

WASTE MANAGEMENT OF CANADA CORPORATION

RICHMOND SANITARY LANDFILL SITE, MONITORING REPORT NO. 34

PART OF LOTS 1, 2 AND 3, CONCESSION IV,
TOWN OF GREATER NAPANEE, COUNTY OF
LENNOX AND ADDINGTON

MARCH 25, 2021





RICHMOND SANITARY LANDFILL SITE, MONITORING REPORT NO. 34

PART OF LOTS 1, 2 AND 3,
CONCESSION IV, TOWN
OF GREATER NAPANEE,
COUNTY OF LENNOX AND
ADDINGTON

WASTE MANAGEMENT OF CANADA
CORPORATION

PROJECT NO.: 081-12459-01 (8570)
DATE: MARCH 25, 2021

WSP
SUITE 101
1450, 1ST AVENUE WEST
OWEN SOUND, ON, CANADA N4K 6W2

T: +1 519 376-7612
F: +1 519 376-8008
WSP.COM



March 25, 2021

WASTE MANAGEMENT OF CANADA CORPORATION
1271 Beechwood Road
Napanee, ON
K7R 3L1

Attention: Mr. William McDonough, Senior Project Manager

Dear Mr. McDonough:

Subject: Waste Management of Canada Corporation - Richmond Landfill Site Annual Monitoring Report #34

We are pleased to provide Monitoring Report #34 in accordance with the conditions of Environmental Compliance Approval No. A371203, and Environmental Compliance Approval No. 1688-8HZNJG.

Two (2) hard copies of this report have been provided to the District Manager and Senior Environmental Officer for the Ministry of the Environment, Conservation and Parks – Kingston District Office. Additional hard copies and electronic copies have been provided to the stakeholders as described in Condition 14.2 of ECA No. A371203. We have provided an electronic copy of this document to you and to Jim Forney. If you require additional copies, please let us know.

Please note that the Ministry of Environment, Conservation and Parks' Monitoring and Screening Checklist form has been included in reports submitted by BluMetric Environmental Inc. under separate cover.

We trust the enclosed is satisfactory. However, if you have any additional questions, please do not hesitate to contact the writer.

Yours truly,

Peter S. Brodzikowski, P.Eng.
Senior Engineer, Solid Waste Management

PSB/bdl
Encl.

WSP ref.: 081-12459-01 (8570)

SUITE 101
1450, 1ST AVENUE WEST
OWEN SOUND, ON, CANADA N4K 6W2

T: +1 519 376-7612
F: +1 519 376-8008
wsp.com

SIGNATURES

PREPARED BY



Beverly D. (Leno) Minshall, C.E.T., rcji
Environmental Technologist

March 25, 2021

Date

APPROVED¹ BY



Peter S. Brodzikowski, P.Eng.
Senior Engineer, Solid Waste Management

March 25, 2021

Date

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1 INTRODUCTION

Waste Management of Canada Corporation's (WM) Richmond Landfill site is located within Part of Lots 1, 2, and 3, Concession IV, Former Township of Richmond, now the Town of Greater Napanee. The landfill site consists of a 16.2-hectare waste disposal landfill site within a total site area of 138 hectares and operates under Environmental Compliance Approval (ECA) (formerly Certificate of Approval) No. A371203, including amendments. The Richmond Landfill ceased to accept waste for final disposal on June 30, 2011, as per Condition 4.4 of the ECA.

This monitoring report for the Richmond Landfill site was prepared following site inspections and discussions with WM staff, and complies with conditions listed in ECA No. A371203, issued July 14, 2017. This version of the ECA consolidated the ECA that was originally issued January 9, 2012 and amended May 3, 2013, October 4, 2013, August 14, 2015, November 5, 2015, April 15, 2016, and June 15, 2016. The report also complies with conditions listed in ECA (Sewage Works) No. 1688-8HZNJG, issued January 10, 2012. The specific conditions in the ECAs to which this report complies with are listed below:

- Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203; and
- Conditions 10(4) (a) (b), (c), (d), (e), (f), (g), and (h) of ECA No. 1688-8HZNJG

The amendments to the ECA No A371203 issued on January 9, 2012 were mostly related to an appeal filed on January 30, 2012 by the Concerned Citizens Committee of Tyendinaga and Environs (CCCTE) pertaining to seven (7) conditions of the ECA. On March 30, 2012, the Environmental Review Tribunal (ERT) granted CCCTE leave to appeal the seven (7) conditions, as outlined below:

- Condition 8.5 (Monitoring Programs);
- Condition 9.1 (Groundwater and Surface Water Impact Contingency Plan);
- Condition 9.2 (Leachate Collection System Contingency Plan);
- Condition 9.5 (Public Notification Plan for Contingency Plans); and
- Conditions 14.1, 14.2, and 14.3 (Monitoring Reports and Annual Reporting).

The ERT lifted the automatic stay initiated by the appeal until the ERT issued its decision or otherwise ordered.

From May 2013 through June 2016, amendments to ECA No. A371203 were issued following ERT decisions pertaining to the aforementioned conditions. Some amendments were also issued that were unrelated to the ECA appeal. The June 2016 amendment to ECA No. A371203 was based on the ERT's final decision issued December 24, 2015, which stated the ERT was no longer required to supervise or participate in the CCCTE appeal of the ECA, subject only to the ERT's determination of the final wording of the ECA conditions and EMP provisions as outlined in the order. At present, no conditions of ECA No. A371203 remain under appeal, however, additional amendments to ECA No. A371203 may be issued based on the findings of reports required in the June 2016 amendment.

In 2017, the Ministry of Environment, Conservation and Parks (MECP) issued a consolidated ECA to reflect all amendments to the ECA that had been issued since January 2012. The consolidated ECA included the approval of an updated financial assurance re-evaluation, and approval of WM's request to discontinue surface emission surveys conducted at the landfill. The consolidated ECA also included additions and modifications to several Schedule "A" items, along with updated references to the reasons for conditions.

This report was prepared following a site inspection performed by WSP Canada Inc. (WSP) on August 17, 2020, discussions with management, and covers activities and monitoring for the 2020 calendar year.

A copy of ECA No. A371203 issued July 14, 2017 is included in **Appendix A.1** of this report. The following other Certificates of Approval (C of As) and ECAs concerning the site are included in this report, as follows:

- ECA No. 1688-8HZNJG dated January 10, 2012, can be found in **Appendix A.2**. This document outlines the new requirements for the operation, maintenance, monitoring, and reporting of the leachate and stormwater management systems.
- C of A (Industrial Sewage Works) No. 4-0129-64-956 dated January 24, 1995 is located in **Appendix A.3**. This approval governs the operation of the oil/sediment interceptor at the former contaminated soil pad.
- C of A for a Waste Disposal Site No. A710003 (Soil Recycling) dated December 20, 1993 (**Appendix A.4**), with amendments, and
- Environmental Compliance Approval No. 5970-9HKP3V (Landfill Gas Collection and Flaring System), dated April 29, 2014 (**Appendix A.5**). The approval permits the operation of a candlestick flare as a contingency measure in the event the enclosed flare is shut down for repair or maintenance.

In January 2020, WM submitted an ECA application to the MECP requesting the removal of, and amendments to, several Conditions within ECA No. A371203. There are several Conditions in the current ECA which were relevant when the site was in operation, but no longer apply now that the landfill has closed. Since late September 2020, WM and the MECP have exchanged correspondence regarding this application, but as of December 31, 2020, a revised ECA had yet to be issued. It is anticipated the revised ECA will be issued in 2021, which will result in changes to the information presented within future versions of this report.

The site location can be seen in the following **Figure 1**.



G:\1985\8570\DRAWINGS\2021\FINAL_8570-FI-2020_WSP.dwg

SHEET
1

DWN BY: T C G DATE: MARCH 25, 2021
CHK BY: P S B SCALE: N T S
WASTE MANAGEMENT OF CANADA CORP.
DRAWING NO. 8570 - Figure 1

SITE LOCATION PLAN
RICHMOND LANDFILL



2 PREVIOUSLY SUBMITTED REPORTS

Several reports have been completed and filed with the MECP in compliance with requirements of the conditions of the previous Provisional C of A and current ECAs. Those prepared by WSP (formerly GENIVAR Inc. and Henderson Paddon & Associates Limited.) are as follows:

Monitoring Report No. 1, March 1988

1987 Annual Monitoring - Complying with Conditions 10(b), 10(c), and 10(e) of the C of A dated August 11, 1987.

Final Design Report, September 1988

Complying with Conditions 2(a) and 11(a) of the C of A dated August 11, 1987, (Condition 2(a) and 10(a) of the C of A dated March 30, 1988).

Application for the Approval of Sewage Works for the Leachate Collection and Treatment Facilities, October 1988

Monitoring Report No. 2 to 23

1988 to 2009 Annual Monitoring Reports - Complying with Conditions 9(b), 9(c), 9(e), and 9(f) of C of A No. A371203 dated March 30, 1988, Condition 12 (3) of C of A No. 3-0975-90-916 dated October 21, 1991 (Monitoring Reports No. 5 through 22), and Conditions 10 (4) (a), (b), (c), (d), (e), (f), (g), and (h) of C of A No. 5268-7E8LJW, dated August 19, 2008 (Monitoring Reports 22 and 23).

Clay Liner – Design Construction and Testing, October 1989

Complying with Condition 2(b) of the C of A dated March 30, 1988.

Condition No. 7 Report, December 1991

This report was prepared and filed on December 31, 1991 by Laidlaw in connection with requirements of Certificate of Approval (Sewage) No. 31720-90-916.

Condition No. 29 Report, December 1991

This report was prepared and filed on December 31, 1991 by Laidlaw in connection with requirements of Certificate of Approval No. 19-371203 dated September 4, 1991.

Development & Operations Report

Report dated March 1996, to comply with Condition 2(a) of the C of A and as requested in the Amendment to the C of A on August 1, 1995.

Final Closure Plan

Final Closure Plan dated June 2007 was submitted to satisfy Condition 34 of the C of A that required a detailed closure plan pertaining to the termination of the landfill site, post closure inspection, maintenance and monitoring, and end use.

Construction Quality Assurance/Construction Quality Control (CQA/CQC) Plan for the Final Cover System

CQA/CQC Plan dated June 25, 2010, to comply with Condition 6(b) of the amended C of A issued March 31, 2010.

Odour Monitoring Plan

Submitted June 25, 2010 as part of the Environmental Monitoring Plan (EMP) prepared by Water and Earth Science Associates (WESA), to satisfy Condition 8(d) of the amended C of A issued March 31, 2010.

Financial Assurance Update

Revised Financial Assurance Plan dated June 25, 2010, to satisfy Condition 19 of the amended C of A issued March 31, 2010.

Operations and Procedures Manual

Updated Operations and Procedures Manual dated June 25, 2010, to satisfy Condition 66 of the amended C of A issued March 31, 2010.

Leachate Collection System Contingency Plan

Dated June 25, 2010, to satisfy Condition 84 of the amended C of A issued March 31, 2010.

Landfill Gas Collection System Contingency Plan

Dated June 25, 2010, to satisfy Condition 88 of the amended C of A issued March 31, 2010.

Design of Low Permeability Surface and Low Permeability Liner for Compost Pad and Pond

Dated June 25, 2010, to satisfy Conditions 138 and 139 of the amended C of A issued March 31, 2010.

Monitoring Report No. 24

2010 Annual Monitoring Report - Complying with Conditions 9(b), 9(c), 9(e), and 9(f) of C of A No. A371203 dated March 30, 1988 (as amended), Conditions 9a and 9b (i through xxv) of Notice 5 to amend C of A No. A371203 dated March 31, 2010, and Conditions 10(4) (a through h) of C of A No. 5268-7E8LJW dated August 19, 2008.

Waste Public Drop off Area ECA Application

Dated May 25, 2011, this application was submitted to request an amendment to Condition 35 of ECA No. A371203, to permit the continued use of the existing public drop off area after site closure on June 30, 2011, for residents to dispose of waste. Approval of this application was provided by the MECP on January 10, 2012.

Monitoring Report No. 25

2011 Annual Monitoring Report – Complying with Conditions 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Operations and Maintenance Manual Revision No. 1 – Stormwater/Leachate Management Systems

Dated March 22, 2012, to satisfy Condition 7 (3) of ECA No. 1688-8HZNJG. This report was updated to reflect changes in site operations. This report was not required to be submitted to MECP but is retained at the site as part of the operating records.

Operations and Procedures Manual Revision No. 1

Dated March 22, 2012, to satisfy Condition 4.3 (c) of ECA No. A371203. This report was updated to reflect changes in site operations. This report was not required to be submitted to MECP but is retained at the site as part of the operating records.

Odour Monitoring Plan Revision No. 1

Dated March 22, 2012, to satisfy Condition 8.5 d of ECA No. A371203. This report was updated to reflect changes in site operations and to address comments from the public and MECP on the initial submission.

Stormwater Contingency and Remedial Action Plan

Dated March 22, 2012 to satisfy Condition 9 (1) of ECA No. 1688-8HZNJG. This condition required the submission of a contingency and remedial action plan pertaining to the stormwater systems within six (6) months of the date of ECA issuance. The report was required to be submitted only to the MECP District Manager for approval. Report is awaiting review by the MECP.

Transfer Station Waste Frequency Removal ECA Application

Dated September 14, 2012, WM requested an amendment to Condition 5.18 (1), to reduce the frequency of waste removal from the public drop off area from twice per week, to once every two (2) weeks. To date, WM has not received comments from the MECP regarding the status of this application.

Public Notification Plan

Dated September 19, 2012 to satisfy Condition 9.5 of ECA No. A371203. This condition required the submission of a public notification plan to notify parties that contingency plans were implemented at the site, within 12 months of the date of issuance of the ECA.

Odour Survey Protocol

Dated February 2013. This report was submitted to address comments from the ERT hearing.

Public Notification Plan

Dated February 2013. This report was submitted to address comments from the ERT hearing.

Financial Assurance Update

Revised Financial Assurance Plan dated March 25, 2013, to satisfy Condition 2.7 of the ECA issued January 9, 2012.

Monitoring Report No. 26

2012 Annual Monitoring Report – Complying with Conditions 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Monitoring Report No. 27

2013 Annual Monitoring Report – Complying with Conditions 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Maintenance Schedule – Ditches, Culverts, and Leachate Collection System

Dated June 12, 2014 to satisfy Conditions 13.9 and 13.10 of ECA No. A371203. This schedule was submitted as part of a MECP application regarding maintenance on the aforementioned landfill infrastructures for the duration of the landfill's contaminating lifespan.

Addendum to Monitoring Reports No. 26 and 27

Dated September 15, 2014, to satisfy Condition 5.11 (i through iv), which was inadvertently excluded from the 2012 and 2013 annual monitoring reports. This letter report was submitted to MECP and various stakeholders as identified under Condition 14.2 of Notice 1 to amend ECA No. A371203.

Operations and Procedures Manual Revision No. 2

Dated October 28, 2014, to satisfy Condition 4.3 (b) of ECA No. A371203. This report was updated to reflect changes in site operations. This report was not required to be submitted to MECP but is retained at the site as part of the operating records.

Odour Monitoring Plan Revision No. 2

Dated November 24, 2014. This report was submitted as part of a MECP application to request consolidation of the Odour Monitoring Plan Revision No. 1, and the Odour Survey Protocol documents identified under Condition 8.5 (d) of ECA No. A371203 and was updated to reflect changes in site operations.

Leachate Storage System Design Brief

Dated January 13, 2015. This report was submitted as part of an ECA application seeking approval to construct an onsite leachate storage facility to simplify and improve leachate removal and truck loading operations.

Monitoring Report No. 28

2014 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Financial Assurance Update

Revised Financial Assurance Plan dated March 30, 2016, to satisfy Condition 2.7 of the ECA issued January 9, 2012. Submission was accepted by MECP in July 2017.

Monitoring Report No. 29

2015 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Surface Emission Survey Frequency Reduction Application

Dated June 24, 2016. This application was prepared in regard to a Condition in ECA No. A371203 which permits WM to apply for a reduction in the frequency of surface emission surveys performed in a calendar year based on the results of the 2013 and 2014 surface emission surveys. Submission was accepted by MECP in July 2017.

Odour Monitoring Plan Revision No. 3

Dated June 24, 2016. This report was prepared to accompany the Surface Emission Survey Frequency Reduction Application as referenced above. Submission was accepted by MECP in July 2017.

Monitoring Report No. 30

2016 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Monitoring Report No. 31

2017 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated July 14, 2017, Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated January 9, 2012 (as amended), and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Monitoring Report No. 32

2018 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated July 14, 2017, and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Revisions to Environmental Compliance Approval No. A371203 Application

Dated January 14, 2020. This application was prepared to request approval for amendments (removal or revision) to several Conditions of ECA No. A371203. There are several Conditions in the current ECA which were relevant when the site was in operation, but no longer apply now that the landfill has closed. The submission is presently being reviewed by the MECP.

Monitoring Report No. 33

2019 Annual Monitoring Report – Complying with Conditions 5.11 (i through vi), 14.2 and 14.3 (i through xxiii) of ECA No. A371203 dated July 14, 2017, and Conditions 10(4) (a through h) of ECA No. 1688-8HZNJG.

Financial Assurance Update

Revised Financial Assurance Plan dated March 20, 2020, to satisfy Condition 2.7 of the ECA issued July 14, 2017. Additional information was requested by the MECP in late December 2020. The submission is presently being reviewed by MECP.

Forcemain to Leachate Holding Lagoon Application

Dated April 15, 2020. This application was prepared to request approval of the forcemain between pumping chamber PS2 and the leachate holding lagoon. Approval from the MECP is pending.

Modifications to Leachate Storage System Application

Dated April 30, 2020. This application was prepared to request approval of various changes to the previously approved leachate storage system under Condition 5.5 of the current ECA No. A371203. The changes include an increase in the size and the type of storage tank (from a buried unit to a above ground facility), among other items. Approval from the MECP is pending.

Public Notification Plan

Dated November 2020. This report was submitted to address comments from the MECP regarding the January 2020 ECA application requesting approval for amendments to several Conditions of ECA No. A371203. Approval from the MECP is pending.

3 REPORTING REQUIREMENTS – ENVIRONMENTAL COMPLIANCE APPROVAL NO. A371203

3.1 ASSESSMENT OF ENGINEERING FACILITIES, DESIGN AND OPERATIONS OF THE SITE, AND ADEQUACY OF, AND NEED TO, IMPLEMENT CONTINGENCY PLANS

Condition 14.3 i of the ECA requires an assessment of the operation and performance of all engineered facilities. The following describes the facilities reviewed and the assessment completed.

