MOE GUIDELINE D-4 ASSESSMENT
PROPOSED ABBOTTS RESIDENTIAL DEVELOPMENT
LANSDOWNE STREET
THORNBURY, ONTARIO

for

MS. TAMMY ABBOTTS

PETO MacCALLUM LTD.
25 SANDFORD FLEMING DRIVE
UNIT 2
COLLINGWOOD, ONTARIO
L9Y 5A6
PHONE:  (705) 445-0005
EMAIL:  collingwood@petomaccallum.com

Distribution:
2 cc:  Client (+email)
1 cc:  C.F. Crozier & Associates Inc. (+email)
1 cc:  PML Barrie

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Ms. Tammy Abbotts
P.O. Box 31
Singhampton, Ontario
N0C 1M0

Dear Ms. Abbotts

**MOE Guideline D-4 Assessment**

**Proposed Abbotts Residential Development**

**Lansdowne Street**

**Thornbury, Ontario**

Peto MacCallum Ltd. (PML) is pleased to present the results of the geoenvironmental study conducted to complete a Ministry of the Environment (MOE) Guideline D-4 Assessment for the Proposed Abbotts Residential Development property (referred to herein as the ‘Site’). Authorization for the work described in this report was provided by Ms. Tammy Abbotts in the signed Engineering Services Agreement Revised, dated June 18, 2019.

It is understood that Ms. Abbotts is planning a residential development for the 205 m by 51 m wide parcel of land on the east side of Lansdowne Street in Thornbury. The proposed concept plan includes 22 attached townhouse units, all fronting on a proposed single lane road (one-way), connecting Lansdowne Street and Huron Street. The Site covers an approximate plan area of 1.1 ha. A closed waste disposal site (landfill), MECP Inventory Number X 2090 is located southwest of the Site at the corner of Huron Street and Lansdowne Street. The County of Grey and The Town of Blue Mountains Official Plan requires the application of the MOE D-4 Guideline (Land Use On or Near Landfills and Dumps) for proposals for land use changes on or near operating or non-operating landfills.

This MOE Guideline D-4 Assessment was conducted to evaluate the potential for impact on the Site from the former landfill, in order to determine if there will be any adverse effects to the proposed residential development.

Drawing 2-1 shows the Site involved in the study in relation to the landfill.

The results of this MOE Guideline D-4 Assessment indicate there is not a concern of significant adverse affects from the landfill on the proposed residential development at the Site.

It is noted that an additional round of methane gas level readings from all three monitoring wells on-Site is required during frozen conditions. Once the second round of methane gas levels are collected, a separate letter will be issued. In the event that methane levels or any other concerns are raised during the additional monitoring, modifications to our conclusions and/or recommendations in this report may be required.
We trust the information presented in this report is sufficient for your present purposes. If you have any questions, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

Melissa King, P.Geo., QPESA
Associate
Discipline Head, Geoenvironmental and Hydrogeological Services

JR/MAK:jlb/tc
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1. INTRODUCTION

Peto MacCallum Ltd. (PML) is pleased to present the results of the geoenvironmental study conducted to complete a Ministry of the Environment (MOE) Guideline D-4 Assessment for the Proposed Abbotts Residential Development property (referred to herein as the ‘Site’). Authorization for the work described in this report was provided by Ms. Tammy Abbotts in the signed Engineering Services Agreement Revised, dated June 18, 2019.

It is understood that Ms. Abbotts is planning a residential development is proposed for the 205 m by 51 m wide parcel of land on the east side of Lansdowne Street in Thornbury. The proposed concept plan includes 22 attached townhouse units, all fronting on a proposed single lane road (one-way), connecting Lansdowne Street and Huron Street. The Site covers an approximate plan area of 1.1 ha. A closed waste disposal site (landfill), MECP Inventory Number X 2090 is located southwest of the Site at the corner of Huron Street and Lansdowne Street. The County of Grey and The Town of Blue Mountains Official Plan requires the application of the MOE D-4 Guideline (Land Use On or Near Landfills and Dumps) for proposals for land use changes on or near operating or non-operating landfills. The MOE D-4 Guideline Assessment (D-4 Assessment) is a guideline to investigate and evaluate the potential for adverse environmental impacts to development within 500 m of the waste footprint of a landfill.

Drawing 2-1 shows the Site involved in the study in relation to the landfill.

A Geotechnical Investigation was carried out concurrently for the Site and the findings were reported under a separate cover (PML Ref. 19CF012, Report 1). It is also noted that an annual ground water level monitoring program is being completed concurrently and the findings will be issued under a separate letter.
2. TERMS OF REFERENCE

PML conducted this assessment to determine if there will be any adverse effects to the proposed residential development from the landfill, considering the following factors as outlined in Section 4.1 of MOE Guideline D-4:

- landfill gas generation and migration;
- ground water and surface water contamination by leachate;
- odour;
- litter;
- contaminant discharges from associated vehicular traffic;
- visual impact;
- dust;
- noise;
- other air emissions;
- fires;
- surface runoff, and
- vectors and vermin.

The objectives of this study were accomplished by completing the following tasks:

Task 1: Reviewing available documents to assess the landfill history, hydrogeologic conditions and landfill and Site operation and development details.

Task 2: Conducting a site reconnaissance of the Site and landfill to enable documentation of site features (landfill configuration, slopes, drainage, vegetation etc.) as well as land use and drainage features adjacent to the landfill.
**Task 3:** Installing ground water monitoring wells and obtain ground water and methane gas levels in the monitoring wells in addition to soil and ground water samples.

**Task 4:** Evaluating the background information and field data to assess the Site and surrounding hydrogeologic conditions. Examining the Guideline D-4 criteria and preparing this report including an interpretation of the data to evaluate impacts to the Site, if any, from the landfill in accordance with the objectives of MOE Guideline D-4.

### 3. INVESTIGATION METHODOLOGY

The scope of work for this assignment included a review of available documents, attendance at the landfill site and the Proposed Abbotts Residential Development property, clearing public utilities, drilling boreholes, installation of ground water monitoring wells, ground water level and methane gas monitoring, soil and ground water sampling and chemical testing, data compilation and evaluation of the information gathered and preparation of this report, discussing the information compiled and the corresponding conclusions and recommendations.

#### 3.1 Field Work

PML attended the Site on June 21, 2019 to layout borehole/monitoring well locations. Borehole drilling, soil sampling and monitoring well installation was completed on July 30, 2019. PML later attended the closed landfill on October 21, 2019, followed by a visit to the Site.

Five boreholes (BH1 to BH5) were advanced to 6.4 to 6.7 m below ground surface (mbgs). Monitoring wells were installed in BH2, BH3 and BH5. The borehole locations were established in the field by PML as shown on Drawing 2-1, appended.

The boreholes were advanced using continuous flight solid stem augers, powered by a track mounted CME-75 drill rig, equipped with an automatic hammer, supplied and operated by a specialist drilling contractor, working under the full-time supervision of a PML technical staff member. The ground surface elevation at the borehole locations was obtained with a Sokkia
SHC5000 Global Navigation Satellite System (GNSS). Vertical and horizontal accuracy of this unit are 0.1 m and 0.5 m, respectively. Co-ordination for clearances of underground utilities was provided by PML. The boreholes were drilled cognizant of the underground utilities.

The samples were field logged and examined for geoenvironmental classification, placed in laboratory provided airtight amber glass containers and/or methanol vials and stored in an insulated cooler for transportation to our laboratory for additional examination. As well, a portion of each soil sample was placed in a sealed plastic bag for later vapour screening. Particular attention was applied to visual and olfactory evidence of potential contamination such as odours and staining during the course of the field work.

The sampling and sample handling procedures were carried out according to the supporting documents of O. Reg. 153/04, as amended and established standards.

Upon completion of the drilling, three ground water monitoring wells were installed (BH2, BH3 and BH5) using clean 50 mm diameter screened and solid PVC Schedule 40 pipe, well gravel, bentonite, j-plugs, well points and stick-up well protectors. The wells were installed to a depth of 6.1 m and were screened at the bottom over lengths of 3.8 to 4.6 m. The annular space of the borehole around the screen was backfilled with clean filter sand (up to at least 0.3 m above the top of the well screen) followed by a bentonite seal and well protector set in concrete.

The details of the monitoring well construction are shown on the appended Log of Borehole/Monitoring Well sheets.

Water levels were measured in the ground water monitoring wells (BH2, BH3 and BH5), on August 23, September 10 and October 21, 2019 using a Heron™ ground water level reader. Purging and development of the wells was completed on August 23 and October 21, 2019 using a combination of fixed volume purging procedures or well evacuation purging as outlined in ASTM D6452-99 (2012).
Monitoring of methane gas concentrations in the wells on-Site was performed using an RKI Eagle Portable Gas Detector with the aid of a Gilair 5 Pump for purging. The RKI Eagle was calibrated using methane by Argus-Hazco.

### 3.2 Chemical Testing Protocol

Soiland ground water samples were submitted for chemical analysis to Caduceon Laboratories, a CALA accredited laboratory in Lakefield, Ontario. The chemical analyses conducted by Caduceon were in accordance with the O. Reg. 153/04 Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004, amended as of July 1, 2011.

The rationale for sample selection was based on visual and/or olfactory evidence of potential contamination, zones potentially impacted and general Site coverage. The following table summarizes the samples submitted for analysis.

<table>
<thead>
<tr>
<th>Location</th>
<th>Sample ID</th>
<th>Approximate Depth (m)</th>
<th>Lithology</th>
<th>Type of Chemical Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole 1 Northwest portion of the Site</td>
<td>BH1 SS3</td>
<td>1.5 to 2.0</td>
<td>Clayey Silt</td>
<td>Corrosivity</td>
</tr>
<tr>
<td>Borehole/Monitoring Well 2 Northeast portion of the Site</td>
<td>BH2 SS6</td>
<td>4.6 to 5.1</td>
<td>Sand and Silt</td>
<td>Metals and inorganics PHCs, VOCs, PAHs, PCBs</td>
</tr>
<tr>
<td>Borehole/Monitoring Well 3 Southwest portion of the Site</td>
<td>BH3 SS6</td>
<td>2.3 to 2.5</td>
<td>Clayey Silt</td>
<td>Metals and inorganics PHCs, VOCs, PAHs, PCBs</td>
</tr>
<tr>
<td>Borehole 4 South-central portion of the Site</td>
<td>BH4 SS3</td>
<td>4.6 to 5.1</td>
<td>Silt to Clayey Silt</td>
<td>Corrosivity</td>
</tr>
<tr>
<td>Borehole/Monitoring Well 5 Southeast portion of the Site</td>
<td>BH5 SS5</td>
<td>4.6 to 5.1</td>
<td>Sand and Silt</td>
<td>Metals and inorganics PHCs, VOCs, PAHs, PCBs</td>
</tr>
<tr>
<td>Location</td>
<td>Sample ID</td>
<td>Approximate Depth (m)</td>
<td>Lithology</td>
<td>Type of Chemical Analysis</td>
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</tr>
<tr>
<td>Ground Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole/Monitoring Well 2</td>
<td>BH2 08-23-19</td>
<td>Screened 1.5 to 6.1</td>
<td>Silt and sand</td>
<td>Metals and inorganics (\text{PHCs, VOCs, PAHs, PCBs, Alkalinity, Chloride, Sodium, Sulphate, Hardness})</td>
</tr>
<tr>
<td>Northeast portion of the Site</td>
<td>and BH2 10-21-19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole/Monitoring Well 3</td>
<td>BH3 08-23-19</td>
<td>Screened 2.4 to 6.2</td>
<td>Sand and silt</td>
<td>Metals and inorganics (\text{PHCs, VOCs, PAHs, PCBs, Alkalinity, Chloride, Sodium, Sulphate, Hardness})</td>
</tr>
<tr>
<td>Southwest portion of the Site</td>
<td>and BH3 10-21-19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borehole/Monitoring Well 5</td>
<td>BH5 08-23-19</td>
<td>Screened 1.5 to 6.1</td>
<td>Silt and sand</td>
<td>Metals and inorganics (\text{PHCs, VOCs, PAHs, PCBs, Alkalinity, Chloride, Sodium, Sulphate, Hardness})</td>
</tr>
<tr>
<td>Southeast portion of the Site</td>
<td>and BH5 10-21-19</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes:  
PHCs = Petroleum Hydrocarbon Fractions F1 to F4; VOCs = Volatile Organic Compounds; PAHs = Polycyclic Aromatic Hydrocarbons; PCBs = Polychlorinated Biphenyls

Based on their common use elsewhere as typical landfill indicator parameters, alkalinity, chloride, sodium and hardness were also tested in the ground water.

4. **FINDINGS**

4.1 **Data Review**

PML reviewed the following documents for the data review portion of this assignment.

4.1.1 **Environmental Reports**

PML was provided an Environmental Impact Study titled “Environmental Impact Study, Thornbury Closed Landfill Site, dated July 2010” for the Town of The Blue Mountains and was completed by R.J. Burnside & Associates Limited (File No. MCO 018503).

The study was conducted to determine if lands within 500 m of the landfill will be environmentally impacted and if lands within 500 m are to be subject to additional studies. The study evaluated
background information and completed test pit excavations with supplemental methane gas monitoring.

A total of seven test pits were excavated to depths of 1.4 to 2.5 mbgs at the landfill site. Soil conditions generally involved silty sand to sandy silt fill that was till-like in local cases. Debris was encountered including bricks, garbage bags, glass, metal, burnt paper, wood, concrete blocks, and paper. An oily odour was noted in three test pits, however was associated with nearby asphalt at two test pits.

Water was encountered in two test pits; however, it was noted that the surficial topsoil layer was saturated and was the source of the water infiltration into the test pit in each case.

Methane gas monitoring was completed by assessing methane release from the sidewalls of two test pits at the north portion of the landfill waste footprint. Methane was not detected in air.

Surface water and ground water flow was anticipated to flow north towards Georgian Bay or on a local scale towards Beaver Creek to the west.

Regarding the location of the Site and zones surrounding the landfill that were determined to require additional landfill studies due to potential landfill impacts, the Site was within 500 m of the landfill and the southwest corner of the Site was included in the potential zones for ground water and landfill gas impacts. Due to being within 500 m of the landfill, an MOE Guideline D4 Assessment is required for development.

