URBAN & ENVIRONMENTAL MANAGEMENT INC.
PROFESSIONAL CONSULTING SERVICES

Memo 08-107
To: Craig Simmons, Melanie Kawalec
City of Peterborough
From: Paul Flood, M.Eng., P.Eng., DCE
Date: November 10, 2009
Re: Peterborough Landfill & Biosolids Disposal Recommendations for Additional Biosolids Processing and/or Diversion from Landfill

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We have reviewed the October 2009 biosolids option study executive summary report by RVA. This memo is based on our discussions with Peterborough Landfill operations staff, the design and current operation of the Landfill, and experience with biosolids processing and landfilling.

1. Initial Review Comments

a. It needs to be appreciated that the Landfill can no longer, at least not in the near future, accept the quantities and characteristics of biosolids currently being generated by the City of Peterborough wastewater treatment plant. If the small remaining capacity at the top of the existing South Fill Area (SFA) receives any more biosolids, the final surface of the SFA will be too weak to support the heavy equipment required to install the final cover or maintain proper vegetation and drainage to support the long term needs of the final contours. Similarly, the new North Fill Area (NFA) should not receive any biosolids at least until the base of the Landfill is covered by at least 3 to 4 m of waste to protect the integrity of the leachate collection system.

b. If biosolids must continue to be landfilled, they should be more dewatered, stabilized, and/or mixed with solid waste that has some structure to achieve any operational success. If there were adequate quantities of construction/demolition and/or leaf & yard waste materials available to mix with the biosolids, the operations might become somewhat manageable. However in that case, those recyclable resource materials would be wasted and use up valuable landfill space.

c. Landfill operations staff is only capable of operating a limited tipping area and working face to allow disposal truck access and minimize daily and intermediate cover requirements. This landfill working space near the top of the SFA is also getting smaller. The quantity and moisture content of the biosolids are too high for the size and location of the working area (within a few metres of the top of waste elevation) and the limited waste quantities available for mixing. Landfill staff is being asked to do something almost physically impossible with the type of waste being mixed with the biosolids i.e. mostly weak and wet refuse, ultimately generating a very soft working surface for continued landfill and final cover operations.

d. In our view, for the biosolids to continue to be landfilled in the SFA or the NFA, additional processing is necessary at the sewage treatment plant and/or the Landfill to further stabilize and dewater the sludge. RVA has this experience in London including fast-tracking the required engineering design, approvals, and construction of such processing equipment during the period when London's incinerator was out of service for a number months.

e. MOE should also take a more accommodating and helpful position. Perhaps the approvals process could be streamlined to add more biosolids processing and storage facilities at the wastewater treatment plant including consideration of the Class EA and C. of A. process.

f. The City of Kawartha Lakes is presently land applying some of their treatment plant biosolids using contract storage and operations. This approach and similar potential partnerships should be further investigated by the City of Peterborough although it is understood that during the last few years many farmers have opted out of the program.

This next part of this memo was prepared based on our site visit of November 5, 2009 for personal observation and discussion with Landfill operations staff to verify our initial review comments noted above.

