

**Goffs Quarry Community Liaison Committee – Meeting Minutes
Meeting 2**

Thursday September 14, 2017 6:00 P.M.-9:00 P.M.

Members in attendance:

- Sean MacLean, Maritimes Northeast Pipeline
- Bud Baker, Resident
- Greg Hughes, Clean Earth
- Bill Horne, MLA
- Dean Bouchard, Airport,
- Mimi LeCain, Resident,
- Rob MacPherson, Scotian Materials
- Janet MacMillan, NATIONAL
- Anna McCarron, SWEPS
- Martin Zwicker, Resident,
- Kerri Irwin, Resident,
- Angela Dicker, Resident
- Jason Crowell, FRABA
- Tom Mills, SWEPS

Regrets:

- Mark Web, Scotian Materials
- Steve Streach, Local Councillor

Others Present:

Janet MacMillan - NATIONAL (facilitator)

Andrew Blanchette - NATIONAL (administration)

Meeting Minutes

The meeting began with a tour of the Goffs Quarry site, the asphalt and concrete plant site, and the future Scotian Materials office site.

Rob MacPherson conducted the tour, and answered questions about the location, planned logistics for traffic and operations that are set to take place once the quarry is operational.

1. Call to Order

Janet MacMillan, Chair, led the meeting by requesting the approval of the minutes from last week.

Kerri and Bud approved the minutes of the following meeting, and the motion is carried

The minutes are uploaded to the CLC website and are now available.

2. Welcome/Introductions

Members of the committee re-introduced themselves, and provided perspective as to why they are serving on the committee.

3. Proceedings

- Presentation given by the Golder Associates Ltd. Team

Phyllis McCrindle and Sean McFarland

Phyllis introduces herself with her schooling and her 19+ years of experience as a hydrogeologist with pits, quarries and mines. Sean introduces himself as a senior hydrogeologist with an overview of his 30 plus years of experience and including his work in pits and quarries.

Sean clarifies the role of Golder as a resource and says he can be asked anything that the group is thinking.

Sean says that the process for his work is to work with the client and then meet with the public, and he is opening himself up to the scrutiny of the site and its water quality.

Presentation begins, Phyllis highlights the different deposits on the site. She shows the private wells around the site and the surrounding rock formations.

Phyllis highlights the boreholes and the wells from the NSE on the EIA. A borehole is a test well, they are drilled through overburden, where it exists, and into the bedrock and then installed with wells, the wells are measuring the water levels and the water quality samples collected from the different geological horizons.

The baseline samples, pre-quality and pre-blasting, are used. The water table is anywhere from 1-5m, below ground surface. The monitoring wells go down to about 25 to 30 m deep and below the base of the quarry from 5-8m. The well that's in the center of the quarry is shallower at about 10m deep.

Sean clarifies the boreholes and the process for monitoring and the levels of elevation in these boreholes.

Groundwater flows from higher elevation to lower elevation, and it can be contoured to show the direction of groundwater flow. The hydraulic gradient, which is downward hydraulic gradient in the wells and is interpreted based upon the water levels measured in the wells.

Sean discusses the zone outside of the quarry that is undisturbed. Bill asks if you have to keep doing the readings after the blast, and the answer is yes, according to NSE IA requirements testing is weekly all months except for Dec-March which is monthly.

Sean begins to talk about blasting.

With normal blasting techniques in a quarry, there are 10 m around the quarry that gets fractured that looked like a fractured skin, and what happens is outside of that is the natural groundwater outside of the skin that flows and then stops, based on the information from our blasting experts

The water that flows in from the sides of the quarry mixes with any overflow from surface water that isn't diverted, then it is mixed in with rainfall, then you pump it out or gravity drainage and 90% of the time you have to pump the water. There isn't a single quarry above the water table that Sean is aware of that achieves 100% gravity drainage, without any pumping.

Sean talks about ground waterflow how to control groundwater that enters the quarry which is typically pumped from the quarry along with precipitation as in the Goffs quarry.

Bill asks about the chemistry of what's on the ground and what's below the surface, does it vary? Sean says it's similar, but rock-water interaction in contact with the fractures leads to an equilibrium state, and what is seen is that the shallow groundwater that is recharged by rain water more frequently results in lower concentrations compared to the deeper groundwater.

Sean indicates that looking at the other quarries in NS that he is aware of, Scotian tested with more deep wells and more tests which is especially impressive by NS standards. Janet asks what the minimal requirement is, referencing other quarries in NS. Sean responds saying the ones that he looked at didn't have multilevel wells like Scotian installed and tests for, and some sites did not have any wells at all. These Goffs quarry monitoring wells allow Golder to understand the hydrogeology and use the data to predict a groundwater radius of influence.

Sean indicates that this quarry has been highly vetted, and the hydrogeologists in NSE did consultation on groundwater, bioscience, wetlands.

The quarry will be continuing to monitor as the quarry expands, and that if something happens they will restore the water supply in the wells. The quarry will monitor groundwater levels, as the quarry expands they'll be measuring the levels in the wells in order to see how closely that matches the estimate groundwater radius of influence.

Martin asks about the figure for radius of influence - is it static dynamic and what the factors that lead to it are? Sean says an average value is used for the hydraulic conductivity, other inputs into the calculation are precipitation and the depth of the quarry floor. This groundwater radius of influence estimate assumes the full extraction of the quarry while in reality the quarry will be extracted piecewise.

The groundwater radius of influence is estimated to be 211 m from the edge of the quarry boundary.

The location of the monitoring wells, one is inside the quarry, the ones on the edge and the more distal wells will remain, and the private wells will also be tested.

Sean touches on the assumptions, which includes the permeability of the rock. The groundwater radius of influence estimate assumes that everything is permeable the same throughout the rock, while in fractured rock that tend to not be the case, there is a fracture network that carries on for a while then it peters out.

The groundwater radius of influence is anticipated from full extraction, and gives time to refine and do testing as the quarry expands. The actual radius of influence will not be as smooth and uniform as the line shown on the figure. It will tend to bend in and out and not be uniform, and be a smaller radius of

influence in some areas. The actual radius of influence will be determined based on the groundwater level monitoring.

The groundwater radius of influence, from a quality perspective, is not anticipated to have an impact due to quarrying activity.

Rob clarifies that the normal sequence is that once you encounter groundwater, you have to do the monitoring. Rob says that they've done the work in advance.

Rob says that there are certainly people that live here invested in their homes and that's their house and what assurances can be made. Sean says that what is always done is a monitoring program for a quarry, and that if houses are all around it, century wells in between the houses and the quarry will monitor anyway, prove it, check it, and the quarry is responsible for providing water supply if it is impacted.

Martin asks if the monitoring reports will be available to the public. And he says that they've discussed and after the last meeting it was raised about how soon information can be released and a report needs to be compiled to make sense of the data.

Sean talks about how he's dealt with wells within the impact zone, and that this situation has the closest wells kilometers away.

- Next Meeting

A meeting time for the next session is agreed upon and will take place with a surface water expert from Golder Associates. There will also be a future meeting held with a blasting expert.