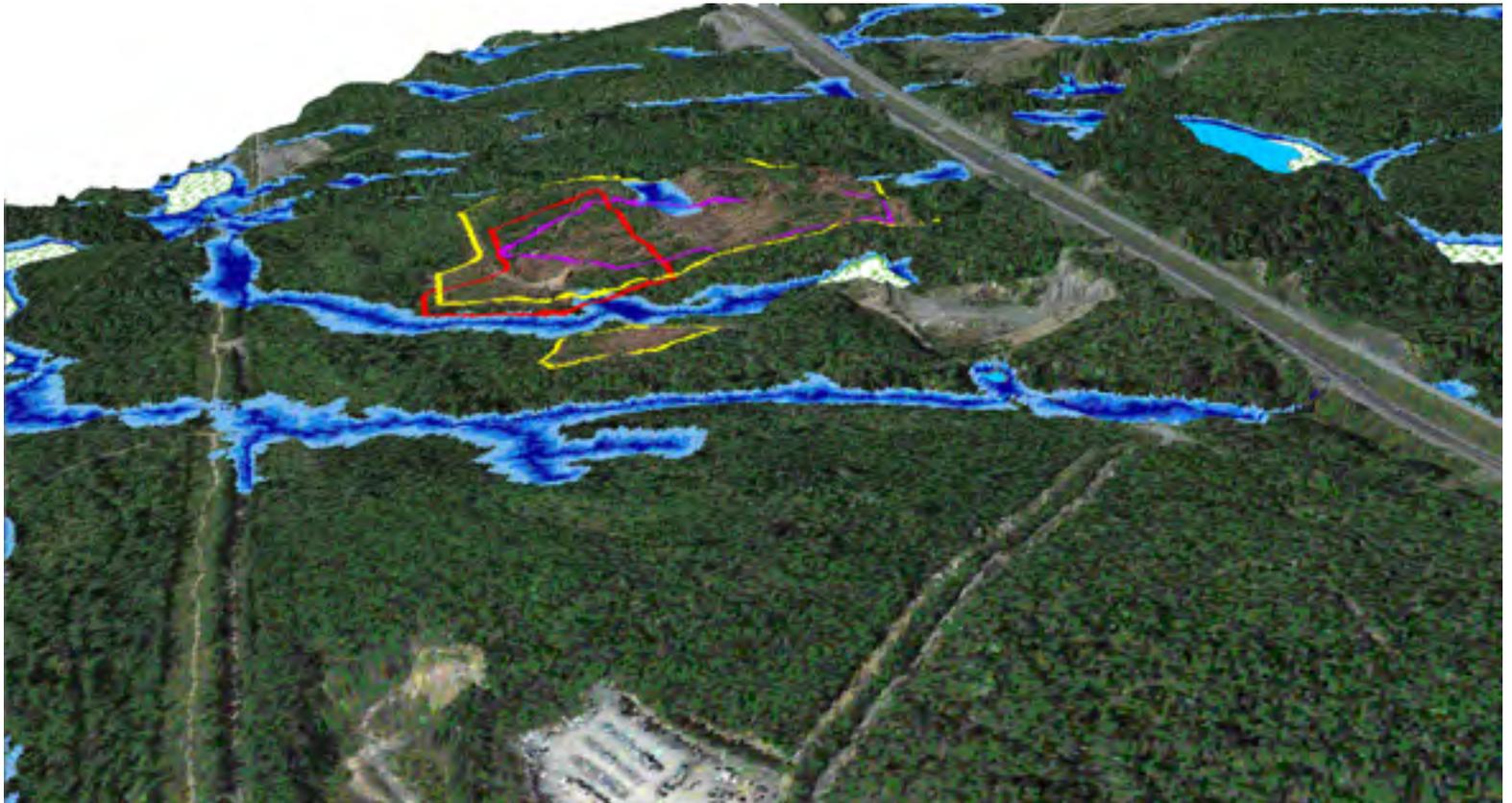


Figure 10. Wet Areas Mapping and flow channels on LiDAR derived Digital Elevations Mapping, with hill-shading, both with elevational gradients and Google Earth imagery, for visual relevance (FWRC).