3.1.1 LANDFILL MASS

The existing landfill mass was reviewed for slope stability, areas of settlement, integrity of the final cover, vegetation, leachate and gas seeps, and areas requiring remediation. The landfill slopes are regularly reviewed by WM and were inspected in the past year by WSP. No areas were discovered with slope instability, and minor amounts of settlement is occurring, mainly in the higher elevations of the landfill. The landfill final cover vegetation was reviewed and has established well, however, there are some barren areas on the northeast, east, and south sides of the landfill mound and in other isolated areas which require re-seeding, which were identified to WM during WSP's 2020 site inspection. Otherwise, we conclude no remedial work is required on the landfill mass.

3.1.2 LEACHATE COLLECTION SYSTEM

The existing leachate collection system and pump stations were reviewed to determine if they are operating as designed, and if any remedial work is required. WM staff regularly reviews the operation of the leachate system and completes repairs as required. It is understood that leachate is being collected from the system, and that no blockages are present. High-level alarms were installed in the north chamber, and replaced in the south pump station, in 2010 as per an ECA requirement.

In April 2020, an ECA application was submitted to the MECP for approval of a leachate forcemain between pumping station PS2 (the north chamber) and the leachate holding lagoon. A second ECA application was submitted in late April 2020 for approval of changes to the previously approved leachate storage system under Condition 5.5 of the current ECA No. A371203. Both applications were submitted as part of WM's response to a Provincial Officer's Order (POO) issued on January 23, 2020 regarding an overflow of leachate from the collection system, and a leachate spill at the site, both incidents occurring in mid-January 2020 during a period of high flows resulting from heavy precipitation events. Additional information regarding the POO can be found in **Section 3.15** of this report. Approval of both applications is pending from the MECP. Construction of the forcemain and storage tank is anticipated to be completed in 2021.

3.1.3 GAS COLLECTION SYSTEM

The existing gas collection system is regularly monitored by WM, to ensure that landfill gas is being collected and destroyed in the flare system. No new gas extraction wells were installed in 2020. The gas system was operating as required in 2020, and no additional remedial work is recommended at this time.

3.1.4 STORMWATER MANAGEMENT SYSTEM

Three (3) stormwater sedimentation ponds collect stormwater runoff from the landfill site and remove sediment prior to discharge. Ponds are regularly inspected by WM staff. The ponds in the northwest and northeast corners of the site had no issues in 2020 and require no remedial work. The south pond was reconstructed in 2008-2009, had no issues in 2020, and currently requires no remedial work.

3.1.5 LEACHATE HOLDING LAGOON

The leachate holding lagoon was inspected and was found to be in acceptable condition. The lagoon was decommissioned by WM in 2010 but remained in place as a contingency for leachate storage. The lagoon was utilized for a period in January 2020 to temporarily store leachate due to high flows experienced as a result of abnormal rainfall events. No issues were noted with the lagoon by WM during this period.

On January 23, 2020, a MECPP POO revoked the use of the leachate holding lagoon as a contingency storage measure. Additional details regarding the POO, and WM's action plan in response to the POO, can be found in **Section 3.15** and **Section 3.23** of this report.

Between May and November 2020, leachate from the lagoon was moved back to the north pumping chamber and was then pumped from the north chamber into a tanker truck and hauled from the site for treatment.

In December 2020, results from a sampling program in the vicinity of the leachate holding lagoon were summarized in a memorandum prepared by BluMetric. The sampling program was completed in January, April, July, and November 2020. Results indicated that no levels of 1,4-dioxane, the primary leachate indicator for the site, was detected in any of the samples collected from the monitoring wells, and that groundwater quality did not indicate the presence of leachate impacts in the shallow groundwater flow zone downgradient from the lagoon. Refer to **Appendix B** for the memorandum and analytical results.

3.1.6 CONCLUSIONS

After a review of the engineered facilities at the site, it was concluded that there is currently no need to amend the design or adjust the operation of the Richmond Landfill site.

Since all engineering works are performing as designed, and monitoring results are satisfactory, it is our conclusion that at this time, there is no need to implement any contingency plans.

3.2 LEACHATE COLLECTION SYSTEM EFFICIENCY

Condition 14.3 ii of the ECA requires an assessment of the efficiency of the leachate collection system.

A review of the leachate volume removed from the landfill site was determined to be of a reasonable volume to conclude that the leachate collection system is continuing to operate effectively and is further discussed in **Section 3.11**. WM regularly inspects the infrastructure and has determined that there are no blockages in the system.

Cleaning and camera inspection were planned for 2020, but due to the current health pandemic, contractors did not wish to send personnel to the site. The activity is planned for 2021, subject to provincial regulations surrounding the health pandemic.

Improvements to the leachate collection system efficiency, including the installation of an onsite storage tank, and permanent forcemain between the north chamber and the leachate holding lagoon, are planned for 2021, as a result of the leachate overflow of the south chamber and the leachate spill near the leachate holding lagoon in 2020. The reader is referred to **Section 3.15** and **Section 3.23** for additional information.

3.3 EXISTING SITE CONDITIONS

Condition 14.3 iii of the ECA requires WM to provide plans showing the existing contours of the site.

WSP completed a GPS survey on November 16, 2011 for as constructed purposes upon completion of final capping conditions. A second GPS survey was completed on June 1, 2017 to document existing conditions. No significant change has occurred in the site topography other than settlement since that survey. This information, along with an updated landfill gas collection system plan, has been combined into a single drawing, which is contained in **Appendix C** of this report.

3.4 2020 LANDFILL OPERATIONS AREA

Condition 14.3 iv of the ECA requires information regarding the areas of landfilling operations during the reporting period.

No landfilling operations took place during the reporting period. On June 30, 2011, the Richmond Landfill ceased to accept waste in accordance with Condition 4.4 of the ECA.

3.4.1 EQUIPMENT

Upon completion of landfilling activities, several pieces of equipment were removed from the site. The following equipment remains onsite to assist in performing regular maintenance activities:

- a Case International farm tractor with a rotary mower.

If additional equipment was required, it was obtained from local contractors.

3.5 2021 LANDFILL OPERATIONS AREA

Condition 14.3 v of the ECA requires information regarding the intended area of landfilling operations during the next reporting period.

Per Condition 4.4 of the ECA, no further landfilling operations will occur at the site.

3.6 2020 EXCAVATION AREAS

Condition 14.3 vi of the ECA requires information regarding areas of excavation during the reporting period.

No excavation was completed at the site in 2020, aside from completing seep repairs on the south, east, and north slopes of the landfill mound.

3.7 FINAL AND VEGETATIVE COVER INSPECTIONS

Condition 14.3 vii of the ECA requires a summary of the inspection of the final cover and vegetative cover, including identification of any seepages and remedial actions taken.

The placement of the final cover system was completed on the Richmond Landfill on September 23, 2011. Inspections which took place in 2020 verified that vegetative cover has mostly become well established. Some barren areas were identified during WSP's inspection on the northeast, east, and south sides of the landfill mound, including the areas where seeps were repaired in 2017, 2018, and 2019, and re-seeding of these areas has been recommended to WM.

WM advised that seep repairs had been completed on the south, east, and north slopes in June 2020. No obvious leachate seeps were observed during WSP's annual inspection. Evidence of brown staining and wet ground conditions was found on the south-central slope above the south pumping chamber. This location was identified to WM in the site inspection report, and repairs were undertaken in September 2020.

Refer to **Section 3.23** for the final cover integrity assessment completed on the landfill mound in May 2020.

3.8 PREVIOUSLY EXISTING SITE FACILITIES

Condition 14.3 viii of the ECA requires information regarding previously existing site facilities.

3.8.1 BUILDINGS AND SIGNAGE

The landfill site office is located to the south of the landfill site on the main access road. The building houses hauling division staff, record services, communications equipment, weigh scale recording devices and operating staff facilities.

Landfill equipment is serviced in the existing maintenance building. Fuel storage is located in this area and a staff room for the landfill equipment operators is attached.

Several unoccupied homes and barns on WM-owned land surrounding the landfill were demolished in 2017.

Signs are erected along the access road near Beechwood Road identify the landfill site. The main sign supplies the following information:



A sign is also present on the main gates notifying the public drop off area for local residents was closed February 28, 2014 and remains closed. Signage indicating types of waste accepted at the site have been removed.

3.8.2 STAFF

WM staff manages and operates the site. Mr. William McDonough acted as the Landfill Manager for the 2020 calendar year. The site was managed by the Environmental Legacy Management Group (ELMG) (formerly Closed Sites Management Group (CSMG)) with Mr. Jim Forney being the Director of the ELMG.

Other landfill staff presently consists of the following:

- One (1) full time operator who is responsible for site maintenance and gas field repairs.

Other monitoring staff, and equipment operators, are brought on the site for contract work as required for ongoing maintenance activities.

3.8.3 TONNAGE CONTROL

A truck weigh scale is present at the site and was used to record daily net tonnages received when the site was accepting waste for disposal. A history of the present scale is provided as follows:

In 1998, an 80' Active Mod-U-Dec pitless truck scale with a Toledo digital weight display and printer was connected to a computer for data management. Truck traffic was controlled from the office by traffic light signals and by an air phone intercom system as trucks approach the scale.

- In 2004, electrical work was completed to allow the scale facility to be run by a generator in the event of power failure to the site. Standby power can be easily connected to the scale house facility to operate the necessities for the acceptance of waste vehicles.
- Three (3) separate calibration procedures were performed on the scale in 2012, and two (2) separate calibration procedures were performed on the scale in 2013, to ensure that weights are recorded correctly. Load cells have also been repaired as required.
- One (1) calibration procedure were performed on the scale in June 2014 to ensure that weights were recorded correctly.

In 2020, the scale was not in operation, and no calibration was performed.

3.8.4 SOIL RECYCLING PAD

A vacant area located to the east of the existing maintenance building is the former soil recycling pad and was used in the past for temporary storage of hydrocarbon-impacted soil. Upon site closure on June 30, 2011, the Richmond Landfill ceased to accept waste, including contaminated soil, for final disposal. The pad was flushed and cleaned after soil receipt ended. Surface runoff from this pad flows directly to the stormwater ponds. The oil/sediment separator is monitored for sediment buildup and cleaned as required. No buildup of sediment was noted within this structure in 2020.

3.8.5 SMALL VEHICLE TRANSFER AREA

The public drop off area was approved for operation by the MECP on January 9, 2012, subject to the conditions listed in ECA No. A371203, and opened to the public on February 1, 2012. This area was used for small vehicles offloading waste, recyclables and compostable materials. This practice facilitated the transfer of material from the smaller vehicles into the roll-off bins. A reuse centre where residents could donate and exchange reusable goods was also constructed within the public drop off area. WM participated in the Ontario Electronic Stewardship (OES) program and Ontario Tire Stewardship (OTS) programs for electronics and tire recycling and was also a member of Stewardship Ontario's Municipal Hazardous or Special Waste (MHSW) program and collected paint and single use batteries for disposal offsite. White goods, including those which were tagged "freon removed", and scrap metal,

were separated from the waste stream and temporarily stored on the site. WM removed these materials regularly for recycling.

On February 28, 2014, WM ceased operation of the public drop off area, reuse centre, OTS, OES and white goods areas. All approvals pertaining to the operation of the facility remain in place under consolidated ECA No. A371203 issued July 14, 2017, and WM may elect to re-open the facility at a future date.

3.8.6 LANDFILL GAS COLLECTION AND FLARING SYSTEM

The landfill gas collection and flaring system (LFGCS) was implemented for odour control at the Richmond Landfill in 2000. The construction of Phase I of the system was carried out in the years 2000/2001 with the installation of a 2.1 metre diameter x 12.2-metre-high enclosed flaring system, according to Certificate of Approval (C of A) (Air) No. 8-4076-99-006, issued by the MECP on December 21, 1999. In 2003, C of A (Air) No. 1355-6LRN9N was issued by the MECP, which revoked and replaced the previous C of A. On April 29, 2014, the MECP issued ECA No. 5970-9HKP3V, which revoked and replaced the previous C of A. This approval permits the operation of a candlestick flare only when the enclosed flare is shut down for maintenance and repair.

Subsequent expansions and upgrades to the LFGCS have been made since the installation of the initial system in order to burn the landfill gas produced by the decomposing waste. WM reports that the present system collects gas from five (5) leachate clean-outs, four (4) leachate collection manholes and 42 vertical gas wells, of the 62 wells installed. 20 decommissioned wells are also present. Please refer to the drawing in **Appendix C** for the gas collection system as built drawing.

Regular operation and maintenance of the landfill gas collection and flare system was carried out in 2020. The landfill gas flare has been effective at reducing odour around the landfill site. In the rare occurrence of flare shutdown, operators, who are automatically notified by a paging system, attend the site to restart the flare or correct any alarm situations. The flare has operated successfully to date.

3.8.7 SEDIMENTATION PONDS

The three sedimentation ponds were operational in 2020. Prior to 2012, pond discharge was controlled and not permitted without prior testing and approval from MECP District staff. On January 10, 2012, the MECP issued ECA No. 1688-8HZNJG, which revoked and replaced the previous C of A for sewage works. The ECA allows WM to operate the discharge outlet valves on the sedimentation ponds in the open position, thereby permitting the ponds to operate as designed in a free-flowing state. Revised maintenance, monitoring, and reporting programs are also listed in the ECA.

3.8.8 SITE ACCESS AND ROADS

The site entrance and roads were inspected by WSP during the annual site inspection. Aside from recommendations for re-grading the road surfaces in various areas of the perimeter access roads, no significant issues were identified by WSP during the August 2020 site inspection.

3.9 FACILITIES INSTALLED IN 2020

Condition 14.3 ix of the ECA requires information about the installation of any facilities at the site during the reporting period.

In 2020, no new facilities were installed.

3.10 SITE PREPARATIONS AND FACILITIES PLANNED FOR 2021

Condition 14.3 x of the ECA requires information regarding any site preparation or installation of facilities planned for the next reporting period.

On January 14, 2020, WM submitted an ECA application to request approval of amendments to conditions with ECA No. A371203, to better reflect a landfill site operating in the post-closure period. In late September 2020, the MECP initiated correspondence regarding this application, and discussions regarding an amended ECA are ongoing. A revised ECA No. A371203 is anticipated to be issued by the MECP in 2021.

On March 20, 2020, WM submitted an updated financial assurance re-evaluation, as required by Condition 2.7 of ECA No. A371203. In late December 2020, the MECP initiated correspondence regarding the submission and requested additional information. A response from WM was provided to the MECP in late January 2021. An approved financial assurance re-evaluation is anticipated to be issued by the MECP in 2021.

On April 14, 2020 and April 30, 2020, WM submitted ECA applications to the MECP requesting approval of a leachate forcemain between the leachate holding lagoon and pumping station PS2 (north chamber); and requesting approval of various changes to the leachate storage facility listed under Condition 5.5 of ECA No. A371203, which was initially approved by the MECP under Notice to amend ECA No. A371203, dated June 15, 2016. These applications were submitted in response to the POO issued to WM by the MECP on January 23, 2020 pertaining to the leachate overflow of the south chamber, and the leachate spill near the leachate holding lagoon, which is discussed in further detail in **Section 3.15**. In late September 2020, the MECP initiated correspondence with WM regarding both applications, and additional information was provided to WM in early October 2020. Approval of the applications is anticipated in early 2021. WM is planning to install the tank, along with associated forcemains and pumps, in 2021.

No other site preparations or facilities are planned to be installed in 2021.

3.11 LEACHATE QUANTITIES

Condition 14.3 xi of the ECA requires a summary of the quantity of any leachate or pre-treated leachate removed from the north and south pumping stations at the site during each operating week.

In 2020, leachate continued to be hauled to the Town of Greater Napanee for treatment. Loads are collected from the site, manifested, and then discharged at the septage receiving facility located at Enviro Park Lane and West Street. In the event the Town of Greater Napanee is unable to receive leachate, WM has approval for disposal at the Ravensview septage receiving facility in Kingston, ON. Leachate continues to be extracted at the lowest portions on Phases 2 and 4 and hauled as required for treatment off-site. Additional details are provided in **Section 4.1**.

WM inspects the site each day for leachate seeps and problem areas in the final cap. If leachate seeps are encountered, they are promptly repaired to avoid any surface water contamination. Generally, leachate seeps are excavated, and granular material and dry clay are replaced and packed. When cracks develop in other areas of the final cap and the potential for gas migration is present, the final cap is scarified, or re-compacted and additional clay may be placed in the area to prevent gas migration. Through the continuous removal of leachate to the leachate treatment facilities and the extraction of landfill gas through the landfill gas collection and disposal system, the potential for leachate seeps and gas outbreaks are minimized and the potential for any off-site impact is reduced. As discussed in **Section 3.7**, leachate seeps were detected on the landfill mound south, east and north slopes and were repaired in June 2020. No obvious leachate seeps were observed during WSP's annual inspection in August 2020, but evidence of brown staining and wet ground conditions were found on the south-central slope above the south pumping chamber. WM undertook repairs in September 2020. Some barren areas were identified on the northeast, east, and south sides of the landfill mound, including the areas where seeps were repaired in 2017 through 2020. These areas were identified to WM. Re-seeding of these areas have been recommended by WSP.

For 2020, leachate quantities are recorded daily, and are reported monthly. The reader is referred to **Section 4.1.1** of this report for a discussion of the monthly leachate quantities removed from the site.

If leachate cannot be hauled from the site due to conditions at the Town of Greater Napanee or City of Kingston plants, leachate or leachate-impacted water was temporarily stored in the leachate-holding lagoon located to the north of the site. Once leachate treatment resumes at the receiving plant, this liquid would then be hauled to the plant for treatment and disposal. Storage of leachate in the holding lagoon is a temporary, last resort measure, and is outlined in the leachate management plan submitted to the MECP. In 2010, this pond was dewatered, and allowed to drain freely in future rainfall events. However, if the pond is required for temporary storage of leachate, the pond was capable of being used for this contingency.

In 2020, the lagoon was utilized for periods in early to mid-January for temporary leachate storage, due to high flows experienced during a period of abnormal rainfall events.

On January 23, 2020, use of the leachate holding lagoon for the temporary storage of leachate was revoked by the MECP under a POO. Additional information regarding the POO can be found in **Section 3.15** of this report.

Between May 2020 and November 2020, leachate from the holding lagoon was transferred back to the north chamber. Leachate from the north chamber was then transferred into trucks for disposal offsite at an approved treatment facility. Monthly quantities of leachate transferred from the lagoon to the north chamber can be found in **Section 4.1.1** of this report.

3.12 TOXICITY TESTING – STORMWATER MANAGEMENT PONDS

Condition 14.3 xii of the ECA requires a discussion of the results of the toxicity testing of the landfill stormwater management ponds which includes potential impacts to the groundwater by the ponds.

BluMetric Environmental Inc. (BluMetric) has provided a memorandum regarding the results of toxicity testing of the stormwater ponds, and potential impacts to the groundwater by the ponds. The memorandum can be found in **Appendix D** of this report.

3.13 WASTE TONNAGE SUMMARIES

Condition 14.3 xiii of the ECA requires the weekly, maximum daily, and total annual quantity (tonnes) of waste received at the site.

No waste was received at the site in 2020.