4.1.2 MECP FOI Records

After a thorough search by the MECP through the files of the Ministry’s Barrie District Office, Investigations and Enforcement Branch, Environmental Monitoring and Reporting Branch, Sector Compliance Branch and Safe Drinking Water Branch, records were not found under the current landfill address 130 King Street in Thornbury, Ontario.
It is noted that a previous FOI request was submitted as part of the Environmental Impact Study for the closed landfill and one letter from the MOE (now MECP) to the Town of The Blue Mountains was found, dated August 13, 2004.

The letter comprised an inspection report completed by the MOE for Closed Waste Disposal Site number X2090 on King Street in The Town of Thornbury. Findings of the inspection identified that leachate control, methane gas control and ground water monitoring programs/systems were not in place, however no anticipation of human health impact, environmental impact or legal environmental impairment was identified. The landfill was being used for aggregate and boat trailer storage.

For ease of reference, the MECP records previously searched as part of the Environmental Impact Study are included in Appendix A.

4.1.3 MOE Waste Disposal Site Inventory

The MOE Waste Disposal Site Inventory, June 1991 indicated that the Site No. X 2090 was located at King and Lansdowne, was closed in 1969 and was classed as an A7 site. Class A7 closed waste disposal sites are rural municipal/domestic waste sites with the potential to impact humans, which have been closed more than 20 years at the time of the inventory record.

4.1.4 Zoning Records

The Town of The Blue Mountains Official Plan Schedule A-2 indicated that the Site is zoned Community Living Area, which includes use for single detached, semi-detached and duplex dwellings, townhouse, multiple and apartment dwellings, accessory apartments in single detached, semi-detached and townhouse dwellings, home occupations, bed and breakfast establishments in single detached dwellings parkettes and neighbourhood parks, day nurseries and institutional uses, special needs housing, private home daycare and other similar uses.
4.1.5 Physiography and Topography

The Site is located within the physiographic region known as the Beaver Creek (Chapman and Putnam, 1984). In the vicinity of the Site the land is characterized as a sand plain that varies from sand to fine silt with some gravelly soils.

Topographic data shown on the Natural Resources Canada online mapping website indicated that the Site ranged from elevation 180 to 190 (metric, geodetic). A drainage ditch is located along the north section of the Site.

According to the previous report by others, the landfill waste footprint is flat on top (elevation 190 +/- m) with steep side slopes.

Georgian Bay is located about 100 m to the north and Beaver Creek is located about 150 m to the west.

4.1.6 Proposed Development Plans

The proposed concept plan includes 22 attached townhouse units, all fronting on a proposed single lane road (one-way), connecting Lansdowne Street and Huron Street. Full-depth basements are being considered for all homes, and based on the grading concept to date, may only be partially buried. The Site will be fully serviced.

A preliminary concept plan is provided for reference in Appendix B.

4.1.7 Geotechnical Investigation Report

A geotechnical investigation was completed by PML for the Site (PML Ref.: 19CF012, Report 1, dated October 16, 2019).

Subsurface soil data and ground water level data was used to supplement the findings of this report in the following sections. Please refer to the geotechnical investigation report for particulars.
4.1.8 **Aerial Photographs**

Aerial photographs for the years 1938, 1962, 1988 and 2002 were reviewed to confirm the timeline of landfill site development. The aerial photographs showing the approximate landfill site boundaries are shown on Figures B-1 to B-4 in Appendix A as part of the Environmental Impact Study.

The 1938 aerial photograph shows the landfill site generally cleared with minor vegetation present and Beaver Creek crossing at its current location. King Street extended further to the west crossing over Beaver Creek to the south of the landfill. The 1962 aerial photograph shows discolouration at the location of the waste footprint with an increase in vegetation surrounding the discoloured area and the entrance to the landfill was at its current location. The 1988 aerial photograph shows some discolouration across the waste footprint which has expanded since 1962, however this may be from storage use of aggregates and miscellaneous items such as plows or boat cribs after the landfill closed in 1969. The 2002 aerial photograph shows generally similar characteristics as noted during PMLs site visit to the closed landfill, except the only use appears to be for aggregate storage.

4.2 **Site Reconnaissance**

4.2.1 **Proposed Abbotts Residential Development Visit**

PML attended the Site on October 21, 2019 to document Site conditions in relation to the landfill. The Site was rectangular in shape with residential properties surrounding the Site to the north, east and south with a narrow wooded area (proposed one-lane roadway area) separating the Site from the residential properties to the north and east. Lansdowne Street was located to the west. The Site was vacant with vegetation across the surface. Overall the ground surface at the Site was generally flat with a minor slope down towards the north.

No stressed or strained vegetation and no odours or significant litter was noted during the Site visit. Mulch stockpiles and on-Site debris piles consisting of metal and concrete were noted.
The Site was separated from the landfill by residential dwellings, Lansdowne Street and Huron Street. The landfill was not visible from the Site since residential dwellings and wooded land separated the two. The waste footprint of the landfill was approximately 100 m to the southwest of the Site.

4.2.2 Landfill Site Visit

PML attended the landfill on October 21, 2019 after receiving permission from the Town of The Blue Mountains to enter unaccompanied. Access to the landfill is from King Street at the south-central portion of the landfill property. The landfill property was a rectangular shape with the waste disposal footprint located in the east portion of the property. The waste footprint was generally bounded by Huron Street to the north, Lansdowne Street to the east, King Street to the west and Beaver Creek to the West. A gate and surrounding fence were noted but was in disrepair. The waste footprint area was mainly open and was being used for boat crib storage, municipal plow storage and aggregate storage with one tarped roof structure that was open and not in use.

No stressed or strained vegetation was noted during the landfill site visit, however darkened spots were noted on surficial granular material likely caused from pulverized asphalt falling off of transportation vehicles entering and leaving the landfill. The closed landfill was covered over with soil and/or granular material where boats, plows and stockpiled materials remained, however some debris was noted such as wood, plastic and metal items.

4.3 Sampling and Monitoring Well Installation

4.3.1 Summarized Subsurface Conditions

Reference is made to the appended Drawing 2-1, and Log of Borehole/Monitoring Well Sheets BH1 to BH5 from the Geotechnical Investigation (included in Appendix C) for details of the field work including sampling locations, visual soil classification, inferred stratigraphy, soil vapour concentrations and ground water observations.
Due to the soil sampling procedures and limited sample size, the depth demarcations on the borehole logs must be viewed as "transitional" zones between layers, and cannot be construed as exact geologic boundaries between layers. PML would be pleased to assist in defining soil boundaries in the field during construction, if required.

Topsoil was encountered over a thin layer of fill, over deposits of native silt to clayey silt, silt, sand and silt, silty sand, and local layers of sand and clayey silt. A description of the distribution of the subsurface conditions encountered is provided below.

4.3.1.1 Soil

Fill was at the surface of all boreholes. The fill comprised silty sand to sandy silt with trace gravel and trace organics. The upper 0.5 m had topsoil inclusions and this appears to be related some activity on the site prior to the field work, including the digging of a ditch just beyond the north edge of the site along the proposed road and piling material on the site. The fill extended to 0.7 to 1.4 m depth (elevation 178.6 to 181.3). The material had N Values of 5 to 50 indicating variable compaction when the fill was placed. The fill was moist, with moisture contents of 3 to 9%.

In Borehole 1, below the fill a thin local clayey silt layer was revealed from 1.4 to 1.6 m depth (elevation 178.4 to 178.6). The material was hard (N Value 48) and considered drier than plastic limit. Underlying the clayey silt layer, a thin sand layer was present from 1.6 m depth to 2.0 m depth (elevation 178.0 to 178.4). The sand was dense (N Value of 48) and wet (moisture content of 15%).

An upper silty sand layer was beneath the fill to 2.1 m depth (elevation 178.9) in Borehole 3. The layer was dense to compact with depth (N Values of 44 and 20) and moist, with water contents of 4% and 7%.

A silt to clayey silt deposit was revealed in all boreholes, except in Borehole 2. The deposit was below fill or local upper layer in Boreholes 1, 3 and 4 and extended to the 6.5 to 6.7 m depth of exploration. In Borehole 5, the silt to clayey silt deposit occurred between 2.9 and 4.0 m depth (elevation178 to 179.1). The deposit was layered and also had wet sand seams. N Values were
typically above 30 being Hard, locally 20 or 26 and being very stiff. Moisture content ranged from 10 to 19%, typically about plastic limit to drier than plastic limit.

Underlying the silt to clayey silt/silt in Boreholes 2 and 5, a sand and silt unit was encountered to 6.0 m depth (elevation 175.0 to 176.0). The soil was very dense (N Values greater than 50) and wet (moisture contents of 13 to 21%).

Below the sand and silt unit in boreholes 2 and 5, a silty fine sand deposit was encountered to the 6.4 to 6.5 m depth of exploration. The material had N Values greater than 50 showing very dense conditions. The soil was wet with moisture content of 17 to 20%.

4.3.1 Soil Vapour Concentration

The correlation between combustible vapour concentrations and PHCs in soil is highly dependent on the soil type, moisture content and characteristics of the contaminant of concern. The measured concentration on the headspace of recovered soil samples was 0 to 25 ppm (methane response off), which is not considered to be significant.

4.3.2 Methane Gas Concentration

Methane is an odourless, colourless flammable gas that can be formed by the decay of natural material and is common in landfills, marshes, septic systems, sewers and areas with buried organic soils.

Flammability limits (Explosive Limits) are the minimum and maximum concentrations (in air) of a flammable gas or vapour between which ignition can occur. Concentrations below the lower explosive limit (LEL) are too lean to burn, while concentrations above the upper explosive limit (UEL) are too rich and oxygen levels are too low to support combustion. All concentrations between the LEL and UEL are in the explosive range, and special precautions are required to prevent explosion or ignition.
To collect methane gas concentrations from inside the three wells on-Site, ASTM Method D7663-12 (Reapproved 2018) for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusive Evaluations was used. Monitoring of methane gas concentrations in the wells on-Site was performed using an RKI Eagle Portable Gas Detector with the aid of a Gilair 5 Pump for purging. The RKI Eagle was calibrated using methane by Argus-Hazco. The methane gas concentrations measured in BH2 and BH3 were less than 1% LEL, and was 12% in BH5, as summarized in the following table:

<table>
<thead>
<tr>
<th>Location</th>
<th>Methane Gas Concentrations (ppm / %LEL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BH2</td>
<td>35/0.1</td>
</tr>
<tr>
<td>BH3</td>
<td>5/0</td>
</tr>
<tr>
<td>BH5</td>
<td>6,000/12</td>
</tr>
</tbody>
</table>

Concentrations equal to or greater than the LEL are considered hazardous. To add a margin of safety, the MECP considers that concentrations greater than 20% LEL may be associated with still higher concentrations, exceeding the LEL. Therefore, methane concentrations greater than 20% LEL warn of conditions which could be potentially hazardous, and further investigation may be warranted and/or gas control systems should be designed to maintain concentrations below this level.

An additional visit will be made during the winter months to obtain methane gas concentrations under frozen conditions, in accordance with the MOE D4 Guideline and will be reported under a separate letter.

4.3.3 *Ground Water*

Upon completion of the boreholes, free water was noted in BH1 to BH5 at 2.7, 2.9, 2.8, 6.1 and 4.0 m depth, respectively. Cave was encountered at 5.5, 3.7, 5.0 and 4.5 m depth in BH1 to BH3 and BH5, respectively. Cave was not encountered in BH4.
The monitoring well screened interval in BH2, BH3 and BH5 was intended to span the ground water surface to allow for methane gas monitoring. Drawing 2-1 shows the monitoring well locations, ground water elevations, interpreted ground water contours and ground water flow direction and the following table provides a summary of the water levels in BH2, BH3 and BH5.

<table>
<thead>
<tr>
<th>Location</th>
<th>Ground Surface Elevation (m)</th>
<th>Screened Interval Elevation (m)</th>
<th>Ground Water Levels Depth/Elevation (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Aug. 23, 2019</td>
</tr>
<tr>
<td>BH2</td>
<td>181.00</td>
<td>179.5 to 174.9</td>
<td>2.8/178.2</td>
</tr>
<tr>
<td>BH3</td>
<td>180.85</td>
<td>178.5 to 174.7</td>
<td>2.4/178.5</td>
</tr>
<tr>
<td>BH5</td>
<td>181.65</td>
<td>180.2 to 175.6</td>
<td>2.7/179.0</td>
</tr>
</tbody>
</table>

Based on PML Site observations and water level measurements, the ground water table underlying at the Site flows down toward the north to northwest, toward Georgian Bay, which is consistent with the surficial topography at the Site.

4.4 **Analytical Findings**

4.4.1 **Applicable Site Condition Standards**

In order to determine the Site Sensitivity, Sections 41 and 43.1 of O. Reg. 153/04, as amended were evaluated by PML as described in Table 1A and 1B, appended.

Potable water for the proposed development will be supplied via a piped municipal distribution system, which utilizes a mix of surface water and ground water, however several water supply wells were located within 250 m of the Site and the Site is within an intake protection zone. The Site is not within 30 m of a water body nor is it apart of an Area of Natural Scientific Interest (ANSI) or Natural Heritage System.
Based on the above factors, PML selected the Generic Criteria of the O. Reg. 153/04, Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act dated April 15, 2011. In particular, the Table 2 (T2) Site Condition Standards (SCSs) for residential/parkland/institutional (RPI) property use were utilized.

The landfill indicator parameters were compared to the Ontario Drinking Water Quality Standards (ODWQS).

4.4.2 Chemical Test Results

Laboratory certificates of analysis compared to the T2 RPI SCSs for soil and ground water, including the QA report are included in Appendix D. The measured values and corresponding SCSs are shown on the certificates of analysis with the levels exceeding the applicable Standards highlighted in red, if applicable.

4.4.2.1 Soil

Based on the results of chemical analysis, the measured concentrations of metals and inorganics, PHCs, VOCs, PAHs and PCBs met the applicable T2 RPI SCSs. Surficial soil samples submitted for corrosivity had a negligible/low potential to be corrosive.

4.4.2.2 Sediment

Not applicable.