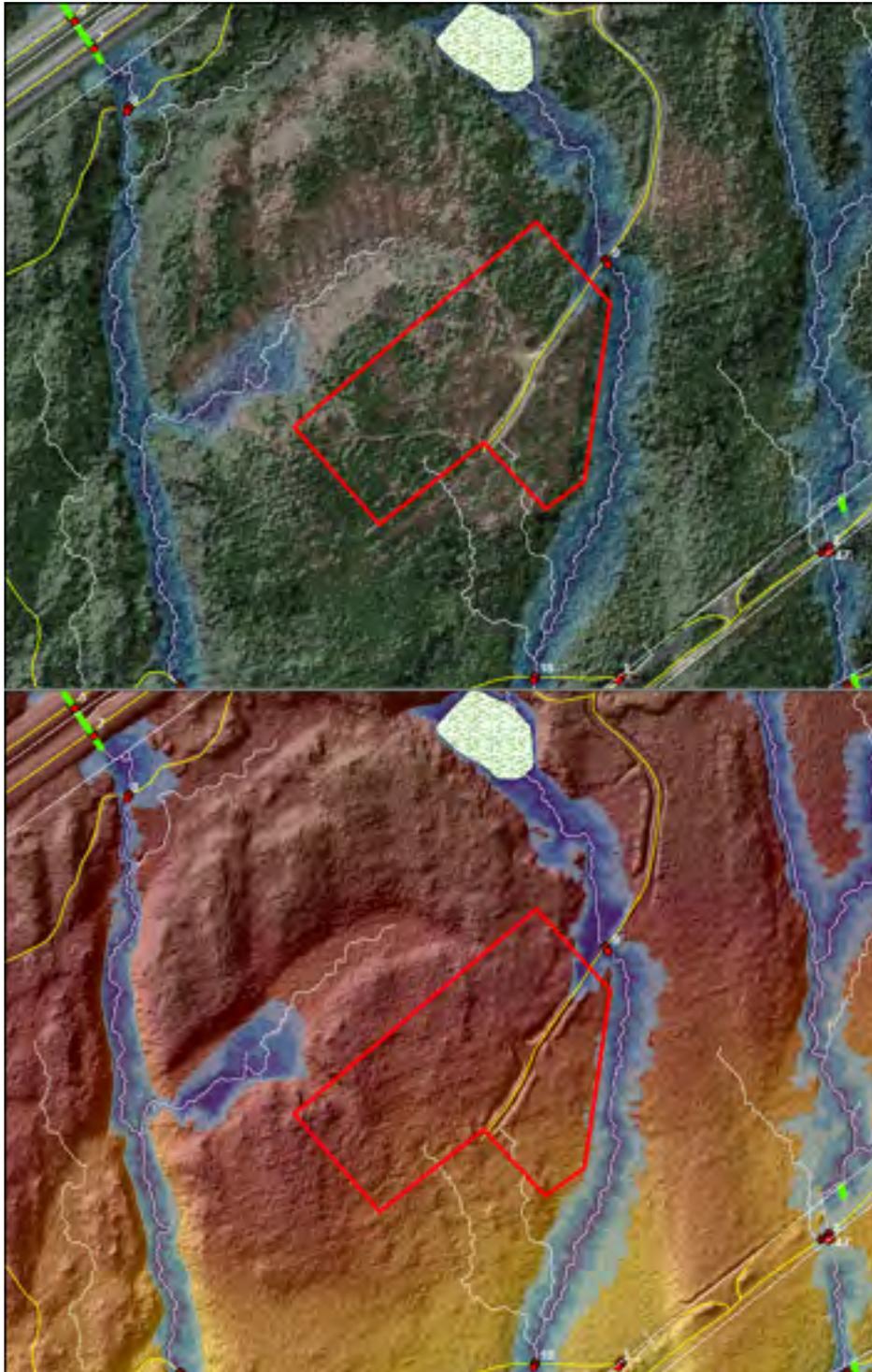


Figure 11. Coordinate-mapped proposed footprint laid overtop LiDAR DEM, flow channels and Golder Associates delineated wetlands (FWRC).

