May 21, 2009

Ref. No.: 04-233-6

Friends of the Rural Communities and Environment (FORCE)
c/o Lawson Park Ltd.,
P.O. Box 15, R.R. #1
Freelton, Ontario L0R 1K0

Attention: Graham Flint, Chair, FORCE

Re: Aquatic Environment Review of Aggregate Resources Act Application, St. Marys Flamborough Quarry Site, City of Hamilton

Dear Mr. Flint,

Please accept this letter as Aquafor Beech Ltd.'s report on the aquatic envrionment review of the Aggregate Resources Act (ARA) Application and supporting documentation for the proposed Flamborough Quarry submitted by St. Marys Cement (Canada) Inc. The St. Marys Cement property is the site of a proposed Quarry is to be developed in the Amabel Formation dolostone to depths of about 36 to 40 m in Part of Lot 1, and Lots 2 and 3, Concession 11, geographic Township of East Flamborough, now the City of Hamilton.

The ARA Application was initially submitted to the Ministry of Natural Resources (MNR) on January 22, 2009 and following resubmission on February 13, 2009, was found by MNR to be complete on March 3, 2009. Because the proposed Quarry will be excavated below the water table in a very permeable bedrock formation surrounded by sensitive surface water-related ecological features and groundwater supplies, there are important hydrological and hydrogeological issues associated with the Application that are raised in the review letter submitted by Intera (Mr. K Raven, May 17, 2009). These issues raise significant questions concerning the impacts on the aquatic environment, both in the immediate vicinity of the site as well as regionally, as are outlined below.

This review letter, focuses on reviewing the ARA Application and primary supporting environmental and hydrological documentation:

- Aggregate Resources Act Summary Statement, St. Mary's Flamborough Quarry, St Marys Cement Inc. (Canada) Inc., report prepared by Glen Schnarr & Associates Inc., February, 2009.
- Hydrological Level 2 Technical Report. St. Mary's Flamborough Quarry. Stantec 2009
- Natural Environment Level 2 Technical Report. St. Mary's Flamborough Quarry. Stantec and Savanta 2009

- Hydrogeological Level 2 Report – St Marys Flamborough Quarry, Volume 1, Report prepared by AECOM Canada Ltd. for St. Marys Cement (Canada) Inc., February 26, 2009.

This report was prepared by Brian Hindley, MSc., Environmental Studies Specialist, Aquafor Beech Ltd.

AQUATIC ENVIRONMENT AND SURFACE WATER REVIEW COMMENTS

Regional effects on Flamborough and Mountsberg Creeks: While considerable attention has been paid to examining the offsite impacts of groundwater changes on the Carlisle well, little attention has been directed at assessing the potential impacts on groundwater discharge to Flamborough and Mountsberg Creek offsite, although there is recognition that offsite groundwater effects may occur. This is particularly likely given Intera's review that suggests that the complexity of the Amabel formation has been inadequately characterized in groundwater modeling. Although both Flamborough and Mountsberg Creek are significantly impacted by the cumulative effects of thermal warming from various online ponds and reservoirs, they still are considered to support cool/cold water fish communities downstream of the site. In this regard, any existing sources of groundwater discharge to these watercourses must be considered significant and of paramount importance to be protected.

Tributary A effects: Tributary A drains the Provincially Significant Wetland and provide contributory drainage to Mountsberg Creek, to the extent that it is considered to be the major source of flow to the reach of Mountsberg Creek adjacent to the site and a significant source of baseflow to Mountsberg Creek. The proposed quarry will eliminate approximately 25% of the surface drainage of this feature, which will become part of the quarry operation. Estimates of base flow contribution of Tributary A to Mountsberg Creek are in the order of 8 – 10 l/s and average flows are in the order of 100 – 300 l/s, however these measurements were determined in 2007, a drought year in southern Ontario. Actual baseflows may be significantly higher. Tributary A is also identified as supporting cool water fish species, and is recognized as providing cool/cold water refugium to fish species in Mountsberg Creek. Though the groundwater discharge from Tributary A is small, it must be considered significant, in that any further loss of sources of groundwater discharge to Mountsberg Creek may result in loss of its status as a cool/cold water fishery.

The loss of 25% of the drainage area of Tributary A is significant. It is not clear what role surface runoff and the maintenance of existing flows in Tributary plays in the maintenance and support of the PSW. Simply replacing the surface flow volumes through some form of pumping system cannot ensure that the natural flow system is maintained. It is not clear from the documentation how this will be accomplished.