4.4.2.3 Ground Water

Based on the results of chemical analysis, the measured concentrations of metals and inorganics, PHCs, VOCs, PAHs and PCBs met the T2 SCSs with the exception of benzo(a)pyrene in sample BH5 08-23-19.
The measured concentrations of hardness, alkalinity, sodium, sulphate and chloride met the ODWQS, with the exception of hardness in BH2, BH3 and BH5 at concentrations of 2,140, 2,210, 2,420 mg/L respectively, which exceeds the recommended range of 80 to 100 mg/L. It is noted however, that the proposed development will be connected to municipal water. Furthermore, limestone bedrock is in the vicinity of the Site according to MECP well records, which may have an impact on the hardness of the ground water (Ontario ground water typically has elevated hardness).

The relative concentrations of the landfill indicator parameters were not elevated in comparison to each other nor was there a pattern of elevated concentrations closer to the landfill.

4.4.2.4 Surface Water

Not applicable.

4.4.3 QA/QC Data

Soil and ground water samples were analysed by using standard reference methods and the testing methods were referenced in Caduceon Environmental Laboratories Certificates of Analysis, as required by the MECP protocol. Laboratory QA/QC data is included with the Certificates of Analysis provided in Appendix D. Laboratory control standard samples, Matrix spike method and duplicate soil samples were analysed by the laboratory and the results of chemical analysis indicated that the recovery ranges were within the statistically determined control limits.
5. DISCUSSION

This D-4 Assessment was conducted to evaluate the potential for impact on the Site from the former landfill located southwest of the Site, in order to determine if there will be any adverse effects to proposed residential development.

5.1 Landfill Gas Generation and Migration

It is our opinion that proposed residential subdivision development is unlikely to be adversely impacted by subsurface migration of combustible gas originating from the landfill site based on the following rationale:

1. The location of the landfill waste disposal footprint is more than 90 m from the Site and there are associated roadways and underground utilities that are likely to act as pathway interceptors.

2. BH2 was located in the southwest corner of the Site at the nearest portion to the landfill and did not contain soil or ground water contamination.

3. Methane gas readings in the monitoring wells were below 20% LEL during PML’s methane monitoring visits. It is noted that methane gas levels were not obtained during frozen temperatures at the time of issuing this report, however will be obtained and reported under a separate cover once the ground has frozen.

4. The landfill has been closed for over 50 years.

5.2 Ground Water and Surface Water Contamination by Leachate

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by ground water contamination by leachate based on the following rationale:

1. The results of chemical testing of soil and ground water generally meet the applicable T2 RPI SCs, with the exception of benzo(a)pyrene (BH5 in the southeast portion of the Site) in ground water. Since there is no evidence of contamination in BH3 (closest to the landfill) and that BH3 separates the landfill
from BH5 where the benzo(a)pyrene exceedance was found, the exceedance is unlikely to be caused by the landfill;

2. Based on the surficial topography of the Site, landfill and surrounding area it is likely that the shallow ground water underlying the landfill, similar to that of the Site, follows the gradient of the ground surface and Beaver Creek. As such the direction of flow of ground water from below the landfill is anticipated to be to the north to northwest, away from the Site;

3. The Site is separated from the landfill by roads and underground utility corridors which may act as pathway interceptors for contaminant movement and preclude movement of contamination toward the Site;

4. No apparent concentration pattern of alkalinity, sodium, sulphate and chloride, which are common landfill indicator parameters was noted that would indicate consistent higher concentrations in upgradient ground water closest to the landfill;

5. The proposed development will not include potable water from wells on-Site, which will instead utilize the municipal water distribution system; and

6. The landfill has been closed for over 50 years.

5.3 *Odour*

It is our opinion that the proposed residential townhouse development is unlikely to be adversely impacted by odour from the landfill based on the following rationale:

1. No indication of deleterious odours was noted at the Site or landfill during PML’s visit.

2. Being that the Site is located between north latitudes 30° and 60° it is anticipated that the wind direction in the vicinity of the Site will be influenced by the Prevailing Westerlies carrying odours east away from the Site.

3. The landfill has been closed for over 50 years.
5.4 **Litter**

It is our opinion that litter from the landfill is not a concern based on the following rationale:

1. No significant amount of litter was noted at the Site or landfill during PML’s visit.

2. The location of the waste footprint is more than 90 m from the Site and is separated by Lansdowne Street and Huron Street.

3. Being that the Site is located between north latitudes 35° and 60° it is anticipated that the wind direction in the vicinity of the Site will be influenced by the Prevailing Westerlies carrying litter east, away from the Site.

4. The landfill is not operating and has been closed for over 50 years.

5.5 **Contaminant Discharges from Associated Vehicular Traffic**

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by contaminant discharges from associated vehicular traffic from the landfill since the landfill is not operating (closed for over 50 years) with minor usage to access municipal plows and trailers.

5.6 **Visual Impact**

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by visual impact from the landfill based on the following rationale:

1. The location of the waste footprint is more than 90 m from the Site and is separated by Lansdowne Street and Huron Street.

2. The landfill site is covered with dense bushes/trees and berm surrounds the waste footprint, which provides a visual barrier.

3. The landfill is not operating and has been closed for over 50 years.
5.7 **Dust**

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by dust from the landfill since the landfill is not operating (closed for over 50 years) with minor usage to access municipal plows and trailers. The landfill is also surrounded by dense bushes/trees acting as a barrier for dust movement.

5.8 **Noise**

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by noise from the landfill since the landfill is not operating with minimal on-site traffic.

5.9 **Other Air Emissions**

It is our opinion the proposed residential subdivision development is unlikely to be adversely impacted by other air emissions from the landfill since no air emissions were noted during PML’s visit to the Site or the landfill, the landfill is not operating and has been closed for over 50 years.

5.10 **Fires**

It is our opinion that fires associated with the landfill are not a concern since the landfill is not operating and has been closed for over 50 years.

5.11 **Surface Runoff**

It is our opinion that the proposed residential subdivision development is unlikely to be adversely impacted by surface runoff from the landfill based on the following rationale:

1. The location of the waste footprint is more than 90 m from the Site and is separated by Lansdowne Street and Huron Street with ditches.

2. Surface runoff from the landfill site is expected to follow the local topography and flow down to the north and west, away from the Site.
3. The landfill is not operating and has been closed for over 50 years.

5.12 Vectors and Vermin

It is our opinion the proposed residential subdivision development is unlikely to be adversely impacted by vectors and vermin from the landfill since the landfill is not operating and has been closed for over 50 years.

5.13 Ground Settlement

It is our opinion the proposed residential subdivision development is unlikely to be adversely impacted by ground settlement from the landfill since the location of the waste footprint is more than 90 m from the Site and ground settlement should be restricted to the landfill property.

5.14 Hazardous Waste

It is our opinion the development area is unlikely to be adversely impacted by hazardous waste from the landfill since the landfill was classified as receiving rural municipal/domestic waste the waste footprint is more than 90 m from the Site and the landfill is not operating and has been closed for over 50 years.

In addition, previous inspection reports indicated that human health impact, environmental impact or legal environmental impairment was not anticipated.
6. **CONCLUSIONS AND RECOMMENDATIONS**

This MOE Guideline D-4 Assessment was conducted to evaluate the potential for impact on the Site from the former landfill, in order to determine if there will be any adverse effects to the proposed residential development.

The results of this MOE Guideline D-4 Assessment indicate there is not a concern of significant adverse affects from the landfill on the proposed residential development at the Site.

It is noted that an additional round of methane gas level readings from all three monitoring wells on-Site is required during frozen conditions. Once the additional round of methane gas levels are collected, a separate letter will be issued. In the event that methane gas levels or any other concerns are raised during the additional monitoring, modifications to our conclusions and/or recommendations in this report may be required.

It should be noted soil and ground water conditions between and beyond the sampled locations may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent during future development to further access and appropriately handle the materials, if any, and evaluate whether modifications to the conclusions documented in this report are necessary.

The assignment is subject to the Statement of Limitations that is included in Appendix E and must be read in conjunction with this report.
We trust the information presented in this report is sufficient for your present purposes. Please do not hesitate to contact our office should you have any questions.

Sincerely

Peto MacCallum Ltd.

Joel Robinson, BSc, EPt, G.I.T.
Project Supervisor
Geoenvironmental and Hydrogeological Services

Melissa King, P.Geo., QP_ESA
Associate
Discipline Head, Geoenvironmental and Hydrogeological Services

JR/MAK/jb/tc
### TABLE 1A

Site Sensitivity Analysis  
Site Condition Standards, Environmentally Sensitive Areas  
Section 41, Ontario Regulation 153/04, as amended

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Decision for the Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>41. (1) This section applies in relation to a property if,</td>
<td></td>
</tr>
<tr>
<td>(a) the property is within an area of natural significance, includes or is adjacent to an area of natural significance or part of such an area, or includes land that is within 30 m of an area of natural significance or part of such area;</td>
<td>No</td>
</tr>
<tr>
<td>(b) the soil at the property has a pH value as follows:</td>
<td></td>
</tr>
<tr>
<td>(i) for surface soil, less than 5 or greater than 9,</td>
<td>No</td>
</tr>
<tr>
<td>(ii) for subsurface soil, less than 5 or greater than 11;</td>
<td></td>
</tr>
<tr>
<td>(c) a qualified person is of the opinion that, given the characteristics of the property and the certifications the qualified person would be required to make in a record of site condition in relation to the property as specified in Schedule A, it is appropriate to apply this section to the property.</td>
<td>No</td>
</tr>
</tbody>
</table>

In Section 41 (1) (a) above, "area of natural significance" means any of the following:

1. A provincial park designated by a regulation under the *Provincial Parks Act*.
2. A conservation reserve established under the *Public Lands Act*.
3. An area of natural and scientific interest (life science) identified by the Ministry of Natural Resources as having provincial significance.
4. A wetland identified by the Ministry of Natural Resources as having provincial significance.
5. An area designated by a municipality in its official plan as environmentally significant, however expressed, including designations of areas as environmentally sensitive, as being of environmental concern and as being ecologically significant.
6. An area designated as an escarpment natural area or an escarpment protection area by the Niagara Escarpment Plan under the *Niagara Escarpment Planning and Development Act*.
7. A habitat of endangered or threatened species identified by the Ministry of Natural Resources.
8. Property within an area designated as a natural core area or natural linkage area within the area to which the Oak Ridges Moraine Conservation Plan under the *Oak Ridges Moraine Conservation Act, 2001*.  

Table 1A, Page 1 of 2
**TABLE 1B**

Site Condition Standards, Shallow Soil or Water Body
Section 43.1, Ontario Regulation 153/04, as amended

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Decision for the Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>43.1. (1) This section applies in relation to a property if,</td>
<td></td>
</tr>
<tr>
<td>(a) the property is a shallow soil property; or</td>
<td>No</td>
</tr>
<tr>
<td>(b) the property includes all or part of a water body or is adjacent to a water body or includes land that is within 30 metres of a water body.</td>
<td>No</td>
</tr>
</tbody>
</table>

In Section 43.1 (1) (a) above:

“shallow soil property” means a property of which 1/3 or more of the area consists of soil equal to or less than 2 metres in depth beneath the soil surface, excluding any non-soil surface treatment such as asphalt, concrete or aggregate;

“soil” means, for the purposes of the definition of shallow soil property, unconsolidated naturally occurring mineral particles and other naturally occurring material resulting from the natural breakdown of rock or organic matter by physical, chemical or biological processes that are smaller than 2 millimetres in size or that pass the US #10 sieve, and includes a mixture of soil and rock if less than 50 per cent by mass of the mixture is rock. O. Reg. 511/09, s. 21.
THORNBURY, ONTARIO

SITE LIMITS

THORNBURY CLOSED LANDFILL

SITE 500 m FROM THORNBURY CLOSED LANDFILL SITE

INFERRED GROUND WATER ELEVATION

{AUGUST 23, 2019}

INFERRED GROUND WATER FLOW DIRECTION

BOREHOLE 1

SURFACE ELEVATION

BOREHOLE 2 (WITH MONITORING WELLS)

SURFACE ELEVATION

GROUN D WATER LEVELS OBTAINED ON AUGUST 23, 2019

GROUND WATER LEVELS OBTAINED ON AUGUST 23, 2019

BASE PLAN PRODUCED FROM INFORMATION FROM THE COUNTY OF GREY INTEGRATIVE MAPPING SYSTEM.
LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: - The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

<table>
<thead>
<tr>
<th>CONSISTENCY</th>
<th>N (blows/0.3 m)</th>
<th>c (kPa)</th>
<th>DENSENESS</th>
<th>N (blows/0.3 m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Soft</td>
<td>0 - 2</td>
<td>0 - 12</td>
<td>Very Loose</td>
<td>0 - 4</td>
</tr>
<tr>
<td>Soft</td>
<td>2 - 4</td>
<td>12 - 25</td>
<td>Loose</td>
<td>4 - 10</td>
</tr>
<tr>
<td>Firm</td>
<td>4 - 8</td>
<td>25 - 50</td>
<td>Compact</td>
<td>10 - 30</td>
</tr>
<tr>
<td>Stiff</td>
<td>8 - 15</td>
<td>50 - 100</td>
<td>Dense</td>
<td>30 - 50</td>
</tr>
<tr>
<td>Very Stiff</td>
<td>15 - 30</td>
<td>100 - 200</td>
<td>Very Dense</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>Hard</td>
<td>&gt; 30</td>
<td>&gt; 200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

WTLL Wetter Than Liquid Limit
WTPL Wetter Than Plastic Limit
APL About Plastic Limit
DTPL Drier Than Plastic Limit

TYPE OF SAMPLE

| SS | Split Spoon | ST | Slotted Tube Sample |
| WS | Washed Sample | TW | Thinwall Open |
| SB | Scraper Bucket Sample | TP | Thinwall Piston |
| AS | Auger Sample | OS | Oesterberg Sample |
| CS | Chunk Sample | FS | Foil Sample |
| GS | Grab Sample | RC | Rock Core |

PH Sample Advanced Hydraulically
PM Sample Advanced Manually

SOIL TESTS

| Qu | Unconfined Compression | LV | Laboratory Vane |
| Q  | Undrained Triaxial     | FV | Field Vane      |
| Qcu| Consolidated Undrained Triaxial | C | Consolidation |
| Qd | Drained Triaxial       |    |                 |
Appendix A

Environmental Impact Study

Thornbury Closed Landfill Site
Environmental Impact Study
Thornbury Closed Landfill Site

Prepared By:
R.J. Burnside & Associates Limited
15 Townline Orangeville ON L9W 3R4

Prepared for:
Town of The Blue Mountains

July 2010

File No: MCO 018503

The material in this report reflects best judgement in light of the information available at the time of preparation. Any use which a third party makes of this report, or any reliance on or decisions made based on it, are the responsibilities of such third parties. R.J. Burnside & Associates Limited accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.
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Environmental Impact Study
Thornbury Closed Landfill Site

July 2010

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   C-1  Existing Natural and Socio-Economic Environment
   C-2  Breeding Bird Atlas Summary

D  Correspondence and Documentation
   D-1  MOE Freedom of Information Search Results
   D-2  Town of Blue Mountain Records
   D-3  MOE Water Well Records Summary
   D-4  Waste Disposal Sites Inventory
1.0 Introduction and Background

R.J. Burnside & Associates Limited was retained by the Town of The Blue Mountains to complete an Environmental Impact Study for the two inactive landfills within the municipality, the Thornbury Closed Landfill Site and the Clarksburg Closed Landfill Site (Site). This work was undertaken because the Town of The Blue Mountains is experiencing pressure for increased development. The Official Plans for both the County of Grey and the Town of The Blue Mountains dictate that an assessment be required prior to the development of lands within 500 m of an active or inactive landfill site. A new comprehensive Zoning Bylaw is currently under development such that all lands within 500 m of a closed or active landfill site will be subject to a holding provision. This Holding (H) provision can only be lifted once a study has been prepared by a qualified engineer, and submitted for review in accordance with Ministry of the Environment (MOE) Guideline D-4. A D-4 study must demonstrate that the lands proposed for development are secure from potential methane gas and or leachate migration. If an impact is interpreted, then the remedial measures or conditions will need to be identified prior to development approval being granted.

