

# DRAFT

Preliminary Hydrogeologic Investigation  
Proposed Septage Disposal Facility

Candidate Site No. 1 Lake St. Peter  
Candidate Site No. 3 Papineau Lake

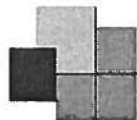
Prepared For:



Municipality of  
**Hastings Highlands**

Prepared By:

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## 1.0 INTRODUCTION

The rationale for conducting this study is based on two (2) provincial initiatives:

1. Nutrient Management Act, 2002 required that nutrient management practices would apply to septage, and that the Act intended to ban the land application of untreated septage. As of September 30, 2003 the land application of any nutrient source material was banned between December 1 to March 31. Under Ontario Regulation 267/03 as amended January 1, 2011 the land application of certain materials including untreated septage is to be approved as a waste under Part V of the Environmental Protection Act (EPA).
2. The Provincial Policy Statement, 2005 (PPS, 2005) established a preferred hierarchy of services for sewage and water systems to direct growth and development.
  - .1 Full Municipal Piped Services
  - .2 Private Communal Services
  - .3 Individual On-Site Sewage and Water Services
  - .4 Partial Services

The policy further states that lot creation would only be permitted if there is sufficient reserve capacity, which includes treatment capacity for hauled sewage (septage) from private communal and individual on-site sewage services.

As it was considered that the Municipality of Hastings Highlands did not have the population base to accommodate a Municipal sewage septage treatment plant, an evaluation of potential septage management options was carried out. In order to formalize the planning and design process the Municipality of Hastings Highlands initiated a Municipal Class EA in January 2011 to establish a Septage Management Strategy. Based on an initial evaluation of alternatives described in the 'Preliminary Project File' dated July 6, 2011, the proposal to develop and operate a Septage Dewatering Trench Facility near the Papineau Lake Waste Disposal Site was presented for agency and public comment.

Due to comments received the consultant team was requested to re-evaluate the alternative solutions. The list of alternative solutions was expanded, and through a request for interest process, private landowners were asked if they wished to sell property for the establishment of a septage management facility. A workshop was held December 3, 2011 to review the environmental screening process for alternative approaches and alternative sites.

The results were presented in the report entitled 'Evaluation of Alternative Approaches' dated March 9, 2012. The report detailed the selection process, described the twelve (12) alternative approaches and the screening process derived as a result of the workshop. Municipal Council accepted the findings and conclusions of the report on April 18, 2012 by Resolution 198-2012 which identified the Septage Dewatering Trench as the preferred solution.

Concurrently the report entitled 'Evaluation of Candidate Areas and Candidate Sites' dated March 9, 2012 was filed for agency and public review. The report detailed the selection process, described the seventeen (17) Candidate Areas and the screening process resulting in the identification of five (5) Candidate Sites. Initially, on May 3, 2012, Council approved the further investigation of three (3) Candidate Sites. On May 16, 2012, Council directed the consultant team to conduct a preliminary hydrogeologic investigation on the two (2) highest ranking sites, Candidate Site No. 1 and No. 3.

## 1.1 MNR Consultation

At the initiation of the Municipal Class EA planning process, the Ministry of Natural Resources (MNR) Bancroft District Office was consulted to obtain study area data and recognizing that the solution may involve Crown lands. The document entitled "A Class Environmental Assessment for MNR Resource Stewardship and Facility Development Projects" dated 2003 was considered. Through consultation with the MOE EA Regional Coordinator, it was confirmed that the Municipal Class EA process would address the MNR requirements if the project solution was subject to the MNR Class EA.

The MNR Bancroft District Office filed preliminary review comments on the five (5) Candidate Sites, dated March 20, 2012 and provided additional staff resources commenting on natural heritage resources, species at risk, forestry and aggregate resource data on the Candidate Sites.

In order to conduct on-site field investigation and surveys on the two (2) Candidate Sites which are located on Crown lands, a meeting was held June 12, 2012 to review Ministry requirements. A Letter of Authority was obtained June 20, 2012 signed by Bruce Mighton, Area Supervisor Bancroft/Mazinaw Area.

It was confirmed that if the municipality wished to establish a septage disposal facility on Crown lands, that the Septage Dewatering Trench area would need to be purchased (Reference: Waste Disposal Sites on Crown Land – Land Use Occupational Authority, April 1, 2005 and Disposition of Public Land at Less Than Market Value, July 15, 2005). The lands required for attenuation are to be secured in the form of an easement (Reference: Easements Grants Of, April 7, 2006). Copies of MNR correspondence and related documents are found in **Appendix A**.