The public drop off area is also permitted on 25 occasions per year to have a “Large Waste Day” and receive up to 100 tonnes per day. In 2020, no Large Waste Days were utilized.

3.14 SUMMARY OF COMPLAINTS

Condition 14.3 xiv of the ECA requires a summary of any complaints received and the responses made.

In 2020, there were no complaints received by WM regarding odours.

Over the years, a few immediate neighbours have occasionally contacted WM regarding odours from the landfill site. The normal decomposition of waste generates odours and is contained in landfill gas. WM implemented the operation of a landfill gas recovery system in 2001 to control the escape of landfill gas. Gas wells were drilled in the waste mound, and collection piping withdraws landfill gas from the wells and all leachate manholes to reduce the odour emitted from the landfill site. Landfill gas is flared off via an enclosed flare to the south of the landfill footprint. The landfill flare was commissioned in April 2001 and successfully reduces landfill gas odours.

In June and July 2009, the consulting group RWDI, accompanied by a representative from the MECP, conducted a three (3) week long odour survey, and found no negative impacts on the local air quality. In addition, the MECP used their TAGA (Trace Atmospheric Gas Analyzer) unit to evaluate the local air quality and concluded that the air quality was similar to any rural air quality in Ontario.

WM staff also tour the surrounding area and concession roads regularly to monitor for odour, litter and illegally dumped waste. Observations are recorded and corrective measures taken as required. A weather station is located north of the office area, which monitors wind speed, wind direction, temperature, rainfall, solar radiation and relative humidity. Recorded local weather patterns help in addressing odour complaints.

If an odour complaint is received at the landfill site, WM staff is dispatched to investigate the source of the odour and record the conditions that may have influenced the odour. WM can complete this response plan if complaints are received directly by WM. If complaints are delayed or not directed towards WM, the potential odour source cannot be investigated, nor can corrective action be taken if the odour was potentially landfill related. A sign is posted near the front entrance, directing residents with questions, concerns and complaints to contact the Landfill Manager or WM Help Line. Phone numbers for both contacts are provided on the sign.

In June 2016, WM submitted an application to the MECP requesting a reduction in the frequency of surface emission surveys performed at the site, based on the results of the 2013 and 2014 surface emission surveys. Included in the application was a revised Odour Monitoring Plan, updated to reflect current site conditions and eliminated the use of surface emission surveys. WM requested that surface emission surveys be performed only in the event of confirming final cover system repairs to areas of the landfill mound, if the landfill mound was confirmed to be a source of odour at an off-site receptor identified in the Odour Monitoring Plan. On July 14, 2017, the MECP approved WM's request, and issued revised Conditions 8.5.3(a), (b) and (c) in consolidated ECA No. A371203.

In 2020, no surface emission surveys were completed.

3.15 SUMMARY OF SEEPS/UPSET CONDITIONS/ EMERGENCY SITUATIONS, AND REMEDIAL ACTIONS

Condition 14.3 xv of the ECA requires a discussion of any seeps, upset conditions or emergency situations and/or corrective/remedial actions taken.

As described under **Section 3.1.5** and **Section 3.11**, the leachate holding lagoon was utilized for temporary leachate storage on the following periods:

- Early January 2020 to January 14, 2020, with a total of 295.23 m³ transferred from the north chamber.

In early January 2020, the site experienced high flows due to wet weather events. Elevated leachate levels were noted in the north and south chambers on January 12, 2020. An overflow of the south chamber was noted on this date, and leachate spilled into the south ditch and infiltrated into the ground near Stormwater Management Pond 3. On January 13, 2020, a load of leachate was transferred from the chamber into a truck operated by Sutcliffe Sanitation Ltd, which transported the load to the north chamber. This action stopped the overflow of leachate from the chamber.

Pumping of leachate from the north chamber to the leachate holding lagoon was ongoing during the period but had to be discontinued as the pump and discharge line froze during a period of colder temperatures. The Town of Greater Napanee had stopped acceptance of leachate loads from the site due to high flows. On January 14, 2020, Sutcliffe Sanitation Ltd. was contacted to remove a load of leachate from the north chamber with the intention of transferring the leachate to the north lagoon. However, soft ground conditions from the earlier wet weather events prevented the truck from accessing the lagoon. The truck operator refused to transport the load to the Ravensview leachate treatment facility in Kingston, ON. To avoid having the load freeze in the truck and to send the truck onto its next scheduled event, the truck operator was directed to dump the entire truck load, consisting of approximately 13,000 litres (13 m³) of leachate, on to the ground.

On January 16, 2020 WM reported the overflow of the south chamber and the leachate spill near the leachate holding lagoon to Mr. David Arnott, Senior Environmental Officer with MECP – Kingston District Office, via telephone call. The MECP attended the site on January 17, 2020 to conduct an investigation. In speaking with onsite WM personnel, and in the subsequent Provincial Officer's Report (POR) dated January 23, 2020, the MECP was advised of WM's concerns related to the potential integrity of the landfill cap; high water infiltration into the landfill mound, and the corresponding increase in leachate volumes being produced as a result. WM also identified previous issues with the south chamber experiencing overflow during high wet weather events. Refer to **Appendix E.1** for the POR from the MECP.

On January 23, 2020, the MECP issued POO No. 3623-BL33DW to the Richmond Landfill, as a result of the leachate overflow and spill events. The following orders were issued:

- **Item 1:** Preparation of an Action Plan detailing measures and dates of implementation of aforementioned measures to effectively assess, manage, and handle leachate generated at the site, including
 - Immediate and short-term (no more than three (3) months) measures to assess and manage leachate measures (compliance date January 31, 2020); including
 - Appropriate staffing to monitor the leachate collection system, particularly during higher flows (wet weather events);
 - Provision of additional equipment to transfer leachate to the leachate holding lagoon in emergency situations;
 - Contracting additional MECP approved waste haulers to respond and transport leachate to approved treatment facilities; and
 - Provision of additional training to WM personnel on provincial spills reporting and relevant waste management legislation.
 - Longer term measures to manage, assess, and reduce leachate volumes generated at the site (compliance date January 31, 2020), including
 - Submission of ECA applications to amend existing approvals to include additional works to the existing leachate collection system, including a permanent forcemain to the leachate holding lagoon; and
 - A formal assessment of landfill infiltration including an evaluation of the existing landfill cap by a third party Qualified Person(s) to assess for settlement, shear or tension cracks, landfill gas, or other signs of compromised integrity.
- **Item 2:** As of January 23, 2020, discontinue transfer of leachate to the leachate holding lagoon until further notice;
- **Item 3:** Retain the services of a Qualified Person(s) to assess potential groundwater and surface water impacts related to the identified spills of leachate from the south chamber and complete the following analytical assessments (compliance date January 27, 2020)
 - Surface water grab sample from Stormwater Management Pond 3 and conduct analysis for all parameters of Table 2 of ECA No. 1688-8HZNJG, in addition to completing an analysis for 1,4-dioxane and acute lethality testing for *Daphnia Magna* and Rainbow Trout; and
 - Obtain multi level groundwater samples from monitoring wells M41, M109, and M9 for the full list of contaminants of concern, including 1,4 dioxane, specified in the current Environmental Monitoring Program for the site.
- **Item 4:** Submit to the POO issuing officer by February 10, 2020 a report prepared by the Qualified Person(s) summarizing and interpreting the results of the surface water/groundwater samples as listed in the above item.

Refer to **Appendix E.2** of this report for a copy of the POO. It is noted an amendment to the POO was issued by the MECP on January 27, 2020, extending the compliance date of **Item 4** to February 17, 2020. A copy of the January 27, 2020 amendment to the POO can be found in **Appendix E.3** of this report.

A summary of WM's response to the POO is discussed in **Section 3.23** of this report.

As a result of the POO, no leachate was transferred from the north or south chamber to the leachate holding lagoon for the remainder of 2020. Beginning in May 2020, leachate from the holding lagoon was transferred back to the north chamber, as follows:

- May 2020 – 78,750 US gallons;
- June 2020 – 362,250 US gallons;
- July 2020 – 400,050 US gallons;
- August 2020 – 390,600 US gallons;
- September 2020 – 513,450 US gallons;
- October 2020 – 409,500 US gallons; and
- November 2020 – 182,700 US gallons.

Overall for 2020, approximately 2,337,300 gallons of leachate was pumped from the leachate holding lagoon to the north chamber. An actual pumping rate of 105 US gallons per hour, was used to determine volumes of leachate removed from the landfill. Using a conversion factor of 1 US gallon = 3.785 litres, a total of 8,847,000 litres of leachate (8,447 m³) was moved from the lagoon to the north chamber in 2020. This leachate was later removed from the north chamber and hauled to the sewage treatment facilities in Napanee and/or Kingston for treatment.

As discussed under **Section 3.7**, seep repairs were undertaken on the south, east and north slopes in June 2020. An additional repair was completed on the south slope in September 2020.

No other seeps, upset conditions or emergency situations were reported at the site in 2020.

3.16 OPERATIONAL PROBLEMS

Condition 14.3 xvi of the ECA requires a discussion of any operational problems encountered at the site, and corrective action taken.

Refer to **Section 3.15** for the leachate overflow and spill incident which occurred at the site in early January 2020 and mid-January 2020. A discussion regarding the corrective action taken can be found in **Section 3.23** of this report.

No other operational problems occurred at the site in 2020.

3.17 REFUSAL OF WASTE

Condition 14.3 xvii of the ECA requires a summary of any waste that was refused for disposal at the site, the reasons for refusal, and the carrier who brought the waste to the site.

In 2020, there were no incidents where waste was brought to the site and refused.

3.18 LEACHATE COLLECTION SYSTEM CLEANING AND INSPECTION

Condition 14.3 xviii of the ECA requires a summary of the leachate collection system cleaning and inspection activities.

In 2020, WM regularly inspected the leachate pumps and system each day that hauling of leachate occurred. The No issues with the equipment or system were noted.

A condition within the July 14, 2017 consolidated ECA No. A371203 requires the leachate collection system to be camera inspected every two (2) years after five (5) years of site closure, with cleaning as required. Camera inspection and flushing was planned for 2020, but due to the current health pandemic, contractors were not willing to travel to the site to complete the work. Camera inspection and flushing is planned for 2021, subject to provincial restrictions pertaining to the health pandemic.

3.19 FINANCIAL ASSURANCE SUMMARY

Condition 14.3 xix of the ECA requires an update summary of the amount of financial assurance which has been provided to the Director.

For 2020, an amount of \$12,171,802 was provided to the Director as per the amount listed under Condition 2.6 (ii) of ECA No. A371203.

It is noted that an updated financial assurance report was submitted to the MECP on March 20, 2020, as per Condition 2.7 of ECA No. A371203. Additional information regarding the submission was requested by the MECP in late December 2020 and was provided in late January 2021. The amount of financial assurance to be posted for 2021 is pending from the MECP.

3.20 CHRONOLOGY OF SIGNIFICANT LANDFILL DESIGN, OPERATIONAL AND LAND USE CHANGES

Condition 14.3 xx of the ECA requires a table detailing the chronology of significant landfill design, operational, and land use changes for the landfill, and any other information with respect to the site which the District Manager or Regional Director may require from time to time.

Please refer to **Appendix F** for a table which lists the aforementioned information. The table also lists the potential sources of Volatile Organic Compounds at the site.

3.21 STATEMENT OF COMPLIANCE

Condition 14.3 xxi of the ECA requires a statement of compliance with all conditions of the ECA and other relevant Ministry groundwater and surface water requirements.

As a result of the site inspection completed in 2020; based on the readily available information provided by WM; and to the best of our knowledge, WSP certifies that WM has complied with the conditions outlined in the various Environmental Compliance Approvals and Certificates of Approval for the site, with respect to site operations. BluMetric has provided a memorandum regarding compliance with the environmental monitoring and reporting requirements of the ECA, which can be found in **Appendix G**.

Monitoring programs have identified elevated levels of some monitoring parameters at locations to the south of the landfill. Detailed explanation of sample results, and work completed prior to 2017, can be found in the spring and fall semi-annual monitoring reports prepared by BluMetric, and in previous annual reports completed by WSP.

In the spring of 2015, the ERT held a hearing on the appeal filed in 2012 by the CCCTE. The decision, with an accompanying order, was issued on December 24, 2015. The ERT ordered that additional field work be completed and a report prepared and provided to all Parties (as defined in the ECA). The report was completed by April 15, 2016.

After review of the April 2016 report, with review and comment from all Parties, the MECP determined that additional field work was required to further define the east and southwest boundaries of the proposed CAZ. That work began in the summer of 2016 and has been continuing since then. The MECP ordered that the report based on this additional field work be submitted by May 31, 2017. As per the ECA, the Parties were to convene a meeting to discuss the report's contents. After reviewing input from all Parties, the MECP was to determine if the CAZ has been adequately defined. If the MECP agreed the CAZ has been adequately defined, WM was to submit the CAZ application. If the MECP did not agree the CAZ has been adequately defined, more field work would be ordered.

The report due May 31, 2017 was submitted by July 20, 2017. The report was delayed while additional field work was being completed. In November of 2017, the MECP indicated that the plume had been adequately defined but requested some additional field work to further define the shallow aquifer within the defined plume. Subsequently, in February 2018, the MECP decided additional field work was required in the northwest area of the CAZ. A work plan was submitted to MECP for approval.

In 2018, the field work in the northwest area of the CAZ was completed and a report was submitted to the MECP. The MECP reviewed the report, and requested an additional well be installed.

In 2019, additional wells were installed in the northwest area of the CAZ. All wells were dry. Additional investigation was completed on the east side of the proposed CAZ, just south of Beechwood Road. This well was also dry. Also in late 2019, additional work was being done to confirm the leachate lagoon was not leaking.

In 2020, work was completed in accordance with the POO issued by the MECP on January 23, 2020 pertaining to the leachate overflow and spill incident as previously described in **Section 3.15** of this report. A discussion regarding the actions taken by WM in response to the POO is provided in **Section 3.23**.

3.22 CONFIRMATION OF SITE INSPECTION PROGRAM

Condition 14.3 xxii of the ECA requires confirmation that the site inspection program as required by this ECA has been complied with by the Owner.

WM has confirmed to WSP that the site inspection program that is required by the Environmental Compliance Approvals, the Certificates of Approval, and by the various reports that address the site operations and monitoring, have been complied with.

3.23 OPERATIONS, EQUIPMENT, PROCEDURES CHANGES, AND RECOMMENDATIONS

Condition 14.3 xxiii of the ECA requires documentation of any changes in operations, equipment, or procedures employed at the site, and recommendations regarding any proposed changes in operations of the site.

As part of ECA No. 1688-8HZNJG, issued January 10, 2012, WM was required to submit a Stormwater Contingency and Remedial Action Plan to the MECP District Manager within six (6) months of the date of issuance for the ECA. On March 22, 2012, WM submitted this plan. To date, WM has not received any comments from the MECP regarding this plan.

On September 14, 2012, WM submitted an application to amend ECA No. A371203, regarding the operation of the public drop off area. WM requested an amendment to Condition 5.18 (1), to reduce the frequency of waste removal from the public drop off area from twice per week, to once every two (2) weeks. To date, WM has not received comments from the MECP regarding the status of this application. As the transfer station has ceased operations, it is not anticipated there is a need for this amendment to proceed.

In 2018, a MECP provincial officer toured the site with WM personnel. No report was provided from the MECP pertaining to this visit.

In August 2019, WM requested and received approval from the City of Kingston to dispose leachate at the Ravensview sewage treatment plant as a contingency measure. This facility replaces the contingency leachate disposal approval previously in place at the sewage treatment plant in Cobourg, ON. The approval for disposal of leachate at this facility is valid and has no calendar restrictions.

On January 17, 2020, a MECP provincial officer toured the site with WM personnel in response to the notification provided by WM on January 16, 2020 regarding a leachate spill and overflow of leachate from the landfill collection system. As referenced in **Section 3.15**, a MECP POR and POO were issued to WM pertaining to these incidents. WM's response to the MECP is outlined in **Section 3.23.1**.

3.23.1 WM RESPONSE TO JANUARY 23, 2020 MECP PROVINCIAL OFFICER'S ORDER

In response to the January 23, 2020 MECP POO pertaining to the leachate overflow and spill incident in early to mid January 2020, WM prepared an Action Plan that was provided to the MECP on January 31, 2020. The following items were noted:

- **Item 1: Short Term Action Plan:**
 - *Appropriate staffing to monitor the leachate collection system, particularly during higher flows (wet weather events):* When WM staff are not available, a knowledgeable consultant or contractor will be available to monitor the leachate sumps to ensure steps are taken so the sumps do not overflow. Staff will record leachate levels on a daily basis on Monday through Friday.
 - *Provision of additional equipment to transfer leachate to the leachate holding lagoon in emergency situations:* As the current road off Deseronto Road to the leachate holding lagoon is accessible only when conditions are dry, WM will evaluate the feasibility of restoring the road for year round access. In the short term, WM rented two (2) frac tanks, a pump, and hoses which have been placed near the south chamber. The aforementioned equipment will provide approximately 150 m³ of leachate storage to be used in the event of an emergency. Use of the leachate holding lagoon as temporary storage remains prohibited by the POO.
 - *Contracting additional MECP approved waste haulers to respond and transport leachate to approved treatment facilities:* On January 20, 2020, Tomlinson Environmental was contracted as an additional hauler of leachate to the Napanee and/or Kingston facilities.
 - *Provision of additional training to WM personnel on provincial spills reporting and relevant waste management legislation:* WM staff will be retrained by February 7, 2020 on all aspects of provincial spill reporting and relevant waste management legislation. All contractors working at the site will also require this training.
- *Longer term measures to manage, assess, and reduce leachate volumes generated at the site, including*
 - *Submission of ECA applications to amend existing approvals to include additional works to the existing leachate collection system, including a permanent forcemain to the leachate holding lagoon:* WM retained WSP to prepare an ECA application for approval

of a permanent forcemain between the leachate holding lagoon and the north chamber for conveyance of leachate between locations. A second ECA application to propose changes to the existing Condition 5.5 of ECA No. A371203 regarding the construction of the leachate storage facility will also be prepared by WSP, with a target submission date of April 15, 2020.

- *A formal assessment of landfill infiltration including an evaluation of the existing landfill cap by a third party Qualified Person(s) to assess for settlement, shear or tension cracks, landfill gas, or other signs of compromised integrity:* WM retained BluMetric to complete the landfill cover integrity assessment, with a completion date of June 15, 2020 provided by BluMetric.

Refer to **Appendix H** for a copy of the Action Item plan submitted by WM to the MECP.