This report details the results of the Environmental Impact Study for the Thornbury Closed Landfill Site (Site). Site location details are presented in Figure 1 (Site Location Plan), Figure 2 (Regional Plan), and Figure 3 (Site Plan).

The Scope of Work was completed as outlined in our proposal entitled "Consulting Services to Undertake an Environmental Impact Study Pertaining to Two Inactive Landfills, TBM-2010-12-P-BPL, Detailed Workplan", April 2010, with minor modifications at the request of the client as the work progressed.
2.0 Methodology

2.1 Scope and Objectives

The main purpose of this study is to evaluate the Thornbury Closed Landfill Site (Site) and determine whether lands within the 500 m radius of the Site can have the Holding (H) provision lifted. In order to do so, an Environmental Impact Study (EIS) needs to be completed to identify areas potentially affected by leachate and landfill gas migration (beyond the landfill property).

The Request for Proposal (RFP) Addendum 1, issued by the Town of The Blue Mountains on March 23, 2010 specifically states that there was to be no intrusive drilling or monitoring well installations as part of this work plan. Test pits could be excavated only to delimit the extent of waste. The Addendum also clarifies that no environmental reports have previously been issued for the Site. There are no monitoring wells or gas probes present at the Site.

The following work was completed at the Thornbury Closed Landfill Site:

1. Collection of readily available information
2. Test pit excavation to outline the fill area
3. Assessment of Site conditions and potential impact areas
4. Documentation of the results in a report.

2.2 Collection of Background Information

In order to determine whether the Holding (H) Provision can be lifted within 500 m of the Site, the following data sources were reviewed:

- Information available at both the upper and lower tiered municipality (i.e. Official Plans, files, historical records, air photographs, etc.) to determine historical land use
- Geological mapping such as drift thickness, quaternary geology, bedrock topography, bedrock geology, groundwater susceptibility mapping
- Soil Survey of Ontario mapping
- Freedom of Information request to the Ministry of the Environment for relevant information
- Regional groundwater reports that include the study area, if available
- Water well records in the vicinity of the Site
- Ontario Base Mapping to identify surface water features and interpret shallow groundwater flow directions
- Historical air photos to compare changes in land use over time and determine possible limits of fill (disturbed areas)
- Niagara Escarpment Plan
• Natural Heritage Information Centre database (rare species records and natural areas inventory)
• Federal Species at Risk database (mapping of SAR habitat range)
• Ontario Breeding Bird Atlas
• Conservation Ontario/Department of Fisheries and Oceans mapping of aquatic species at risk
• Grey-Sauble Conservation Authority documents and studies (e.g. watershed studies and watershed report cards).

The information obtained from the above sources have been complied and relevant information has been incorporated into this report.

2.3 Test Pit Excavation

Prior to breaking ground, underground utility locates were obtained by MultiVIEW Geoservices Inc., a private locating company, to secure public locates. A total of seven test pits were excavated around and within the fill area on May 27, 2010. A backhoe was provided by the Town of The Blue Mountains and Burnside field staff documented subsurface conditions encountered at each test pit location. The test pit locations are presented in Figure 3 and the soil descriptions are presented in the test pit logs in Appendix A-1. The test pit logs detailed: the presence/absence of waste; the nature of the waste; subsurface soil conditions; and, shallow groundwater conditions. Representative soil samples were collected from the test pits and two samples were submitted for grain size analysis (Appendix A-2).

Photographs taken during the Site investigation are presented in Appendix A-3.
3.0 Results

3.1 Document Search

3.1.1 Town of The Blue Mountains Official Plan

Section 8.19 of the Town of The Blue Mountains Official Plan (March 2007) details setback buffer requirements for Sewage Treatment Plants and Landfill Sites.

Paragraph (2) states: “Existing and known former landfill sites are shown on Appendix Map E [provided herein in Appendix D-2]. Land uses and development proposed within the 500 m buffer surrounding a closed or open landfill site...shall be required to undergo an evaluation of their susceptibility to impact such as methane and leachate”.

Paragraph (3) states: “All land uses and development proposed within the buffer setbacks identified under paragraphs (1) and (2) shall be subject to a relevant study submitted for review by the County and Town to address the current and future impacts, and to assess appropriate design, buffering and separation distances, in conformity with the Ministry of the Environment guidelines and information requirements. Implementation of the study’s recommendations may be required under an agreement between the proponent and the Municipality.”

The main purpose of this report is to determine whether these requirements can be removed from all or portions of the land within 500 m of the Thornbury Closed Landfill Site.

3.1.2 Town of The Blue Mountains Historical Information

The Town of The Blue Mountains has very little information their files regarding the Site. A copy of the same MOE inspection report summarized later in the Section 3.1.3 was on file along with two D-4 Studies completed in the vicinity of the Site.

Henderson Paddon & Associates Limited completed a report entitled “Guideline D-4 Study Proposed Lora Bay Heights Townhouse Development, Thornbury, Ontario”, dated August 2005. The proposed Lora Bay Heights Townhouse Development located approximately 140 m southwest of the waste fill area at the northeast corner of Peel Street and Highway 26 (August 2008). The report concluded there was no potential for environmental impacts (e.g. from surface water/groundwater contamination, visual impacts, soil contamination, landfill gas) to the proposed development from the former landfill site. There was no need identified for ongoing monitoring or the installation of
control devices for the proposed development based on the presence of the Thornbury Closed Landfill Site.

Henderson Paddon & Associates Limited completed a report entitled "Guideline D-4 Study and Methane Monitoring, Proposed Townhouse Development, Thornbury, Ontario", dated February 2008. The proposed townhouse development was located immediately east of the Site at the northeast corner of King Street West and Lansdown Street North (February 2008). Groundwater and surface water impacts from the landfill were interpreted to flow toward Nottawasaga Bay (Georgian Bay) away from the proposed development therefore impacts were not expected, however, groundwater sampling would be required to verify this. Soil impacts from the landfill on the proposed development were not expected. The potential for methane gas migration onto the proposed development was investigated with the installation of 5 shallow monitoring wells. Methane gas was measured on five occasions between July 25, 2006 and February 15, 2008. Methane gas was not detected in any of the monitors. The water table was encountered at depths ranging from 0.3 m to 2.2 m. Methane gas was interpreted to migrate in the upper 2 to 3 m of soils. A swale along the west side of the proposed development site was interpreted by the author to provide a venting feature in the event of lateral gas migration from the landfill Site. The report made to following conclusions:

- Confirmation of groundwater flow direction at the Site and characterization of groundwater quality would require installation and sampling of water wells. Consideration should be given to adding a restrictive clause to the development agreement prohibiting installation of groundwater wells
- Potential surface water contamination from the former landfill is not anticipated to impact the site
- There was no evidence of impacts from methane in landfill gas on the Matesa Property nor are such impacts anticipated.

3.1.3 Ministry of the Environment

3.1.3.1 Freedom of Information

The MOE Regional Inventory of Closed Waste Disposal Sites, South-western Region documents that the Thornbury Closed Landfill Site (MOE Site Number: X2090) was closed in 1969. An FOI request was made to the Ministry of the Environment (MOE) to obtain information in their files regarding the Site. The FOI request revealed a letter from the MOE addressed to the Town of The Blue Mountains dated August 13, 2004. The letter detailed the results of an MOE inspection of the Site conducted on July 8, 2004. A copy is presented in Appendix D-1. The 2004 inspection indicated that the Site was being used for aggregate storage and storage of a large number of boat cribs which was
considered, by the MOE, as a reasonable use for the Site given that it had been closed for more than 25 years. The inspection did not reveal any non-compliance issues. The inspection recommended that a Closure Plan be provided for the Site (in accordance with Ontario Regulation 232) and that the Municipality register the Site on title as a closed waste disposal site (in accordance with Section 197 (2) of the Environmental Protection Act). The inspection also recommended that the Closure Plan include a plan to re-vegetate part or all of the Site to prevent run off.

3.1.3.2 Groundwater Susceptibility

The Site falls within Zone 4, with respect to groundwater susceptibility. This zone is described as follows, "There is generally high susceptibility to contamination in this area. Most of the surficial soils consist of sand with minor amounts of gravel, and these materials often form aquifers that are unprotected from surface contaminates. Most of the area is flat lying (sand plain) and contaminates that reach groundwater are likely to remaining at shallow depths".

Areas immediately south of the Site fall within Zone 6a, where the susceptibility to groundwater is considered variable, however "since there are no significant shallow aquifers the potential for contaminating major groundwater resources is small (Map S100).

3.1.4 Air Photo Search

Historical air photos were reviewed for the Site and surrounding areas. Air photos for 1938, 1962, 1988, and 2002 are included in Appendix B. The historical photographs revealed the following:

- In 1938, the Site was vacant with sparse vegetation. There were no obvious disturbed areas of fill
- In 1962, a small fill area was visible, and the north and west portions of the Site were well vegetated
- In 1988, the fill area appeared vegetated with trees in the northern and western portions of the Site
- In 2002, the fill area was similar to 1988, however, the ground surface is disturbed and is interpreted to be similar to existing conditions.

3.2 Physical Setting

The Thornbury Closed Landfill Site is situated on the north Side of King Street West, between Lansdown Street North and Beaver Creek.
The gated Site entrance is along King Street West. A soil berm surrounds most of the fill area creating a visual buffer around the site. The fill area is generally level from the entrance and has been covered with soil fill. There are stockpiles of asphalt, mulch, soils, concrete, wooden skids along the northern portion of the site. Several boats and boat cribs line the inside of the berm. Ground surface drops off significantly (more than 3 m in some areas) at the edge of the waste towards Beaver Creek to the west and Huron Street West to the north. Photographs taken during a Site walk over on April 21, 2010 are provided in Appendix A-3.

The Site and surrounding area are situated in the Beaver Valley Physiographic Region. The Beaver Valley is described by Chapman and Putnum (1984) as a well defined region stretching from Flesherton in the south to Thornbury in the north. The geology is complex and includes the following landforms: lake plains, beaches, moraines, steep valley sides, and vertical cliffs. The surficial geology of the Site and surrounding area is shown in Figure 2. The Site is situated on a combination of swamp deposits in the eastern portions, alluvial deposits along Beaver Creek, glaciolacustrine clayey to sandy silt deposits to the south, sandy silt till deposits to the west of Beaver Creek, and glaciolacustrine sand between the Site and Georgian Bay. It is interpreted that the areas designated as Zone 4 on the groundwater susceptibility map (S100) refer to the glaciolacustrine sand deposits documented north of the Site rather than soils on the actual landfill property. The waste is situated on finer grained soils more likely associated with Zone 6a, where groundwater susceptibility to contamination is variable and the potential or impacting a major aquifer is small.

### 3.3 Surface Water Features

There are two main surface water features in the vicinity of the Site: Georgian Bay located 200 m to the north and Beaver Creek located on the Site along the western edge of the fill area. Beaver Creek is situated in a well defined channel and drains northerly into Georgian Bay.

No leachate seeps were observed discharging from the Site. There was, however, a small swale that drained the northwest corner of the fill area. The swale was dry at the time of the field investigation. Some dark staining was evident on the soils lining the top portions of the swale. The staining was interpreted to be the result of surface water mixing with the asphalt stockpiles situated on top of the waste.

### 3.4 Natural Features

A summary of the natural features in the vicinity of the Site are described in Appendix C. The following terms were taken into consideration: natural heritage features, rare and
designated flora and fauna species, wildlife and wildlife habitats, aquatic environment in order to assess development implications.

Portions of the Site and the immediate vicinity are characterized by significant and potentially significant natural heritage and natural hazard features, including:

- The floodplain of the Beaver River
- Potential steep slopes of the Nipissing Ridge
- Woodlands
- Potential habitat for endangered and threatened species
- Potential significant wildlife habitat, including habitat for species of conservation concern and habitat for area-sensitive species.

Fish habitat is not present on the Site but is present in the nearby Beaver Creek. Any development that requires discharge of stormwater or other substances into the Beaver Creek will require consideration for fish communities and fish habitat.

Prior to development on the Site and surrounding areas, the following additional work is recommended:

- A permit from the GSCA, in association with development in a hazard-regulated area (if applicable). This may require floodplain or other hazard-related studies to support the permit application, and
- A detailed Environmental Impact Study ("EIS") is required prior to development. The EIS should include:
  - Field investigations to confirm the presence or absence of significant features
  - An analysis to demonstrate that no negative impacts to the feature or its ecological functions will result from the proposed development.

