



May 13, 2004

Attention: Wayne Black
KLPOA President

Re: Review of Hydrogeological and Soil Assessment
Application for Hauled Sewage Lagoon
Township of Algonquin Highlands
File No: HA 04 6922.410

Dear Mr. Black,

The proposed Hauled Sewage facility at the existing Pine Springs Landfill is a change to the existing approved site activity. This change requires a variety of planning and technical approvals that depend on the existing and proposed activities. As requested, we have completed a planning and hydrogeologic review of the proposed disposal of Hauled Sewage at the Pine Springs Landfill. The focus of this review is the possible adverse impact on Kushog Lake.

We have reviewed the letter of April 16, 2003 from Grace and Associates to the Township of Algonquin Highlands with respect to the approvals required for the proposed sewage lagoon facility. While we concur with Grace and Associates that this facility will likely require an amended Certificate of Approval (C of A) for the Pine Springs landfill under the *Environmental Protection Act*, we do not concur that this will be the only approval required. We think that the following additional approvals will also need to be obtained, depending on the circumstances noted:

- An *Ontario Water Resources Act* C of A will be required for a new sewage work;
- An *Environmental Protection Act* C of A may be required for any air emissions associated with the new sewage work;
- An Official Plan amendment (OPA), Zoning By-law amendment (ZBA) or Site Plan Approval (SPA) under the *Planning Act* may be required, depending on the current land use provisions of the County of Haliburton and Township of Algonquin Highlands Official Plans and Zoning By-laws; and, most importantly,

- The proposed sewage lagoon will need to comply with the Schedule 'C' provisions of the Municipal Class Environmental Assessment (Municipal Engineers Association, 2002), as the proponent of the facility is a municipality and their proposed undertaking is of a type listed in Schedule C of that Environmental Assessment.

We have now completed a preliminary review of the hydrogeological assessment report (hereinafter referred to as the Report) entitled: "Hydrogeological and Soil Assessment – Application for Hauled Sewage Lagoon" dated November 2003 prepared by Grace & Associates. This letter report provides a brief summary of our comments on the hydrogeological conditions of the proposed site for the lagoon and the surroundings. Comments on the adequacy of the investigations completed by Grace & Associates (November 2003) and potential impacts of the proposed sewage lagoon on the local environment are also included in this report. As you are aware, the observations made in the report are based on the review of the data provided in the above report and some literature and mapping available in our offices and did not involve any field work

1.0 General Hydrogeology

The proposed hauled sewage treatment and disposal system is proposed to be located at the Pine Springs Waste Disposal Site (landfill). A monitoring program to monitor the groundwater and surface water in the vicinity of the landfill is in place. The report was prepared as supporting documentation for an application for Certificate of Approval for the operation of a hauled sewage lagoon at the landfill site. In order to ensure that the proposed sewage disposal does not negatively impact the natural environment, our review was focused the following questions:

- Is the data used and the investigations conducted adequate and is the level of understanding of the hydrogeological conditions, both locally and regionally, adequate? Are the applied hydrogeological analysis techniques consistent and acceptable?
- Is the potential impacts assessment adequate? Have appropriate contaminants been considered in this assessment?
- Is the proposed design suitable to contain migration of contaminants? Have contingency measures to mitigate and address failure situations been proposed?
- Has a monitoring program been proposed and if so, is the proposed monitoring program design adequate?

We have critically reviewed the Report to determine if the hydrogeological analysis is adequate and to ensure that the operation of the proposed sewage lagoon and disposal would not adversely impact the water resources in the area.

2.0 Hydrogeological Characterization

In general, the report is well laid-out and gives a good general description of the hydrogeology of the Pine Springs Waste disposal site. The figures are laid out in a clear and understandable format. However, there are several deficiencies in the data and method of investigations resulting in inadequate hydrogeological analysis and limited understanding of the site hydrogeology and how the proposed disposal will impact the existing hydrogeologic environment and surface water features.

The hydrogeological characterization provided in the Report was based on regional mapping and reports and monitoring wells installed on site, as well as some limited door-to-door surveys and water quality analysis. A brief discussion and comments on the data sources used, investigations conducted and hydrogeological assessments completed and presented in the Report is provided below.

2.1 Background Reports, Data and Information Sources

Comments:

- i) The background information used for the purpose of regional descriptions of the physiography and surficial geology, and hydrogeological conditions etc is generally appropriate and acceptable. However, no specific references to physiographic features and geology mapping on the site and surroundings are included. The report is not clear on questions such as:*
 - a. Are there any bedrock knobs and ridges either on site or in the immediate surroundings?
 - b. Is the topography hummocky on the site?
 - c. Is the proposed site - part of an Esker or a till plain? and
 - d. Implication of such physiographic features on contaminant migration from the proposed sewage disposal on the site

2.2 Regional hydrogeological characteristics were inferred from the Ministry of Environment (MOE) Water Well Records. Groundwater conditions on the site and the surroundings were assessed from on-site investigations and door-to-door well surveys.