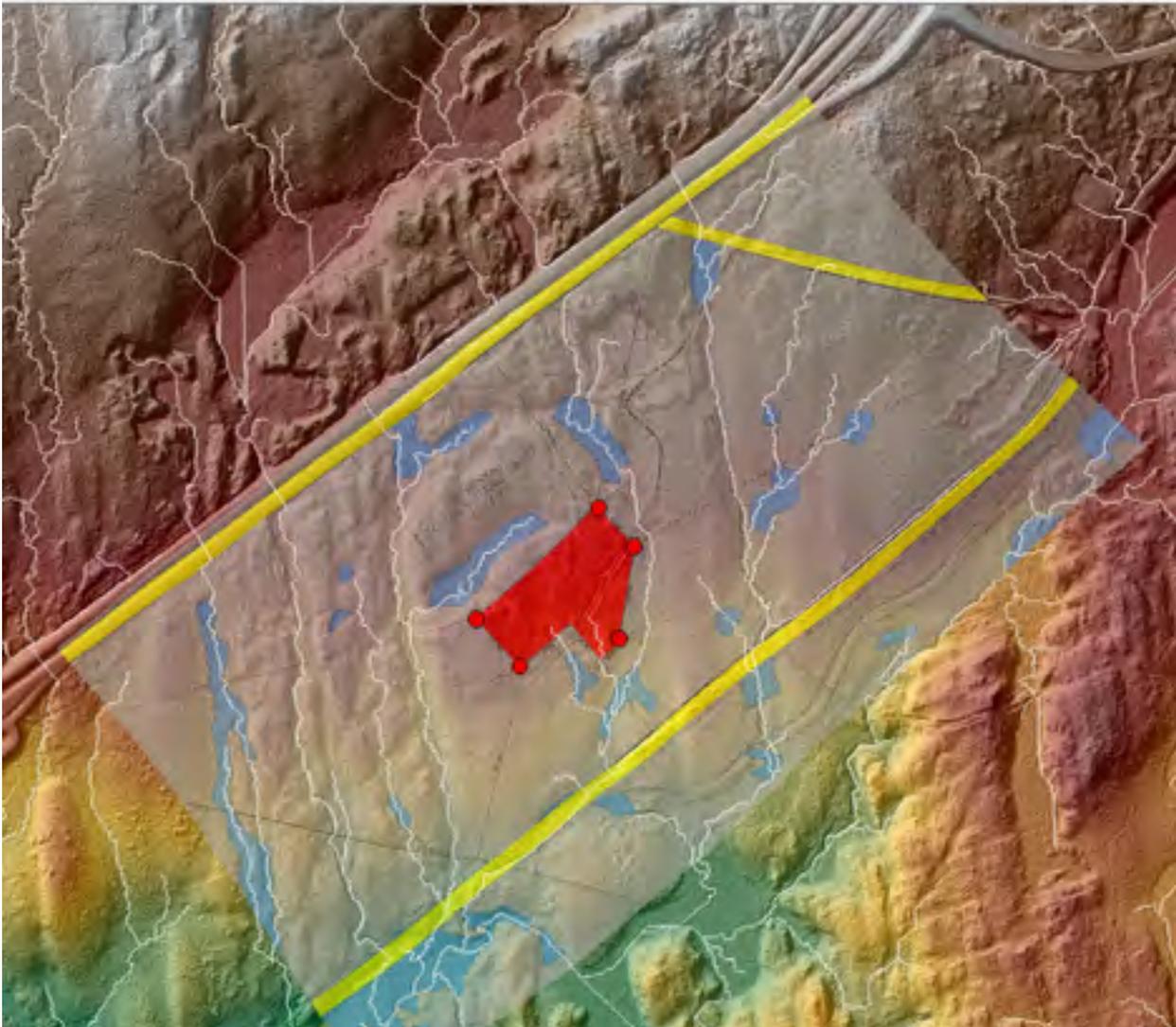


Figure 12. Elevations, at surface and intended quarry depth, and depths of water table in nearby wells (Forest Watershed Research Center).