## 1.2 Description of Candidate Sites

The results of the evaluation of Candidate Areas identified two (2) locations, each adjacent to a waste disposal site (WDS) on Crown lands with potential for dewatering trench facilities. The initial screening of the 17 Candidate Areas applied a 500 m setback from dwellings and major surface water features. If an area of approximately 3 ha not affected by the setbacks resulted, a Candidate Site was realized. The preliminary Candidate Site boundaries based on the setbacks were presented in the March 9, 2012 report and the April 2, 2012 re-evaluation. A location plan of the Candidate Areas is provided in **Figure 1-1** and **1-3** as presented in the July 6, 2011 report. The Candidate Site base map illustrating the initial setback application for each respective site is provided in **Figure 2-1** and **Figure 2-2** dated February 2012 which was filed in the March 9, 2012 report. Based on further agency and public consultation and site investigation the Candidate Site boundaries were refined as shown on **Figure 2-3** dated May 2012 and **Figure 2-4** dated August 2012. The following summarizes how each of the Candidate Sites were defined.

The initial Candidate Area requirement of 20 to 40 ha was to accommodate the dewatering trenches and a downgradient attenuation zone. The initial 500m setback screening was to identify a potential location which maximizes the distance to sensitive groundwater and surface water features. The 3 ha area requirement was determined based on the conceptual layout of the septage dewatering trench (Evaluation of Approaches, March 2012). For the final evaluation the fifteen (15) trenches spaced apart by 10m are proposed within a 170 x 120m area not including the surrounding access road.

### Lake St. Peter Candidate Site No. 1

The Lake St. Peter Waste Disposal Site is comprised of a 2.2 ha landfilling area located on Crown land on Lot 10, Concession 12 and 13 in the Township of McClure. The landfill site operates under C of A No. A361115. The area proposed for septage management known as Candidate Site No. 1 is west of the landfilling area.

- The July 2011 evaluation of a potential 40 ha Crown Land property identified an Environmental Protection designated area in the County Official Plan located in the northern portion of Lots 11 and 12, Concession 13 and poor drainage along Provincial Highway 127. Based on these features, steep topography and evidence of bedrock outcropping the site was considered unsuitable.
- The March 2012 evaluation applied the 500m setback to all major water bodies/watercourse identified on the Land Information Ontario (LIO) mapping which resulted in a potential 39.8 ha site area shown on **Figure 2-1**.
- The April 2012 evaluation assumed the limits of the northerly wetland based on topographical mapping/air photos and applied the 500m setback to all major water bodies/watercourse identified on the LIO mapping resulting in a potential 11.1 ha site area shown on **Figure 2-3**.

### Papineau Lake Candidate Site No. 3

The Papineau Lake Road Waste Disposal Site is located on Crown land, on Part of Lot 2, Concession 5 in the Township of Bangor. The landfill site operates under C of A No. A361105 and is comprised of a 0.8 hectare landfilling area within an aggregate extraction pit. The area proposed for septage management known as Candidate Site No. 3 is located to the northwest and southeast of the landfilling area.

- The July 2011 evaluation of a potential 40 ha Crown Land property identified site characteristics west of the WDS and the active aggregate pit deemed suitable for septage dewatering trenches.
- The March 2012 evaluation applied the 500m setback to all dwellings and major water bodies/watercourse identified on LIO mapping; isolated wetland limits were not considered. A 100m setback from the cemetery was also applied. This resulted in a site area of approximately 35 ha including the active WDS as shown on **Figure 2-2**.
- Based on public comment and further site review the wetland located along South Papineau Lake Road was included in the assessment. This results in two (2) potential candidate site areas for septage dewatering trenches. Candidate Site 3A comprises a potential 11.8 ha site, and Candidate Site 3B comprises a potential 11.2 ha site respectively, shown on **Figure 2-4**.

### 1.3 Work Activities

The purpose of the study is to assess the suitability of the Candidate Sites to locate and operate a "Septage Trench Dewatering Facility" with natural attenuation based on favourable surficial geology and groundwater flow characteristics.

The following work activities were completed at each site as part of the preliminary hydrogeological assessment:

- Review of Available Information
- Test Pit Program
- Water Level Survey
- Collection of Soil Samples
- Reasonable Use Criteria Assessment

The following published information was reviewed in our assessment of the Candidate Sites.

