



WASTE MANAGEMENT

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MEMORANDUM

DATE: October 9, 2008
TO: Don Wright, WMCC
CC: Tim Murphy, WMCC
FROM: Christopher P. Prucha, P.Geo.
SUBJECT: **Comments on report titled “Groundwater Contamination at the Carp Rd. Landfill Site” dated September 28, 2006.**

The following comments have been prepared to address the above referenced report. This report is based on a review of the Off-Site Groundwater Assessment Report prepared by WESA, dated February 2005, which was submitted to the Ministry of the Environment on February 14, 2005.

Author	The author of this report is not identified. Therefore, the qualifications and abilities of the author to technically analyze the information and put forth appropriate conclusions based on the analysis cannot be verified. The Province of Ontario has licensing requirements for professional engineers and geoscientists to ensure technical qualifications and expertise in the evaluation of and reporting on hydrogeologic data.
Page 2, Second Paragraph	The author states “since the initial discovery of off-site leachate, no new survey of the size of the leachate plume has been made public to our knowledge.” Although the author claims to not have knowledge, WMCC has been submitting annual reports to the MOE that document the monitoring on the Spratt property since the late 1990s.
Page 2, Figure 1	The figure is misleading without the context of the WESA report, which is not included in the review. At the time that the 1987 report was written by WESA, there were no boreholes or monitoring wells drilled within the interchange or south of Highway 417. The estimated extent of the plume was based at that time on specific conductance measurements of surface water and visual observations of same. Since that time a considerable amount of investigation work has been

	<p>completed defining two very important points that counter the 1987 plume delineation conclusion: 1) groundwater in the area immediately north of Highway 417 flows in a northeasterly direction (approximately perpendicular to Carp Road) and not in the direction to the east/southeast across the highway; and 2) road salting activities associated with the highway interchange deem specific conductance measurements ineffective in delineating groundwater impact as the result of leachate migration.</p>
<p>Page 2, Second Paragraph, Data Source Section</p>	<p>The author states “the water quality data track 22 separate properties in selected surface, shallow and deep groundwater sites on the Carp landfill Site and adjoining properties. These properties are sensitive indicators of groundwater contact with leachate.” I am not sure what this means.</p>
<p>Page 3, First Bullet at top of page (actually second bullet under Data Analysis Section), Page 5, Second Paragraph</p>	<p>The assumption listed here indicates that constituent concentrations from the ‘leachate wells’ are “representative of the highest concentration of contaminants.” Whose assumption is this? It is WMCC’s and the MOE’s position that constituent concentrations from the ‘leachate wells’ are representative of leachate. That does not imply that these concentrations are necessarily the highest concentrations that will ever be measured in leachate at the site.</p>
<p>Page 4, First Paragraph</p>	<p>It should be noted that the author of the WESA report understands that all VOCs are not anthropogenic. Some, such as BTEX compounds can be naturally occurring.</p>
<p>Page 4, Second Paragraph, Results Section</p>	<p>The author states “If the trends are not monotonically decreasing then the author concludes that the source is not the landfill.” This is an over simplification of the process. The trend analysis must be done with the knowledge of the potential impacts related to sources other than the landfill. This allows a more realistic evaluation of the trends and allows one to make more appropriate conclusions regarding the landfill as the source of elevated concentrations.</p>
<p>Page 4, First Paragraph, Analysis Section</p>	<p>The author used average concentration data over five years to create the plot displayed as Figure 2. This is not an appropriate methodology as it may have a tendency to hide real concentration changes over time. Specifically, the wells more distant to Carp Road may show decreasing concentrations at a faster rate than those closer to the road.</p>
<p>Page 4, Last Paragraph, Page 5, First Paragraph</p>	<p>WMCC concurs that the presence of elevated concentrations from a source other than the landfill does not mean that the secondary source is responsible for all elevated concentrations of that constituent. It does mean that one cannot distinguish between the two sources and making a conclusion of leachate impact when there are multiple sources of the same constituent is not defensible. It is not appropriate to just substitute another</p>