In response to Item 3 regarding surface water and groundwater sampling, and Item 4 pertaining to reporting of the results of the sampling program:

- WM provided a Notice to Interested Parties on the Beechwood Road Environmental Centre (BREC) website on February 3, 2020 and February 4, 2020. Within those notices, WM advised that surface water sampling programs were conducted on January 16, 17, and 23, 2020. Initial results indicated there were no offsite impacts on any neighbouring properties; in Marysville Creek, or in Beechwood Ditch. Additionally, no exceedances of health-related Provincial Water Quality Objectives (PWQO) were found at the downstream surface water sampling locations. Refer to **Appendix I.1** of this report for a copy of the notices provided on the website.
- On February 17, 2020, a memorandum prepared by BluMetric provided a summary and interpretation of the results from the sampling conducted in accordance with Item 3 of the POO. Results from the sampling program found there were no adverse impact to the surface water or groundwater as a result of the overflow from the south chamber. Refer to **Appendix I.2** for a copy of the memorandum, which was also posted to the BREC website.

Additional sampling was requested by the MECP in an email dated January 30, 2020 in the area of the leachate holding lagoon. The sampling was completed on January 31, 2020, and a memorandum prepared by BluMetric on February 21, 2020 stated that the results indicated no adverse impact to the groundwater as a result of the release of leachate to the west of the lagoon. Refer to **Appendix J.1** for the correspondence from the MECP, and to **Appendix J.2** for a copy of the memorandum, which was also posted to the BREC website. A Notice to Interested Parties regarding the results of the sampling program was provided by WM on the BREC website on February 26, 2020. Refer to **Appendix J.3** for a copy of this notice.

On March 26, 2020, WM provided a Notice to Interested Parties on the BREC website that all actions requested of WM by the POO had been completed. Refer to **Appendix K** for a copy of the notice.

As noted under **Section 3.1.2** and **3.10** of this report, WM retained WSP to prepare ECA applications, requesting approval of the construction of a permanent forcemain between the leachate holding lagoon and the north chamber, and also requesting changes to the leachate storage facility previously approved under Condition 5.5 of ECA No. A371203. These applications were submitted to the MECP on April 14, 2020 and April 30, 2020, respectively. Approval of both applications is pending from the MECP, and construction of the aforementioned infrastructure is anticipated to occur in 2021.

Between May 20, 2020 and May 22, 2020, WM retained BluMetric Environmental Inc. (BluMetric) to complete a final cover integrity assessment of the landfill mound. A series of test pits were excavated through the final cover system in various locations of the landfill mound. Bulk soil samples and Shelby tube samples were collected from undisturbed soils within the test pits, among other work that was completed as part of the program. As per the final report issued in December 2020 by BluMetric, the final cover system was observed to be in generally good condition. Additional information regarding the final cover integrity assessment can be found under **Appendix L** of this report.

3.24 PHYTOREMEDIATION SYSTEM

Condition 5.11 of the ECA lists the reporting requirements for the phytoremediation system at the Richmond Landfill, which includes the following:

- (i) Results and an analysis of the results of the monitoring programs for the phytoremediation system;
- (ii) Assessment of the results of the phytoremediation system as related to the stated objectives for the existing and proposed phytoremediation system;
- (iii) Assessment of the need to change the monitoring program for the phytoremediation system and a recommendation of the required changes;
- (iv) A report on operational problems identified during the operation of the phytoremediation system and a discussion of each problem and what was done to rectify each problem;
- (v) Assessment of the need for operational changes for the phytoremediation system and a recommendation of the required changes; and
- (vi) A Site plan which shows the location of the phytoremediation system and any changes made to the phytoremediation system.

The approval for the phytoremediation system was initially issued by the MECP on May 2, 2011 through Notice 8 to amend C of A No. A371203. As noted in previous annual monitoring reports, the system was installed in late May 2011 in the northwest corner of the landfill property. No monitoring results or assessment of the system's operation were available for 2011 as the trees required time to establish in their environment. In late September 2012, the entire plantation was plowed under due to poor growth and wet site conditions.

In April 2013, the ground within the entire phytoremediation area was disked, and low areas were drained to remove standing water. All planting areas were frost seeded with white clover and barley at this time. In May 2013, under the direction of Mr. Steve Shaw from Landscape Rehab Tree and Turf, approximately 6,700 dogwoods and willows were planted, and the area was sprayed with the chemical "Round Up" to retard weed growth. WM monitored the growth of the plantation throughout late spring, and by July 2013 reported a tree growth rate of 100 millimetres to 200 millimetres. Grass was mowed between the rows to promote continued growth. In October 2013, "Round Up" was again sprayed for weed control in the planted areas, and grass was mowed between tree rows. WM reported a live tree plantation of approximately 60%, with an average tree height between 250 millimetres to 350 millimetres.

In June 2014, under the direction of Mr. Steve Shaw of Landscape Rehab Tree and Turf, the herbicide Simazine was applied at a rate of seven (7) kilograms per hectare. A post emergent herbicide was also applied to areas where vegetation was already starting to re-establish. Gromoxone was used to burn down re-established grass and weeds and was applied at a rate of two (2) litres per hectare. A tree height of 50 centimetres to 100 centimetres was also reported.

In 2015, WM reported the plantation experienced good growth, with willows measuring approximately 1.5 metres to 2.4 metres in height, and the dogwoods measuring 0.9 metres to 1.2 metres in height. Approximately five (5) to 10 percent more shrubs that were not visible previously due to weeds also showed signs of growth.

For 2016, WM reported the plantation maintained vegetation, with the willows measuring 1.5 metres to 2.4 metres in height, and the dogwoods measuring between 0.9 metres to 1.2 metres in height. Additional shrubs that were not previously visible due to weeds exhibited signs of growth.

In 2017, 2018, and 2019, WM reported the plantation continued to develop and no operational issues were noted.

To address Condition 5.11 for 2020, the following is noted:

- For Condition 5.11 (i, ii, and iii), please refer to **Appendix M** for the results of the 2020 monitoring program for the phytoremediation area, as provided by BluMetric;
- In regards to Conditions 5.11 (iv and v) inclusive, WM reports growth continues to develop, and no operational issues were noted. In the August 2020 site inspection memorandum, WSP recommended

pruning of vegetation in the phytoremediation area to ensure vegetation does not extend beyond a height of 12 feet, as per a condition of ECA No. A371203. All plant life will continue to be monitored for any signs of impairment. No other operational recommendations nor changes to the system are presented at this time.

- Please refer to the site plan located in **Appendix N** of this report, which shows the location of the phytoremediation system area as required by Condition 5.11 (vi).

4 REPORTING REQUIREMENTS – ENVIRONMENTAL COMPLIANCE APPROVAL NO. 1688-8HZNJG

On January 10, 2012, the MECP issued Environmental Compliance Approval No. 1688-8HZNJG, which revoked and replaced the previous Certificate of Approval. The ECA removed the requirement to operate the ponds in a closed manner, thereby allowing the ponds to operate as designed, subject to quarterly toxicity testing to confirm no adverse effects to species listed in the ECA.

Since the ECA is the most recent version of the approval regarding the operation and management of the stormwater and leachate management systems at the Richmond Landfill, this section of the annual monitoring report is submitted in accordance with Conditions 10 (4) (a) (b), (c), (d), (e), (f), (g), and (h) of this document. An overview of the leachate management system present at the Richmond Landfill is provided below.

4.1 LEACHATE MANAGEMENT

Leachate haulage from the site to the Town of Greater Napanee sewage system began in 1996. Leachate was regularly hauled from the landfill by Sutcliffe Sanitation Services Ltd. and discharged directly to the sewage system. Close communication between the Town, WM and the leachate hauler was maintained to determine if leachate may be accepted for treatment. Before picking up a load of leachate, WM confirms with the Town that leachate can be hauled on that particular day. In the event that the Town is operating on high flows, the Town will notify WM that no leachate can be accepted until levels are reduced. WM will in turn notify the hauler.

During the winter of 2003/2004, WM constructed a leachate/septage dumping facility within the Town of Greater Napanee. The dumping facility is located at Enviro Park Lane and West Street within the Town of Greater Napanee on municipally owned property. The dumping facility was commissioned in April 2004, after which time all leachate was deposited at the dumping station. Station users are recorded by PIN numbers that uniquely identify each station user and log the quantity of material discharged to the dumping facility. Users are then billed on a user pay basis by the Napanee Utilities. Ownership, operation and maintenance of the facility are the responsibility of the Greater Napanee Utilities. WM has a usage contract, which allows WM to use the facility for a specified period of time as long as Napanee Utilities does not have a restriction on dumping due to treatment conditions at the sewage treatment plant. The dumping facility contains dumped loads and slowly discharges wastewater into the Napanee sewage system. Napanee Utilities has a C of A for this site.

It is a requirement of the landfill site's ECA that alternative leachate treatment options are available should the facility in the Town of Greater Napanee be unable to treat leachate. Approval was given to discharge leachate at the Ravensview Sewage Treatment Plant in 2019 on an on-going, as needed basis, and this approval is presented in **Appendix O** of this report. Leachate was hauled from the Richmond Landfill to Kingston for treatment in 2020.

In 2020, Tomlinson Environmental, a MECP approved waste hauler, was contracted by WM as an additional hauler to remove leachate from the Richmond Landfill. In May 2020, Smith's Septic Tank Service was contracted to replace both Sutcliffe Sanitation and Tomlinson Environmental as the designated leachate hauler from the site.

4.1.1 LEACHATE QUANTITIES

Condition 10(4) (b) of the ECA requires a summary of the monthly quantity of leachate disposed offsite and corresponding leachate average quality.

Table 4.1 on the following page indicates the leachate quantities trucked from the site to the Town of Greater Napanee sewage treatment plant and to the Kingston Ravensview sewage treatment plant in 2020.

Table 4-1 2020 Monthly Leachate Quantities Hauled for Treatment

Month	Napanee (m³)	Kingston (m³)	TOTAL
January	2,329.36	1,157.51	3,486.87*
February	2,184.84	194.85	2,379.69
March	830.02	3,671.45	4,501.47
April	1,513.97	1,921.88	3,435.85
May	1,727.11	315.76	2,042.87
June	1,927.19	0	1,927.19
July	1,869.28	0	1,869.28
August	1,789.48	0	1,789.48
September	2,307.11	0	2,307.11
October	2,440.20	0	2,440.20
November	1,416.26	0	1,416.26
December	1,949.99	235.87**	2,185.86
Total	22,284.81	7,497.32	29,782.13

*does not include 295.23 m³ volume pumped to the leachate holding lagoon in early to mid-January 2020, or the 13 m³ spilled on January 14, 2020.

**BluMetric's monthly leachate quantities did not include this value, which affects the overall volume of leachate hauled to treatment in December 2020, and results in a slight difference in the overall leachate treatment volume for 2020.

The average rate of removal for treatment was initially calculated to be 80.93 m³/day.

Upon issuance of the MECPP POO on January 23, 2020, no leachate was transferred from the north chamber to the leachate holding lagoon for the remainder of 2020. However, for periods between May and November 2020, leachate was transferred from the leachate holding lagoon back to the north chamber, for subsequent removal from the site. Refer to **Table 4.2** on the following page for the volume of leachate transferred between the two locations.

Table 4-2 2020 Monthly Leachate Quantities Generated by the Landfill Mound

Month	Total Hauled for Treatment (m ³)	Total Removed from Lagoon Back to North Chamber (m ³)	TOTAL Leachate Generated in 2020 (m ³)
January	3,486.87	0	3,795.10*
February	2,379.69	0	2,379.69
March	4,501.47	0	4,501.47
April	3,435.85	0	3,435.85
May	2,042.87	298.07	1,744.80
June	1,927.19	1,371.12	556.07
July	1,869.28	1,514.19	355.09
August	1,789.48	1,478.42	311.06
September	2,307.11	1,943.41	363.70
October	2,440.20	1,549.96	890.24
November	1,416.26	691.52	724.74
December	2,185.86**	0	2,185.86
Total	29,782.13	8,846.69	21,243.67

*includes 295.23 m³ moved from the north chamber to the leachate holding lagoon prior to January 14, 2020. Also includes 13 m³ of leachate removed from the north chamber on January 14, 2020 and spilled on the ground near the leachate holding lagoon.

**this value includes leachate volume hauled to Ravensview facility as per WM records. This volume (235.87 m³) was inadvertently not included in BluMetric’s calculation for the same period.

The volume of leachate transferred from the lagoon back to the north chamber was subtracted from the overall volume of leachate hauled for treatment for each relevant month. The result of this calculation is a volume of leachate generated by the landfill mound for each corresponding month, and an overall volume of leachate generated by the landfill mound for 2020.

The average rate of removal of leachate generated by the landfill mound in 2020 was 58.04 m³/day. It is recommended that leachate removal continue.

Please refer to **Appendix D** for information regarding monthly average leachate quality data, provided by BluMetric.

4.1.2 OPERATIONAL PROBLEMS AND CORRECTIVE ACTIONS

Condition 10(4) (c) of the ECA requires a description of any operating problems encountered and corrective actions taken.

A leachate spill and leachate overflow event occurred at the site in January 2020 due to high flows resulting from precipitation events. Additional details regarding these incidents; actions initiated by the MECP; and corrective actions undertaken by WM, are provided in **Sections 3.15** and **3.23** of this report.

As noted under **Section 3.23.1** of this report, WM retained WSP to prepare ECA applications pertaining to improvements to the leachate collection system. More specifically, an ECA application was submitted to the MECP for approval on April 14, 2020, requesting approval of the construction of a permanent forcemain between the leachate holding lagoon and the north chamber. A second ECA application was submitted to the MECP on April 30,

2020, requesting changes to the leachate storage facility previously approved under Condition 5.5 of ECA No. A371203. Approval of both applications is pending from the MECP, and construction of the aforementioned infrastructure is anticipated to occur in 2021.

No issues from the treatment of the leachate at either the Napanee or Kingston sewage treatment plants have arisen that have been communicated to WM.

4.1.3 MAINTENANCE PERFORMED ON STRUCTURES

Condition 10(4) (d) of the ECA requires a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism, or thing forming part of the Works.

In 2020, no maintenance was completed.

4.1.4 CALIBRATION AND MAINTENANCE OF LEACHATE MONITORING EQUIPMENT

Condition 10(4) (e) of the ECA requires a summary of the calibration and maintenance carried out on all leachate monitoring equipment.

In 2020, no calibration procedures were performed on any structures or equipment.

4.1.5 SUMMARY OF COMPLAINTS RECEIVED

Condition 10(4) (f) of the ECA requires a summary of any complaints received during the reporting period, and any steps taken to address the complaints.

In 2020, no odour complaints were received.

4.1.6 SUMMARY OF BY-PASS, SPILL OR ABNORMAL DISCHARGE EVENTS

Condition 10(4) (g) of the ECA requires a summary of all By-pass, spill, or abnormal discharge events.

In January 2020, there was a leachate spill and leachate overflow event due to high flows experienced during abnormal rainfall events. The reader is referred to **Section 3.15** of this report for a description of the spill and overflow incidents. The reader is also referred to **Section 3.23** of this report for the MECP response to these incidents, and WM's actions in response to the MECP POO.

4.2 SURFACE WATER MANAGEMENT

Surface water quality management is also operated under ECA No. 1688-8HZNJG, which revoked and replaced the previous C of A on January 10, 2012. The new approval permits the ponds to be free flowing, subject to toxicity testing to verify no adverse effects are caused to species listed in the ECA. This section is intended to satisfy the requirements outlined in Condition 10(4) (a), (c), (d), (f) and (g) of the ECA.

4.2.1 SUMMARY OF STORMWATER MONITORING DATA

Condition 10(4) (a) of the ECA requires a summary and interpretation of all stormwater monitoring data and a comparison to the Provincial Water Quality Objectives (PWQO), including an overview of the success and adequacy of the Works.

BluMetric has prepared a memorandum to satisfy this section of the ECA. The reader is directed to **Appendix D** of this report for further information.

Additional monitoring events pertaining to the POO issued by the MECP on January 23, 2020 for the leachate spill and leachate overflow incidents, have been previously discussed under **Section 3.23** of this report.

4.2.2 OPERATING PROBLEMS AND CORRECTIVE ACTIONS

Condition 10(4) (c) of the ECA requires a description of any operating problems encountered and corrective actions taken.

In 2020, there were no operating problems encountered or corrective actions taken for the stormwater management system.

4.2.3 SUMMARY OF MAINTENANCE ACTIVITIES

Condition 10 (4) (d) of the ECA requires a summary of all maintenance carried out on any major structure, equipment, apparatus, mechanism, or thing forming part of the Works.

The two (2) northerly sedimentation ponds and the south sedimentation pond operated in 2020 without any maintenance required on the ponds. The ponds are regularly inspected to ensure their operation meets the ECA, and no remedial work was required in 2020.

No maintenance activities were undertaken in 2020.

4.2.4 SUMMARY OF COMPLAINTS RECEIVED

Condition 10(4) (f) of the ECA requires a summary of any complaints received during the reporting period, and any steps taken to address the complaints.

In 2020, there were no complaints received regarding the ponds.

4.2.5 SUMMARY OF BY-PASS, SPILL OR ABNORMAL DISCHARGE EVENTS

Condition 10(4) (g) of the ECA requires a summary of all By-pass, spill, or abnormal discharge events.

In 2020, there were no stormwater events that were a by-pass, spill, or abnormal discharge event.

5 GENERAL

In 2020, WM completed ongoing maintenance and operation of the landfill site. Active litter control, gas management, leachate treatment and active monitoring of the landfill site resulted in no operational impacts on the surrounding area. The continued use of the landfill gas collection and flaring system, and system maintenance and upgrades, has reduced any potential landfill gas odours. WM has been very active in monitoring all aspects of the site, both on and off site, ensuring that no impacts were caused on the surrounding areas. The entire landfill mound has had final cover in place since September 2011 and is regularly inspected. A final cover integrity assessment was completed in May 2020 and concluded the final cover system was in generally good condition. WM advised that seep repairs had been completed on the south, east, and north slopes in June 2020. No obvious leachate seeps were observed during WSP's annual inspection. Evidence of brown staining and wet ground conditions was found on the south central slope above the south pumping chamber. This location was identified to WM in the site inspection report, and repairs were undertaken in September 2020. Re-seeding of these areas has been recommended to WM.

In January 2020, WM submitted an ECA application to the MECP requesting the removal of, and amendments to, several Conditions within ECA No. A371203. There are several Conditions in the current ECA which were relevant when the site was in operation, but no longer apply now that the landfill has closed. Since late September 2020, WM and the MECP have exchanged correspondence regarding this application, but as of December 31, 2020, a revised ECA had yet to be issued. It is anticipated the revised ECA will be issued in 2021, which will result in changes to the information presented within future versions of this report.

Leachate extraction and treatment continues at the landfill site. Approximately 29,782.13 m³ of leachate was removed and disposed offsite during the past year, or approximately 80.93 m³/day. This volume does not include approximately 295.23 m³ of leachate that was transferred from the north chamber to the leachate holding lagoon in January 2020; nor does it include the 13 m³ of leachate spilled on January 14, 2020. There was approximately 8,846.69 m³ of leachate transferred from the leachate holding lagoon back to the north chamber for subsequent removal from the site. Therefore, the overall amount of leachate produced by the landfill mound in 2020 was 21,243.67 m³, or approximately 58.04 m³/day. It is recommended that leachate removal for treatment offsite continue.