2. General Observations

1. The landfill appeared to be well operated and maintained. Operations are contracted to WMI with security personnel operating the weigh scale. Proper and sufficient equipment and personnel were on site and working continuously during the site visit. Considerable odour was noticeable with the delivery of biosolids in open dump trucks as well as during and following disposal.
2. Significant visual evidence of previously disposed biosolids was observed (black color at the surface, rutting, differential settlement, wet surface) despite efforts to mix and/or cover the material with other refuse. Clearly, proper compaction and effective use of the remaining capacity of the SFA will be difficult to achieve with the present quantities and characteristics of the biosolids being received.
3. Operating space in the SFA is becoming increasingly limited as the final contours are approached. Much of the SFA (13.5 ha) is already under final cover and only 4.7 ha of the SFA remains to be filled. The thickness of waste to be placed in the active fill area ranges from about 2 m to about 6 m with an average of about 3.5 m.
4. Optimized use of the remaining capacity of the SFA for solid waste and biosolids will be difficult considering that presently, about 5,800 tonnes of solid waste and 550 to 680 tonnes of biosolids are shipped to the site each month. The biosolids have a low solids content and generally should be mixed with about 10 times their weight (rather than 5) of other solid waste for proper stabilization and successful compaction purposes.
5. The limited working area, relative proportions of biosolids and solid waste, together with the limited thickness of material that can be placed from current to final contours, make it necessary to place biosolids over a majority of the remaining fill area to allow for successful landfilling. Wet conditions (snow, rain) will continue to render the landfilling of biosolids increasingly onerous on operating equipment and waste haul vehicles. The chemical characteristics of the biosolids will increase the strength of the leachate.

3. Summary of Discussion Items

3.1 South Fill Area

1. The SFA is approaching its approved capacity. If 70,000 tonnes of waste is landfilled annually and in the SFA only (apparent waste density of 0.63 t/m^3), the SFA will reach its approved capacity by May 2011. However, upon construction of Cell 2 (NFA) in early 2010, most if not all of the waste delivered to the site will be diverted to the NFA to cover the newly constructed liner. To place a minimum of 1.8 m of waste and daily cover over the 3.2 ha Cell 2 liner will take 5 to 6 months. If waste disposal then reverted solely to the SFA, the SFA would reach its approved capacity by December 2011. If more waste is placed in the NFA to better protect the liner and leachate collection system (3 to 4 m total) then the SFA will remain inactive for upwards of one (1) year.
2. The Landfill operator has tried a number of different techniques to tip, spread, mix, and compact biosolids with incoming solid waste, but with generally poor results. For example, trenches have been excavated into the existing waste and biosolids disposed into the trenches followed by placement of solid waste on top. This process reduced odours from the biosolids but significant operational issues continued, including wheel rutting, soft wet surface conditions, vehicles getting stuck, etc., as the biosolids/waste mix is too weak to adequately support landfill equipment and disposal vehicles that continue to travel on the Landfill.

3. Polymers used to increase the solids content of the biosolids to provide more structure break down over time, and the biosolids become more sloppy and odorous, particularly during wet weather.
4. Continued disposal of solid waste and biosolids in their current proportions (too much biosolids relative to quantity of waste) will result in significantly reduced structural integrity of the landfill surface. This will continue to negatively impact the ability of the landfill to support heavy waste haul, cover, and compaction equipment and vehicles during continued waste disposal and final cover placement operations.
5. Continued placement of biosolids/waste so close to the final elevations of the SFA will result in difficulties in final cover placement. This includes the inability to adequately shape the top of the fill area to place final cover soil and topsoil, provide positive surface water drainage ditches, etc. as rutting will occur during material placement, compaction, and grading activities.
6. Over time, significant differential settlement is expected to occur in areas that contain biosolids due to the accelerated waste decomposition process inherent in those areas. This could cause surface water to pond in depressions which would generate higher volumes of leachate and possibly impact the operation of the gas collection system.
7. There is potential for increased gas generation due to landfilling of biosolids, but also potential for biosolids to clog the granular materials surrounding gas collection wells. Soft areas in the final cover (due to underlying biosolids and subsequent differential settlement) could also result in the development of erosion channels and sliding of disposed waste and cover material; potentially exposing waste and allowing air to infiltrate the gas collection system and reduce the quality of collected gas.
8. All of the above will result in increased cell closure and post closure operating and maintenance costs and reduced effectiveness of the final soil and vegetative cover.
9. Landfill workers will continue to struggle with biosolids odour. Workers at other municipal landfills have refused to work under conditions involving the disposal of biosolids due to odour and health & safety concerns.

