Gartner Lee Limited

September 28, 2006

Ministry of the Environment
Attention: Permit to Take Water
Environmental Assessment and Approvals Branch
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario M4V 1L5

cc: Elizabeth Payer, P.Geo., Hydrogeologist
Ministry of the Environment, West Central Region

Re: **GLL 60702 – Temporary PTTW to Conduct a Series of Pumping Tests, Proposed CBM St. Marys Cement Flamborough Quarry, City of Hamilton, Ontario**

Please find enclosed, a Category 3 PTTW application for a series of pumping tests to be undertaken at the subject property. The testing is being conducted to support an application for the development of a quarry on the property. This is part of an ongoing assessment and is intended to address technical issues flagged by the City of Hamilton and various agencies including the Ministry of the Environment, on a draft document titled Hydrogeological Level 2 Report, Proposed Dolostone Quarry, which was prepared for Lowndes Holdings Limited by Gartner Lee (June 2005).

A Work Plan that outlines the proposed undertaking and various reports that describe the physical setting from an ecologic, hydrologic and hydrogeologic perspective accompany our PTTW application. As this project is intended to provide information on the potential effects of the proposed undertaking on local groundwater and surface water resources, our assessment of said impacts (contained in this letter and discussed in the attached Stantec report), is preliminary at this time.

The objectives of the proposed pumping tests are to:

- collect additional geologic and hydrogeologic information on the bedrock to characterize a 'productive zone' within the Amabel Formation; and,

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- to undertake a pilot-scale evaluation of the preferred measure referred to as a Groundwater Recirculation System or GRS, that would be installed peripheral to the quarry to mitigate quarry dewatering effects.

This letter presents a summary overview of the proposed testing program.

General Description of the Work

The testing program will involve the completion of a series of short-duration (5 to 6 day long) pumping tests using wells that are to be installed on the property later this summer. Gerrit Well Drilling will be retained to install the wells and Lotowater Technical Services Inc. will conduct the testing under the direction of Gartner Lee Limited.

The intent of the GRS Pilot Scale test is to demonstrate the ability of the mitigation system to control groundwater levels in proximity to the proposed quarry, thereby creating an effective hydraulic barrier between quarry operations and local features that depend on groundwater levels such as wetlands and private water well supplies. The important factor to be evaluated is the ability to maintain the water levels on the upstream side of the recharge trench in response to a groundwater stress (i.e., pumping) on the 'quarry side' of the trench. The success of test program will be determined by the demonstrated ability to achieve limited or no drawdown in the monitors installed on the upstream side of the trench.

To create the hydraulic conditions for a quarry-dewatering scenario adjacent to the GRS, it will be necessary to drawdown the groundwater level using pumping wells. Quarries are typically deepened by a series of excavations, initially to an intermediate level or bench, and eventually to the full target depth. The initial bench cut at this proposed quarry will be to a depth of about 20 m and subsequent excavation will deepen the quarry to the base of the Amabel Formation to a total depth below ground surface of between 34 m and 37 m. The depth to which the water table will be drawn down as a result of gravity drainage into the quarry will depend on site-specific conditions. Typically, the drawdown at the quarry face will be less than the full depth of the quarry and result in a 'wetted face' forming along the quarry wall.

It is intended to use pumping wells to simulate the effects of quarry dewatering under gravity drainage. Although this is not ideal, because the hydraulic mechanism that governs dewatering response from pumping of a well under a confined condition differ from that imposed by gravity drainage, this is the only option currently available to undertake a study of this nature.

At this time, we are proposing to undertake three separate pumping tests. The initial test (Test 1) is intended assess the dewatering response during pumping without mitigation. The test response will be monitored using an extensive network of overburden and bedrock observation wells, staff gauges installed in wetland areas and mini-piezometers. The groundwater level response to pumping will be analyzed to generate data that can be used to refine the existing groundwater model and to provide an approximation of a 'worst case' condition for purposes of assessing the performance of the GRS.

The next two pumping tests will involve the recirculation of the groundwater extracted from the pumping wells into the GRS. Specifically, the second test (Test 2) will be designed to assess the effectiveness of an open trench cut into bedrock. The depth of bedrock cut along the length of the trench will depend on the relief on the bedrock surface, but the goal will be to achieve an average depth of 1 metre. Following this second test and the analysis of the collected data, a series of open boreholes will be installed along the axis of the trench. The boreholes will act as conduits for the water to move to depth in the bedrock, thereby maintaining hydraulic heads in the deeper bedrock. The third test (Test 3) will be conducted after the open boreholes have been installed.

Specific Considerations

Location of Pilot-Scale GRS Study Area: By design, the study area is to be located at the approximate edge of the proposed quarry footprint, with the pumping wells positioned along the quarry face and the GRS positioned between the wells and the adjacent undisturbed property, parallel to and about 35 m from the wells.

Four possible locations were evaluated (Figure 1 in the attached memorandum from Aldis Zandbergs dated August 29, 2006). This memorandum summarizes conditions at each of the four locations. Based on the various factors that were considered including: general access, overburden depth and bedrock topography; access to Mountsberg Creek for discharge purposes; flow at the point of discharge and creek geometry; size of the buffer setback from woodlots and wetlands; and existing monitoring points, it was decided that Location A (Figure 1) offered the best prospect with respect to general access, access to Mountsberg Creek (at Tributary A) and availability of existing monitors. Subsequent discussions, indicated that moving the trench to the west slightly would be more advantageous in that there would be less of an impact to the adjacent woodlot. A test pit program to verify overburden depths and the bedrock topography at the proposed location is to be undertaken shortly.

In an email correspondence from the City of Hamilton (S. Holiday, Sept 26, 2006) it was noted that the construction of the GRS would require a site alteration permit obtained from the City of Hamilton. Requirements outlined within this email would be addressed in conjunction with the application of the site alteration permit.

Well Installation: As outlined in greater detail in the attached Work plan, three large diameter (300 mm ID) wells are to be installed that will be pumped to create the necessary drawdown to simulate dewatering along the quarry sidewall/face. The wells will be installed in a line with the wells spaced about 50 m to 60 m apart. The boreholes will be advanced to an approximate depth of 50 m and cased to a depth of about 5 m (through the overburden and about 2 m into the top of the bedrock). An additional five (5) observation wells will be installed in the general vicinity or these wells. The observation wells will be installed to an approximate depth of 40 m and be of sufficient diameter to allow for their completion as multi-level wells.

It is intended that continuous core be collected during advancement of the test wells and at least 3 of the observation wells. Each of these 6 boreholes be logged (downhole geophysics and video), packer tested and that flow profiled. The proposed configuration of wells to be installed at the test site is shown in Figures 1 and 2 in the attached Work Plan.

Estimated Well Yield: As the large diameter test wells have yet to be installed, it is not possible to provide a well yield based on actual field test results. On installation, these wells are to undergo short duration pumping tests to determine their yield.

For purposes of this PTTW application, a modeling analysis was completed to provide a preliminary estimate of the volume of groundwater that could to be produced during the testing. The analysis also provides an estimate of the volume of groundwater expected to be re-circulate back toward the wells via the GRS.

The modeling analysis involved the development of a two-dimensional groundwater model based on the calibrated three-dimensional groundwater model, which is described in the draft Hydrogeological Level 2 Report prepared by Gartner Lee (2005) for the proposed quarry. This report is also attached (CD) for information purposes. Boundaries of the model were selected along groundwater equipotential lines with constant heads of 286 and 284 m ASL assigned to the north and south, respectively, and no flow boundaries to the east and west. The model simulates the overburden and the underlying Amabel Formation bedrock as a single layer with a confined 45-metre thickness. Hydraulic conductivity of this simplified layer was calibrated against results of the 168-hour pumping test completed in November 2004 on the subject property, using existing test wells TW12 and TW13.

The calibrated model was run at various pumping rates to evaluate the following conditions:

a) Test 1 Condition, which involves no mitigation. During this test, the water will be pumped to Mountsberg Creek and no recirculation of groundwater will occur. Constant heads ranging from 15 m to 40 m below ground surface were assigned to simulate drawdown during the testing.

b) Test 3 Condition, which involve mitigation. During these tests, the water is re-circulated through the GRS. The same constant heads or pumping depths (15 m to 40 m below ground surface) were applied and water elevations ranging from 285 m ASL to 287 m ASL were applied at the infiltration trench.

The modeling results are presented in Table 1. During Test 1, pumping of the three (3) proposed production wells is estimated to generate a volume of between 5,355 m^3/d to 13,147 m^3/d (818 to 2,009 IGPM) depending on the assigned drawdown. This groundwater is to be released to Mountsberg Creek and not recharged. Under the mitigation simulation, the volume of water pumped to maintain constant heads of between 15 m and 40 m would increase to 8,414 m^3/d to 22,944 m^3/d (1,285 to 3,505 IGPM). The increase is attributed to the re-circulation of approximately 45-50% of the extracted groundwater via the GRS to the wells.

For the purpose of PTTW application, we propose an average groundwater taking of about 9,700 m^3/d (1,500 IGPM or 112 L/s) distributed between three pumping wells. This assumes that the water level at the test site is drawn down by about 30 m. As noted, the actual rate may vary and cannot be fully established until the testing is undertaken.

Discharge Considerations: It is currently proposed that the water extracted during Test 1 be directed to Tributary A of Mountsberg Creek (as indicated in Figure 1 - attached). A temporary erosion control structure consisting of plywood sheets and concrete blocks will be placed at the discharge point to disperse flow. The structure will be removed between tests.

A general discussion of the projected impact of the release of 1,500 IGPM (112 L/s) of groundwater during Test 1 on the water quality of Mountsberg Creek is provided in the attached memorandum from Jim Perrone, Stantec, dated September 27, 2006. As indicated, no quality or flooding impacts are anticipated to occur at the discharge rate noted.

It is anticipated that a portion of the water extracted during Test 2 and Test 3 will also need to be diverted to the same release point on Mountsberg Creek. This is because the volume of groundwater that will infiltrate at the trench (GRS) under gravity flow will be less than what can be extracted from the wells under pumping.

At this time, it is not possible to determine what fraction of the water will be released to the creek and what portion will recharge and be re-circulated at the GRS. The quantity of water will however be less than that projected for Test 1.

Monitoring Program: Water flow and water level monitoring during the test will involve the following elements:

- measurement of the rate of extraction from the individual wells and the rate and volume of discharge to Mountsberg Creek and the GRS. [Note: Closed channel-type water meters will be installed on the discharge line from each pumping well and on any branched lines that direct flow to the Creek and/or the GRS];

- manual measurement of the water level in the pumping wells (using a drop pipe);

- continuous measurement of water levels using pressure transducers at the five (5) multi-level observation well nests that are to be installed and at several existing overburden and bedrock wells (see Figure 3 in the Work Plan);

- continuous and manual measurement of water levels at staff gauges and mini-piezometers located in the wetland and north of the test site; and,

- manual and continuous stream flow monitoring at various locations along Mountsberg Creek.

The pressure transducers will be downloaded at the end of the recovery period for each test interval.

Water Quality and Temperature Monitoring: At the request of the Region of Halton, groundwater samples will be collected from selected wells prior to the start of the GRS testing and at the conclusion of the testing. The purpose of this monitoring is to determine if the recirculation of the groundwater has contributed to any general change in the quality of the groundwater.

Water samples from the well discharge at both Mountsberg Creek and the GRS will be collected one hour after the start of each test, 2 days into the test and at the termination of the test. Additional samples will be collected from the Creek upstream to establish ambient water quality and downstream of the discharge point to establish the quality of the groundwater/surface water mixture. The samples will be submitted to an independent laboratory for the analysis of major and minor ions, nutrients and metals.

Continuous temperature monitoring of the discharge will be undertaken during all three tests and additional temperature monitoring will occur at selected points that will be determined.

Precipitation and Pressure Monitoring: A rain gauge has been established on site and atmospheric pressure will be recorded using appropriate instrumentation.

Water Use Survey: As indicated in the attached Work Plan, a water well survey, to a 1 km distance from the test site, will be completed prior to the test to identify any wells, which based on their proximity to the test and pump/well depth may be susceptible to impacts during the testing. The survey will involve compiling all known wells in the test area from the MOE Water Well record base, notifying residents that the test will be completed and providing a contact name in the event of any quantity or quality impacts during the test.

Contingency Plan: The following actions are to be taken in the event of a well supply complaint:

1) The Ministry of the Environment will be informed that a complaint has been received and will be addressed by the following procedure.

2) The complainant will receive a response within 4-hours of notification from a licensed pump installer/well technician. This will be followed by a site visit by the technician to determine the nature of the problem.

3) If it is determined, that the complaint is related to an inadequate supply problem caused by dewatering during the testing, a supply of bottled water will be provided for drinking purposes immediately and a larger potable supply will be arranged and connected to the household pressure system. The supply requirements will be maintained for as long as necessary. If the complaint is related to a non-testing problem such as pump failure, the complainant will be advised and recommendations will be provided for addressing the problem.

4) A letter report will be prepared that presents a chronology of the event and a summary of the action/responses taken. Copies of the report will be presented to the complainant and the MOE.

Reporting

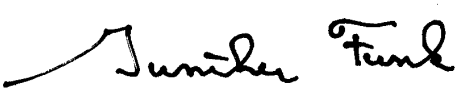
A comprehensive report of the GRS Pilot Scale testing will be completed on conclusion of the test. This report will present the data collected, and the analysis and interpretations of these data. Any problems encountered will be discussed in detail and if warranted recommendations for improving the hydraulic efficiencies of the GRS will be provided. A copy of this report will be presented to the MOE and other agencies within 6 weeks of completion of the testing program.

This testing is expected to generate other hydrogeologic information that will assist in the characterization of the productive zones in the bedrock and the groundwater/surface water relationship. This information will be incorporated in the Hydrogeological Level 2 Report and will be used to refine the existing groundwater model.

Feel free to contact me should you have any questions.

Yours sincerely,

GARTNER LEE LIMITED



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