In January 2020, abnormal rainfall events resulted in high flows at the site. A leachate overflow incident and leachate spill incident were reported by WM to the MECP on January 16, 2020. On January 23, 2020, the MECP issued a Provincial Officer's Order for the site pertaining to these incidents and revoked the use of the leachate holding lagoon as contingency storage for leachate. Additional surface water and groundwater monitoring events were undertaken to confirm no impact to the surrounding environment as a result of the overflow and spill incidents. WM retained WSP to prepare ECA applications pertaining to improvements to the leachate collection system. More specifically, an ECA application was submitted to the MECP for approval on April 14, 2020, requesting approval of the construction of a permanent forcemain between the leachate holding lagoon and the north chamber. A second ECA application was submitted to the MECP on April 30, 2020, requesting changes to the leachate storage facility previously approved under Condition 5.5 of ECA No. A371203. Approval of both applications is pending from the MECP, and construction of the aforementioned infrastructure is anticipated to occur in 2021.

The landfill gas extraction and flaring system successfully collected and flared the landfill gas generated from the site. Continued operation and maintenance of this system will be completed in the coming years to ensure that odours are minimized around the landfill site. Additional wells may be installed to replace non-functioning wells. In 2014, WM received approval for the installation of a backup flare, which would operate in the event the enclosed flare is down for maintenance or repairs.

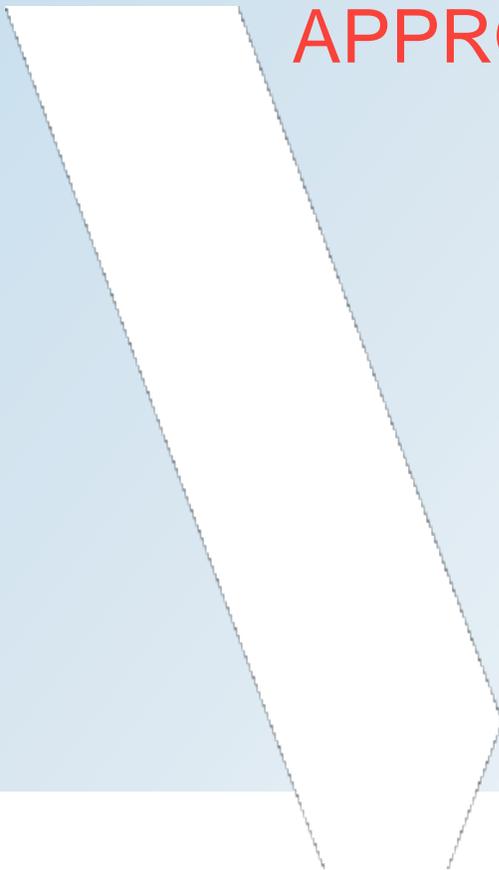
Neighbours with concerns are always invited to visit the landfill with their concerns, which are addressed by the site manager.

As a result of the site inspection completed in 2020; based on the readily available information provided by WM; and to the best of our knowledge, we conclude the landfill is managed and operated in an environmentally sound and orderly manner in the post-closure period.

APPENDIX

A

ENVIRONMENTAL
COMPLIANCE APPROVALS
AND CERTIFICATES OF
APPROVAL



APPENDIX

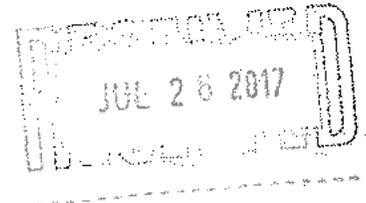
A-1 AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL (WASTE DISPOSAL SITE) NO. A371203, DATED JULY 14, 2017 (CONSOLIDATION OF JANUARY 9, 2012 ECA AND 2012 TO 2016 AMENDMENTS, REVISION OF CONDITION 8.5, ADDITION OF ITEMS 66 AND 67 TO SCHEDULE "A", AND MINOR CORRECTIONS AND REVISIONS TO VARIOUS CONDITIONS, SCHEDULE "A" ITEMS, AND REASONS FOR CONDITIONS)

AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A371203

Issue Date: July 14, 2017

Waste Management of Canada Corporation
851 Robinson Rd E
Rural Route, No. 6
Erie, Pennsylvania
USA 16509



Site Location: Richmond Landfill Site
Lot Pt 1, 2, 3, Concession 4
Greater Napanee Town, County of Lennox and Addington
K7R 3L1

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

the use, operation, and closure of a 16.2 hectare waste disposal landfill site including a landfill gas collection system and landfill gas flare within a total site area of 138 hectares

For the purpose of this environmental compliance approval, the following definitions apply:

"Contaminating Lifespan" or "CLS" refers to the period of time, after closure until the *Site* finally produces contaminants at concentrations below levels which have unacceptable health or environmental effects;

"Director" means any *Ministry* employee appointed in writing by the Minister pursuant to section 5 of the *EPA* as a *Director* for the purposes of Part V of the *EPA*;

"District Manager" refers to the *District Manager* in the Ministry of the Environment's Kingston District Office;

"District Office" refers to the Ministry of the Environment Kingston *District Office* ;

"EAB" refers to the Environmental Approvals Branch of the Ministry of the Environment;

"EMP" refers to the Environmental Monitoring Plan;

"Environmental Compliance Approval" or "ECA" means this entire provisional Environmental Compliance Approval document, issued in accordance with Section 20.2 of the *EPA*, and includes any schedules to it, the application and the supporting documentation listed in Schedule "A";

"EPA " means *Environmental Protection Act*, R.S.O. 1990, c. E. 19, as amended from time to time;

"Major Works " are those works that have an engineering component.

"MOECC " or **"Ministry "** refers to the Ontario Ministry of the Environment and Climate Change;

"Operator " has the same meaning as "Operator" as defined in s.25 of the *EPA* ;

"Owner " means Waste Management of Canada Corporation and its successors and assigns;

"O. Reg. 101/94" means Ontario Regulation 101/94 as amended from time to time;

"PA " means the *Pesticides Act*, R.S.O. 1990, c. P-11, as amended from time to time;

"Parties" mean Concerned Citizens Committee of Tyendinaga and Environs; Director, Ministry of the Environment and Climate Change; Waste Management of Canada Corporation; Mohawks of the Bay of Quinte; and Tom Touzel on behalf of Napanee Green Lights.

"Provincial Officer " means any person designated in writing by the Minister as a provincial officer pursuant to Section 5 of the *OWRA* or Section 5 of the *EPA* or Section 17 of *PA*;

"Regional Director" refers to the Director of the Ministry of the Environment's Eastern Regional Office;

"Regulation 232 " or **"Reg. 232"** or **"O. Reg. 232/98"** means Ontario Regulation 232/98 (New Landfill Standards) made under the *EPA*, as amended from time to time;

"Regulation 347 " or **"Reg. 347 "** means Regulation 347, R.R.O. 1990, made under the *EPA*, as amended from time to time; and

"Site " means the Richmond Landfill Site.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1.0 GENERAL

Compliance

- 1.1 The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Site* is notified of the *ECA* and the conditions herein and shall take all reasonable measures to ensure the person complies with the same.
- 1.2 Any person authorized to carry out work on or operate any aspect of the *Site* shall comply with the conditions of this *ECA* .

In Accordance

- 1.3 Except as otherwise provided for in this *ECA* , the *Site* shall be designed, developed, constructed, operated and maintained in accordance with the supporting documentation listed in Schedule "A".

Other Legal Obligations

- 1.4 The issuance of, and compliance with, this *ECA* does not:
 - a. relieve any person of any obligation to comply with any provision of the *EPA* or any other applicable statute, regulation or other legal requirement; or
 - b. limit in any way the authority of the *Ministry* to require certain steps be taken or to request that any further information related to compliance with this *ECA* be provided to the *Ministry* .

unless a provision of this *ECA* specifically refers to the other requirement or authority and clearly states that the other requirement or authority is to be replaced or limited by this *ECA* .

Adverse Effect

- 1.5 The *Owner* or *Operator* remain responsible for any contravention of any other condition of this *ECA* or any applicable statute, regulation, or other legal requirement resulting from any act or omission that caused the adverse effect or impairment of air and/or water quality.

Furnish Information

- 1.6 Any information requested by the *Director* or a *Provincial Officer* concerning the *Site* and its operation under this *ECA* , including but not limited to any records required to be kept by this *ECA* shall be provided in a timely manner.
- 1.7 The receipt of any information by the *Ministry* or the failure of the *Ministry* to prosecute any person or to require any person to take any action, under this *ECA* or under any statute, regulation or subordinate legal instrument, in relation to the information, shall not be construed as:

- i. an approval, waiver, or justification by the *Ministry* of any act or omission of any person that contravenes any condition of this *ECA* or any statute, regulation or other subordinate legal requirement; or
- ii. acceptance by the *Ministry* of the information's completeness or accuracy.

1.8 Any information related to this *ECA* and contained in *Ministry* files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act, RSO 1990, CF-31.

Interpretation

1.9 This *ECA* revokes and replaces the previous *ECA* and all subsequent amendments.

1.10 Where there is a conflict between a provision of any document, including the application, referred to in this *ECA*, and the conditions of this *ECA*, the conditions in this *ECA* shall take precedence.

1.11 Where there is a conflict between the application and a provision in any documents listed in Schedule "A", the application shall take precedence, unless it is clear that the purpose of the document was to amend the application and that the *Ministry* approved the amendment in writing.

1.12 Where there is a conflict between any two documents listed in Schedule "A", other than the application, the document bearing the most recent date shall take precedence.

1.13 The conditions of this *ECA* are severable. If any condition of this *ECA*, or the application of any condition of this *ECA* to any circumstance, is held invalid or unenforceable, the application of such condition to other circumstances and the remainder of this *ECA* shall not be affected thereby.

Certificate of Requirement

1.14 Pursuant to Section 197 of the *EPA*, no person having an interest in the *Site* shall deal with the *Site* in any way without first giving a copy of this *Certificate* to each person acquiring an interest in the *Site* as a result of the dealing.

1.15 The Certificate of Requirement shall be registered in the appropriate land registry office on title to the *Site* and a duplicate registered copy shall be submitted to the *Director* within ten (10) calendar days of receiving the Certificate of Requirement signed by the *Director*.

No Transfer or Encumbrance

1.16 No portion of this *Site* shall be transferred or encumbered prior to or after closing of the *Site* unless the *Director* is notified in advance and is satisfied with the arrangements made to ensure that all conditions of this *ECA* will be carried out and that sufficient financial assurance is

deposited with the *Ministry* to ensure that these conditions will be carried out.

Change of Owner

- 1.17 The *Owner* shall notify the *Director* , in writing, and forward a copy of the notification to the *District Manager* , within 30 days of the occurrence of any changes in the following information:
- i. the ownership of the *Site* ;
 - ii. the *Operator* of the *Site* ;
 - iii. the address of the *Owner* or *Operator* ;
 - iv. the partners, where the *Owner* or *Operator* is or at any time becomes a partnership and a copy of the most recent declaration filed under the *Business Names Act* , R. S. O. 1990, c. B.17, shall be included in the notification;
 - v. the name of the corporation where the *Owner* or *Operator* is or at any time becomes a corporation, other than a municipal corporation, and a copy of the most current information filed under the *Corporations Information Act* , R. S. O. 1990, c. C.39, shall be included in the notification.
- 1.18 In the event of any change in the ownership of the *Site* , other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *ECA* , and a copy of such notice shall be forward to the *Director* and *District Manager* .

Inspections

- 1.19 No person shall hinder or obstruct a *Provincial Officer* from carrying out any and all inspections authorized by the *EPA* , or the *PA* , of any place to which this *ECA* relates, and without limiting the foregoing:
- i. to enter upon the premises where the approved works are located, or the location where the records required by the conditions of this *ECA* are kept;
 - ii. to have access to, inspect, and copy any records required to be kept by the conditions of this *ECA* ;
 - iii. to inspect the *Site*, related equipment and appurtenances;
 - iv. to inspect the practices, procedures, or operations required by the conditions of this *ECA* ; and
 - v. to sample and monitor for the purposes of assessing compliance with the terms and conditions of this *ECA* or the *EPA* , or the *PA* .

2.0 FINANCIAL ASSURANCE

Overview

- 2.1 Financial assurance shall be provided as required by the *Director* , in an amount that is sufficient to pay for compliance with and performance of any action specified in this *ECA* , including

closure, monitoring and maintenance of the *Site* , maintenance of all required contaminant control systems including leachate management systems, contaminant monitoring for the contaminating lifespan of the *Site* and contingency plans for the *Site* in accordance with this *ECA*.

- 2.2 Financial assurance may be provided in one or more of the following forms: cash, irrevocable letter of credit, surety bond, or some other form, all satisfactory to the *Director* .

Inflation Rate

- 2.3 The *Owner* shall ensure the methodology used to determine the inflation rate for the financial assurance re-evaluation calculation is the current approach deemed acceptable by the *Ministry* .

Interest (Discount) Rate

- 2.4 The *Owner* shall ensure the methodology used to determine the interest rate for the financial assurance re-evaluation calculation is the current approach deemed acceptable by the *Ministry* .

Proposed Payment Schedule

- 2.5 Within twenty (20) days of issuance of this *ECA* , the *Owner* shall submit an updated financial assurance, as defined in Section 131 of the *EPA* , for the amount of **\$13,659,912.00** to the *Director* . This Financial Assurance shall be in a form acceptable to the *Director* and shall provide sufficient funds for the closure, contingency, post-closure operation, monitoring and maintenance of the *Site* .

- 2.6 The total amount of financial assurance shall be updated as follows for the following years:

- i. March 31, 2018 - **\$13,172,376.00**;
- ii. March 31, 2019 - **\$12,685,305.00**; and
- iii. March 31, 2020 - **\$12,171,802.00**.

Updated Review Report

- 2.7 A revised or new financial assurance program shall be submitted to the *Director* by no later than **March 31, 2020** and then at an interval no greater than a period of every three (3) years thereafter. The report shall include:

- a. updates of the discount, interest and inflation rates associated with the requirements for financial assurance in this *ECA* including justifications and sources of the proposed rates; and
- b. a report prepared by a qualified Professional Engineer which updates the cost estimates on which the amounts associated with the requirements for financial assurance in this *ECA* are based.

- 2.8 No waste shall be received, accepted, disposed or transferred at the *Site* unless appropriate financial assurance is received.
- 2.9 If any financial assurance is scheduled to expire or notice is received, indicating financial assurance will not be renewed, and satisfactory methods have not been made to replace the financial assurance at least sixty (60) days before the financial assurance terminates, the financial assurance shall forthwith be replaced by cash.

3.0 CONSTRUCTION, INSTALLATION and PLANNING

Major Works

- 3.1 (1) The final detailed design of *Major Works* shall include the following:
- a. design drawings and specifications;
 - b. a detailed quality assurance / quality control (QA/QC) program for construction of the major work, including necessary precautions to avoid disturbance to the underlying soils; and
 - c. details on the monitoring, maintenance, repair and replacement of the engineered components of the major work, if any.
- (2) Maintenance or replacing components (i.e. piping for the gas collection system) related to existing *Major Works* are not considered *Major Works* under Section 3.0 of the *ECA*
- 3.2 Any design optimization or modification that is inconsistent with the conceptual design shall be clearly identified, along with an explanation of the reasons for the change.
- 3.3 Each major work shall be constructed in accordance with the approved final detailed design and the QA/QC procedures shall be implemented as proposed by the *Owner* . Any significant variances from the conceptual design for the *Site* shall be subject to approval by the *Director* .
- 3.4 As-built drawings for all *Major Works* shall be retained on site and made available to *Ministry* staff for inspection.

4.0 GENERAL OPERATIONS

Proper Operation

- 4.1 The *Site* shall be properly operated and maintained at all times. All waste shall be managed and disposed of in accordance with the *EPA* and *Regulation 347* and the requirements of this *ECA*. At no time shall the discharge of a contaminant that causes or is likely to cause an adverse effect be permitted.

Operations Manual

4.2 The *Owner* shall ensure the operations and procedures manual for the *Site* includes discussions on the following items:

- a. Health and safety;
- b. Operation and maintenance of the *Site* ;
- c. Waste disposal area and development;
- d. Nuisance management;
- e. Leachate management;
- f. Landfill gas management;
- g. Surface water/Stormwater management;
- h. Inspections and monitoring;
- i. Contingency plans and emergency procedures;
- j. Complaints; and,
- k. Reporting and record keeping.

4.3 The operations and procedures manual shall be:

- a. retained at the *Site* ;
- b. reviewed on an annual basis and updated by the *Owner* as required; and
- c. be available for inspection by *Ministry* staff.

Site Closure

4.4 The *Owner* shall ensure that no waste is received for disposal at the *Site* after **June 30, 2011** and the site is capped with final cover material by **September 30, 2011**.

Capacity

4.5 The *ECA* permits disposal of waste at the *Site* to fill an air space of **2,842,700 cubic metres** (including waste, daily and interim cover material).

Yearly Waste Limit

4.6 No more than 125,000 tonnes of waste per year may be accepted at the *Site* .

Service Area

4.7 Only waste that is generated in the Province of Ontario shall be accepted at the *Site* .

Hours of Operation

4.8 Waste shall only be accepted at the *Site* during the following time periods:

- i. 8 am to 5 PM - Monday to Friday (except statutory holidays)
- ii. 8 am to 1 PM - Saturday

- 4.9 With the prior written approval of the *District Manager*, the time periods may be extended to accommodate seasonal or unusual quantities of waste.
- 4.10 The *Owner* may provide limited hours of operation provided that the hours are posted at the landfill gate and that suitable notice is provided to the public of any change in operating hours.
- 4.11 Upon reasonable notice to the *Director*, contingency actions may take place outside normal hours of operation. Emergency response may occur at any time as required.

Site Security

- 4.12 During non-operating hours, the *Site* entrance and exit gates shall be locked and the *Site* shall be secured against access by unauthorized persons.

On-Site Roads

- 4.13 *Site* roads shall be maintained in a manner approved by Item 19 of Schedule "A".

Waste Inspection Procedures

- 4.14 The *Operator* shall develop and implement a program to inspect waste to ensure that the waste is of a type approved for acceptance under this *ECA*.

Waste Inspection and Deposition

- 4.15 All loads of waste must be properly inspected by trained *Site* personnel prior to acceptance at the *Site* and waste vehicles must be diverted to appropriate areas for waste disposal.
- 4.16 The *Owner* shall deposit waste in a manner that minimizes exposure area at the landfill working face and all waste shall be compacted before cover is applied.

Litter Control:

- 4.17 All loose, windblown litter shall be collected and disposed of at an approved disposal facility.

Vermin, Scavenging, Dust, Litter, Odour, Noise, etc.

- 4.18 The *Site* shall be operated and maintained such that the vermin, vectors, dust, litter, odour, noise and traffic do not create a nuisance.
- 4.19 No scavenging is to occur at the *Site*.