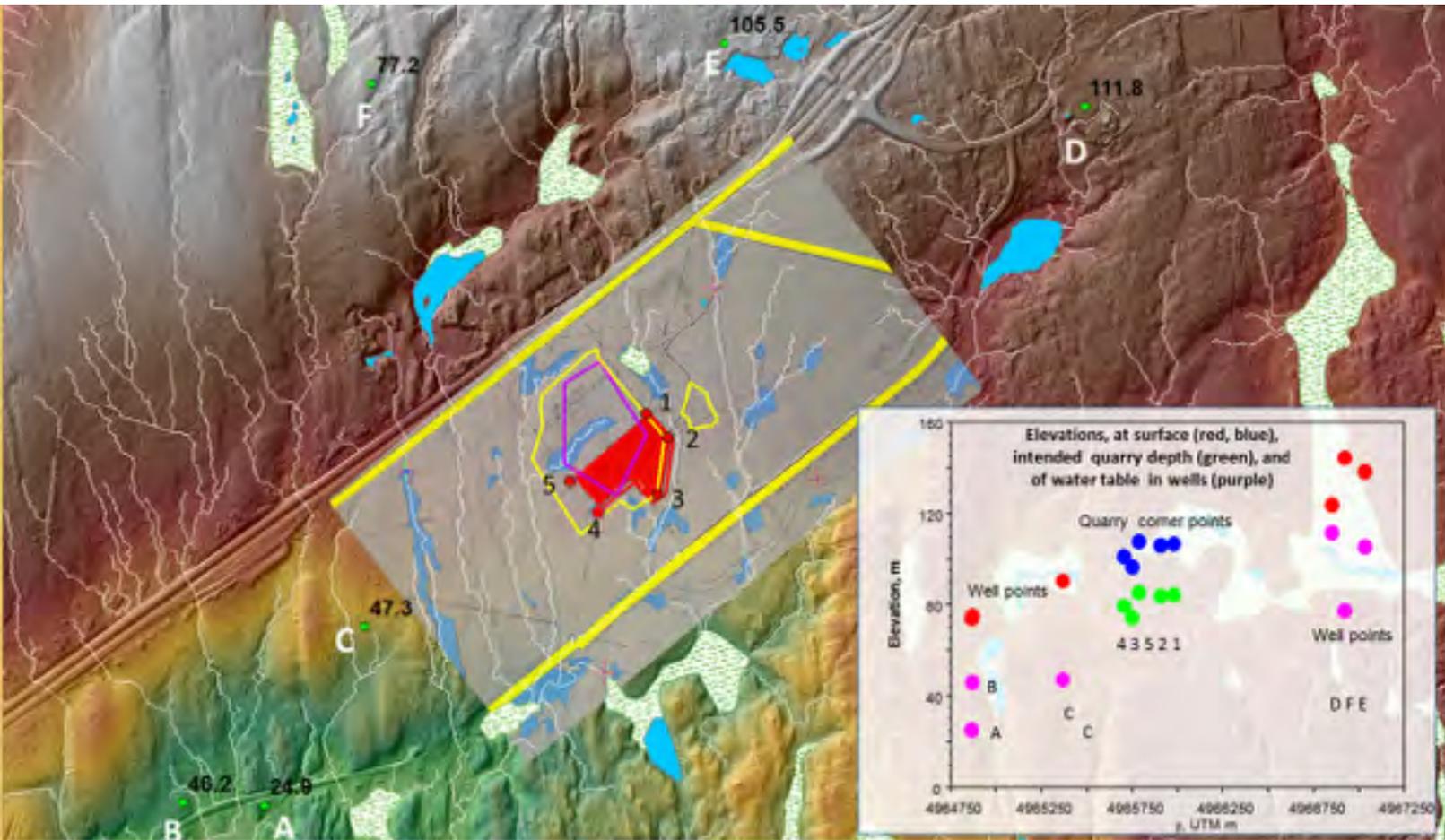


Figure 13. Landscape material found embedded in the bank just northeast of Wetland “A” at position 14 in the red-circled area of Figure 3 (writer’s photo taken April 13, 2016).



Table 1. Elevations, at surface and intended quarry depth, and depths of water table in nearby wells (Forest Watershed Research Center).