- Topographic Mapping (LIO)
- Aerial Photography (County of Hastings)
- Surficial Geology Maps (LIO)
- Bedrock Geology Maps (LIO)
- MOE Water Well Records (MOE)
- Annual Monitoring Reports for the Waste Disposal Sites (WESA)

Copies of the geological mapping, well records and monitoring well borehole logs from the Annual Reports are found in **Appendix B**.

### 1.4 Regional Hydrogeological Setting

The municipality is located within the Haliburton Highlands Physiographic Region that contains numerous bedrock controlled knobs and ridges separated by flat bottomed valleys containing streams, rivers and wetlands. The dominant surficial sediments in the valleys between the rock ridges are typically comprised of a matrix of glaciofluvial outwash sands, gravelly sands and gravel. The bedrock in the vicinity is reported to be comprised of a variety of middle to late Precambrian rocks.

Overburden geology obtained from available mapping, show that within 1 km of the Candidate Sites, the soil is mostly characterized by overburden consisting of fine sand to gravel. Candidate sites No. 1 and 3A are generally located on an elevated rock ridge with shallow till. Downgradient of the sites there is thicker deposits of sand and gravel associated with glacial outwash spillways. In the local lower-lying areas, peat and muck deposits occur. Candidate Site No. 3B is located on a thick sand and gravel deposit.

Two (2) potential aquifers within 1 km of the Candidate Sites have been identified from the physiographic mapping and MOE water well records. The Precambrian bedrock, and the thick coarse grained overburden materials constitute supply aquifers. Only the bedrock is being used as a domestic water supply source, a number of WDS monitoring wells are installed in the overburden.

## 1.5 Fieldwork and Analysis

The area of investigation involving test pit surveys on the Candidate Sites was limited in part to existing trails through the heavily forested areas, and on lands which were generally level, relatively dry, and had at a minimum an assumed overburden thickness of 1.5 m to bedrock and/or the water table.

On June 22, 2012 the municipality completed clearing and rough grading of a bush access road at Site No. 1. Access at Site No. 3A was confirmed to be satisfactory via existing recreational trails and through the aggregate extraction pit. In association with municipal staff, Jp2g field technicians completed the backhoe test pit program at Site No. 1 on July 3, 2012 and at Site No. 3A on July 4, 2012. The physiography of Site No. 3B is generally evident from the adjacent aggregate pit and bedrock outcropping.

The test pits were excavated to assumed bedrock or large boulder refusal, into the water table, or to the extended reach of the equipment. Upon completion of the test pits, the investigation was tied in for vertical and horizontal control. Vertical elevations are based on assumed benchmarks established at the respective WDS's and horizontal control is based on hand held GPS equipment. Samples representative of the soil characteristics were collected in the test pits. All holes were filled once the survey was completed.

Water level measurements were taken when the groundwater flow into the hole stabilized or at the elevation of saturated soil in the test pit. The water levels recorded represent the water table within the shallow overburden materials at the time of survey. The intent of the measurements was to determine the relative groundwater depth and flow direction within the respective Candidate Sites. The levels were then compared to the water levels recorded for the monitoring wells installed at the respective WDS.

Based on the initial findings, additional site reconnaissance was completed at the Candidate Sites on August 23, 2012. Using a hand held GPS additional physical features were plotted on the base mapping.

## 2.0 HYDROGEOLOGIC SETTING CANDIDATE SITE NO. 1 (LAKE ST PETER)

In order to determine the relative ground elevation, depth to bedrock and/or water table, and to characterize the overburden soils, a test pit program was completed on July 3, 2012. Twelve (12) test pits were constructed, test pit stratigraphy is provided in **Appendix C** and photographs of selected test pits are provided in **Appendix D**. The test pit program focused on a relatively level area west of the WDS accessed by an existing bush road. This Area of Investigation (AOI) is generally located in the Candidate Site No. 1 limits maintaining a 500 m setback from the nearby major surface water features identified on the Land Information Ontario and County Official Plan mapping as shown on **Figure 3-1**. Subsequently, the site investigation was extended to identify the optimum potential site for dewatering trenches.



## 2.1 Area of Investigation

The Lake St. Peter WDS is located west of Provincial Highway 127 approximately 2 km north of the built-up community of Lake St. Peter. The Candidate Site No. 1 limits were defined and located in Part of Lots 10 and 11, Concession 13, Township of McClure west of the WDS (**Figure 2-1**).