Dust

- 4.20 The *Owner* shall control fugitive dust emissions from *Site* sources including but not limited to *Site* roads, stockpiled cover material and closed landfill area prior to seeding especially during times of dry weather conditions. If necessary, major sources of dust shall be treated with water and/or dust suppression materials to minimize the overall dust emissions from the *Site*.

Noise

- 4.21 The *Owner* shall comply with noise criteria in *MOECC* Guideline entitled "Noise Guidelines for Landfill Sites."

5.0 SITE OPERATIONS

Cover Material

- 5.1
- i. Intermediate Cover - In areas where landfilling has been temporarily discontinued for six (6) months or more, a minimum thickness of 300 mm of soil cover or an approved thickness of alternative cover material shall be placed.
 - ii. Final Cover - Final cover placed after the effective date of this *ECA* must meet the following specifications. In areas where landfilling has been completed to final contours, a minimum 900 mm thick layer of native silty clay till soil shall be placed having a hydraulic conductivity of 1×10^{-8} m/s or less followed by 150 mm of topsoil. The *Owner* shall construct the final cover system for the *Site* in accordance with Items 33 to 36 of Schedule "A" and this *ECA*.
 - iii. The *Owner* shall ensure that no contaminated soils are used in the final cover.

Cleaning Leachate Collection System

- 5.2 The leachate collection system piping for each stage of the landfill shall be inspected and cleaned in accordance with the schedule outlined in Condition 13.10.

Leachate Sump Pits

- 5.3 A leachate maintenance level of no greater than 0.66 metres shall be maintained in the north pumping chamber and documented each working day.
- 5.4 Appropriate alarms shall be installed to warn *Site* personnel of rising leachate levels within the sump pits so that the *Owner* can take appropriate action to prevent an overflow.

Leachate Storage System

- 5.5 Approval is hereby granted for construction of the leachate storage system, all in accordance with Items 63 and 64 in Schedule "A".
- 5.6 The *Owner* shall ensure there are no leachate spills during construction of the leachate storage system and during truck loading.

Compost Pad Area and Compost Pond

- 5.7 The *Owner* shall stop operation of the compost pad by no later than **September 30, 2011**.
- 5.8 The *Owner* shall removed all compost material (finished, curing compost, bulking material) from the *Site* by no later than **September 30, 2011**.

Construction and Operation of Phytoremediation System

- 5.9. (1) The phytoremediation system located in the northwest corner of *Site* shall be constructed and operated in accordance with Item 38 in Schedule A.
- (2) The extent of the phytoremediation system shall not extent beyond the limits as shown in Item 38 in Schedule A.
- (3) The phytoremediation system located in the northwest corner of the *Site* shall not be irrigated with any leachate.
- (4) The *Owner* shall ensure that the vegetation does not exceed a height of 12 feet.
- (5) Where vegetation reaches or exceeds a height of 12 feet, the *Owner* shall prune the vegetation forthwith.
- (6) Within seven (7) days of completion of planting of the phytoremediation system as identified in Item 38 of Schedule "A", the *Owner* shall notify the *District Manager* in writing that the planting has been completed.

Monitoring of Phytoremediation System

- 5.10 (1) The following monitor wells will be used to monitor groundwater levels around the phytoremediation system in the northwest corner of the *Site* :
- a. Shallow Zone - M27, M29, M30, M31, M38, M66-2, M67-2, M100, M101, M102 and M103
 - b. Intermediate Bedrock Zone - M3A-3, M5-3, M6-3, M74 and M75
- (2) The following monitors will be used to monitor groundwater quality around the phytoremediation system in the northwest corner of the *Site* :

- a. Shallow Zone - M29, M66-2, M67-2, M101, M102 and M103
 - b. Intermediate Bedrock Zone - M5-3, M6-3, M74 and M75
- (3) For the monitoring wells identified in Condition 5.10 (2), the *Owner* shall analyze groundwater for determining the quality of groundwater around the phytoremediation system in the northwest corner of the *Site* based on the *EMP* approved prior to this notice and any future approved changes identified in future amendments.

Reporting

- 5.11 Reporting on the phytoremediation system shall be part of the annual monitoring report for the *Site* and shall include but not be limited to the following:
- i. results and an analysis of the results of the monitoring programs for the phytoremediation system;
 - ii. assessment of the results of the phytoremediation system as related to the stated objectives for the existing and proposed phytoremediation system;
 - iii. assessment of the need to change the monitoring program for the phytoremediation system and a recommendation of the required changes;
 - iv. a report on operational problems identified during the operation of the phytoremediation system and a discussion of each problem and details of what was done to rectify each problem;
 - v. assessment of the need for operational changes for the phytoremediation system and a recommendation of the required changes;
 - vi. a *Site* plan which shows the location of the phytoremediation system and any changes made to the phytoremediation system;

Waste and Recyclable Drop-Off Facility

Compliance

- 5.12 Except as otherwise provided by these conditions, the Waste and Recyclable Drop-Off Facility shall be designed, developed, maintained and operated in accordance with the Applications for a Provisional Certificate of Approval for a Waste Disposal Site dated May 25, 2011, and the supporting documentation, plans and specifications listed in Schedule "A".

Waste Types

- 5.13 (1) The Waste and Recycling Drop-Off Facility shall accept the following types of waste:
- i. Solid Non Hazardous Waste - Domestic Waste, Construction and Demolition Waste;
 - ii. Blue Box Materials;
 - iii. Tires; and
 - iv. White Goods and Metal;

- (2) Contaminated soil shall not be accepted at the Waste and Recycling Drop Off Facility.
- (3) If the *Owner* participates in Stewardship Ontario, Ontario Tire Stewardship, or any other recycling program developed by the Province of Ontario, then the waste that has been approved for collection under the aforementioned programs will also be accepted at the public drop off area.

Waste Quantity

- 5.14
- (1) The total amount of waste and recyclable material, which may be received at the Waste and Recyclable Drop off Facility shall not exceed **50 tonnes** per day.
 - (2) On twenty-five occasions throughout a single calendar year the *Owner* is permitted to have a "Large Waste Day" where the *Owner* is permitted to accept up to **100 tonnes** per day. The *Owner* shall notify the *District Manager* in writing within 48 hours after the *Owner* has used one of the "Large Waste Days".
 - (3) The maximum amount of waste that may be stored at the Waste and Recycling Drop-Off Facility shall not exceed **50 tonnes**.
 - (4) The maximum number of waste storage containers that may be stored/utilized at the Waste and Recyclable Drop-Off Facility at any one time shall be as follows:
 - i. nine (9) - 40 yard bins for metals, tires and solid non hazardous waste consisting of domestic, construction and demolition waste;
 - ii. two (2) - 8 yard bins for blue box materials;
 - iii. three (3) - five (5) gallon pails for single use batteries.

Service Area

- 5.15 Only waste that is generated within the boundaries of the **Town of Greater Napanee, Town of Deseronto and Tyendinaga Township** which includes the **Mohawks of the Bay of Quinte** shall be accepted at the *Site*. No waste shall be received for disposal at this *Site* from outside the approved service area.

Hours of Operation

- 5.16. The operating hours of the Waste and Recycling Drop-Off Facility shall be as follows:
- i. 8 a.m. to 5 p.m. - Monday to Friday, except for statutory holidays; and
 - ii. 8 a.m. to 1 p.m. - Saturday
- 5.17 No waste shall be received at the Waste and Recycling Drop-Off Facility except during operating hours when the *Site* is under the supervision of trained personnel.

Removal Frequency

- 5.18 (1) Waste materials shall be removed from the Waste and Recycling Drop-Off Facility on a minimal frequency of twice per week with the exception of white goods and blue box materials.
- (2) White goods and blue box materials shall be removed at a frequency no less than once every six months.
- (3) Wastes which have been approved for collection under Stewardship Ontario, Ontario Tire Stewardship, or any other recycling programs developed by the Province of Ontario, shall be removed from the *Site* at the frequency as detailed in the requirements for the aforementioned programs.

Operations

- 5.19 Recycling activities shall be completed as per *Ontario Regulation 101/94*.
- 5.20 Recyclable materials shall be properly separated and each area properly identified. The areas shall be kept in a neat and tidy manner.
- 5.21 All storage containers/bins used to store waste and/or recyclable materials shall be maintained in good condition to prevent leakage. The *Owner* shall immediately remove from service any leaking container. Containers/bins used to store clean scrap metal may be equipped with drainage holes to permit the drainage of rainwater.
- 5.22 With the exception of white goods, waste may only be stored within the waste storage bins in accordance with Items 52, 53, 54 and 55 in Schedule "A".
- 5.23 All waste types shall be segregated either into bins, or in designated areas defined by barriers. All bins and designated waste storage areas shall be clearly labelled.
- 5.24 The *Owner* shall ensure that all white goods received at the Waste and Recyclable Drop-off Facility have been drained of any refrigerants, and have the appropriate paperwork (current ODP card) demonstrating that the refrigerants have been removed.

Surface Water

- 5.25 The *Owner* shall take all appropriate measures to minimize surface water from coming in contact with waste. Temporary berms and ditches shall be constructed around active waste disposal areas to prevent extraneous surface water from coming in contact with the active working face.
- 5.26 The *Owner* shall not discharge surface water to receiving water bodies without an approval under Section 53 of the *OWRA*.

6.0 TRAINING

Employees and Training

6.1 A training plan for all employees that operate any aspect of the *Site* shall be developed and implemented by the *Operator*. Only trained employees shall operate any aspect of the *Site* or carry out any activity required under this *ECA*. For the purpose of this *ECA* "trained" means knowledgeable either through instruction or practice in:

- i. the relevant waste management legislation including *EPA, O. Reg. 347*, regulations and guidelines;
- ii. major environmental and occupational health and safety concerns pertaining to the waste to be handled;
- iii. the proper handling of wastes;
- iv. the management procedures including the use and operation of equipment for the processes and wastes to be handled;
- v. the emergency response procedures;
- vi. the specific written procedures for the control of nuisance conditions;
- vii. the terms, conditions and operating requirements of this *ECA* and,
- viii. proper inspection, receiving and recording procedures and the activities to be undertaken during and after a load rejection.

7.0 INSPECTIONS AND RECORD KEEPING

Daily Inspections and Log Book

7.1 An inspection of the entire *Site* and all equipment on the *Site* shall be conducted each day the *Site* is in operation to ensure that the *Site* is being operated in compliance with this *ECA*. Any deficiencies discovered as a result of the inspection shall be remedied immediately, including temporarily ceasing operations at the *Site* if needed.

7.2 A record of the inspections shall be kept in a daily log book or a dedicated electronic file that includes:

- i. the name and signature of person that conducted the inspection;
- ii. the date and time of the inspection;
- iii. the list of any deficiencies discovered;
- iv. the recommendations for remedial action; and
- v. the date, time and description of actions taken.

7.3 A record shall be kept in the daily log book of all the following:

- i. the type, date and time of arrival, hauler, and quantity (tonnes) of all waste received at the *Site*; and,

- ii. a list of the refusal of waste shipments, the reason(s) for refusal, and the origin of the waste, if known.

Monthly Records

7.4 Monthly *Site* inspection records in the form of a written log or a dedicated electronic file shall include the following:

- i. a summary of wastes received and refused for disposal at the *Site* ;
- ii. the area of the *Site* in which waste disposal operations are taking place;
- iii. a calculation of the total quantity (tonnes) of waste received at the *Site* during each operating day and each operating week;
- iv. the amount of any leachate removed, or treated and discharged from the *Site* ;
- v. a record of litter collection activities and the application of any dust suppressants;
- vi. a record of the daily inspections;
- vii. a description of any out-of-service period of any control, treatment, disposal or monitoring facilities, the reasons for the loss of service, and action taken to restore and maintain service;
- viii. type and amount of daily, intermediate and final cover used;
- ix. maintenance and repairs performed on equipment employed at the *Site* ;
- x. complaints received and actions taken to resolve them;
- xi. emergency situations and actions taken to resolve them; and
- xii. any other information required by the *District Manager* .

Site Inspections

7.5 During *Site* operations, the *Owner* shall inspect the site monthly for the following items but not limited to these items:

- i. General settlement areas or depressions on the waste mound;
- ii. Shear and tension cracks on the waste mound;
- iii. Condition of surface water drainage works;
- iv. Erosion and sedimentation in surface water drainage system;
- v. Presence of any ponded water on the waste mound;
- vi. Adequacy of cover material;
- vii. Evidence of vegetative stress, distressed poplars or side slope plantings on or adjacent to the waste mound;
- viii. Condition of groundwater monitoring wells and gas wells;
- ix. Presence of insects, vermin, rodents and scavenging animals on or adjacent to the waste mound;
- x. Condition of fence surrounding the *Site* ; and,
- xi. General *Site* appearance.

7.6 The *Owner* shall inspect the waste mound and surrounding areas for the presence of leachate seeps as required by Condition No. 13.5.

Record Retention

- 7.7 Except as authorized in writing by the *Director* , all records required by this *ECA* shall be retained at the *Site* for a minimum of two (2) years from their date of creation.
- 7.8 The *Owner* shall retain all documentation listed in Schedule "A" for as long as this *ECA* is valid.
- 7.9 All monthly summary reports are to be kept at the *Site* until they are included in the Annual Report.
- 7.10 The *Owner* shall retain employee training records as long as the employee is working at the *Site* .
- 7.11 The *Owner* shall make all of the above documents available for inspection upon request of *Ministry* staff.

8.0 MONITORING

Groundwater Monitors

- 8.1 The *Owner* shall ensure all groundwater monitoring wells are properly capped, locked and protected from damage.
- 8.2. All groundwater monitoring wells whether included in the monitoring program or not shall be assessed at least every five years, and repaired, replaced or decommissioned as required in accordance with good standard practice to prevent groundwater contamination and in compliance with the requirements of Ontario Regulation 903.
- 8.3 The *Owner* shall repair or replace any monitoring well included in the monitoring program which is destroyed or in any way made inoperable for sampling such that no more than one sampling event is missed.
- 8.4 Any monitoring well included in the monitoring program that is no longer required as part of the groundwater monitoring program may be decommissioned provided its removal from the monitoring program has been approved by the *Director* . A report on the decommissioning shall be provided in the annual monitoring report for the period during which the well was decommissioned.

Monitoring Programs

- 8.5 (a) The *Owner* shall submit to the *District Manager* by no later than April 15, 2016, with copies to the *Parties* , a revised Environmental Monitoring Plan ("*EMP* "). The revised *EMP* shall implement all of the provisions of the Interim Environmental Monitoring Plan Revision No. 04,

prepared by WESA, dated August 2015, ("Interim *EMP* ") subject to the following modifications ordered by the Tribunal:

- i. The Interim *EMP* shall be further modified to implement continuous conductivity monitoring on Marysville Creek for one year, commencing May 1, 2016, with continuous conductivity loggers placed at: an appropriate location on the Creek, far enough upstream of Deseronto Road to ensure no interference from road salt; and a second location upstream of the landfill to detect background influences. The results of the continuous conductivity monitoring shall be reported in conjunction with the January and July 2017 Semi-annual reports.
 - ii. The Interim *EMP* shall be further modified to state that the need for additional nested monitoring wells in the area of Marysville Creek and the landfill shall be assessed should 1,4-dioxane or another listed parameter be detected.
 - iii. The Interim *EMP* shall be further modified to require that the domestic and agricultural wells at properties located south of Highway 401 on County Road 1 West and Belleville Road, at the addresses noted in the row entitled "Off-site Domestic Wells", Table 2, page 11 of the August 2015 Interim *EMP* , should be tested for 1,4-dioxane every two years for at least the next six years, or until the extent of the leachate contaminated groundwater is declined if that takes longer than six years, and then every five years once the delineation is complete.
 - iv. The Interim *EMP* shall be further modified to require that confirmation resampling (Step 2 under the groundwater evaluation methods and trigger mechanisms set out in Section 7.1 of the proposed revised *EMP*) is to occur at the same time as a water quality conformance assessment (Step 1).
 - v. The Interim *EMP* shall be further modified to set a Reasonable Use Limit (RUL) for 1,4-dioxane at 1 µg/L. Should Ontario amend O. Reg 169/03 to set an Ontario Drinking Water Quality Standard for 1,4-dioxane, the RUL shall be re-calculated in accordance with procedure document B-7-1, and the Interim *EMP* shall be amended as necessary to reflect the re-calculated RUL.
- (b) The *Owner* shall carry out monitoring in accordance with the revised *EMP* submitted by April 15, 2016 as of April 16, 2016.
- (c) The *Owner* shall submit a report to all the *Parties* and the *District Manager* by April 15, 2016 detailing any relevant work carried out relating to the delineation of off-site leachate impacted groundwater or surface water not otherwise described in the January 15, 2016 report submitted further to items 8.5(c) i. to iii. set out in the Tribunal's Order dated July 21, 2015 as amended on October 29, 2015 [the provisions of which are set out in Appendix A], detailing any relevant additional work carried out during this time period, and providing an assessment with necessary supporting rationale as to whether the off-site leachate impacted groundwater has been delineated. The assessment shall be conducted in accordance with the following criteria:

The extent of leachate impacted groundwater shall be delineated if it is demonstrated that groundwater quality within a sufficient number of monitoring wells at the outer extent of the impacted area that are hydraulically connected to the defined area of leachate impacted groundwater does not exceed:

- i. the reasonable use limit ("RUL") for 1,4-dioxane;
 - ii. any RUL as defined in Guideline B-7 and its corresponding procedure, B-7-1 unless the exceedance is identified as not originating from the leachate from the landfill; or
 - iii. any RUL set out in this approval for other parameters unless the exceedance is identified as not originating from the leachate from the landfill.
- (d) The following process shall be followed with respect to the report submitted under 8.5(c):
- i. CCCTE, the MBQ and NGL shall have until June 1, 2016 to provide written comments on the report to the *Owner* and the *District Manager* and specifically whether delineation has been completed in accordance with the criteria.
 - ii. After receiving the written comments from CCCTE, the MBQ and NGL, the *District Manager* will convene a meeting among all the *Parties* to obtain further input and attempt to reach a consensus on whether delineation has been completed.
 - iii. By no later than July 31, 2016, the *District Manager* shall issue a written notice to the *Owner* and copying the *Parties* indicating whether delineation has been completed in accordance with the criteria.
 - iv. If it has been determined by the *District Manager* that delineation has not been completed, the *Owner* shall submit another proposal for additional groundwater investigation that shall be considered in accordance with steps i. through iii. with timelines modified by the *District Manager* accordingly.
 - v. The procedures or deadlines set out in steps i. through iv. can be altered with the consent of all the *Parties*.
- (e) Within 90 days of the *District Manager* providing written notice to the *Owner* that delineation has been completed, the *Owner* shall submit to the *Director*, Environmental Approvals Branch, Ministry of the Environment and Climate Change an application for approval to amend the *ECA* to address any non-compliance with Condition 8.6 and Guideline B-7, including if warranted an application to incorporate a contaminant attenuation zone into the approval, and including a proposed updated *EMP*. The application to amend the *ECA* shall be treated as a standard application and be posted on the EBR Registry for public comment. The application shall outline the options that were considered for bringing the *Site* into compliance with Guideline B-7 and the rationale for the preferred option, and include all necessary supporting documentation.