Quarry corner points	northing	easting	x	y	Elevation at surface	Intended quarry depth	Elevation of intended quarry bottom
					m		
1	4967739.107	5574076.781	455514.973	4965977.0	106.4	22.0	84.4
2	4967671.312	5574138.599	455575.508	4965908.5	105.9	22.0	83.9
3	4967510.668	5574113.014	455546.971	4965748.0	96.5	22.0	74.5
4	4967461.107	5573939.166	455372.298	4965702.0	101.3	22.0	79.3
5	4967544.383	5573863.231	455297.939	4965786.5	107.8	22.0	85.8

Wells		x	y	Elevation at surface	Depth to watertable in well	Elevation of watertable in well
				m		
0	A	454428.747	4964864.566	73.9	49.0	24.9
1	B	454198.586	4964870.703	75.2	29.0	46.2
2	C	454714.146	4965370.919	90.3	43.0	47.3
3	D	456764.108	4966854.687	123.8	12.0	111.8
4	E	455739.127	4967032.677	138.5	33.0	105.5
5	F	454732.559	4966918.825	144.2	67.0	77.2

Appendix A. Scotian Materials website showing public acknowledgement of wetlands monitoring plan and site clearing (screenshots taken April 16-19, 2016 from <http://www.scotianmaterials.info/questions--answers.html> and <http://www.scotianmaterials.info/project-overview.html>).

Question

Where will the quarry be located?

Answer

The proposed quarry is located in Goffs, Halifax County on PID 00505941 near Exit 5A on Hwy 102 and the Aerotech Industrial Park. The property has frontage on Perrin Drive to the east and it is bound by Highway 102 and Aerotech Drive to the northwest. A fencing company occupies a small portion of this land, with a short driveway to Perrin Drive connecting directly with Aerotech Drive.

Question

What will be the impacts to the watershed and wetlands in the area?

Answer

Scotian Materials commissioned a number of field surveys across the properties purchased in the vicinity of the proposed quarry to support plans for various types of potential developments (e.g., commercial, residential, industrial). Surveys were conducted for wetlands and vegetation communities, surface water and fish / fish habitat, and wildlife. The boundary of the proposed quarry footprint was selected to avoid wetlands and watercourses and to optimize the resource available and access to it. As specified in the Pit and Quarry Guidelines (NSEL 1999), a 30 metre buffer will be maintained between the quarry footprint and all watercourses and wetlands identified. Surface water discharged from the site will be treated in a settling pond for removal of suspended sediment prior to discharge.

Scotian Materials has set up a wetland monitoring program to monitor these features on a regular and ongoing basis.

Site Preparation and Construction

Site preparation and construction typically will begin with clearing trees, grubbing (i.e., removal of stumps), stripping of topsoil, and removal of overburden, however the site has been cleared, grubbed and stripped based on a previously issued approval from NSE. Stockpiles will be stabilized with hydroseed and/or straw mulch to minimize erosion and sedimentation for subsequent use during site reclamation.

To the extent possible, surface flow will be directed around the site and/or away from disturbed areas. Quarry drainage and surface runoff collection and controls will be in place for the quarry at the commencement of construction. The settling pond will be designed to hold a sufficient volume of water to allow for settling of suspended sediment. Overflow from the pond, if any, will be directed to a vegetated area (on lands owned by Scotian Materials) for further filtration. Any water discharged will be monitored and reported in compliance with NSE regulations.

Site preparation and construction work will continue once all required permits are obtained.

Appendix B. Page 7 of Goffs Quarry 2016 application showing the site preparation occurred "in October 2015" according to the proponent.

**INDUSTRIAL APPROVAL APPLICATION FOR GOFFS QUARRY:
SUPPLEMENTAL INFORMATION**

1.4 Project Activities

1.4.1 Site Preparation and Construction

Site preparation and construction occurred in October 2015, under a previous Industrial Approval No. 2015-093150. This work included clearing trees, grubbing (i.e., removal of stumps), stripping of topsoil, and removal of overburden. Stockpiles will be stabilized by hydroseeding and/or the application of straw mulch to minimize erosion and sedimentation for subsequent use during site reclamation. To the extent possible, surface flow will be directed around the site and/or away from disturbed areas. Quarry drainage, and surface runoff collection and controls, will be in place for the quarry at the commencement of operation. Two sedimentation ponds will be designed to hold a sufficient volume of water (i.e., 1,091 m³ and 2,108 m³ in ponds A and B, respectively) to allow for settling of suspended sediment (see Appendix C).