The proposed GRS Technology suggests that large volumes of water will be pumped into recharging wells to maintain existing water tables. It can be expected that groundwater temperatures will be modified by these surface water volumes that will be pumped back into the ground. The probable result will be an increase in summer groundwater temperatures and a decrease in winter groundwater temperatures, however there is limited discussion on this impact. It is also unclear whether groundwater flow direction as well as elevation will be properly maintained. Intera notes that short circuiting of the groundwater system may occur where flows will move back towards the quarry rather than in the direction of the watercourses.

It is difficult to understand how pumping such large volumes of water to recharge groundwater will effectively maintain what is acknowledged to be a microscale groundwater discharge system, supplying in the order of 10 – 15 l/s of discharge into Tributary A and Mountsberg Creek and what thermal effects may occur if more significant discharges occur.

Tributary F effects: While the surface drainage to Tributary F will be eliminated, there is a small seasonal groundwater component within Tributary F (either onsite or just offsite) that will also be lost. The comments regarding Tributary A groundwater effects are also relevant to Tributary F.

Tributary D effects: The report suggests that an average discharge of 23.7 l/s will be released to Tributary D as part of quarry operations and that this quantity is within typical flows for the tributary. There needs to be better resolution/description of how this flow is distributed throughout the year and what the range in flows are to ensure that there are no impacts to the channel characteristics and capacity of Tributary D, an intermittent feature. There needs to be an assessment of the fluivial geomorphological characteristics of Tributary D to ensure that the proposed discharges can be accommodated. In addition, it is not clear, exactly what the impact is on this re-distribution of flows to Mountsberg and Flamboro Creeks

Function of the GRS Technology and Adaptive Management Program: The proposed GRS system lacks sufficient detail and analysis to specifically show how loss of drainage area and loss of groundwater discharge to Tributaries A and F will be mitigated. While it may be possible that this system can achieve the pre-development water table elevations, it is clear that there is a substantial amount of "recirculating" of groundwater back to the quarry. It is not clear whether in fact there will continue to be an upward gradient or discharge of groundwater to Tributary A, for example, that will ensure that this tributary continues to provide a source of groundwater and a cool/coldwater refuge to Mountsberg Creek. The direction of groundwater movement also is difficult to monitor and it is apparent from Intera's comments that short circuiting could reverse groundwater flow patterns. These are micro-scale effects that are not easily modeled in our opinion. As noted above, it is not apparent how this system will address offsite or regional groundwater discharge patterns within Mountsberg and Flamborough Creeks. As noted previously, these watercourses are at risk of losing their cool/coldwater fishery status, if any further losses of groundwater discharge or thermal alteration of groundwater discharge occurs.

Adaptive Management can be generally defined as: "learn by doing" management. It accepts that management actions may be implemented based on incomplete knowledge (based on conservative assumptions), provided that the consequences of the action are closely monitoring with a feedback (reporting) mechanism that allows the management action to be modified if predicted effects are not being realized. This "loop" of implement, monitor, feedback, modify and re-implement is adaptive management. This approach avoids the trap of using lack of knowledge as a reason for inaction until undesirable consequences are irreversible." Based on our review, there are two key principles of the Adaptive Management Approach that are not met with the proposed GRS system:

- Proof of Concept – the GRS system is not a proven mitigation system in the context it is being applied at the Flamborough site. In fact, based on Intera's review, there is evidence based on pilot studies that it will fail.
- Implement based on Conservative Assumptions: in our view, there is insufficient evidence that the GRS system will work and the first step would be to undertake a pilot scale test. The risk of

failure has significant environmental consequences and the proposed monitoring program lacks sufficient detail on both what would trigger a cessation of activity and on what further mitigation would be undertaken in order to remedy potential environmental effects.

- Environmental Pathways: It is not clear whether all of the linkages have been identified in terms of potential impacts and the ultimate environmental receptors. This is key to establishing a comprehensive environmental monitoring program to ensure that unanticipated impacts are identified as early as possible.

Rehabilitation Plan: The proposal to rehabilitate the quarry to a lake would seem to be inconsistent with the general priniciples for rehabilitation. It would seem that leaving the existing aquifer system directly exposed to a large surface water feature may be less desirable that restoring the property to its current land use condition. There is no information provided on how this feature is or is not linked to the existing drainage systems (Mountsberg and Flamboro Creeks) or what impacts it may have on stream function and cool/cold water fishery status. It is also not clear what impact this feature would have on groundwater systems.

In conclusion, it is my opinion that this application as proposed will have significant, or at least unknown, environmental effects and should not proceed.

Yours sincerely,

Brian Hindley, MSc.
Environmental Studies Specialist