- 8.5.2 The *Owner* shall conduct a comprehensive investigation of the hydrogeological implications and potential impacts of an existing pipeline which runs across the northern part of the neighbouring properties to the south of the *Site* and submit a report to the *District Manager* and the *Parties* outlining the findings by June 15, 2016.
- 8.5.3 (a) The *Owner* shall conduct odour monitoring and undertake abatement activities as described in the Odour Monitoring Plan dated June 2016, set out as Item 67 in Schedule "A".
- (b) Surface emission surveys may be discontinued upon completion of the fourth quarter surveys in 2016, provided that the total hydrocarbon vapours, expressed as methane, does not exceed 500 parts per million per each grid dimension.
- (c) In the event of odours that are three (3) intensity units (based on the scale provided on Table 3.1 of the Odour Monitoring Plan) or greater are detected at an offsite receptor over a period outlined in Section 3.3.1.2 of the Odour Monitoring Plan, and the landfill mound is confirmed to be the source of the odour, repairs shall be made to the landfill mound as soon as possible. Upon completion of repairs, a surface emission survey shall be carried out to demonstrate that total hydrocarbon vapours, expressed as methane, do not exceed 500 parts per million per each grid dimension.

Compliance Criteria

- 8.6 The *Site* shall be operated in such a way to ensure compliance with the *MOECC* 's Guideline B-7 Reasonable Use Concept at monitoring points along the property line that have the potential to be impacted by leachate from the *Site* .
- 8.6.1 For the purpose of Condition 8.6, a reasonable use limit of 1 µg/L shall be used for the parameter 1,4-dioxane unless an Ontario Drinking Water Quality Standard is established in O. Reg. 169/03 in which case the RUL for 1,4-dioxane shall be recalculated in accordance with the B-7-1 Procedure Document and the interim *EMP* or *EMP* , as the case may be, shall be amended as necessary to reflect the recalculated RUL.
- 8.6.2 Notwithstanding Condition 8.6, if a contaminant attenuation zone ("CAZ") is established, the *Site* shall be operated in such a way to ensure compliance with *MOECC* 's Guideline B-7 Reasonable Use Concept at
- i. monitoring wells that act as groundwater compliance points within the CAZ; or

- ii. along the boundary of the CAZ where it replaces the property line,

unless the non-compliance is identified as not originating from the leachate from the landfill.

- 8.7 Any off site exceedance of parameters for groundwater, surface water, or odour shall be reported to the District Manager within 48 hours of determination of the exceedance. In addition, a statement detailing which results are out of compliance with the Ministry's guidelines and objectives shall be provided at the same time as the results.
- 8.8 Any monitoring result that detects 1,4-dioxane at or above the detection limit of 1 µg/l at any groundwater well or domestic well at which 1,4-dioxane has not been detected in the past or at any surface water monitoring location shall be reported to the District Manager within 48 hours of determination of the exceedance.
- 8.9 Unless otherwise agreed to in writing by the residents of the residences listed below, unless the residence is vacant and likely to remain vacant, the *Owner* shall provide whole house replacement water supplies for the residences located at 1264, 1252, 1250, 1206, 1181, and 1144 Beechwood Road.

9.0 CONTINGENCY PLANS

Groundwater and Surface Water Impact Contingency Plan

- 9.1 (a) The *Owner* shall initiate the contingency plans outlines in section 7.4 of the revised *EMP* referenced in Condition 8.5(a), or as replaced with an updated version, when any of the identified trigger mechanisms occur.
- (b) Notwithstanding Condition 9.1(a), the *Owner* shall not use fracture trench as a Leachate Collection System contingency measure.

Leachate Collection System Contingency Plan

- 9.2 i. The *Owner* shall initiate the Leachate Collection System Contingency Plan at a minimum when the trigger mechanisms identified in Items 41, 47 and 48 of Schedule "A" have been identified as occurring.
- ii. The conceptual Leachate Collection System Contingency Plans as identified in Item Nos. 41, 47 and 48 in Schedule "A" are considered acceptable. In the event the *Owner* needs to implement the Contingency Plan, the *Owner* shall submit to the *Director* for approval prior to implementation, with copies to the *District Manager*, detailed design drawings for works or any remedial system required for the contingency plan.

Leachate Contingency Plan

- 9.3 The *Owner* shall on a biannual basis confirm that there is a suitable location available for disposal of leachate and what that location is. Confirmation shall be provided to the *District Manager* upon receipt. If a location for disposal of leachate is not available, the *Owner* shall provide an action plan for approval to the *District Manager*.

Landfill Gas Contingency Plan

- 9.4 i. The *Owner* shall initiate the Landfill Gas System Contingency Plan at a minimum when the trigger mechanisms identified in Item Nos. 42, 47 and 48 in Schedule "A" have been identified as occurring.
- ii. The conceptual Landfill Gas System Contingency Plans as identified in Item Nos. 42 and 48 in Schedule "A" are considered acceptable. In the event the *Owner* needs to implement the Contingency Plan, the *Owner* shall submit to the *Director* for approval prior to implementation, with copies to the *District Manager*, detailed design drawings for works or any remedial system required for the contingency plan.

Public Notification Plan for Contingency Plans

- 9.5 (a) The *Owner* shall provide notice to interested persons and follow the procedures set out in the Public Notification Plan dated February 2013 set out as Item 58 in Schedule "A" upon the occurrence of any event that triggers notice to be given as set out in the Plan.
- (b) Should the *Owner* wish to amend the Public Notification Plan, the *Owner* shall apply to the *Director* for an amendment to this approval and include in the Application a list of interested persons that were consulted on the proposed amendments and a summary of their comments.

10.0 PUBLIC LIAISON COMMITTEE

- 10.1 The *Owner* shall use its best efforts to establish and maintain a Public Liaison Committee (*PLC*) for the *Site*. The *PLC* shall serve as a focal point for dissemination, review and exchange of information and monitoring results relevant to the operation of the undertaking. In addition, the purpose of the *PLC* will be to provide community review of the development, operation (current and proposed) and ongoing monitoring, closure and post-closure care related to the *Site*. The *PLC* will also be provided the opportunity to review and comment on any subsequent applications for approval under the *EPA*.
- 10.2 The *Owner* shall invite representatives from the Town of Greater Napanee, the *Ministry*, the Township of Tyendinaga, the Quinte Conservation Authority and the Mohawks of the Bay of Quinte to sit on the committee.
- 10.3 The *Owner* shall, in consultation with the *PLC*, develop a terms of reference for the *PLC* that will

describe how the *PLC* shall carry out business, and the terms of reference shall include a dispute resolution strategy to resolve issues and disagreements between the *PLC* and the *Owner* . The *Owner* shall provide the terms of reference to the *Director* and the *Regional Director* for placement on the public record.

- 10.4 The general mandate of the *PLC* shall include;
- a. Review operations and provide regular input to the *Owner* with respect to all matters pertaining to landfill site operation, including issues pertaining to ongoing operations, monitoring, the need for contingency plans or remedial measures, response to community complaints, the need for changes to the *ECA* , post-closure monitoring and maintenance, and development of the proposed end use for the *Site* ;
 - b. Review operational and monitoring reports;
 - c. Consider and make recommendations to the *Owner* regarding outside consulting advice in respect of the *Site* ;
 - d. Facilitate ongoing dialogue between the *Owner* , and the community, including residents and businesses in the immediate vicinity of the *Site* ;
 - e. Provide reports regularly to the community on the activities of the *PLC* , the landfill operations and landfill related issues and seek public input on these activities and issues;
 - f. Monitor the *Owner* 's complaint response program and make recommendations to the *Owner* with respect to this program; and
 - g. Provide recommendations to the *Owner* with respect to unresolved complaints.
- 10.5 The *PLC* shall not exercise any supervisory, regulatory, approval, legal or other decision making role with respect to the operations at the *Site* .
- 10.6 The *Owner* shall provide for the administrative costs of operating the *PLC* , including the cost of meeting places and clerical services.
- 10.7 The *PLC* shall operate under a Terms of Reference of the committee. Any changes to the Terms of Reference for the *PLC* shall be made by the *PLC* . Any changes to the Terms of Reference for the *PLC* shall be provided to the *Ministry* for information purposes.
- 10.8 Community members shall be appointed by the *PLC* . The community member positions are intended to be available to individuals that are not members of groups already represented on the *PLC* and have an interest in the operation of the *Site* . The *PLC* shall encourage individuals who reside in close proximity to the *Site* to participate. A community member is defined as a taxpayer and/or resident of the Town of Greater Napanee and/or The Township of Tyendinaga.
- 10.9 The function of the *Ministry* member will be to provide advice, information and input to other members as required.
- 10.10 The *PLC* shall determine the appropriate meeting frequency and review it on an annual basis.

- 10.11 Minutes and agendas of meetings shall be printed and distributed on a timely basis.
- 10.12 The *PLC* shall have reasonable access to the *Site* and its landfill related facilities for the purpose of carrying out its objective and mandate and the *Owner* 's consultants' reports relating to *Site* operations shall be provided to the *PLC* .
- 10.13 The *Owner* shall provide the *PLC* with access to the *Owner* 's consultants as required and consultants reports in accordance with protocols agreed to between the *Owner* and the *PLC* .
- 10.14 Unless disclosure would be contrary to the Freedom of Information and Protection of Privacy Act ,the *PLC* , the Town of Greater Napanee, the Township of Tyendinaga, and the Mohawks of the Bay of Quinte are to be provided all formal submissions and correspondence related to the *Site* operations by the *Owner* at the same time as these items are submitted to the *Ministry* .
- 10.15 The *Owner* shall allow access to the *Site* during normal operating hours, to enable any individual member of the *PLC* and member of the public recommended by local representatives on the *PLC* , to observe operations. An individual member of the *PLC* must contact the *Operator* to arrange for a *Site* pass, be accompanied by an *Operators* representative at all times and follow all safety procedures.
- 10.16 All recommendations made to the *Owner* with respect to ongoing *Site* operations, monitoring and the implementation of contingency measures shall be discussed at joint meetings between representatives of the *Owner* and the *PLC* . The purpose of these meetings will be to arrive at an agreement between the *Owner* and *PLC* with respect to implementation of the recommendations.
- 10.17 The *Owner* will provide and deliver to the *PLC* , the Town of Greater Napanee, the Township of Tyendinaga and the Mohawks of the Bay of Quinte all monitoring results, reports and any other information required to be collected and/or submitted to the *MOECC* by a Condition of this *ECA* .
- 10.18 The *Owner* with approval from the *Director* and the *District Manager*, may dispense with the *PLC* if, after a period of time and after giving sufficient notice, there is no interest from the public in continuing with it. The need for a *PLC* shall be reviewed by the *Owner* on a yearly basis.

11.0 COMPLAINTS PROCEDURE

- 11.1 If at any time, the *Owner* receives complaints regarding the operation of the *Site* , the *Owner* shall respond to these complaints according to the following procedure:
- a. The *Owner* shall record and number each complaint, either electronically or in a log book, and shall include the following information: the nature of the complaint, the name, address and the telephone number of the complainant if the complainant will provide this information and the time and date of the complaint;
 - b. The *Owner* , upon notification of the complaint, shall initiate appropriate steps to

determine all possible causes of the complaint, proceed to take the necessary actions to eliminate the cause of the complaint and forward a formal reply to the complainant; and

- c. The *Owner* shall complete a report written within one (1) week of the complaint date, listing the actions taken to resolve the complaint and any recommendations for remedial measures, and managerial or operational changes to reasonably avoid the recurrence of similar incidents. A copy of the report shall be retained at the *Site* .

11.2 The *Owner* shall post *Site* complaints procedure at *Site* entrance along with the name and phone number of a suitable, local contact to receive complaints or questions related to the *Site* . All complaints and the *Owner* 's actions taken to remedy the complaints must be summarized in the Annual Report.

12.0 EMERGENCY SITUATIONS

12.1 In the event of a fire or discharge of a contaminant to the environment, *Site* staff shall contact the *MOECC* Spills Action Centre (1-800-268-6060) and the *District Office* of the *MOECC* .

12.2 The *Owner* shall submit to the *District Manager* a written report within three (3) days of the spill or incident, outlining the nature of the incident, remedial measures taken and measures taken to prevent future occurrences at the *Site* .

12.3 The Emergency Response Manual shall be updated on a regular basis and be provided to the *District Manager* within one month of the revision date.

12.4 The *Owner* shall ensure that adequate fire fighting and contingency spill clean up equipment is available and that emergency response personnel are familiar with its use and location.

13.0 SITE CLOSURE

13.1 i. The *Owner* shall construct the final cover system for the *Site* in accordance with Items 33 to 36 inclusive of Schedule "A" and this *ECA* .

ii. Prior to subgrade preparation, the *Owner* shall inspect for any evidence of leachate springs or seeps and immediately remedy any seeps or springs prior to placement of the final cover and topsoil.

13.2 If final contours are reached in any part of the *Site* then that part of the *Site* shall be closed in accordance with the closure plan, Items 19 to 30 on Schedule "A" and this amendment to the *ECA* as approved by the *Director*.

13.3 Within sixty (60) days prior to *Site* closure, the *Owner* shall notify the public via an advertisement in all local newspapers. In addition, notice shall be given to the *District Office* , the Town of Greater Napanee, the Mohawks of the Bay of Quinte and all residents and businesses

within a 1,000 metre radius of the *Site* .

13.4 The *Owner* shall update the sign at the front gate of the *Site* to indicate the following:

- a. the name of the *Site* and *Owner* ;
- b. the *ECA* number;
- c. the name of the *Operator* ;
- d. a warning against unauthorized access;
- e. the telephone number to which complaints or questions may be directed;
- f. a twenty-four (24) hour emergency telephone number;
- g. the *Site* is closed;
- h. dumping outside of the gate is illegal; and
- i. alternative locations for waste disposal.

13.5 After *Site* closure, on a weekly basis, the *Owner* shall inspect the *Site* for leachate seeps and for signs of illegal dumping of waste. Illegal waste shall be removed and disposed of within 48 hours of detection. Leachate seeps shall be repaired within 48 hours of detection.. Upon approval from the *Director* , the frequency for inspecting for leachate seeps may be reduced to quarterly.

13.6 Upon closure of the *Site* , the following features will be inspected, recorded and maintained on a quarterly (every three (3) months) basis:

- a. evidence of settlement;
- b. landfill gas collection system, landfill gas flare and related equipment;
- c. cover soil integrity;
- d. vegetative cover;
- e. gates and fencing around the *Site* ;
- f. surface water drainage works; and
- g. erosion and sediment in surface water drainage system.

13.7 Any deficiencies noted in the above items shall be repaired within one month time of notice.

13.8 Upon *Site* closure, grass on the berms and the top of the landfill shall be cut a minimum of two (2) times per year.

13.9 Upon closure of the *Site* , the ditches and culverts surrounding the *Site* shall be cleaned on an annual basis for the first five (5) years after *Site* closure. After 5 years of *Site* closure, the ditches and culverts shall be inspected on a annual basis and cleaned as required until the end of the *contaminating lifespan* .

13.10 i. The leachate collection system shall be camera inspected and cleaned on an annual basis for years 4 and 5 after *Site* closure.

ii. The leachate collection system shall be camera inspected every two years after 5 years of

Site closure, with cleaning as required.

- iii. Changes to the maintenance schedule for the leachate collection system shall be approved by the *Director*.

13.11 If weather conditions do not allow timely placement of final and vegetative cover, silt curtains shall be employed to minimize silt loadings to surface water bodies.

13.12 The following shall remain in place and be operational at the *Site* until the end of the contaminating lifespan:

- a. Leachate extraction equipment;
- b. Landfill gas extraction equipment; and
- c. Sedimentation ponds.

14.0 SEMI ANNUAL AND ANNUAL REPORTING

Semi Annual Monitoring Reporting

14.1 By **January 15** and **July 15** of each year, the *Owner* shall submit semi-annual monitoring reports to the *District Office* and post the reports on a publicly accessible website. These semi annual reports shall include:

- a. The results in tabular form and an interpretive analysis of the results from the leachate, groundwater, surface water, and landfill gas monitoring programs approved by this *ECA*, including:
 - i. an assessment of the need to amend the monitoring programs;
 - ii. an evaluation of any observations of saline upwelling in the groundwater;
 - iii. an estimation of the leachate generated at the *Site*;
 - iv. an evaluation of leachate quality, levels, and mounding within the landfill;
 - v. figure(s) showing the landfill site and contaminant attenuation zone;
 - vi. maps or figures showing groundwater concentrations of alkalinity, tritium, 1-4 dioxane, and ammonia in the shallow and intermediate aquifers;
 - vii. figure(s) showing the off-site properties suspected or confirmed of being impacted by leachate from the landfill;
 - viii. a complete inventory of the groundwater monitoring well locations;
 - ix. detailed analysis on groundwater quality trends on downgradient groundwater wells which have been impacted or are suspected of being impacted by leachate from the landfill.
- b. An assessment with regards to the compliance of the groundwater quality at the property boundary and compliance points with regards to Guideline B-7 Reasonable

Use Concept;

- c. A report on the status of any monitoring wells required to be tested pursuant to the EMP and a statement as to whether those wells are in compliance with Ontario Regulation 903;
- d. The second semi-annual report will include an Annual Summary section which describes the results from the current calendar year and any data quality changes identified from previous years, or through the current year.
- e. All surface and groundwater analytical results reported in future Semi-Annual and Annual Monitoring Reports shall be reported by groups of substances (i.e. VOCs, PAHs, inorganics, etc.) and by numeric location, and shall be posted by WMC on a publicly accessible website, with the data being posted on such website being updated annually.