Sedimentation Pond A will collect all runoff associated with the overburdened stockpiles and will discharge to a vegetated area to the south (on lands owned by Scotian). Pond A will be decommissioned when this area is actively quarried. The surface water collected in Sedimentation Pond A will be redirected toward Sedimentation Pond B via site sloping and ditching, which will be expanded to provide storage for the additional runoff.

Sedimentation Pond B will collect all runoff associated with active quarrying limits. Water in this pond will be held until its Total Suspended Solids (TSS) complies with the NSE Pit and Quarry Guidelines for effluent discharge (NSEL 1999). The water will then be pumped to a riprap splash pad where it will re-enter the natural environment.

A fueling and vehicle maintenance area will be constructed and will consist of a clay-lined containment area enclosed within side curbs and a sloping floor. This will contain any inadvertent spills or leaks during fueling and / or vehicle maintenance. Equipment operators will remain with the equipment at all times during refueling in accordance with the Petroleum Management Regulations of the Nova Scotia Environment Act.

Site development will continue once all required permits are obtained.

1.4.2 Quarry Operations

The proposed Project activities will be consistent with industry standard practice and will be in accordance with the NSE Pit and Quarry Guidelines (NSEL 1999). These guidelines apply to all pit and quarry operations in the province of Nova Scotia and provide: separation distances for operations, including blasting; liquid effluent discharge level limits; suspended particulate matter limits; sound level limits; and requirements for a reclamation plan and security bond.

Aggregate production will begin with drilling and blasting. Drilling and blasting will be conducted by an independent, licensed contractor who will be responsible for blast designs and methods in accordance with the General Blasting Regulations pursuant to the Nova Scotia Occupational Health and Safety Act (1998). Further, all blasting activity will be conducted in accordance with the Pit and Quarry Guidelines (NSEL 1999). A typical blast design is provided in Appendix D.

It is anticipated that blasting could occur 4 to 6 times a year based on the proposed production rate of 200,000 tonnes per year.

The frequency of blasting is based on the ^{from 8-10} aggregate supply contracts awarded (i.e., supply and demand). Similarly, the number of loaded trucks hauling material from the Project site is also based on aggregate supply contracts.

Appendix C. Page 12 of Goffs Quarry 2016 application showing wetland “boundaries were confirmed” after clearing activities between September and October 2015, and that monitoring of wetlands “will continue.”

 **INDUSTRIAL APPROVAL APPLICATION FOR GOFFS QUARRY:
SUPPLEMENTAL INFORMATION**

3.3 Wetlands Monitoring Program

Under previously submitted Industrial Approval Application, Scotian has developed a monitoring program for effects of quarry development on wetland habitat and groundwater levels (the Monitoring Program). With consideration to the proximity of wetlands up-gradient of the Project, the Monitoring Program was designed to meet the following objectives:

- Monitor changes to wetland boundaries and vegetation through annual delineation and vegetation community assessments.
- Record groundwater levels over the course of the Project on a quarterly basis, from piezometers installed within and adjacent to nearby wetlands.
- Record surface water levels within each wetland over the course of the Project on a quarterly basis.
- Minimize / avoid ground disturbance.

Between September and October, 2015, Scotian completed the pre-development phase of the Monitoring Program, to establish baseline information. Wetland boundaries were confirmed in habitats adjacent to the proposed Project footprint, using vegetation, soil, and hydrology as wetland indicators. As illustrated in Figure 3, Wetland 3 and Wetland 4 showed sign of increased saturation (i.e., flooding) due to clearing activities in the vicinity of the Project. The function of Wetland 3 and Wetland 4 remains consistent with the previous assessment completed by Golder in 2012. Short-term effects related to clearing of vegetation have resulted in changes to hydrology and soil indicators. Monitoring of wetland habitat will continue throughout the development and operation of the Quarry in consultation with NSE.

Vegetation community assessments were also conducted within the wetlands, via a system of quadrats and transects. Piezometers were installed in a configuration that allows for simple comparison between water levels inside and outside of wetland areas. Lastly, surface water levels within the wetlands were recorded using staff gauges installed in wet areas. These data will be correlated with the baseline information and future recordings to develop seasonal trends, and to show the effect of quarry operations, if any.