	<p>well for the one with elevated concentrations of multiple-source constituents, as the presence of elevated concentrations of that same constituent in the new well will cause the same uncertainty regarding the source. The prudent approach is to not use that constituent as a direct indicator of leachate impact.</p>
Page 5, Second Paragraph	<p>The author states “due to groundwater flow from east to west...”. There are no data to support that there is groundwater flow from east to west at the site, with the exception of that due to the hydraulic control in the immediate vicinity of the groundwater extraction system.</p>
Page 5, Figure 2	<p>The author does not indicate which wells are used in this plot. It cannot be ascertained whether the plotted line (i.e. line of cross-section) is consistent with groundwater flow. This is especially important as the sodium concentrations are going to be affected by the amount of road salting that takes place (i.e. interchange vs. further north along Carp Road), and the downgradient migration of sodium in the groundwater will follow the flow direction.</p>
Page 5, Third Paragraph	<p>The author states “Rather than a rapid drop in concentration with distance expected for a road salt origin...”. If the direction of groundwater flow in the shallow aquifer is oriented away from a continuing source of road salt, the elevated concentrations of sodium, chloride and other constituents may extend considerable distances from the source. This is clearly seen at this site.</p>
Page 5, Last Paragraph	<p>WMCC does not assert that leachate from the site has not crossed the landfill property boundary. Our assertion is that certain constituents are not appropriate to use as indicators of leachate impact due to other potential sources of impact. In the case of the focus of the author’s review and reporting, sodium is one such constituent that is not appropriate due to the continuing road salting activities along the interchange and north along Carp Road.</p>
Page 6, Figure 3	<p>As indicated for Figure 2, this plot uses average sodium concentrations over time which, as stated above, may have a tendency to hide decreasing concentrations at locations more distant from the source.</p> <p>The author has once again not identified which wells are used in the plot, thus the line of cross-section cannot be deciphered. In addition, as one moves in a line perpendicular to Highway 417, he is also moving perpendicular to the groundwater flow direction. As such, no conclusions can be made regarding the transport of sodium impact.</p>

<p>Page 6, First Paragraph under Figure 3</p>	<p>The author states “the data for many of the other leachate indicators show similar trends.” As identified above, these trends are questionable as the data are averaged and the data points are not identified.</p>
<p>Page 6, Same Paragraph, Figure 4</p>	<p>This figure is very misleading. The data used to create the plot is not concentration data, rather percentage of RUG exceedances for a given location. It does not indicate if the author is basing the exceedances on a single parameter, or if there is an exceedance of any parameter it is considered an exceedance (i.e. ignoring the issue related to potential multiple sources). In any event, if a location is impacted it is impacted. The percentage of samples that are impacted cannot be used to define a concentration plume. The author states that these are estimated contamination contours. I am not sure what that means. No data or legend is supplied with the figure to allow for evaluation of the contouring, specifically to see what the definition of “different levels of groundwater contamination” means.</p> <p>The author states “This is not the only set of contours that can be drawn through the data but these do take into consideration the previously established groundwater flow direction from west to east.” Is the author suggesting that the contouring is subjective? If so, this is not an appropriate contouring method. In addition, groundwater flow at this site is in a northeasterly direction and does not conform to the orientation of the contours as the author implies.</p>
<p>Page 6, Second Last Paragraph</p>	<p>The author states “The pattern is consistent with a landfill leachate source. It is similar to the leachate plume mapped out in the late eighties (c.f. Figure 1).” As discussed above, the contouring in Figure 4 does not represent a leachate plume. It represents a contouring of percent exceedance measurements of RUG, although it is not defined how an exceedance is actually measured. In any event, as pointed out above, Figure 1 has been proven to be a misinterpretation of surface conditions.</p>
<p>Page 6, Last Paragraph</p>	<p>The author states “There is no consistent downwards trend to support the conclusion of the author of the WESA report that the purge well system has been effective.” This statement is based on a flawed analysis that ignored the multiple sources of typical leachate indicators. The appropriate primary leachate indicators are consistent in the trend of decreasing concentrations with distance from the landfill. In addition, routine monthly water level measurements in the area of the purge well system demonstrate that hydraulic capture is being maintained, thus making the system effective.</p>

Page 7, First Paragraph	<p>In the February 2005 WESA report, the reporting limits for the VOCs are based on a detailed quantitative evaluation of the analytical laboratory's equipment and methodologies. WMCC acknowledges that the reporting limit at that time for vinyl chloride was above the ODWS. This situation has been continuously improved starting in 2006 by working with our analytical laboratories. WMCC now uses Maxxam Analytics for our groundwater analytical work, and the reporting limits for VOCs are all below the ODWS and considerably lower than those used in 2005.</p>
Page 8, Conclusions	<p>Neither WMCC, nor WESA has ever concluded that there is no off-site migration of leachate. The primary leachate indicators show a trend of decreasing concentration off-site with increased distance from the landfill and purge well system. In addition, most of the indicators also show stable or decreasing concentrations with time, which supports the conclusion that the purge well system is effective in cutting off the source of off-site leachate migration.</p> <p>The monitoring data and hydrogeologic principles do support the fact that the landfill is not a unique source of many leachate indicators. The author's hypothesis that road salt is not a source of elevated concentrations of indicators sodium and chloride in the down gradient wells is not supported by these principles and data.</p>