Comments:

- ii) This approach is appropriate; however, the Report does not contain any regional or site geological mapping. In the absence of such mapping, it is difficult to understand the local hydrogeological conditions within the regional setting and it is not possible to infer potential impacts to the natural environment outside the property boundaries, as all the results presented are restricted to within the site boundaries*
- iii) The study site is part of the area covered under the Trent Groundwater Study funded by the MOE. We understand that project is nearing completion and any mapping and other hydrogeological information pertinent to the site should be referred to in this Report. We also understand that Grace & Associates are providing project management on this study. As such, the regional hydrogeological mapping and other related information surrounding the site would be readily available for the authors of the Report*
- iv) Table 3 of the Report indicates that a total of 15 wells were surveyed as part of the door-to-door well survey; however, the results included in Appendix C of the Report list only eight wells (of which data for only four wells is presented). Also, the information provided in Table 3 is inconsistent with the information provided in Appendix C. The questionnaire used for the water well survey should be included with a summary of the results in Appendix C.*

2.3 A series of existing shallow landfill boreholes was augmented with a series of shallow overburden monitors to characterize the site-specific soil and groundwater conditions on the site.

Comments:

- i) All the monitoring wells installed are located on-site in the immediate vicinity of the landfill. There are no monitoring wells on the up-gradient side of the landfill, nor are there any boreholes drilled to the west of the proposed sewage lagoon and disposal trenches (see Figure 4).*
- ii) The monitoring wells are limited in depth and the total overburden thickness is not known at the site or in the surrounding area. In the absence of any assessment of vertical gradients, it is not possible to*

assess impacts of the waste disposal on deeper groundwater flow systems. Moreover, there are no bedrock wells on the site to determine the groundwater flow in the bedrock underlying the site and how it would interact with Lake Kushog or a domestic well.

- iii) Further, the groundwater flow inferred from the existing monitors could be different for a fully developed site scenario with the lagoon and the disposal bed in operation. Additional baseline data will be required.*
- iv) The Report refers to a current monitoring program at the landfill site as per a condition of the C of A for the operation of the waste disposal site (first paragraph, Page 3). However, no discussion on previous monitoring results is included in this report.*
- v) The proponent should provide all existing monitoring data and its analysis. This monitoring data could provide a better knowledge of the site conditions and potential impacts from the landfill (assuming that the monitoring program is properly designed).*

2.4 Water quality sampling analysis is limited to sampling of two shallow monitoring wells, 2 surface water stations (location of these stations is not known) and two private wells.

Comments:

- i) The sample ID number designations BH5-1, and LR9-1 in Table 6 is confusing. It is not clear if more than one monitor was installed at these locations or more than one sample was collected. It also appears that only one sample was analyzed.*
- ii) The sampling program is extremely limited and does not provide enough data to understand spatial variation of groundwater quality. Furthermore, as the water quality data is limited to one sampling event, it is not possible to determine if there are any seasonal or temporal trends. In this regard, it would be useful to review historic landfill monitoring data, if any. In the absence of long-term monitoring data, additional groundwater level and water quality data involving quarterly monitoring events for a period of at least one year will be required to understand temporal changes in groundwater flow and quality and to determine potential impacts of the landfill and the proposed sewage disposal facility.*
- iii) The groundwater samples were analyzed for only three parameters (Phosphorous, Dissolved Organic Carbon (DOC), and Chemical Oxygen Demand (COD))(Table 6 of the Report). As the site is used as a*

waste disposal site, the groundwater samples should have been analyzed for all landfill impact indicator parameters.

- iv) Paragraph 5.2.2 (page 16) refers to DOC and BOD as being higher in LR-9. Table 6 and the certificates of analysis included in Appendix D show that the groundwater samples were analyzed for COD not BOD, while surface water sample were analyzed for both BOD and COD.*
- v) Elevated concentrations of DOC and Phosphorous in groundwater samples were inferred to be natural "due to traces of ancient plant matter". There was no discussion on such ancient plant matter in any of the borehole logs or anywhere else in the report. A more extensive sampling (of more wells) and analysis (of additional landfill impact indicator parameters) will be required to confirm that these elevated concentrations are not attributable to the landfilling operations. If the landfill is found to impact the groundwater chemistry, there is a high likelihood that the proposed sewage disposal would also have an impact on the water resources, at least locally.*

3.0 Potential Impact Assessment

The potential impact assessment completed in the Report was limited to Nitrate loading impact assessment. Although the mass balance approach followed in this assessment and verifying the results against the Ministry of the Environment's Reasonable Use Policy are appropriate, there appear to be some inconsistencies and inadequacies in the actual analysis.