STOP the Fall River Quarry

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www.stopthefallriverquarry.com

Honourable
Minister of Environment
Nova Scotia
Canada

To the Honourable Minister of Environment, Margaret Miller,

We do not accept your recent responses to our group members' complaints of wetland destruction at the Goffs Quarry proposed site as complete. We take issue with the following items, in particular, which you have not addressed:

1. You have indicated the Google Earth images of the proposed site from September 5, 2016, "*show **tree harvesting** in a wetland identified in the Wetland Monitoring Plan,*" and that an approval is not required for tree harvesting. The images clearly indicate more than "tree harvesting," which would leave most ground conditions intact, with stumps and brush left behind. Isn't your department interested in determining why the wetland area needed to be not only tree-harvested but grubbed and cleared of brush and expose the soil?
2. You have referenced the Google Earth images only. Are we to assume that it was felt unnecessary to do a **site inspection** to determine the extent of the damage to the wetland, whether the flow of water was altered in the wetlands (a designated activity under the Environment Act), nor whether the functionality of the wetlands remain intact? If a site inspection has been conducted, we request the date of such, so it is not confused with other site inspections which have taken place. If a site inspection has been conducted, we don't see why Scotian Materials and Nova Scotia Environment wouldn't want to share photographs taken at ground level to show the public that our concerns are unfounded.
3. You have not addressed the issue surrounding the date of these images. These images were captured by Google Earth **ten days prior** to an industrial approval being issued. Under S.31(1) of the Environment Act, no person shall commence work on the undertaking until the proponent has been notified in writing by the Minister that the undertaking is approved. Contained within the file should have been an email from Nova Scotia Environment stating that no site preparation will take place prior to an approval. Our group holds a copy of this email and yet it has never been included in any FOIPOP request nor court submissions regarding

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the Goffs Quarry application, along with hundreds of other pages also not included in court documents. The shape, size and location of the clearing, along with the application, leaves no question that *this was site preparation*.

4. You have not addressed the question of **why any activities** would take place in wetland areas. As you have referenced in your letter, the muddy wetland was included in a wetland monitoring plan by Scotian Materials. Isn't Nova Scotia Environment interested in investigating why clearing activities took place in an 11.6ha area, including wetland areas, rather than in the 3.9ha proposed footprint only, which was proposed to be located south of this wetland so as to *minimize disturbances* to the wetland areas?
5. We can quote multiple places in the file that state there is **exposed soil** at the site. Isn't the Minister interested in where the exposed soils are located for erosion purposes as well as investigation of our complaint?
6. You've stated your investigator's response on the telephone in reference to the environmental complaint of wetland destruction was a result of a miscommunication. However, there was no such miscommunication. The investigator was told within the first 30 seconds of the conversation that a letter with images had been submitted. The investigator acknowledged this statement. More than one of our members was present for the conversation, which took place on speaker phone. Our member's complaint about this investigator was her lack of concern, her suspiciousness, and her statement that this complaint "may or may not be investigated." **Your response appears to indicate that the department will not investigate.** We request this in writing.
7. You have not addressed our complaint which is the wetland areas are the areas **most heavily excavated**. Please see the images on the two last pages. Isn't your department interested in investigating why the wetland areas appear specifically targeted, rather than excavation of the proposed footprint, which was supposed to have a setback to these wetlands?
8. A wetland assessment was recently ordered. You have not addressed our complaint that these activities will **prevent a proper wetland assessment** from determining the size and functionality of the wetlands on the property because delineation methods rely on locations and types of plant life.
9. From your letters it appears you are also not concerned about the lack of "best management practices" for tree harvesting to minimize damage, a phrase you used in your letters. If you are still satisfied with your response to our group members after considering the 7 points above,

we ask for your confirmation that wetlands in the Province of Nova Scotia, in municipal watersheds or elsewhere, whether they are habitats or not, may be legally tree-harvested by bulldozer by any proponent, leaving ground conditions as seen in the September 5, 2015 Google Earth image of the proposed Goffs Quarry site, without fear of reprisal from Nova Scotia Environment, and that this activity as described is not considered to be “wetland alteration.”

Wetland non-footprint area (top), and non-wetland footprint area (bottom) part of the cleared property in Goffs, September 5, 2015:



