EXCELLENCE IN ENVIRONMENTAL CONSULTING SERVICES

May 29, 2009 **XCG File No. 1-664-17-03**

Chief and Council
Mohawks of the Bay of Quinte
13 Old York Road, RR#1
Tyendinaga Mohawk Territory, ON K0K 1X0
Postal Code

**Re: Surface and Groundwater Sampling, Richmond Landfill Vicinity**

Dear Chief and Council:

At the request of the Mohawks of the Bay of Quinte (MBQ), XCG completed surface and groundwater sampling in the vicinity of the Richmond Landfill site in March and April of 2009. The work was conducted in accordance with XCG's proposal entitled, "Proposal for Completion of Environmental Monitoring in the Vicinity of the Richmond Landfill Site, Near Napanee, Ontario," dated February 19, 2009.

### *Background*

The purpose of this surface and groundwater quality monitoring program in the vicinity of the landfill site was to further verify and augment the findings of XCG's earlier studies completed in 2000, 2002 and 2007.

The Richmond Landfill site is located near a high point of land, with drainage leaving the site in a number of directions. The focus of the surface water monitoring for this investigation was to the south of the landfill in the Beechwood ditch along Beechwood Road, where historical surface water quality impacts have been found.

The following two sampling locations were to be investigated as part of the surface water monitoring program:

- A background water quality sampling location called "Background Beechwood" at a point about mid-way between Waste Management's (WM's) sampling locations S4 and S8, upstream of the confluence of the south stormwater retention pond outlet ditch and the Beechwood Ditch;
- A sampling location called "South 10 West" at a point approximately 10 metres west (downstream in the Beechwood Ditch) of the confluence of the south stormwater retention pond outlet ditch and the Beechwood Ditch.

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Historical groundwater investigations completed by XCG included the sampling of two groundwater wells located to the southeast of the landfill. Water quality analyses of samples from these two wells in the past were found to contain tritium levels indicative of a possible leachate impact. The two wells were a private residential supply well at 1141 Beechwood Road (about 700 m southeast of the waste mound) and a monitoring well located in the road allowance of Beechwood Road labelled MW03-06-D that was installed by XCG in March 2006. These two wells were to be included in this monitoring program.

### *Scope of Work*

The location of the two surface water sampling sites was adjusted in the field due to significant surface water drainage changes on the landfill property that have been recently completed along the southern limit of the site. Based on reviewing WM's annual monitoring report entitled "Richmond Sanitary Landfill Site OS-08-570-13-OS Monitoring Report No. 22, Part of Lots 1, 2 and 3, Concession IV, Township of Richmond, County of Lennox & Addington," dated March 2009, the previous southern stormwater management pond has now been decommissioned and replaced with a new stormwater management pond located further to the west. The new pond discharges into the Beechwood Ditch at a point about 150 metres downstream of the discharge point for the old southern stormwater management pond.

As a result of the above changes, the downstream samples for XCG's investigation were collected from just downstream of the outlet of the newly constructed storm water management pond as it discharged into the Beechwood Ditch. The upstream samples were collected from the Beechwood Ditch approximately 5 metres upstream of the confluence of the Beechwood Ditch and the new storm water pond outlet ditch. The locations of the two surface water sampling points have been indicated on the attached annotated photos.

The scope of work for this round of surface water monitoring consisted of collecting surface water samples at the above-mentioned two sampling locations during three wet weather / snow melt events.

The surface water samples were analyzed for the following parameters as outlined in the proposal: calcium, magnesium, sodium, potassium, aluminum, cadmium, total chromium, chromium VI, copper, iron, lead, nickel, silver, zinc, arsenic, selenium, mercury, hardness, alkalinity, sulphate, chloride, nitrite, nitrate, ammonia, conductivity, pH, TKN, TOC, DOC, cyanide, dissolved oxygen, total phosphorous, BOD5, COD and phenols.

The groundwater sampling for this monitoring event consisted of the collection of one groundwater sample from monitoring well MW03-06-D. XCG was not able to obtain permission from the property owner to collect a groundwater sample from the drinking water well located at 1141 Beechwood Road.

The groundwater sample was analyzed for the following parameters as outlined in the proposal: metals (Sb, Al, As, Ba, Be, B(HWS), Ca, Cd, Cr(total, VI), Co, Cu, Fe, Pb, Hg, K, Mg, Mo, Na, Ni, Se, Ag, Tl, V and Zn), hardness, $BOD_5$, alkalinity, ammonia, anions (Cl, NO2, NO3, SO4), COD, DOC, TOC, pH, conductivity, phenolics water (4-AAP), TKN, volatile organic compounds (VOCs) and tritium.

### *Methodology*

Mr. Mark Dickson and Mr. Dale White of XCG conducted the field activities for the surface and groundwater sampling program. Surface water samples were collected from the two new sampling sites identified as *Pond 3 Outlet* and *Background Beechwood 09*. For the purposes of identification during sampling events, *Pond 3 Outlet* was labelled *DS* and *Background Beechwood 09* was labelled *US*.

All samples were collected in accordance with standard operating procedures developed by XCG and reviewed in the past by various agencies including the U.S. EPA. Appropriate laboratory prepared sample containers and sample preservatives were used in all cases.

Samples were immediately placed in coolers with ice and were delivered to Caduceon Environmental Laboratories in Kingston, Ontario, for laboratory analysis of the parameters outlined in the previous section, with the exception of tritium. The analysis for tritium was completed by the University of Waterloo, Environmental Isotope Lab, in Waterloo, Ontario. The laboratory certificates of analysis are attached to this letter.

### *Discussion of Analytical Results*

The surface water samples were compared against the Provincial Water Quality Objectives (PWQOs) published in Policies, Guidelines, Provincial Water Quality Objectives, dated July 1994. The groundwater samples were compared to Table 2 – Full Depth Generic Site Condition Standards in a Potable Ground Water Condition, from "Soil, Ground Water and Sediment Standards," March 9, 2004.

#### *Discussion of surface water results*

Due to the significant drainage alterations undertaken at the Richmond Landfill, comparing this round of surface water results to historic surface water results for the Beechwood Ditch would be of limited value. As a result, no comparisons with past results have been made.

The three surface water sampling events occurred on March 11, April 1 and April 3, 2009. There were minor exceedances of the PWQOs in each of the three surface water samples collected. For each of the three sampling events, the analytical results for the upstream background sample were compared against the results for the downstream sample. In all three cases, there was little or no variation in contaminant concentrations between the upstream and downstream samples.

It should be noted that the XCG surface water samples were collected during or immediately after rainfall events and water appeared to be actively discharging from the new southern stormwater pond (designated as stormwater management pond 3 by WM) during two of these events (on March 11 and April 3). Based on XCG's review of the 2008 annual monitoring report for the Richmond Landfill, the conditions of WM's Certificate of Approval (C of A) number 5268-7E8LJW for the new storm water pond include the following requirement (Section 9.4): "*Prior to any planned discharge of stormwater from any of the SWM Ponds to the natural environment, the owner shall collect a stormwater grab sample from the designated sampling location at the SWM Pond and conduct acute lethality testing for Daphnia magna and Rainbow Trout. The Owner shall ensure that the stormwater runoff collected in the SWM Pond is not acutely lethal to Daphnia magna and Rainbow Trout before allowing any discharge of stormwater from the SWM Pond."* At the time of XCG's sampling on March 11, it had rained heavily the night before on March 10

and in the early morning on March 11. According to Pollutech acute lethality bioassay reports obtained from the MOE, a pond sample was collected on March 9, 2009, and found to cause 0% mortality of rainbow trout and daphnia magna. However, after this sample was collected additional stormwater from continuing rain had entered the pond and was being released, apparently untested, on March 11. A similar situation occurred on April 3 when stormwater was actively flowing both into and, based on XCG's observations of the outlet ditch flow volume, out of the pond during the sampling event. On April 3 it appears likely that at least a portion of the stormwater flowing out of the pond would have consisted of stormwater that had very recently flowed into it, and therefore would not have been subjected to the required testing prior to discharge in accordance with the above requirement. Based on these observations, it appears that the pond is not being operated in compliance with the C of A.

***Discussion of groundwater results***

As stated above, XCG was not able to obtain permission to collect a groundwater sample from the residential well located at 1141 Beechwood Road. As a result, a single groundwater sample was collected from monitoring well MW03-06-D.

In order to collect a representative groundwater sample from MW03-06-D the well was pumped dry on two occasions on March 23 and 27. The well was sampled on March 30, 2009. There was insufficient well volume to collect a duplicate water sample.

There were no exceedances of the Table 2 standards for potable groundwater, and the results are consistent with samples collected from MW03-06-D in 2006. The concentration of tritium in MW03-06-D was analysed to be 40.9 TU (+/-8.0 TU). This result is consistent with the 2006 results collected from MW03-06-D which were 48 TU (+/- 4 TU) and 54 TU (+/- 4 TU). Based on the results of the tritium results obtained to date, there is a high probability that off-site leachate impacts are present in MW03-06-D.

Because of naturally occurring contaminants in the groundwater in the area, it is difficult to distinguish the difference between groundwater samples that have been impacted by high concentrations of naturally occurring substances (such as chloride and iron) and groundwater samples that have been impacted by leachate. During the period from 1998 to 2000, WM conducted several isotopic studies to identify parameters that would be of greater value as leachate indicators. Based on these studies, tritium appears to be a valuable parameter for assessing leachate impacts. Based on past WM studies, tritium levels found in the raw leachate range from about 3985 TU to 8000 TU, while typical background tritium activities in modern precipitation (and non-leachate-impacted groundwater) do not exceed 50 TU. Because there is a difference of two orders of magnitude between tritium levels in the leachate and tritium levels in background groundwater, tritium is a very useful indicator and should be incorporated into the groundwater monitoring program at the site.

It is further noted that a number of volatile organic compounds (VOCs) were detected in the groundwater from MW03-06-D, including benzene, dichloromethane, toluene, vinyl chloride and o-xylene. A number of these parameters have been associated with Richmond Landfill leachate in past studies. The presence of these compounds in the groundwater sample is further evidence of a potential off-site leachate impact at this location.

### *Limitations*

It should be noted that conditions between and beyond the sampling locations for this investigation may become apparent during future investigations or on-site work. As such, XCG cannot be held responsible for environmental conditions at the site that were not apparent at the time of this investigation.

The scope of this report is limited to the matters expressly covered. This report is prepared for the sole benefit of the Mohawks of the Bay of Quinte and may not be relied upon by any other person or entity without the written authorization of XCG Consultants Ltd. Any use or reuse of this document (or the findings, conclusions or recommendations represented herein), by parties other than the Mohawks of the Bay of Quinte is at the sole risk of those parties.

### *Closure*

If you have any questions or comments regarding this letter, please do not hesitate to contact Dale White (Extension 213) or Kevin Shipley (Extension 215).

Yours very truly,

**XCG CONSULTANTS LTD.**

Dale White, Senior Technologist
Project Manager

Kevin Shipley, M.A.Sc., P.Eng., CEA, CEAS, QPRA
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Attachments:

Photos Showing Surface Water Sampling Locations

Laboratory Certificates of Analysis