Comments:

- i) Sewage contains other nutrients, such as phosphorous, which could negatively impact the surface water sources in the vicinity. The fact that phosphorous concentration in the groundwater is already elevated is a clear indication that the soils on site would not allow attenuation of this contaminant and would most likely be carried off-site and discharge to surface water in the area. This would have a negative impact on the surface water bodies.*
- ii) As discussed above, it is not known if any other potential contaminants exist in the groundwater (irrespective of their origin, either from the landfill or naturally occurring on site) that could be mobilized by the additional hydraulic loading from the proposed disposal bed.*
- iii) Contrary to the statement (on page 19, Section 7.1) that "the infiltration factor procedure is shown in Appendix F", the information provided in Appendix F is limited to Canadian Climate Normals 1971-*

2000 downloaded from Environment Canada's website. In the absence of clear topographic and soils mapping (which are not included in the Report), it is not clear how the values were assigned and how the infiltration was estimated as 280 mm/year. The proponent should provide more details on this assessment.

- iv) *The Reasonable Use Policy criteria are related to the background concentrations. As such, assuming the criteria value to be 2.5 mg/L pre-supposes the background nitrate concentration to be 0 mg/L. This is not acceptable. It is necessary to establish the background levels through installation of background monitors up-gradient of the site.*
- v) *As discussed above, the groundwater flow was characterized using the on-site boreholes. In the absence of any boreholes up-gradient of the landfill and to the west of the proposed sewage treatment lagoon and disposal area, it is not possible to determine shallow flow paths surrounding the proposed facilities. As such, the proposed attenuation zone identified in Figure 4 may not appropriate. If there is any significant radial flow surrounding the proposed disposal bed resulting in some flow towards the west, off-site migration of contaminants may occur.*
- vi) *The Report is completely silent on potential impacts to surface water and air quality. The Report should include comments on potential impacts to surface water sources in the area and potential degradation of air quality.*
- vii) *The impact assessment should also consider the groundwater velocities, particularly because of relatively high permeable sandy soils on the site.*

4.0 Design Considerations

The present review of the design is limited to general considerations of the liner design, and spill contingency plan. The details with respect to hydraulic loading and sizing are out of scope of the present review.

Comments:

- i) *The Report indicates that the present application is for the initial phase of the proposed sewage treatment system and includes two concrete trash tanks and a storage lagoon. The proponents propose to apply sewage on land adjacent to the lagoon, as an interim measure (prior to 2007); however, there is no description on where and how the sewage will be applied. Any application close to the property boundary could result in*

off-site impacts. A clear delineation of the proposed area of application of sewage, along with an assessment of potential groundwater mounding and its implication on water quality, should be included.

- ii) Based on a cursory review of the proposed design for the lagoon, it appears that the design considerations for the liner are appropriate. A geosynthetic liner could be effective as long as the liner is not perforated or torn. .*
- iii) The contingency plan is restricted to spill contingencies. The Report should also include a discussion on failure scenarios (such as failure of geosynthetic liner, rupture of berms etc.).*
- iv) The Report also does not provide any details on possible accumulation of biosolids over time in the lagoon.*
- v) The design considerations do not address potential complaints related to air quality*

5.0 Monitoring Program

The proposed monitoring program includes quarterly monitoring of sewage quality in the trash tank, primary lagoon and 3 onsite monitors (BH1, BH5, and BH9) and at 2 surface water-sampling locations. Comments on the proposed monitoring program are discussed below.

Comments:

- i) The monitoring program during when the sewage will be applied on land should be more extensive and should not be restricted to the above three monitors only.*
- ii) Installation of multi-level monitors at selected locations to assess potential for vertically downward flow of contaminated groundwater is recommended.*
- iii) Selection of surface water monitoring stations may need to be reviewed. In addition to proposed quarterly sampling, surface sampling during wet and dry periods should be undertaken.*

6.0 Summary

In summary, the hydrogeological investigations that have been completed at the proposed site for the sewage lagoon construction are limited in extent and further studies will be required to ensure that the proposed facilities would not have adverse impacts on local water resources.

We trust that the above addresses all the identified issues adequately. Should you need any clarifications or have any questions related to this review, please do not hesitate to contact me at: 519 823 4995.

Yours truly,

R.J. Burnside & Associates Ltd.

Bindu Uppaluri, Ph.D., P.Geo.
Manager/Senior Hydrogeologist

c.c. Mr. Gerald Bain, Township of Algonquin Highlands
Mr. Andrew Mobberley, Waste Approvals Unit, MOE
Ms Vicki Mitchell, Eastern Region EA Coordinator, MOE
Mr. Bruce Hancock, Peterborough District Manager, MOE