Based on initial site reconnaissance, the Area of Investigation (AOI) for the test pits was located along a bush access road on an elevated relatively level area approximately 300 m from the WDS (**Figure 3-1**). The intent was to maximize the distance from the local wetlands draining around the WDS and Highway 127, and it was assumed and confirmed through fieldwork that the elevated ridge towards the wetlands to the west comprised shallow overburden and bedrock outcroppings. The location of the sites' physical characteristics, test pits and the monitoring wells at the WDS are shown on **Figure 4-1**.

## 2.2 Physical Setting

The topographic surface at Candidate Site No. 1 AOI slopes from an elevation of approximately 460 m to 450 m above sea level (asl) eastward to the WDS and a poorly drained area along Highway 127 at an elevation of 410 m asl. This wetland flows under Highway 127 via a 900mm diameter culvert to a creek which drains into Lake St. Peter. To the west and north of the AOI the lands rise to an elevation of over 490 m asl. The northern portion of the AOI is level and well drained, extending along the northerly limits of the Candidate Site No. 1.

## 2.3 Bedrock Geology

There are three (3) boreholes drilled at the Lake St. Peter WDS at depths ranging from 7.6 to 8.2 m. Bedrock was not encountered in any of the three wells. Relative to an assumed benchmark elevation established by WESA on site in 2003, the borehole depths are:

|         | Ground<br>Elevation (m) | End of<br>Borehole (m) | Well<br>Depth (m) |
|---------|-------------------------|------------------------|-------------------|
| LSP1-03 | 98.87                   | 90.64                  | 8.23              |
| LSP2-03 | 98.89                   | 91.27                  | 7.62              |
| LSP3-03 | 98.73                   | 91.11                  | 7.62              |

In five (5) of the twelve (12) backhoe test pits constructed on July 3, 2012 bedrock or boulder refusal was encountered.

|      | Ground<br>Elevation (m) | Rock<br>Elevation (m) | Refusal<br>Depth (m) |
|------|-------------------------|-----------------------|----------------------|
| TP4  | 133.19                  | 131.79                | 1.4                  |
| TP5  | 135.68                  | 133.98                | 1.7                  |
| TP7  | 137.88                  | 136.03                | 1.85                 |
| TP9  | 140.91                  | 139.86                | 1.05                 |
| TP10 | 135.89                  | 133.89                | 2.0                  |

Based on these findings, the topographic high where the AOI is situated, is comprised of an elevated bedrock ridge, with evidence of bedrock outcropping in the southern portion. Overburden thickness increases north and east of the AOI. Due to limited accessibility the backhoe test pit program did not cover the entire level area.

## 2.4 Surficial Geology

Overburden geology information was obtained from MOE Well Water Records, the WDS borehole logs, and on site field investigations.

Based on borehole logs of wells drilled at the WDS and the test pit program, the overburden is mostly characterized by brown coarse sand with cobbles, stones and boulders. In the lower lying areas near the WDS and Highway 127, peat and muck deposits are evident. At Candidate Site No. 1 AOI the depth of overburden ranged from 1.0 m to over 2.5 m. It is assumed the overburden thickness increases to the north and east.

## 2.5 Hydrogeology

Groundwater in the overburden is largely controlled by the topographic and bedrock surfaces. Based on 2010 water level measurements of the WDS boreholes, the water table is found at an average depth of approximately 3.7 to 4.8 m below ground surface (WESA, 2010). The WESA April 2012 measurements show similar results. The water table was encountered in test pits 1, 3, 6 and 8 at a depth of greater than 2.0 m below ground surface. The groundwater elevation at the respective test sites is as follows:

|         | Ground<br>Elevation (m) | Water Table<br>Elevation (m) | Water Level<br>Depth (m) | Water Table<br>Elevation (m) | Water Level<br>Depth (m) |
|---------|-------------------------|------------------------------|--------------------------|------------------------------|--------------------------|
| LSP1-03 | 98.87                   | 93.99 (2010)                 | 4.88                     | 94.09 (2012)                 | 4.78                     |
| LSP2-03 | 98.89                   | 95.16 (2010)                 | 3.73                     | 95.14 (2012)                 | 3.75                     |
| LSP3-03 | 98.73                   | 94.08 (2010)                 | 4.65                     | 94.18 (2012)                 | 4.55                     |
| TP1     | 127.66                  |                              |                          | 125.56                       | 2.1                      |
| TP3     | 131.33                  |                              |                          | 128.88                       | 2.45                     |
| TP6     | 136.68                  |                              |                          | 134.38                       | 2.3                      |
| TP8     | 139.26                  |                              |                          | 137.06                       | 2.2                      |

**Figure 4-1** illustrates the assumed direction of shallow overburden groundwater flow at the AOI which is controlled by bedrock along the bush access road and the slope of land to east towards the wetlands along Highway 127. WESA states groundwater flow at the WDS is to the east.

## 2.6 Nearby Groundwater Users

Based on MOE water well records there are three (3) domestic wells which use the deep Precambrian rock at 50 m to 73 m depths within approximately 1 km of the Candidate Site.

## 2.7 Nearby Surface Water Features

The AOI is relatively well drained, although there is evidence of intermittent ponding and drainage courses throughout the forested area. The closest permanent surface water feature to the AOI is the wetland located near the WDS and Highway 127.

### 3.0 HYDROGEOLOGIC SETTING CANDIDATE SITE NO. 3 (PAPINEAU LAKE)

In order to determine the relative ground elevation, depth to bedrock and/or water table, and to characterize the overburden soils, a test pit program was completed on July 4, 2012. These site characteristics are easily defined within the open aggregate extraction pit and in consideration of the boreholes installed at the WDS. Nine (9) test pits were constructed, the test pit stratigraphy is provided in **Appendix C** and photographs of selected test pit program and surrounding area are provided in **Appendix D**. The test pit program focused on the area that is located approximately 250 metres west of the active fill area of the WDS in the forested area adjacent to the aggregate pit. The Area of Investigation (AOI) lies, in part, outside the Candidate Site No. 3A limits as shown on **Figure 3-2** due to the extent of existing accessible trails. Based on additional site review including the ATV trail leading northeast of the site, the Candidate Site No. 3A exhibits steep topography sloping to the south into an area which is poorly drained. The features to define the features of Candidate Site No. 3B were reviewed and plotted on the base mapping.

#### 3.1 Area of Investigation

The Papineau Lake WDS is located within an aggregate extraction pit north of Highway 62 and west of the entrance from South Papineau Lake Road. The initial Candidate Site No. 3 limits were defined and located in Part Lot 1, 2 and 3, Concession 5 and in Lot 2 and 3, Concession 4, Township of Bangor around the WDS (**Figure 1-3**).

The Area of Investigation (AOI) for test pits was located south and downgradient of the topographic high in Lots 1 and 2, Concession 5 Bangor (**Figure 3-2**). The AOI location was selected due to the existing recreational trails accessible by backhoe and to maximize the distance from Papineau Lake. The location of physical characteristics, test pits and the monitoring wells at the WDS for Candidate Site No. 3A and 3B are shown on **Figure 4-2**.

#### 3.2 Physical Setting

The topographic surface at the Candidate Site No. 3A is located with an overall gradient sloping to the south and southwest towards Kitts Creek to a poorly drained area which flows through a 500mm diameter culvert on the recreation trail. Candidate Site No. 3A is located between 370 to 330m asl. Relative to the surrounding water bodies Kitts Creek is at an elevation of approximately 310 m asl and Davis Pond is at approximately 350 m asl. The wetland on South Papineau Road is at 330 m asl.

Candidate Site No. 3B is located at an elevation of approximately 330m between the aggregate pit and the bedrock ridge. There is a relatively level area immediately adjacent to the aggregate extraction pit gently sloping to the southwest. The southerly portion of the site comprises a large bedrock outcropping.

Kitts Creek is located south of both sites and flows in a westerly direction through a wetland to Papineau Creek. The creek is located approximately 300 m at the closest distance from the Candidate Site 3A AOI and 500 m from Candidate Site No. 3B. Papineau Creek is located approximately 2.5 km west of the Candidate Sites.

### 3.3 Bedrock Geology

The bedrock is reported to be comprised of Precambrian basement rock with outcropping along Highway 62. At the WDS, three (3) on-site boreholes were completed in 2006 to depths ranging from approximately 6 m to 13 m, bedrock was not encountered. Relative to an assumed benchmark elevation established by WESA the borehole depths are:

|        | Ground<br>Elevation (m) | End of<br>Borehole (m) | Well<br>Depth (m) |
|--------|-------------------------|------------------------|-------------------|
| PL1-06 | 89.86                   | 83.76                  | 6.1               |
| PL2-06 | 96.89                   | 86.99                  | 9.9               |
| PL3-06 | 96.89                   | 83.84                  | 12.95             |

In three (3) of the nine (9) backhoe test pits constructed on July 4, 2012, bedrock or boulder refusal was encountered.

|     | Ground<br>Elevation (m) | Rock<br>Elevation (m) | Refusal<br>Depth (m) |
|-----|-------------------------|-----------------------|----------------------|
| TP1 | 93.16                   | 89.76                 | 3.4                  |
| TP5 | 95.29                   | 92.49                 | 2.8                  |
| TP6 | 97.84                   | 96.04                 | 1.8                  |

Based on these findings it is assumed that the topographic high in the northern portion of the Candidate Site No. 3A is a result of elevated bedrock (which approaches the ground surface at higher elevations). Overburden thickness increases in depth south and east of Candidate Site No. 3A. Overburden thickness decreases in depth to the south of Candidate Site No. 3B into large bedrock outcropping.

### 3.4 Surficial Geology

Surficial geological information is taken from the field investigation data and a review of published information. Beneath the landfill and the surrounding area, the overburden is comprised of a complex of sands, gravels, cobbles and boulders which extend to the Precambrian bedrock surface. At the Candidate Site No. 3A AOI, the depth of overburden ranged from 1.8 m to over 3.4 m, at Candidate Site No. 3B it is assumed the depths exceed 6m based on the monitoring wells installed at the WDS.

### 3.5 Hydrogeology

Beneath the Candidate Sites and the landfill site area, the movement of infiltrating precipitation is vertically downward within the unsaturated overburden. Thereafter, within the permeable material, groundwater movement is largely lateral, being controlled by the local bedrock and topographic gradients. It is anticipated that the general water table configuration at the site, and immediate surrounding area will be generally flat, with a slight gradient to the south towards Kitts Creek.

Groundwater levels in the boreholes at the WDS are found at an average depth (assumed) of approximately 0.5 to 7.5 m below ground surface (WESA, 2010). Groundwater was observed in several of the test pits that were constructed at the site at depths greater than 2.0 m below ground surface. The water levels in the WDS boreholes are generally similar between the 2010 average and the 2012 measurements. The water table at monitoring well

PL1-06 which is constructed at the lowest elevation within the extraction pit is often near the surface. Water table elevations from the Papineau Lake sites are as follows:

|        | Ground<br>Elevation (m) | Water Table<br>Elevation (m) | Water Level<br>Depth (m) | Water Table<br>Elevation (m) | Water Level<br>Depth (m) |
|--------|-------------------------|------------------------------|--------------------------|------------------------------|--------------------------|
| PL1-06 | 89.86                   | 89.33 (2010)                 | 0.5                      | 89.39 (2012)                 | 0.47                     |
| PL2-06 | 96.89                   | 89.39 (2010)                 | 7.5                      | 89.47 (2012)                 | 7.42                     |
| PL3-06 | 96.89                   | 90.05 (2010)                 | 6.84                     | 90.03 (2012)                 | 6.86                     |
| TP2    | 93.16                   |                              |                          | 91.06                        | 2.1                      |
| TP4    | 92.17                   |                              |                          | 89.32                        | 2.85                     |
| TP7    | 92.58                   |                              |                          | 89.58                        | 3                        |
| TP8    | 92.18                   |                              |                          | 89.18                        | 3                        |
| TP9    | 91.49                   |                              |                          | 88.89                        | 2.6                      |

**Figure 4-2** illustrates the assumed direction of shallow overburden groundwater flow at the Candidate Site 3A AOI which is controlled by the bedrock ridge to the north and the slope of land towards Kitts Creek to the south. WESA states that groundwater flow at the WDS is to the north northwest, although MOE has asked that additional monitoring wells be installed to confirm. Water levels are assumed to be similar to monitoring wells PL2-06 and PL3-06 at the WDS. The groundwater flow from Candidate Site 3B is unknown, and will be determined through further assessment of the WDS.

### 3.6 Nearby Groundwater Users

The nearest groundwater users are the homes and cottages that are located along the south shore of Papineau Lake although many may use the lake as a source of water. Based on MOE water well records within 1 km of the Candidate Site, there are eight (8) domestic wells which use the bedrock aquifer at depths that vary between 24 m to 61 m. There are no groundwater users between the Site and Kitts Creek.

### 3.7 Nearby Surface Water Features

The area is relatively well drained, although there is evidence of intermittent ponding of water in the aggregate extraction pit and the forested area. The closest permanent surface water feature to Candidate Site No. 3A AOI or 3B is Kitts Creek. There is also a wetland located along South Papineau Lake Road which drains through a 600mm diameter culvert easterly towards Mud Pond. This wetland was considered in the 500m setback re-evaluation of the Candidate Sites however, the Candidate Site No. 3A AOI is located a distance of approximately 300 m, separated by an elevated ridge.

#### 4.0 PRELIMINARY ASSESSMENT

The preliminary hydrogeological assessment is intended to initiate the development of supporting documentation for a septage dewatering trench Certificate of Approval application in accordance with the 'Draft Guide to Disposal of Septage in Dewatering Trenches' MOE, September 2008. As per the Guide, these initial findings will be filed with the MOE Regional Technical Support Section for further consultation to define the requirements for the detailed hydrogeological assessment. Three (3) design criteria are to be addressed:

- 1) On-site soils are suitable for dewatering trench operation.
- 2) The trench can meet the minimum separation distance of 1.5 m that is required between the water table and the bottom of the trenches to allow for effective effluent treatment.
- 3) The water quality will comply with all MOE water quality protection policies including Guideline B-1-2 'Water Management – Policies, Guidelines Provincial Water Quality Objectives of the Ministry of the Environment' and Guideline B-7 'Incorporation of the Reasonable Use Concept into MOE Groundwater Management Activities'.

Based on the evaluation of approaches (March 9, 2012) it is assumed that an area of approximately 170 m x 120 m is required for the dewatering trenches. A conceptual plan of the septage trench disposal facility is reproduced as **Figure 5**. The preliminary location of the septage facilities for each of the selected Sites is shown on **Figure 5-1** and **5-2**.

#### 4.1 On Site Soils

Sourced from the physiographic mapping, MOE water well records, borehole logs, and the test pit programs, the shallow overburden material of the Candidate Sites is generally comprised of medium grained sand and gravel. In some areas of thicker deposits, larger diameter cobble and boulders may be encountered. The preliminary selection for the dewatering trench location assumes the soils have a percolation time of between 1 to 10 min/cm. Percolation time as defined in the Building Code O. Reg. 350/06 is the average time in minutes that is required for water to drop one centimetre during the percolation test or as determined by a soil analysis.

Generally the soils at the three (3) Sites are considered permeable and would have a hydraulic conductivity in the range of  $10^2$  to  $10^{-4}$  cm/sec. (i.e. sands and gravels, Freeze and Cherry 1979).

#### 4.2 Depth to Water Table

The water table is recommended to be 1.5 metres below the base of the trench. This criteria is assumed to be available in the vicinity of the three (3) Site locations, although the depth to the water table will vary during the year. The selection of the location for potential septage dewatering trenches within or adjacent to the Candidate Site limits avoided area of shallow overburden and high groundwater conditions. In addition areas of poor drainage and seasonal watercourses were avoided and maximized the distance from the assumed downgradient waterbody.

Site No. 3B characteristics (pending further evaluation of the WDS) readily satisfy these criteria, whereas Site No. 3A has limited potential. Site No. 1 has sufficient overburden thickness with a water table over 2.0m deep.

### 4.3 Reasonable Use

The Reasonable Use Concept addresses the levels of off-site contaminants which are considered acceptable by the MOE. The potential acceptability of a Candidate Site in terms of its impact on groundwater has been assessed in terms of the Reasonable Use Policy Objectives (RUPO). The RUPO establish the acceptability of change in groundwater quality (cm) as follows:

#### *Aesthetic Parameters*

- Degradation of less than 50% of the difference between the background quality and the established objective for the particular health related parameter.

#### *Health Related Parameters*

- Degradation of less than 25% of the difference between the background quality and the established objective for the particular health related parameter.
- Acceptable concentrations are based on background levels and water quality guidelines (ie. Drinking water objectives).