### 3.5 Soil Conditions

Seven test pits were excavated on the Site on May 27, 2010. The locations are shown in Figure 3 and the test pit logs are provided in Appendix A-1. Native silt till-like soils were encountered at TP1, TP2 and TP7. These soils were used as a fill over the waste at TP5 located in the northern portions of the fill area. Water laid silt textured soils were encountered at TP3 and TP4 in the south-eastern quadrant of the Site.

### 3.6 Groundwater Conditions

#### 3.6.1 Water Table

It is assumed that Georgian Bay represents the minimum local water table level at an elevation of approximately 176.8 metres above sea level (masl). It is assumed that the
water table, in the vicinity of the Site, would not be lower than the level in Georgian Bay. It is more likely that the water level at the Site is higher than the water level in Georgian Bay and similar to the base of Beaver Creek along the west edge of the fill area. Shallow groundwater is interpreted to flow northerly toward Georgian Bay with some localized flow toward Beaver Creek. The groundwater conditions encountered in the test pits excavated on the Site are summarized below.

Table 3.1 Summary of Test Pit Conditions

<table>
<thead>
<tr>
<th>Test Pit 1</th>
<th>Groundwater Conditions</th>
<th>Estimated Water Table Elevation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1 (185 masl)</td>
<td>Water table below 2.5 m</td>
<td>&gt;182.5</td>
</tr>
<tr>
<td>TP2 (187 masl)</td>
<td>Water table below 2.3 m</td>
<td>&gt;184.7</td>
</tr>
<tr>
<td>TP3 (183 masl)</td>
<td>Perched water in topsoil at surface Grey at 1.0m</td>
<td>182</td>
</tr>
<tr>
<td>TP4 (184 masl)</td>
<td>Perched water in topsoil at surface Grey at 1.0m</td>
<td>183</td>
</tr>
<tr>
<td>TP5 (190 masl)</td>
<td>Water table below 2.5 m</td>
<td></td>
</tr>
<tr>
<td>TP6 (190 masl)</td>
<td>Water table below 2.0 m</td>
<td>&gt;188</td>
</tr>
<tr>
<td>TP7 (190 masl)</td>
<td>Water table below 1.5 m</td>
<td>&gt;188.5</td>
</tr>
</tbody>
</table>

Notes:
Ground surface elevations were estimated based on topography presented on the Ontario Base Maps (1:10,000 scale) in conjunction with field observations. The test pit elevations were not surveyed. masl indicates metres above sea level.

Ground surface elevations at the Site vary from 183 masl (in the northeast corner) up to 190 masl (near the Site entrance). It is estimated that the water table is greater than 2.5 metres below ground level (mbgl) in the waste and 1 m bgl north of the waste along Huron Street West.

Water levels documented as part of a D-4 Study for a townhouse development proposed east of the Site indicate that the water table was in the order of 2 mbgl in areas immediately east of the Site (Henderson Paddon, 2008).

In summary, it is interpreted that the highest possible water level at the Site would be 2 mbgl (188 masl) and the lowest water table level would be 176.8 masl. The actual water table in the waste is likely closer to 183 masl (based on conditions at TP4) and the base of Beaver Creek.
3.6.2 Groundwater Flow

The hydraulic conductivity (K) for the two dominant soil types present at the Site estimated as follows:

- Silt Till, sandy to clayey - \(1 \times 10^{-7}\) m/s
- Lacustrine Silt - \(1 \times 10^{-6}\) m/s

If the highest water table level is assumed to be in the order of 188 masl (at least 2 mbgl in the waste) at the Site and the water table at Georgian Bay (located 200 m north) is assumed to be 176.8 m (Ontario Base Mapping scale 1:10,000) then the resulting gradient (\(i\)) would be a maximum of 0.06m/m.

Using the Darcy relationship \(v = Ki/n\)

Where

- \(K\) = hydraulic conductivity \((1 \times 10^{-7}\) m/s\)
- \(i\) = gradient (0.06)
- \(n\) = porosity of (0.3 estimated)

It is estimated that groundwater flows at a maximum rate of 0.6 m/year toward Georgian Bay. At this rate, contaminants could have migrated at least 24 m from the Site since it was closed in 1969 (recognizing that contaminants have been moving from the Site since it was opened years prior to 1969). The glaciolacustrine sand north of the site would allow for more rapid movement of contaminants. Therefore, it is expected that contaminants have likely moved further than 24 m since the Site was opened.

3.7 Methane Gas Conditions

Methane gas readings were collected from the sidewalls of each test pit upon completion. The readings are documented in the test pit logs (Appendix A-1). Methane gas was not detected in the soils at any of the test pit locations.

Methane gas readings were also collected (by others) on several occasions from standpipes installed as part of a D-4 Study for a townhouse development proposed east of the Site (Henderson Paddon, 2008). No methane gas was detected.
4.0 Impact Assessment

4.1 Groundwater Impacts

Precipitation that falls on a landfill either runs off the waste as surface water or infiltrates into the waste. The portion of water that enters the waste depends on site specific conditions such as surface grading, soil permeability, and vegetation. Water that infiltrates into the waste causes contaminants to leach into the water percolating through it. The resulting mixture is referred to as leachate. The top surface of the fill area is relatively flat with steep side slopes along Beaver Creek and Huron Street West. Under these conditions it is expected that infiltration would be moderately high. Leachate generated from the waste will flow downward into the water table where it will migrate laterally in the direction of groundwater flow (i.e. toward the north with some flow expected toward Beaver Creek to the west).

The extent of groundwater impacts cannot be known without installing groundwater wells and sampling groundwater quality in the vicinity of the Site. It is inferred that groundwater impacts would most likely occur north/northwest of the Site based on interpreted groundwater flow directions. Some local radial effects could also be expected if water table mounding has occurred in the waste, driving shallow groundwater in all directions away from the waste. This would be expected assuming that the infiltration into the waste footprint is greater than the infiltration out of the waste into the underlying soil.

The Ministry of the Environment, Reasonable Use Policy Guideline B-7 (RUP) outlines that a landfill cannot degrade the groundwater quality on an adjacent property by more than 50 percent of the difference between background water quality and the water quality required for use of that property for non health related parameters, and 25% for health related parameters as outlined in the Ontario Drinking Water Standards (ODWS). This can be represented by the formula:

\[ C_m = C_b = X(C_r - C_b) \]

Where:

\( C_m \) = the maximum concentration of a particular contaminant that would be acceptable in the groundwater beneath the adjacent property.

\( C_b \) = the background concentration of the particular contaminant in the groundwater before affected by the landfill. (0 mg/L conservatively assumed in this case).
Cr = the maximum concentration of the particular contaminant that should, according to provincial water management policy, be present in the groundwater. (The ODWS is 250 mg/L for chloride).

\[ X = 25 \text{ percent for health related parameters, 50 percent for non-health related parameters. Chloride is a non-health related parameter therefore } X \text{ would be 50 percent (0.5).} \]

Thus:

\[ C_m = C_b + X(C_r - C_b) \]
\[ = 0 + 0.5(250 - 0) \]
\[ = 125 \text{ mg/L} \]

The maximum allowable concentration of chloride at the Site boundary according to the RUP would therefore be 125 mg/L. It is estimated that contaminants from the Site (in this case chloride) could migrate up to 320 m in the direction of groundwater flow before concentrations would be reduced to levels below RUP. This estimate is based on the following assumptions:

- Chloride levels in the waste are assumed to be 500 mg/L (which is reasonable given the size and age of the Site)
- The waste fill area occupies a total of 6,427 m² and has a width of 90 m in the direction of groundwater flow
- Infiltration would be slightly higher in the waste than into the native soil downgradient of the Site.

Based on the generalized assumptions listed above, a potential impact zone to groundwater are shown for the area around the Site in Figure 6. The potential impact zones includes an area downgradient of the Site to a distance of 320 m in the direction of groundwater flow as well as a 100 m buffer around the Site to account for possible mounding effects driving groundwater in other directions (i.e. toward the east and south). More detailed groundwater impact zones cannot be delineated around the Site based on the information collected to date.

### 4.2 Surface Water Impacts

A small, dry, swale, originating at the northwest corner of the waste fill area was black stained with an oily odour in areas closest to the fill. Beaver Creek is located immediately west of the waste fill area and actually transects the landfill property discharging into Georgian Bay. If Beaver Creek represents the water table with shallow groundwater discharging to the creek, there is a potential for the landfill to impact surface water...
quality in the creek. Given that the swale is typically dry, and that the creek has some natural assimilative capacity, it is possible that contributions from the landfill could be too small to measure. Surface water sampling would be required to confirm whether there is a measureable impact on surface water from the Site.

Potential impact zones to surface water are shown in Figure 6 along Beaver Creek from the south edge of the Site down to where Beaver Creek discharges to Georgian Bay.

### 4.3 Methane Gas Impacts

This Site has been closed for 41 years. Some of the waste was burned before it was buried (TP6) while some was simply buried in place (TP5 and TP6). If the Site was closed in 1969, it infers that most of the waste at the Site has been emplaced and decomposing for more than 40 years. Mild "oily" odours were noted at TP5 and TP6 indicative of continued waste decomposition in some portions of the fill area even though methane gas was not detected during excavation.

The deep Beaver Creek channel, to the west of the fill area could represent the water table and limit the migration of methane gas from the Site toward the west. Ground surface also drops north of the fill area. If the grey soils (1 metre below ground surface at TP3) are assumed to represent the groundwater table to the north of the waste then this also could limit the northerly migration of methane gas. Based on surface topography and inferred water table levels, methane gas would predominantly migrate south and east of the fill area.

As a general guideline, it assumed that methane gas migrates a maximum distance equivalent to ten times the depth to water in the waste. Beyond that distance impacts are unlikely. Three scenarios were considered for estimating the lateral distance landfill gas could travel away from the Site. Details are presented in the following table.

### Table 4.1 Methane Gas Migration Scenarios

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Assumptions</th>
<th>Depth to Water Table in Waste</th>
<th>Estimated Lateral Distance of Methane Gas Migration (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Assumes water table equivalent to Georgian Bay</td>
<td>13.2 mbgl (190-176.8 masl)</td>
<td>132</td>
</tr>
<tr>
<td>2</td>
<td>Water table m at 1 m below ground surface at TP3</td>
<td>8 mbgl (190-182 masl)</td>
<td>80</td>
</tr>
<tr>
<td>3</td>
<td>Water table at 2.2 m as documented in D-4 Study (Feb 2008)</td>
<td>2.2 mbgl</td>
<td>22</td>
</tr>
</tbody>
</table>
Scenario 1 is the worst case where the water table is the deepest. Scenario 2 is the most likely situation based on the conditions encountered in the test pits excavated on Site. Scenario 3 is also possible, however, water was not found in any of the test pits excavated within the fill area suggesting a deeper water table at the Site. Without Site-specific information regarding methane gas levels and water table elevations a more definition estimate of potential impact distances an area is not possible.

For planning purposes, it can be assumed that methane would likely not migrate more than 150 m from the Site. A 150 m buffer incorporates a safety margin in the absence of more detailed Site-specific information. It is also assumed that Beaver Creek represents a natural water barrier preventing gas from migrating west of Beaver Creek. These areas would retain their Holding (H) provisions. Areas beyond the potential methane impact zone could have the Holding (H) provisions lifted. This zone is shown on Figure 6.
5.0 Conclusions

The following conclusions are presented, based on the results of this study.

**Groundwater**
Leachate generated from the waste will flow downward into the water table where it will migrate laterally in the direction of groundwater flow (i.e. toward the north with some flow expected toward Beaver Creek to the west).

Some local radial effects could also be expected if water table mounding has occurred in the waste, driving shallow groundwater in all directions away from the waste. This would be most notable if the rate of infiltration into the waste is greater than the infiltration into the native soils.

Although groundwater flow rates are interpreted to be slow at the Site restricting the migration of contaminants, the actual subsurface conditions can only be determined through Site specific investigations.

For groundwater a potential impact zone has been delineated up to 320 m downgradient of the Site and 100 m from the Site in other directions. A more detailed (i.e. concise) impact zone cannot be delineated without more Site-specific information.

**Surface Water**
If Beaver Creek represents the water table with shallow groundwater discharging to the creek there is a potential for the landfill to impact surface water quality in the creek. For surface water a potential impact zone has been identified along Beaver Creek from the south edge of the Site to the discharge point in Georgian Bay. A more detailed (i.e. concise) impact zone cannot be delineated without more Site-specific information.

**Landfill Gas**
For planning purposes, it can be assumed that methane would likely not migrate more than 150 m from the Site and will not migrate west of Beaver Creek assuming that the creek represents the water table in the vicinity of the Site.

**Natural Environment Features**
Portions of the Site and surrounding lands are characterized by significant and potentially significant natural heritage and natural hazard features, including:

- The floodplain of the Beaver River
- Potential steep slopes of the Nipissing Ridge
- Woodlands
• Potential habitat for endangered and threatened species
• Potential significant wildlife habitat, including habitat for species of conservation concern and habitat for area-sensitive species.
6.0 Recommendations

The following recommendations are presented based on the results of this study.

In order to better define potential impact zones around the Site, the following work is recommended:

- Installation of shallow monitoring wells upgradient (south), within and downgradient (north/northwest) of the waste (screens should straddle the water table, if possible)
- Installation of one deeper well downgradient of the Site to determine whether contaminants are migrating into deeper zones
- Collection of landfill gas measurements at all well locations
- Collection of water levels
- Collection of groundwater quality samples.

The Potential Impact Zones identified in Figure 6 for groundwater, surface water and landfill gas incorporate a safety margin in the absence of more detailed Site specific information. Areas within these zones would retain their Holding (H) provisions. Areas beyond these zones could have the Holding (H) provisions lifted.

Exceptions to the above noted holding provisions could be accommodated on a case by case basis so as to permit the reconstruction or replacement of existing dwellings, additions and alterations to existing dwellings and the construction of accessory buildings.

With respect to the Natural Environment, the following additional work is recommended prior to development on the Site and surrounding areas:

- Obtain a permit from the GSCA, in association with development in a hazard-regulated area (if applicable). This may require floodplain or other hazard-related studies to support the permit application, and
- Conduct a detailed Environmental Impact Study ("EIS") prior to development of the Site. The EIS should include:
  - Field investigations to confirm the presence or absence of significant features
  - An analysis to demonstrate that no negative impacts to the feature or its ecological functions will result from the proposed development.
7.0 Study Limitations and Use of Report

R. J. Burnside & Associates Limited (Burnside) has conducted this study in accordance with generally accepted standards and field practices. The conclusions and recommendations in this report are professional opinions, based upon visual observations and limited analytical results for the Site conditions existing at the time of our assessment.

To the best of our knowledge, the information contained in our report is accurate, however, Burnside does not guarantee the accuracy and reliability of the information provided by other persons or agencies, and does not claim responsibility for undisclosed or non-visible environmental concerns that may result in costs for environmental clean-up or remediation.

This report was prepared for the exclusive use of The Town of The Blue Mountains. Any use of, reliance on, or decisions based on this report by a third party, is the responsibility of such third parties. Burnside accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

This report is respectfully submitted by:

R.J. Burnside & Associates Limited

______________________________       July 29, 2010
Kim Hawkes, P. Eng.             Date

______________________________       July 29, 2010
Jim Walls, P.Geo.                Date
8.0 References


Ontario Ministry of the Environment, Water Resources Branch. Hydrogeological Environments and the Susceptibility of Groundwater to Contamination, Map S100, scale 1:1,000,000.


FIGURE 1 - SITE LOCATION MAP

TOWN OF THE BLUE MOUNTAINS
THORNBURY CLOSED LANDFILL
ENVIRONMENTAL IMPACT STUDY

May 2010
Project Number: MC0018503
Prepared by: C. Sheppard
Verified by: K. Hawkes

BURNSIDE
A WEST ELEVATION (m amsl)

EAST FIGURE 4

TOWN OF THE BLUE MOUNTAINS
THORNBURY CLOSED LANDFILL
ENVIRONMENTAL IMPACT STUDY

CROSS-SECTION A-A

LEGEND

TEST PIT LOCATION & NUMBER
EXISTING GROUND PROFILE
GEOLOGICAL STRATIGRAPHY
STATIC WATER LEVEL (All line of drilling)
WELL SCREEN

SURFICIAL GEOLOGY

Sandy Sil Tuf
Modern Alluvium
Swamp Deposits
Glaicilacustrine Sand

SANDY SIL TUF
MODERN ALLUVIUM
SWAMP DEPOSITS
GLACIALACSTRINE SAND

Horizontal Scale 1:5,500
Vertical Scale 1:250
Vertical exaggeration 30x

July 2010
Project Number: MC0018503
Prepared by: C. Shoppad
Verified by: K. Henke
Waste is flat on top (elev. = ±190 m/asl) with steep side slopes. Top of slope = Edge of Vegetation Bottom of slope = Edge of Trees (taller vegetation)

**SURFICIAL GEOLOGY**

- Glaciolacustrine Sh
- Swamp Deposits (mud, mud & peat)
- Glaciolacustrine Sand minor like gravel
- Georgian Bay 178.8 m/asl (estimate)

**LEGEND**

- Test Pit Location & Number
- Existing Ground Profile
- Geological Stratigraphy
- Geology
Appendix A
Field Data
Appendix A-1
Test Pit Logs
## Test Pit Logs

### Thornbury Site

**TP1 Near South Edge of Fill Area**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1.2 m</td>
<td>Greyish brown, clayey, silty sand fill, gravel, cobbles, and boulders throughout, roots, blocky, moist</td>
</tr>
<tr>
<td>1.2 to 2.5 m</td>
<td>Grey, silty sand to sandy silt, some clay, occasional gravel, blocky, mottled orange, moist (till-like)</td>
</tr>
</tbody>
</table>

**Notes:**
- Several boulders and cobbles at surface making excavation difficult
- The test pit was excavated into the slope such that north face was 2.5 m deep and south face was 1.2 m deep
- No sloughing
- No water entering test pit
- Gas readings in open test pit:
  - CH4 - 0 % (volume in air)
  - CO2 - 0%
  - O2 - 21.2 %
  - Balance - 78.8 %

**TP2 Near Southwest Corner of Site, Outside Fill Area**

<table>
<thead>
<tr>
<th>Depth</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0 to 0.2 m</td>
<td>Brown, silt topsoil, loose, roots, moist</td>
</tr>
<tr>
<td>0.2 to 0.8 m</td>
<td>Brown, silt to sandy silt, some gravel, dense, blocky, orange and black mottling, moist (till like)</td>
</tr>
<tr>
<td>0.8 to 1.8 m</td>
<td>Grey moist sandy silt to silty sand, some gravel, dense, blocky, some black mottling</td>
</tr>
<tr>
<td>1.8 to 2.0 m</td>
<td>Grey, silty sand to sand, some silt, some gravel, massive, softer than above, wet</td>
</tr>
<tr>
<td>2.0 to 2.3 m</td>
<td>Grey, silty sand, some clay to clayey, blocky, no mottling, moist to wet (till like). Occasional pockets of fine sand, rust and black stained, wet to saturated</td>
</tr>
</tbody>
</table>

**Notes:**
- No sloughing
- No water entering test pit
- Gas readings in open test pit:
  - CH4 - 0.0 % (volume in air)
  - CO2 - 0.4%
  - O2 - 20.9 %
  - Balance - 78.7 %
TP3  Near Southeast Corner of Site Outside Fill Area

0.0 to 0.3 m  Black, topsoil, wet to saturated roots
0.3 to 1.0 m  Brown, very fine sandy silt to silty sand, laminated, layered, some orange staining
1.0 to 1.9 m  Grey, as above

Notes:
- Minor swampy odour
- Soil sample at 1.6 m
- Left excavation open for 10 minutes
- Water at base of test pit entering from base of saturated topsoil layer
- Difficulty getting back onto roadway. Ground was soft

TP4  Along The Eastern Edge of Site Outside Fill Area

0.0 to 0.3 m  Black, silt topsoil, roots, wet
0.3 to 1.0 m  Rusty brown, silt, laminated, rust, black staining, dense, shale-like, moist
1.0 to 1.4 m  Grey as above

Notes:
- Soils similar to TP3
- No sloughing
- No water entering test pit although topsoil was very wet
- Difficulty getting back onto roadway. Ground was soft

TP5  Within Southern Portion of Fill Area

0.0 to 1.9 m  Brown clayey silt, some sand, trace gravel fill, some boulders, some cobbles, dark brown to 0.3 m, brown from 0.3 m to 1.2 m, black below 1.2 m, dry to moist (till like soils)
1.9 to 2.5 m  Waste: bricks, garbage bags, glass, metal, burnt paper, and wood, concrete blocks, paper, moist

Notes:
- Soils similar to TP1
- Sloughing below 1.9 m, could not get below 2.5 m
- No water entering test pit although waste is moist to wet below 1.9 m
- Oily odour
- Grain size analysis completed on sample collected from 0.3 to 0.4 m

TP6  Within Western Portion of Fill Area

0.0 to 1.0 m  Brown to black, silty fine sand fill, some gravel, cobbles and boulders, large asphalt pieces at 0.2 m, concrete, concrete pipe fragment, dry to moist
1.0 to 2.0 m: Rusty, brown, silty fine sand fill, as above, more boulders/large cobbles, dry to moist

Notes:
- No sloughing
- No water entering excavation
- Difficulty digging, no water entering test pit although waste is moist to wet below 1.9 m
- Minor oily odour, likely from asphalt

**TP7 Within the Northern Portion of The Waste Fill Area**

0.0 to 0.4 m: Brown, silty sand and gravel fill, cobbles, brick fragment, becoming black at 0.3 m

0.4 to 1.5 m: Brown, sand and silt, some clay, trace gravel, some cobbles, dense, difficulty digging, blocky, rust mottling, moist (till-like)

Notes:
- No sloughing
- No water entering excavation
- Difficulty digging very dense
- Boulder in test pit, sloughed into excavation some water around it
- Minor oily odour, likely from asphalt.
- Grain size analysis completed on sample collected from 0.5 to 0.7 m
Appendix A-2
Grain Size Distribution Curves
TRANSMITTAL

To: R.J. Burnside & Associates Ltd.
15 Townline
Orangeville, Ontario
L9W 3R4

Attn: Kim Hawkes, P.Eng.

Date: June 16, 2010
Project No.: G3021-0-6
Project: Materials Testing
File No. MCO 018503.1000
Thornbury

Transit: Mail

Enclosed Please Find:

• Two (2) copies *Grain Size Distribution Curves (TP 5, 0.3 - 0.4m & TP 7, 0.5 - 0.7m)*.

Comments:

Type of Action:

☐ Approved
☐ Approved as Noted – Please Correct
☐ Revised as Noted – Please Revise & Submit
☐ Not Approved
☐ For Your Approval – Please Check & Return
☐ For Your Information & Use
GRAIN SIZE DISTRIBUTION

OUR REFERENCE N° G3021-0-6

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSER FINE COARSE MEDIUM FINE SILT & CLAY

U.S. STANDARD SIEVE SIZES

GRAVEL

SAND

SLT & CLAY

PROJECT: MCO 018503.1000
LOCATION: Thornbury
TEST PIT N°: 5
SAMPLE N°:
DEPTH: 0.3 - 0.4m
ELEVATION:

PERCENT PASSING

PROJECT: MCO 018503.1000
LOCATION: Thornbury
TEST PIT N°: 5
SAMPLE N°:
DEPTH: 0.3 - 0.4m
ELEVATION:

GRAIN SIZE DISTRIBUTION

GRAVEL

SAND

SLT & CLAY

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSER FINE COARSE MEDIUM FINE SILT & CLAY

U.S. STANDARD SIEVE SIZES

GRAVEL

SAND

SLT & CLAY

PROJECT: MCO 018503.1000
LOCATION: Thornbury
TEST PIT N°: 5
SAMPLE N°:
DEPTH: 0.3 - 0.4m
ELEVATION:

GRAIN SIZE DISTRIBUTION

GRAVEL

SAND

SLT & CLAY

UNIFIED SOIL CLASSIFICATION SYSTEM

COARSER FINE COARSE MEDIUM FINE SILT & CLAY

U.S. STANDARD SIEVE SIZES

GRAVEL

SAND

SLT & CLAY

PROJECT: MCO 018503.1000
LOCATION: Thornbury
TEST PIT N°: 5
SAMPLE N°:
DEPTH: 0.3 - 0.4m
ELEVATION:

Classification of Sample and Group Symbol:

CLAYEY SILT, some sand, trace gravel

PLASTIC PROPERTIES

LIQUID LIMIT %=
PLASTIC LIMIT %=
PLASTICITY INDEX %=
MOISTURE CONTENT %=

V.A. WOOD (GUELPH) INCORPORATED
GRAIN SIZE DISTRIBUTION

PROJECT: MCO 018503.1000
LOCATION: Thornbury
TEST PIT N°: 7
SAMPLE N°:
DEPTH: 0.5 - 0.7m
ELEVATION:

COEFFICIENT OF UNIFORMITY:
COEFFICIENT OF CURVATURE:

PLASTIC PROPERTIES
LIQUID LIMIT % =
PLASTIC LIMIT % =
PLASTICITY INDEX % =
MOISTURE CONTENT % =

Classification of Sample and Group Symbol:
SILT AND SAND, some clay, trace gravel

V. A. WOOD (GUELPH) INCORPORATED
Appendix A-3
Site Photographs
Photo 1  Looking south towards King Street West from inside gate.

Photo 2  Stockpile of mulch and asphalt.

Project Title: Environmental Impact Study
Thornbury Closed Landfill Site
File No.: MCO 018503
Date: July 2010
Photo 3  Soil stockpiles and boats parked along west side of fill area.

Photo 4  Berm around fill area looking north from southeast corner. Note boat cradles.
Photo 5  West slope of Beaver Creek.

Photo 6  Swale draining northwest corner of the waste fill area.
Photo 7  Side slope of waste looking south along Beaver Creek.

Photo 8  Metal debris along west side slope.
Appendix B
Historical Air Photos
FIGURE B-1
TOWN OF THE BLUE MOUNTAINS
THORNBURY CLOSED LANDFILL
ENVIRONMENTAL IMPACT ASSESSMENT

1938 AIR PHOTO

LEGEND

APPROXIMATE SITE OUTLINE
FIGURE B-4
TOWN OF THE BLUE MOUNTAINS
THORNBURY CLOSED LANDFILL
ENVIRONMENTAL IMPACT ASSESSMENT

2002 AIR PHOTO

LEGEND

APPROXIMATE SITE OUTLINE

© 2002: aerial photograph from the National Air Photo Library

1/25,000

Projected: UTM Zone 17
Datum: NAD83

Burnside
Appendix C
Natural Environment Features Summary
Appendix C-1
Existing Natural and Socio-Economic Environment
1.0 Description of the Existing Natural and Socio-Economic Environment

A desktop review was undertaken of existing information, in, and within the vicinity of, the subject lands. Descriptions of the various components of the natural environment were determined based on a review of:

- Aerial photography
- Grey County Official Plan (2000)
- Town of the Blue Mountains Official Plan (2007)
- Natural Heritage Information Centre ("NHIC") database for rare species records
- Federal Species at Risk database for rare species habitat ranges
- Ontario Breeding Bird Atlas ("OBBA") for records of breeding birds
- Conservation Ontario Aquatic Species at Risk mapping, and
- Grey Sauble Conservation Authority Regulation mapping.

1.1 Land Use

1.1.1 Provincial Policy Statement

The Provincial Policy Statement, 2005 ("PPS") provides general policies on land use patterns, resources, and public health and safety that guide development across Ontario.

Seven types of natural heritage features are identified in Section 2.1, of which four are present, or potentially present, on the subject or adjacent lands. These include:

- Significant habitat of endangered or threatened species
- Fish habitat
- Significant woodlands, and
- Significant wildlife habitat.

Development and site alteration is not permitted within significant habitat of endangered and threatened species and may only be permitted within the other features listed if it can be demonstrated that there will be no negative impacts on the natural feature or its ecological function.

Section 3.0 of the PPS addresses natural hazards and indicates that, "development shall generally be directed to areas outside of... b) hazardous lands adjacent to river ... systems which are impacted by flooding hazards and/or erosion hazards." (Section 3.1.1)

The Beaver River is located in close proximity to the subject lands and its floodplain may include all, or portions, of the subject lands.
1.1.2 Official Plans

Grey County Official Plan (2000)

Schedule A of the Grey County Official Plan indicates that portions of the subject lands are designated as "Urban" and "Hazard Lands".

The Urban designation indicates that development is permitted in accordance with local or secondary plans. The Official Plan of the Town of Blue Mountains will, therefore, provide the appropriate policies for this area.

In Hazard Land-designation areas, development is generally not permitted. The actual boundaries of the Hazard Lands will need to be confirmed with the Grey Sauble Conservation Authority ("GSCA"), see GSCA Regulations, below.

Town of the Blue Mountains Official Plan (2007)

Similar to the County's Official Plan, the Town of the Blue Mountains designates the eastern portion of the property as "Residential" and the western portion as "Hazard Lands".

Grey Sauble Conservation Authority Regulations (2006)

The Grey Sauble Conservation Authority ("GSCA") regulates development in or around hazard lands (i.e. floodplains, slopes, wetlands) through the Development, Interference with Wetlands and Alterations to Shorelines and Watercourses, Ontario Regulation 151/06. GSCA mapping shows that the portions of the property along the Beaver Creek and its tributary are located within the regulation limit. Development may not be permitted in these areas, in accordance with PPS hazard land policies and O. Reg. 151/06.

The Authority may grant permission for development in regulated areas if, in its opinion, the control of flooding, erosion, pollution or the conservation of land will not be affected by the proposed development. The GSCA will require technical studies to be provided prior to issuing a permit. The specific studies will be confirmed by the GSCA, at the time of permit application.

1.2 Terrestrial Environment

1.2.1 Designated Sites

A review of the Natural Heritage Information Centre ("NHIC") database did not identify any designated sites on, or in the vicinity of, the site.

1.2.2 Wooded Areas

The Town of the Blue Mountains does not identify Significant Woodlands in its Official Plan. However, Section 8.9 indicates that "Development should be designed to minimize disturbance of wooded areas." The Plan recognizes that development may result in the loss of wooded areas but also indicates that tree cutting in sensitive areas such as steep slopes and stream valleys should be minimized.
On the subject property, wooded lands are present along the Beaver River and in the eastern portion of the property fronting Landsdown St. Wooded areas, particularly along the Beaver River will need to be maintained as much as possible.

1.2.3 Rare and Designated Flora Species

Significant habitats of endangered and threatened species are protected under the policies of the PPS as well as the *Endangered Species Act*. For other rare species, not listed as endangered or threatened, habitat protection may also be provided through the significant wildlife habitat policies of the PPS. Significant habitat of “species of conservation concern” is considered to be a type of significant wildlife habitat.

The Natural Heritage Information Centre (“NHIC”) database and federal Species at Risk Registry (“SARA Registry”) were reviewed for records of rare flora in the vicinity of the study area.

Records from the NHIC database documents recorded species sightings while the SARA Registry identifies broad species ranges. Table 1 summarizes designated species that have been reported or that have a potential range in the vicinity of the project location. The table also documents whether suitable habitat is currently present at, or around, the subject lands.

**Table 1 Rare and Designated Flora Species**

<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>S-Rank</th>
<th>OESA Designation</th>
<th>SARA Designation</th>
<th>Source of Species Record</th>
<th>Habitat Preference</th>
<th>Potential to be Located Near Project Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shubbery St. John's-wort</td>
<td><em>Hypericum prolificum</em></td>
<td>S2</td>
<td>N/A</td>
<td>N/A</td>
<td>NHIC</td>
<td>Field, thickets, prairies and open woods.</td>
<td>There is some potential for this species to be present in the open wooded areas along beaver Creek in the western portion of the property.</td>
</tr>
<tr>
<td>Smith's bulrush</td>
<td><em>Schoenoplectus smithii</em></td>
<td>S3</td>
<td>N/A</td>
<td>N/A</td>
<td>NHIC</td>
<td>Moist, sandy or muddy shorelines.</td>
<td>Habitat may be present along the shore of the Beaver River.</td>
</tr>
<tr>
<td>Species</td>
<td>Scientific Name</td>
<td>S-Rank</td>
<td>OESA Designation</td>
<td>SARA Designation</td>
<td>Source of Species Record</td>
<td>Habitat Preference*</td>
<td>Potential to be Located Near Project Location</td>
</tr>
<tr>
<td>-----------------------</td>
<td>-----------------------</td>
<td>--------</td>
<td>------------------</td>
<td>------------------</td>
<td>--------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>American ginseng</td>
<td><em>Panax quinquefolius</em></td>
<td>S2 END</td>
<td>END</td>
<td>END Sched. 1</td>
<td>SARA Registry</td>
<td>Grows in rich, moist, undisturbed and relatively mature deciduous woods in areas of neutral soil with a forest canopy usually dominated by sugar maple, white ash, bitternut hickory, and basswood. Colonies are usually found at the bottom of gentle slopes facing south in a warm and well-drained area.</td>
<td>Habitat is potentially present in the wooded areas on the site.</td>
</tr>
<tr>
<td>Butternut</td>
<td><em>Juglans cinerea</em></td>
<td>S3? END</td>
<td>END</td>
<td>END Sched. 1</td>
<td>SARA Registry</td>
<td>Usually found as a minor component of deciduous stands, and is commonly associated with linden, black cherry, beech, black walnut, elm, hemlock, hickory, oak, red maple, sugar maple, yellow poplar, white ash and yellow birch. Large pure populations also exist on certain flood plains. Butternut grows best in rich, moist, well-drained soils often found along streams or in well-drained gravel sites made up of limestone.</td>
<td>Habitat is potentially present in the wooded areas on the site.</td>
</tr>
</tbody>
</table>

Based on Table 1, above, there is potential for all of the four species listed to be present on the site. Field investigations should be undertaken prior to development to determine if any of these species are present. Additional mitigation measures may be required if one, or more of these species are confirmed on the Site.

1.2.4 Wildlife

The Ontario Breeding Bird Atlas was reviewed for records of birds breeding in the vicinity of the study area. The results of this review are provided in Appendix C-2. Ninety-nine species were identified in OBBA square 17NK43\(^1\). The number of species identified according to each provincial rarity ranking is provided in Table 2 below.

\(^{1}\) OBBA species lists are provided for 10x10km squares. Species may have been identified anywhere within the square and not necessarily on the site.
Table 2 Provincial Ranking of Bird Species

<table>
<thead>
<tr>
<th>Provincial Ranking</th>
<th>Description of Ranking</th>
<th>Number of Bird Species with Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>S2</td>
<td>Imperiled</td>
<td>1</td>
</tr>
<tr>
<td>S4</td>
<td>Apparently Secure</td>
<td>16</td>
</tr>
<tr>
<td>S4S5</td>
<td>Secure-Apparently Secure</td>
<td>1</td>
</tr>
<tr>
<td>S5</td>
<td>Common and demonstrably secure in the province</td>
<td>76</td>
</tr>
<tr>
<td>SE</td>
<td>Exotic or not believed to be a native component of Ontario's flora</td>
<td>5</td>
</tr>
</tbody>
</table>

The S2-ranked species is the great egret, *Casmerodius albus*. It is described in greater detail in Section 1.2.5, Rare and Designated Fauna Species.

### 1.2.5 Wildlife Habitat

Under the PPS, no development or site alteration is permitted within significant wildlife habitat unless it can be demonstrated that no negative impacts will result. Habitat for area-sensitive species, which are species that require large habitat tracts, is considered to be a type of significant wildlife habitat. The OBBA identified 21 species that are considered to be area-sensitive potentially inhabiting the subject lands and its vicinity, including:

**Forest area-sensitive species:**
- Cooper's hawk, *Accipiter cooperii*
- Northern parula, *Parula Americana*
- Veery, *Catharus fuscescens*
- White-breasted nuthatch, *Sitta carolinensis*
- Hairy woodpecker, *Picoides villosus*
- American restart, *Setophaga ruticilla*
- Black-and-white warbler, *Mniotilta varia*
- Black-throated green warbler, *Dendroica virens*
- Least flycatcher, *Empidonax minimus*
- Magnolia warbler, *Dendroica magnolia*
- Ovenbird, *Seiurus aurocapillus*
- Red-breasted nuthatch, *Sitta Canadensis*
- Sharp-shinned hawk, *Accipiter striatus*
- Winter wren, *Troglydytes troglodytes*
- Yellow-bellied sapsucker, *Sphyrapicus varius*.

**Open Water area-sensitive species:**
- Common loon, *Gavia immer*
- Common merganser, *Mergus merganser*.

**Open Country area-sensitive species:**
• Bobolink, *Dolichonyx oryzivorus*
• Eastern meadowlark, *Sturnella magna*
• Grasshopper sparrow, *Ammodramus savannarum*
• Savannah sparrow, *Passerculus sandwichensis*.

Forested areas are present in the western portion of the property, extending along Beaver Creek. Based on aerial photography, wooded areas are narrow, with large gaps in the canopy and large areas of young and sparsely covered lands. These treed areas are unlikely to provide significant habitat for forest area-sensitive species, although some may inhabit the area from time to time.

Beaver Creek traverses the subject lands. These records are more likely associated with the larger water body of Georgina Bay to the north of the site.

Based on aerial photography, little grassland area appears to be present. Much of the open area is disturbed with little ground cover. Significant habitat for area-sensitive open country species is not present.

Appendix Map D of the Town of Blue Mountains Official Plan shows a deer wintering area immediately adjacent to the site.

### 1.2.6 Rare and Designated Fauna Species

The Natural Heritage Information Centre ("NHIC") database, federal Species at Risk Registry ("SARA Registry") and Ontario Breeding Bird Atlas ("OBBA") were reviewed for records of rare fauna in the vicinity of the study area.

Records from the NHIC and OBBA databases document recorded species sightings while the SARA Registry identifies broad species ranges. Table 3 summarizes designated species that have been reported or that have a potential range in the vicinity of the project location. The table also documents whether suitable habitat is currently present at, or around, the subject lands.

According to Table 3, above, a number of rare species could potentially be found in the vicinity of the subject lands, including:

• Grey fox
• Spotted turtle
• Eastern hog-nosed snake
• Milksnake
• Spotted turtle, and
• Monarch.

Field investigations to confirm the presence or absence of these species should be undertaken prior to development of the subject lands.
<table>
<thead>
<tr>
<th>Species</th>
<th>Scientific Name</th>
<th>S-Rank</th>
<th>OEBRA Designation</th>
<th>SARA Designation</th>
<th>Source of Species Record</th>
<th>Date Last Recorded</th>
<th>Habitat Preference*</th>
<th>Potential to be Located Near Project Location</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Mammals</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grey Fox</td>
<td>Urocyon cinereoargenteus</td>
<td>S1</td>
<td>THR</td>
<td>THR</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Found on the outskirts of urban areas in deciduous forests and marshes. Their dens are usually located in areas of dense brush, close to water sources and are made out of rock outcrops, hollow trees, underground burrows dug by other animals or piles of brush. The Grey Fox is considered a habitat generalist.</td>
<td>Habitat is potentially present on subject lands.</td>
</tr>
<tr>
<td>Great Egret</td>
<td>Ardea alba</td>
<td>S2</td>
<td>N/A</td>
<td>N/A</td>
<td>OEBRA Database</td>
<td>N/A</td>
<td>Build stick nests in mature forests near large water bodies. Nests are often built in large colonies.</td>
<td></td>
</tr>
<tr>
<td>Cerulean Warbler</td>
<td>Dendroica ceruleana</td>
<td>S3</td>
<td>SC</td>
<td>SC</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Found in mature deciduous forests with large trees and open understory in wet bottomland areas or dry ridges in upland locations. They also prefer to nest in older, second growth forests.</td>
<td></td>
</tr>
<tr>
<td>Least Bittern</td>
<td>Ixobrychus exilis</td>
<td>S4</td>
<td>THR</td>
<td>THR</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Prefers to nest in freshwater marshes with dense tall aquatic vegetation interspersed in clumps of woody vegetation and open water. They are usually found in marshes greater than 5 ha.</td>
<td>Suitable habitat is not present on the subject lands.</td>
</tr>
<tr>
<td><strong>Birds</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Northern long-eared bat</td>
<td>Plecotus auritus</td>
<td>S37</td>
<td>N/A</td>
<td>N/A</td>
<td>NHIC 1939</td>
<td>1939</td>
<td>Hibernation typically occurs in caves, abandoned mines or other crevices. In the summer months, roosting takes place in the cavities of large, mature and decaying trees. Habitats near water sources provide insects for feeding.</td>
<td>This record is from 1939 and is no longer relevant. Suitable habitat sites are not present on the site. Forests may not be mature enough to provide suitable tree cavities for roosting.</td>
</tr>
<tr>
<td><strong>Reptiles</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eastern Hog-nosed Snake</td>
<td>Heterodon platirhinos</td>
<td>S3</td>
<td>THR</td>
<td>THR</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Prefer sandy, well-drained habitats such as beaches and dry woods to lay their eggs in burrows and hibernate. Need access to wet areas such as swamps to hunt.</td>
<td>Suitable habitat may be present on the site.</td>
</tr>
<tr>
<td>Milk Snake</td>
<td>Lampropeltis triangulum</td>
<td>S3</td>
<td>SC</td>
<td>SC</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Occurs predominately in rural areas, and in and around buildings, especially old structures. It can be found in a variety of habitats including prairie, pasture, hayfields, rocky hillside and a wide variety of forest types. Proximity to water and suitable locations for basking and egg-laying are important features of good Milksnake habitat.</td>
<td>Aerial photography indicates that debris piles may be present on the subject lands that could provide habitat for Milk snakes.</td>
</tr>
<tr>
<td>Massasauga</td>
<td>Sistrurus catenatus</td>
<td>S3</td>
<td>THR</td>
<td>THR</td>
<td>NHIC 1975</td>
<td>1975</td>
<td>In the Georgian Bay area, they are often found along the Niagara Escarpment, using granite rock tables for basking.</td>
<td></td>
</tr>
<tr>
<td><strong>Lepidoptera</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monarch</td>
<td>Danaus plexippus</td>
<td>S4</td>
<td>SC</td>
<td>SC</td>
<td>SARA Registry</td>
<td>N/A</td>
<td>Can be found in ditches, ponds, streams, swamps, bogs, and marshes, and prefer soft muddy substrate with some aquatic vegetation. They require quiet waters, and their presence in swift-flowing bodies indicates marshy areas along the shore.</td>
<td>Suitable habitat may be present along the Beaver River.</td>
</tr>
<tr>
<td>Variegated Meadowhawk</td>
<td>Sympetrum corruptum</td>
<td>S3</td>
<td>N/A</td>
<td>N/A</td>
<td>NHIC 1907</td>
<td>1907</td>
<td>Requires open water habitat for breeding.</td>
<td>This record is from 1907 and is no longer relevant. Suitable habitat may be present but it is unlikely that the species is currently in the area.</td>
</tr>
</tbody>
</table>
1.3 Aquatic Environment

The Beaver River flows northward through the subject lands towards Georgian Bay. Appendix A, Map 2 of the Grey County Official Plan identifies the Beaver River as providing coldwater fish habitat. However, there is potential that the reservoir behind Clendenan Dam warms the water and downstream water temperatures may be unsuitable for coldwater fish species. The Town of the Blue Mountains Official Plan requires development setbacks of 30m for coldwater streams and 15m for warmwater streams. The temperature classification of the Beaver River in this area will need to be confirmed with the Ministry of Natural Resources or GSCA.

The GSCA's Watershed Report Card (GSCA, n.d.) shows that water quality is excellent in the Beaver River system, based on phosphorus levels and benthic invertebrate sampling. Riparian vegetation cover along the Beaver River earned a "fair" score due to a lack of tree, shrub and grass cover along the watercourse to provide shade, bank stabilization and in-stream fish cover.

A review of the Conservation Ontario Aquatic Species at Risk mapping found no records of rare fish or mussel species for the Beaver River in the vicinity of the site.

1.4 Geologic Features

The Nipissing Ridge is a prominent geological feature that forms a bluff along the Georgian Bay shoreline. The Ridge is generally designated as Hazard Lands; however Section 8.18 of the Town of Blue Mountains Official Plan states that, "Given the reduced physical relief and proximity to development in the Thornbury area, the Nipissing Ridge is not identified as Hazard Lands." The subject lands are located as the edge of the Thornbury urban limit and the status of the Nipissing Ridge designation on the property should be confirmed.

2.0 Implications for Development

Table 4 provides a summary of potential natural heritage constraints and their implications for development of the former Clarksburg landfill site.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Location</th>
<th>Policy</th>
<th>Development Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Lands</td>
<td>- The entire property is located within the GSCA's regulation limit which is associated with the floodplain of Beaver Creek</td>
<td>- Development and site alteration is generally directed away from hazard land areas</td>
<td>- A permit will be required for development in GSCA regulated areas</td>
</tr>
<tr>
<td></td>
<td>- The Nipissing Ridge may or may not be designated as a Hazard land on the site.</td>
<td>- Development may be permitted by permit from the GSCA</td>
<td>- Background studies may be required, such as floodplain delineation, as identified by the GSCA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Hazards associated with the steep slopes of the Nipissing Ridge may need</td>
<td>- Slope stability and other geotechnical studies may be required for development on steep slopes, if present.</td>
</tr>
<tr>
<td>Feature</td>
<td>Location</td>
<td>Policy</td>
<td>Development Implications</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Woodlands</td>
<td>Western portion of the property along the Beaver River and in the eastern portion of the site near Landsdown St.</td>
<td>Loss of wooded areas should be minimized, particularly along watercourses.</td>
<td>A Forest Management Plan, Woodland Conservation Plan or Environmental Impact Study (&quot;EIS&quot;) may be required to show how woodlands will be protected.</td>
</tr>
<tr>
<td>Significant Habitat of Endangered and Threatened Species</td>
<td>There is some potential for butternut and American ginseng to be present in woodlands on, and in the vicinity of, the site.</td>
<td>Development and site alteration are not permitted within significant habitat of endangered and threatened species.</td>
<td>Field investigation, as part of an EIS, should be undertaken prior to development of the site.</td>
</tr>
<tr>
<td>Significant Wildlife Habitat</td>
<td>Habitat for forest area-sensitive bird species is present on, and around, the site. Habitat for “species of conservation concern” (i.e. rare species not designated as endangered or threatened) may be present. Deer wintering habitat is identified in close proximity to the site.</td>
<td>Development and site alteration are only permitted if it can be demonstrated that no negative impacts to the feature or its functions will result.</td>
<td>Field investigations are required to confirm the presence or absence of rare species. An Environmental Impact Study (&quot;EIS&quot;) will be required to demonstrate no negative impacts prior to development.</td>
</tr>
<tr>
<td>Fish Habitat</td>
<td>Fish habitat is present in the Beaver River which traverses the site. Coldwater habitat may be present, depending on how much warming occurs in the upstream Clendenan Dam reservoir.</td>
<td>Development and site alteration is not permitted within fish habitat, except in accordance with provincial and federal regulations.</td>
<td>If any water crossings are required, permission may be required from the GSCA under O. Reg. 151/06 and/or the Department of Fisheries and Oceans under the Fisheries Act. Consideration may also need to be given to fish habitat if discharges from stormwater management facilities or sewage treatment facilities or any water takings are part of the development proposal. The Town of the Blue</td>
</tr>
</tbody>
</table>
3.0 Conclusions

Portions of the subject lands and their vicinity are characterized by significant and potentially significant natural heritage and natural hazard features, including:

- The floodplain of the Beaver River
- Potential steep slopes of the Nipissing Ridge
- Woodlands
- Potential habitat for endangered and threatened species
- Potential significant wildlife habitat, including habitat for species of conservation concern and habitat for area-sensitive species.

Fish habitat is not present on site but is present in the adjacent Beaver River. Any development that requires discharge of stormwater or other substances into the river will require consideration for fish communities and fish habitat.

Prior to development, the following additional work is required:

- A permit from the GSCA, in association with development in a hazard-regulated area. This may require floodplain or other hazard-related studies to support the permit application, and
- An Environmental Impact Study ("EIS") is required prior to development of the site. The EIS should include:
  - Field investigations to confirm the presence or absence of significant features
  - An analysis to demonstrate that no negative impacts to the feature or its ecological functions will result from the proposed development.
Appendix C-2
Breeding Bird Atlas Summary
<table>
<thead>
<tr>
<th>Species Name</th>
<th>Scientific Name</th>
<th>Distribution</th>
<th>AEP-2021 Status</th>
<th>AEP-2016 Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Crow</td>
<td>Corvus brachyrhynchos</td>
<td>NSB, SZN</td>
<td>NSB, N5N</td>
<td>&gt;100 ha</td>
<td>Yes</td>
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<td>American Goldfinch</td>
<td>Carduelis tristis</td>
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Note: The table lists various bird species along with their scientific names, distribution areas, and notes regarding their status and habitat requirements.
Kim Hawkes  
RJ Burnside & Assoc Ltd  
15 Townline  
Orangeville, ON L9W 3R4

Dear Kim Hawkes:

**RE: Freedom of Information and Protection of Privacy Act Request**  
Our File #: A-2010-01779, Your Reference #: MCO018503.1

This letter is in response to your request made pursuant to the *Freedom of Information and Protection of Privacy Act* relating to Thornbury Closed Landfill Site - X2090 - King Street, Thornbury.

After a thorough search of the Ministry’s Owen Sound Area Office, Investigations and Enforcement Branch, Environmental Monitoring and Reporting Branch, Sector Compliance Branch and Safe Drinking Water Branch, records were located in response to your request. It is my decision to provide full access to the attached information.

In accordance with Section 57 of the *Freedom of Information and Protection of Privacy Act*, detailed below are our charges:

- Search Time 1 hour @ $30/hour  
  - $30.00
- Copying 20 pages @ $0.20/page  
  - $4.00
- Delivery  
  - 3.00
- Total  
  - $37.00
- Deposit Received  
  - 30.00
- **BALANCE WAIVED** (NOT REQUIRED)  
  - 7.00

The Environmental Assessment and Approvals Branch has advised that there may be inactive records in the Records Centre. To retrieve these files there is a charge of $60.00 with no guarantee that any records will be located responsive to your request. If you would like us to retrieve these files, please forward to me at the above address payment by money order or cheque (made payable to the “Minister of Finance (FOI)”) or by credit card in the amount of $60.00. Please note, a request for records must usually be answered within 30 calendar days, however Section 27 allows for time extensions under certain circumstances. If you choose to have the files retrieved from the Records Centre, the time for answering your request will be extended for an additional 30 days.

If you object to any decision I have made, you may request a review by contacting the Information and Privacy Commissioner/Ontario, 2 Bloor Street East, Suite 1400, Toronto, ON M4W 1A8 (800-387-0073 or 416-326-3333). Please note that there is a $25.00 fee and you only have 30 days from receipt of this letter to request a review.
If you have any questions regarding this matter, please contact Erin Coulter at (416) 327-1985.

Yours truly,

Donna Currie  
FOI Coordinator  
Freedom of Information and Protection of Privacy Office

Attachments
August 13, 2004

To:
Attention: Mr. Jeff Fletcher
Waste Management Review Co-ordinator
The Corporation of the Town of the Blue Mountains
26 Bridge Street East, P.O Box 310
Thornbury, Ontario
Canada
N0H 2P0

RE:
Closed Waste Disposal Site #X2090
King Street, Thornbury
County of Grey

Reference Number: 0605-63DP6S

Dear Mr. Fletcher:

Enclosed is the final Ministry of the Environment (MOE) inspection report for Closed Waste Disposal Site number X2090, located on King Street in the Town of Thornbury.

If you have any questions or concerns regarding this inspection report, please contact Mark Powell at the Owen Sound area office, (519) 371-2901.

Yours truly,

[Signature]

Sarah Watts
PCB Site Reduction and Landfill ID Coordinator

File Storage Number: GR BM 19 1/1

[Signature]

1/1 600
1.0 INTRODUCTION

This inspection was completed with the intent to establish the exact location and status of the closed waste disposal site. The closed landfill site was inspected with attention to both environmental impacts on ground/surface water and the current physical condition of the site (including: vegetation cover, leachate seeps, security fencing, monitoring programs, etc.).

This site is a closed landfill that was used by the town of Thornbury. This site was capped and closed before 1978. The site entrance is located on King St. Currently the site is being used for aggregate storage and also storage for a large number of boats. The use of the site for these purposes is reasonable since the site has been closed for over 25 years.

2.0 INSPECTION OBSERVATIONS

2.1 FINANCIAL ASSURANCE

There is no financial assurance required since this is a municipal site.

2.2 CLOSURE PLAN

The Ministry has not received a closure plan for this site.
2.3 **ACCESS CONTROL**
The entrance to the site is controlled by a locked gate. There is no fencing around the site, but there are berms around most of the site to shield it from view. There were no signs of illegal dumping on site.

2.4 **FINAL COVER**
The final cover at the site appears intact. The majority of the area of the closed landfill has sparse vegetation growing out of sand and gravel. The area surrounding the landfill had vegetation.

2.5 **LEACHATE CONTROL SYSTEM**
There is no leachate control system on site.

2.6 **METHANE GAS CONTROL SYSTEM**
There is no methane gas control system on site.

2.7 **MONITORING PROGRAMS:**
There are no monitoring programs at this site.

2.8 **GROUND WATER/SURFACE WATER IMPACTS**
There is a water course nearby and down-gradient from the closed landfill site. There was no run-off at the time of the inspection. However, there was evidence of prior run-off.

There was some ponding on the landfill surface.

There was no evidence of leachate break-out on the site.

The municipality indicated that the nearby residences are serviced with municipal water. No wells were observed in the area during the inspection.

2.9 **Registration On Title:**

*Is the site registered on title as an historic landfill?*

This site is not registered on title as a historic landfill.

3.0 **REVIEW OF PREVIOUS NON-COMPLIANCE ISSUES**
A review of the district files did not reveal any non-compliance issues related to this inspection.

4.0 **SUMMARY OF INSPECTION FINDINGS (HEALTH/ENVIRONMENTAL IMPACT)**

Was there any indication of a known or anticipated human health impact during the inspection and/or review of relevant material, related to this Ministry's mandate?

**NO**

Specifics:

Was there any indication of a known or anticipated environmental impact during the inspection and/or review of relevant material?

**NO**

Specifics:

Was there any indication of a known or suspected violation of a legal requirement during the inspection and/or review of relevant material which could cause a human health impact or environmental impairment?

**NO**

Specifics:

Was there any indication of a potential for environmental impairment during the inspection and/or the review of relevant material?

**NO**

Specifics:
Closed Waste Disposal Site Inspection Report

Specifics:

5.0 ACTION(S) REQUIRED

There are no actions required.

6.0 OTHER INSPECTION FINDINGS

It is recommended that the Municipality provide a closure plan for the site as required under Ontario Regulation 232 s.31. Additionally, it is recommended that the Municipality register the site on title as a historic waste disposal site as required by the Environmental Protection Act Section 197 (2). The Municipality should consider as part of their closure plan, a plan to re-vegetate part or all of the site. Vegetation would help prevent run-off from the site.

7.0 INCIDENT REPORT

[Not Applicable]

8.0 ATTACHMENTS

Required attachments:

P7080012.JPG P7080001.JPG P7080002.JPG P7080003.JPG P7080004.JPG P7080005.JPG P7080006.JPG P7080007.JPG
P7080008.JPG P7080009.JPG P7080010.JPG P7080011.JPG

PREPARED BY:
Environmental Officer: Mark Powell
District Office: Owen Sound Area Office
Date: 2004/08/10
Signature:

REVIEWED BY:
District Supervisor: Heather Pollard
District Office: Owen Sound Area Office
Date: 2004/08/12
Signature:

File Storage Number: GR BM C9 141
Closed Waste Disposal Site Inspection Report

Note:
"This inspection report does not in any way suggest that there is or has been compliance with applicable legislation and regulations as they may apply to this facility. It is, and remains, the responsibility of the owner and/or the operating authority to ensure compliance with all applicable legislative and regulatory requirements."