3.2 North Fill Area

1. Construction of the engineered controls associated with the new NFA is currently underway. The liner and leachate collection system for Cell 2 (the first waste disposal cell in the NFA) will be constructed in early 2010. Waste disposal is expected to start in the NFA by mid 2010.
2. Disposal of biosolids near the base of the NFA will be of even greater concern than continued disposal on top of the SFA. Some landfill sites do not permit the disposal of biosolids within several metres of the liner and leachate collection system. Other landfills do not permit the disposal of biosolids at all except under emergency conditions.
3. Biosolids have a high moisture content and low strength. These materials do not adequately support the weight of construction equipment and waste haul vehicles. This is particularly problematic within close proximity to a newly constructed liner and leachate collection system as rutting of the fill area surface could be deep possibly tearing or damaging the geotextile protecting the leachate collection system.
4. Migration of biosolids toward and into the leachate collection system can cause biologic clogging of the geotextile and stone surrounding the leachate collection system. This could render the leachate collection system less effective and result in localized leachate mounding. A high leachate mound could reverse design hydraulic gradients (from inward to outward gradients) and eventually cause leachate to migrate out through the liner and into the native soil. Care must be taken to ensure leachate mounds do not exceed critical elevations.

3.3 Biosolids Management

1. There are other better biosolids management alternatives available, including resource recovery, however they are more expensive. Class EA and C. of A. requirements could delay the selection and implementation of available alternatives.
2. The Peterborough wastewater treatment facility has some lagoon biosolids storage capacity available. Can it be used again for storage of some of the biosolids quantities, at least until sufficient drying and stabilization has occurred? Can additional processing take place at the plant to decrease water content, increase solids content and reduce odours?
3. Previously, Peterborough biosolids were land applied, as is still the case for some Kawartha Lakes material. Biosolids were also previously hauled away under contract for land application in southwestern Ontario. Can this practice be resumed for some of the biosolids material?

4. Conclusions and Recommendations

1. If the SFA is to continue to accept biosolids without additional dewatering and/or other stabilization methods (e.g. lime addition) the biosolids should only be placed in areas where remaining waste thickness is greatest i.e. near the centre of the fill area. A minimum of 3m of waste should be placed in all areas below the bottom of final cover to support its construction.
2. If the quantity of biosolids cannot be reduced or alternative disposal methods arranged (e.g. land application) the characteristics of the material needs to be improved by decreasing the moisture content and increasing the solids content to provide improved stabilization and structural characteristics.
3. No biosolids should be disposed in the NFA until the entire bottom of the landfill cell is covered by at least 3 to 4 meters of solid waste. This could take about 12 to 18 months to achieve. Disposal of biosolids at present quantities and characteristics should not resume in the SFA for the operational concerns noted above.
4. It may be possible to coordinate solid waste and biosolids disposal over the short term, so that when the NFA is ready to receive waste, all solid waste is disposed of in the NFA and all biosolids are disposed of in the SFA. Operational changes will be required in the SFA to accommodate such activities. This includes mixing the biosolids with compost, wood chips, contaminated soil etc and spreading the material in thin lifts using light or wide track equipment. Operating costs will increase with the operation of two (2) tipping areas.
5. The remaining life of the SFA is about 24 months (end of 2011) assuming that all waste delivered to the site in mid to late 2010 will be diverted to the NFA for at least 6 months to protect the liner that will be constructed at the NFA in early to mid 2010. We recommend that the new NFA, when constructed, not receive any biosolids until at least 3 to 4m of waste and daily cover have been placed on top of the cell bottom liner. This means that significantly reduced quantities of biosolids should be received at the Landfill for the next 2.5 to 3 years unless significant additional processing/stabilization takes place. Ideally, an alternate method for the management of all biosolids should be developed and put in place as soon as possible.

Prepared & respectfully submitted by
Urban & Environmental Management Inc.

c Joe Ovcjak, P.Eng., DCE; Senior Landfill Design Engineer