The chosen background values are utilized to calculate the RUC allowable concentrations for specific parameters, as per the following formulas:

Health Related:

$$C_{\text{allow}} = P_b + (C_m - P_b) \times 25\%$$

Non-Health Related:

$$C_{\text{allow}} = P_b + (C_m - P_b) \times 50\%$$

Where:

- $C_{\text{allow}}$  = Maximum allowable concentration of parameter as per the RUC guidelines.
- $C_m$  = Maximum acceptable concentration (MAC) of parameter as per the ODWS.
- $P_b$  = Chosen background value of parameter.

Nitrate nitrogen is considered the critical contaminant for the assessment. The RUPO for nitrate nitrogen (assuming 0.0 mg/L background) is 2.5 mg/L. We have provided in **Appendix E** a preliminary Contaminant Attenuation Model. The resultant nitrate concentrations are estimated to be approximately 1.5 m/L at an assumed downgradient property 300 m from dewatering trenches.

The proposed 170m x 120m (2.04 ha) dewatering trench area for Site No. 1, 3A and 3B is illustrated on **Figures 5-1** and **5-2**.

Site No. 1 and Site No. 3B provides more than a 300m setback to a downgradient receiving waterbody Site No. 3A is located to meet the minimum requirement.

## 5.0 DISCUSSION

The purpose of this study is to assess on a preliminary basis the suitability of the Candidate Sites to locate and operate a "Septage Disposal Facility" with natural attenuation. The completion of the preliminary assessment included a review of existing information a field reconnaissance and a test pit program to locate a potential site. In summary we offer the following:

### General

- The study area is located within the Haliburton Highlands Physiographic Region that contains numerous bedrock knobs and ridges separated by flat-bottomed valleys containing streams, rivers and wetlands.
- The bedrock in the study area is reported to be comprised of a variety of middle to late Precambrian bedrock.
- The dominant surficial sediments in the valleys between the rock ridges are comprised of a matrix of glaciofluvial outwash sands, gravelly sands and gravel.
- The test pit program and a review of existing borehole logs confirmed the presence of fine to coarse grained overburden materials at the Candidate Sites.

### Candidate Site No. 1 Lake St. Peter

- A test pit program was completed in an area west of the landfill site area. Twelve test pits were excavated to depths varying between 1.0 and 2.75 metres. Evidence of the water table was encountered in four of the test pits at depths greater than 2.0 m.
- Based on evidence of bedrock outcropping and topographic relief it is assumed groundwater flow is easterly towards Highway 127.
- A suitable 2.04 ha trenching area located over 400 m to the wetlands along Highway No. 127 can be achieved for Site No. 1.

### Candidate Site No. 3A Papineau Lake

- A test pit program was completed in an area west of the landfill site area in a forested area adjacent to the aggregate pit. Nine test pits were excavated to depths varying between 1.8 and 3.5 metres. Evidence of the water table was encountered in five of the test pits at depths greater than 2.0 m.
- Based on evidence of shallow overburden deposits as the elevation increased from the aggregate pit, it is assumed the groundwater flow from the Site No. 3A is to the south towards Kitts Creek.
- Due to steep relief and areas of poor drainage a suitable 2.04 ha trenching area would have to be located partially in the aggregate pit to satisfy a minimum 300 m distance to Kitts Creek.



Candidate Site No. 3B Papineau Lake

- A relatively level area covered with pine exists between the aggregate pit and bedrock outcropping which extends to Highway No. 62.
- Assumed thick deposit of sand and gravel with a water table depth greater than 6m, based on WDS monitoring wells PL2 and PL3.
- Assumed groundwater flow is controlled by the bedrock ridge whereby flow is to the southwest towards Kitts Creek. This to be confirmed with the installation of additional monitoring wells at the Papineau Lake Waste Disposal Site.
- A suitable 2.04 ha trenching area located over 300m to Kitts Creek can be achieved for Site No. 3B.

Preliminary Assessment

- A permeable soil below the bottom of a 0.15 to 1 metre deep trench is recommended. The water table is recommended to be 1.5 metres below the base of the trench.
- Both of these characteristics are available at the potential septage dewatering trench Sites 1, 3A and 3B although the depth to the water table measured during the field investigation will vary during the year. Trenches that are constructed in locations that can maximize the distance to the water table such as at Site No. 1 and 3B are preferred.
- Based on a conceptual layout of the dewatering trenches each of the Sites may be capable of satisfying the Reasonable Use Policy Options (RUPO) assuming that a minimum distance of 300 m to the downgradient permanent waterbody is provided. Site No. 1 and 3B can provide more than a 300 m attenuation zone distance.

All of which is respectfully submitted

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