Annual Reporting

- 14.2 A written report on the development, operation, and closure of the *Site* shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager, the PLC, the Town of Greater Napanee, the Township of Tyendinaga, the Mohawks of the Bay of Quinte, and a representative of the Concerned Citizens Committee of Tyendinaga and Environs* by **March 31st** of each year and shall cover the year ending the preceding December 31st.
- 14.3 The Annual Report shall include the following:
- i. an assessment of the operation and performance of all engineered facilities, the need to amend the design or operation of the *Site*, and the adequacy of and need to implement the contingency plans;
 - ii. an assessment of the efficiency of the leachate collection system;
 - iii. *Site* plans showing the existing contours of the *Site*;
 - iv. areas of landfilling operation during the reporting period;
 - v. areas of intended operation during the next reporting period;
 - vi. areas of excavation during the reporting period;
 - vii. a summary of the inspection of the final cover and vegetative cover including identification of any seepages and remedial actions taken;
 - viii. previously existing *Site* facilities;
 - ix. facilities installed during the reporting period;
 - x. A discussion on any facilities planned for installation during the next reporting period;
 - xi. a summary of the quantity of any leachate or pre-treated leachate removed from the north and south pumping stations at the *Site* during each operating week;
 - xii. a discussion of the results of the toxicity testing of the landfill stormwater management ponds which includes potential impacts to the groundwater by the

SWMP;

- xiii. a summary of the weekly, maximum daily and total annual quantity (tonnes) of waste received at the *Site* .
- xiv. a summary of any complaints received, the responses made and corrective/remedial taken if required;
- xv. a summary of any seeps, upset conditions or emergency situations and or corrective/remedial actions taken
- xvi. a discussion of any operational problems encountered at the *Site* and corrective action taken;
- xvii. a summary of the amount of wastes refused for disposal at the *Site* , the reasons for refusal and the carrier who brought the waste to the *Site* ;
- xviii. a summary of the leachate collection system cleaning and inspection activities;
- xix. an update summary of the amount of financial assurance which has been provided to the *Director*;
- xx. a table detailing the chronology of significant landfill design, operational, and land use changes for the landfill and any other information with respect to the site which the *District Manager or Regional Director* may require from time to time;
- xxi. a statement of compliance with all conditions of this *ECA* and other relevant *Ministry* groundwater and surface water requirements;
- xxii. a confirmation that the *Site* inspection program as required by this *ECA* has been complied with by the *Owner* ;
- xxiii. any changes in operations, equipment or procedures employed at the *Site* ; and recommendations regarding any proposed changes in operations of the *Site* .

- 14.4 (a) In the event the *District Manager* requires additional information to be submitted to complete the *District Office* 's assessment on whether or not the *Site* is in compliance, the *District Manager* shall provide written notification to the *Owner* at least sixty (60) days before the submission of the next Semi-Annual or Annual Report submission date on the type of additional information to be included in the report.
- (b) In the event the *District Manager* determines that the inclusion of information in either the annual or semi-annual report annual for which notification under 14.4(a) was provided is no longer warranted or needed for the *Ministry* 's assessment of whether or not the *Site* is in compliance, the *District Manager* shall notify the *Owner* in writing of the information that is no longer required. The *District Manager* can later request the information be re-included in the report as per Condition 14.4 (a).

Schedule "A"

1. Application for a Certificate of Approval for a Waste Disposal Site (Landfill), dated January 11, 1988.
2. Report entitled "Sutcliffe Sanitation Services Ltd., Landfill Site Expansion Development and Operations Report", prepared by Henderson Paddon and Associates Limited, dated September 1985.
3. Report entitled "Addendum No. 1 Sutcliffe Sanitation Services Limited Landfill Site Expansion Development and Operations Report" prepared by Henderson Paddon and Associates Limited dated December 1986.
4. Report entitled "Hydrogeologic Study Proposed Landfill Expansion, Township of Richmond" prepared by Morrison Beatty Limited and dated September 30, 1985.
5. Report entitled "Proposed Groundwater and Surface Water Monitoring Program, Sutcliffe Sanitation Services Limited Landfill, Township of Richmond" prepared by Morrison Beatty Limited and dated August 1987.
6. Letter dated September 12, 1990 from Mr. J.R. Bray, P.Eng. to Tricil Limited (c/o Laidlaw Waste Systems Ltd.).
7. Application for Approval of a Waste Disposal Site, dated May 24, 1995 and signed by Michael Pullen, Director, Environmental Management, Laidlaw Waste Systems (Richmond) Ltd.
8. Letter from Jeff Armstrong, Henderson, Paddon & Associates Limited to I. Parrott, MOEE dated May 30, 1995 re: Development of Landfill Base of Phases IV and V (including attached drawings 8570D-400 to 406, inclusive and 8570D-94-Site).
9. Letter from Jeff Armstrong, Henderson Paddon and Associates Limited to i. Parrott, MOEE dated June 23, 1995 re: Additional information to Support Application for Provisional Certificate of Approval for a Waste Disposal Site A371203.
10. Letter from Jeff Armstrong, Henderson Paddon and Associates Limited to I. Parrott, MOEE dated July 21, 1995 re: Public Consultation on the Re-Design of the Landfill Base for Phase IV and V.
11. Application for Approval for a Waste Disposal Site dated July 25, 1996 signed by Mr. Michael Pullen, Director, Environmental Management.
12. Report entitled "Undertaking to Establish an Organic Composting Facility at the Laidlaw Waste Systems (Richmond) Ltd. Landfill Site" dated July 1996, prepared by Laidlaw Waste Systems (Richmond) Ltd.

13. Plan entitled "Richmond Township Landfill Proposed Compost Pad Expansion", revised April 12, 1996, prepared by Henderson Paddon and Associates Ltd.
14. The June 9, 1999, report entitled "Conceptual Design for a Landfill Gas Collection and Flaring System Richmond Landfill Site Napanee, Ontario" which was prepared by Comcor Environmental Limited.
15. Drawing 8570G-L1 dated May 2000- Phase I Proposed Leachate Collector, Napanee Landfill, Napanee, Ontario
16. A letter dated July 31, 2000, regarding concerns raised during review of application, to Tes Gebrezghi, MOE, from Jeff Armstrong, Henderson Paddon & Associates Limited
17. A report titled "Assessment of Napanee Water Pollution Control Plant To Treat Leachate from the Laidlaw Landfill, Richmond, Ontario, dated May 1996 and prepared by Henderson, Paddon & Associates Limited
18. A report titled "CWS Response to the Town of Greater Napanee Audit of the Richmond Landfill Operation, dated May 12, 2000, and prepared by Canadian Waste Services Inc.
19. Report entitled "Richmond Sanitary Landfill Site Final Closure Plan" and appendices dated June 2007 prepared by Henderson, Paddon and Associates Limited.
20. Memorandum dated November 30, 2007 from K. Stephenson, Hydrogeologist, Eastern Region, MOE to C. Dobiech, Kingston District, MOE.
21. Memorandum dated December 5, 2007 from Victor Castro, Surface Water Scientist, Eastern Region, MOE to Craig Dobiech, Kingston District, MOE.
22. Letter dated July 11, 2008 from Greg Washuta, Senior Waste Engineer, EAAB, MOE to Mike Walters, WMCC.
23. Letter, attachments, and Appendix B dated September 26, 2008 from Randy Harris, Site Manager, WMCC to Greg Washuta, Senior Waste Engineer, EAAB, MOE.
24. Letter dated February 23, 2009 from Greg Washuta, Senior Waste Engineer, EAAB, MOE to Randy Harris, Site Manager, WMCC.
25. Drawing number 8570-2006 entitled "June 2006 Existing Conditions Richmond Landfill Napanee, Ontario" dated March 19, 2007 prepared by Henderson Paddon and Associates Limited.
26. Drawing number 8570F-104 entitled "Richmond Landfill Site Proposed Final Contours Landfill and Borrow Areas" dated March 1995 prepared by Henderson Paddon and Associates Limited.

27. Letter dated March 2009 from Randy Harris, Site Manager, Waste Management of Canada Corporation to Greg Washuta, Senior Waste Engineer, Waste Unit, EAAB, MOE.
28. Drawing number 8570F-114 entitled "Richmond Township Landfill Sections 'A-A' and 'B-B'" created by Henderson Paddon and Associates Limited, dated March 1996.
29. Drawing number 8570F-115 entitled "Richmond Township Landfill Sections 'C-C', 'D-D', and 'E-E'" created by Henderson Paddon and Associates Limited, dated March 1996.
30. Memorandum dated February 25, 2009 from K. Stephenson, Hydrogeologist, Eastern Region, MOE to C. Dobiech, Kingston District, MOE.
31. Letter dated June 1, 2009 from Mr. Randy Harris, Site Manager, Waste Management of Canada Corporation to Application Processor, Client Services Section, Environmental Assessment and Approvals Branch, Ministry of the Environment.
32. Report entitled "Site Conceptual Model Report, WM Richmond Landfill" and attached appendices A to H inclusive by Dr. B.H. Kueper and WESA Inc., dated October 2009.
33. Report entitled "Richmond Sanitary Landfill Site OS-08-570-13-OS Construction Quality Assurance/Construction Quality Control Plan for the Final Cover System", dated June 2010, prepared by GENIVAR Consultants LP.
34. E-mail dated August 20, 2010 from Greg Washuta, Senior Waste Engineer, Waste Unit, Environmental Assessment and Approvals Branch, Ministry of the Environment to Dave White and Randy Harris, Waste Management of Canada Corporation.
35. Letter dated August 24, 2010 from Jeff E. Armstrong, Senior Environmental Engineer, GENIVAR Consultants LP to Greg Washuta, Senior Waste Engineer, Waste Unit, Environmental Assessment and Approvals Branch, Ministry of the Environment.
36. Document entitled "Richmond Sanitary Landfill Site Construction Quality Assurance/Construction Quality Control Plan for the Final Cover System ERRATA" prepared by Jeff E. Armstrong, Senior Environmental Engineer, GENIVAR Consultants LP, dated August 24, 2010.
37. Application for a Provisional Certificate of Approval for a Waste Disposal Site for Waste Management of Canada Corporation's Richmond Landfill Site, signed by Randy Harris, Site Manager on September 30, 2010.
38. Report entitled "Phytoremediation Plan - WM Richmond Landfill Town of Greater Napanee, Ontario" dated December 2010 and prepared by WESA Inc.
39. Report entitled "Richmond Sanitary Landfill Site - Operations and Procedures Manual June 25, 2010" prepared by GENIVAR Consultants LP Inc dated June 25, 2010.

40. Report entitled "Landfill Gas Collection and Flaring System Design Report - Richmond Landfill" prepared by GENIVAR Consultants LP dated June 29, 2009.
41. Report entitled "Richmond Sanitary Landfill Site - Leachate Collection System Contingency Plan" prepared by GENIVAR Consultants LP dated June 25, 2010.
42. Report entitled "Richmond Sanitary Landfill Site - Landfill Gas Collection System Contingency Plan" prepared by GENIVAR Consultants LP dated June 25, 2010.
43. Report entitled "Financial Assurance Plan" completed by GENIVAR Consultants LP and dated June 25, 2010;
44. Report entitled "Contaminating Lifespan" (Appendix D of Financial Assurance Plan) completed by GENIVAR Consultants LP and dated June 16, 2010.
45. Report entitled "Final Report - Environmental Monitoring Plan - WM Richmond Landfill" prepared for Waste Management of Canada Corporation by WESA Inc. and dated June 29, 2010.
46. Appendix "A" (Report Entitled "Odour Monitoring Plan" prepared for Waste Management of Canada Corporation by GENIVAR Consultants LP dated June 25, 2010) of the report entitled "Environmental Monitoring Plan - WM Richmond Landfill" prepared for Waste Management of Canada Corporation by WESA Inc. and dated June 29, 2010.
47. Letter dated January 14, 2011 addressed to Mr. Randy Harris, Waste Management of Canada Corporation from Mr. Greg Washuta, Ministry of the Environment providing comments on Items 39 through 46 in Schedule "A".
48. Letter dated February 28, 2011 addressed to Mr. Greg Washuta, Ministry of the Environment from Mr. Randy Harris, Waste Management of Canada Corporation providing additional information regarding financial assurance, the status of the environmental monitoring plan and various contingency plans.
49. Letter dated April 5, 2011 addressed to Mr. Randy Harris, Waste Management of Canada Corporation from Mr. Dale Gable, Ministry of the Environment requesting additional information on financial assurance, the status of the environmental monitoring plan and various contingency plans.
50. Letter dated April 20, 2011 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Jeff Armstrong, GENIVAR Inc. providing additional information on the environmental monitoring plan, financial assurance and the contaminating lifespan of the Site.
51. Letter dated August 12, 2011 and supporting documentation addressed to Mr. Tesfaye Gebrezghi, Ministry of the Environment from Mr. Reid Cleland, Waste Management of Canada Corporation requesting amendment to Condition No. 35. The supporting documentation included the following:

- i. Application for a Certificate of Approval for a Waste Disposal Site signed by Mr. Reid Cleland, Waste Management of Canada Corporation and dated August 15, 2011.
52. Letter report dated May 25, 2011 addressed to Mr. Tesfaye Gebrezghi, Ministry of the Environment from Mr. Jeff Armstrong, GENIVAR Inc. requesting an amendment to permit the approval of continued recyclables disposal at the Richmond Landfill Site. The supporting documentation included the following:
 - i. Application for a Certificate of Approval for a Waste Disposal Site signed by Mr. Reid Cleland, Waste Management of Canada Corporation and dated May 25, 2011;
 - ii. Drawing No 8570713-MT1 entitled "Site Location Map" prepared by GENIVAR INC. and dated May 17, 2011; and
 - iii. Drawing No. 8670713-MT2 entitled "Site Plan Mini-transfer Station" prepared by GENIVAR Inc. and dated May 17, 2011.
53. Letter report dated May 25, 2011 addressed to Mr. Tesfaye Gebrezghi, Ministry of the Environment from Mr. Jeff Armstrong, GENIVAR Inc. requesting an amendment to Condition No. 35 which would allow the continue use of the mini-transfer station at the Richmond Landfill Site. The supporting documentation included the following:
 - i. Application for a Certificate of Approval for a Waste Disposal Site signed by Mr. Reid Cleland, Waste Management of Canada Corporation and dated May 25, 2011;
 - ii. Development and Operations Report for a Waste Transfer Station prepared by GENIVAR Inc. (Project No. 081-12493-00) and dated May 2011
 - iii. Drawing No 8570713-MT1 entitled "Site Location Map" prepared by GENIVAR INC. and dated May 17, 2011; and
 - iv. Drawing No. 8670713-MT2 entitled "Site Plan Mini-transfer Station" prepared by GENIVAR Inc. and dated May 17, 2011.
54. Letter dated June 20, 2011 addressed to Mr. Reid Cleland, Waste Management of Canada Corporation from Mr. Dale Gable, Ministry of the Environment requesting additional information on the continued operation of the Waste and Recycling Drop-Off Facility.
55. Letter dated June 30, 2011 addressed to Mr. Dale Gable, Ministry of the Environment from Mr. Jeff Armstrong, GENIVAR Inc. providing additional information on the operations of the Waste and Recycling Drop-Off Facility. The information included the following:
 - i. Development and Operations Report for a Waste Transfer Station prepared by GENIVAR Inc. (Project No. 081-12493-00) and dated June 2011.
56. Environmental Review Tribunal Order for Case No. 12-033 issued on April 26, 2013.
57. Report entitled "Richmond Sanitary Landfill Site- Odour Monitoring Plan - Revision No. 2" prepared for WMCC by WSP Canada and dated November 25, 2014.

58. Report entitled "Richmond Sanitary Landfill Site (081-12459-00) - Public Notification Plan - February 2013" prepared for WMCC by GENIVAR Inc. and dated February 2013.
59. Environmental Review Tribunal Order for Case No. 12-033 issued on July 21, 2015.
60. Environmental Review Tribunal Order for Case No. 12-033 issued on August 13, 2015.
61. Environmental Review Tribunal Order for Case No. 12-033 issued on October 29, 2015.
62. Environmental Compliance Approval Application dated June 10, 2014 signed by Reid Cleland, Waste Management of Canada Corporation.
63. Environmental Compliance Approval Application dated January 13, 2015 signed by Reid Cleland, Waste Management of Canada Corporation, and the supporting documentation including the Design Brief - Leachate Storage System Richmond Landfill Site dated January 2015 prepared by WSP Canada Inc.
64. Environmental Review Tribunal Order for Case No. 12-033 issued on December 24, 2015.
65. Email dated May 13, 2016 from Peter Brodzikowski, WSP Canada to Rick Li, Ministry of the Environmental and Climate Change providing a response to the Ministry' review comments on the leachate storage system and the maintenance schedule.
66. Environmental Review Tribunal Order for Case No. 12-033 issued on April 14, 2016.
67. Report entitled "Odour Monitoring Plan - Revision No. 3 Richmond Sanitary Landfill Site" prepared for WMCC by WSP Canada and dated June 2016.

The reasons for the imposition of these terms and conditions are as follows:

- 1. The reason for Conditions 1.1 and 1.2 is to ensure that the Site is designed, operated, monitored and maintained in accordance with the application and supporting documentation submitted by the Owner, and not in a manner which the Director has not been asked to consider.*
- 2. The reason for Conditions 1.3, 1. 4. 1. 5, 1.9, 1.10, 1.11, 1.12, 1.13, 3.1, 3.2, 3.3 and 8.6 is to clarify the legal rights and responsibilities of the Owner under this ECA.*
- 3. Conditions 1.6, 1.7 and 1.8 are included to ensure that the appropriate Ministry staff have ready access to information and the operations of the Site, which are approved under this Certificate.*
- 4. Conditions 1.14 and 1.15 are included, pursuant to subsection 197(1) of the EPA, to provide that any persons having an interest in the Site are aware that the land has been*

approved and used for the purposes of waste disposal.

5. *The reasons for Condition 1.16 are to restrict potential transfer or encumbrance of the Site without the approval of the Director and to ensure that any transfer of encumbrance can be made only on the basis that it will not endanger compliance with this ECA.*
6. *The reasons for Conditions 1.17 and 1.18 are to ensure that the Site is operated under the corporate name which appears on the application form submitted for this approval and to ensure that the Director is informed of any changes.*
7. *The reason for Condition 1.19 is to ensure that appropriate Ministry staff have ready access to the Site for inspection of facilities, equipment, practices and operations required by the conditions in this ECA. This condition is supplementary to the powers of entry afforded a Provincial Officer pursuant to the EPA and OWRA.*
8. *The reasons for Conditions 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7, 2.8, and 2.9 are to ensure that sufficient funds are available to the Ministry to close the landfill, and to carry out all expected post-closure care activities and any contingencies. Failure to include requirements for financial assurance would not be in the public interest and may result in a hazard or nuisance to the natural environment or any person.*
9. *The reason for Condition 3.4 is to ensure the availability of as-built drawings for inspection and information purposes.*
10. *The reasons for Conditions 4.1, 4.2 and 4.3 are to ensure the Owner operates the Site in an environmentally safe manner. This is to ensure the environment and public health are protected.*
11. *The reason for Condition 4.4 is to establish a closure date for the Site.*
12. *The reasons for Conditions 4.5, 4.6 and 4.7 is to specify the approved areas from which waste may be accepted at the Site and the types and amounts of waste that may be accepted for disposal at the Site, based on the Owner's application and supporting documentation.*
13. *The reasons for Conditions 4.8, 4.9, 4.10 and 4.11 are to specify the normal hours of operation for the landfill Site and a mechanism for amendment of the hours of operation.*
14. *The reasons for Condition 4.12 are to specify Site access to/from the Site and to ensure the controlled access and integrity of the Site by preventing unauthorized access when the Site is closed and no Site attendant is on duty.*
15. *The reason for Condition 4.13 is to ensure the on-site roads are well maintained to provide access to the site operation and maintenance works.*

16. *The reason for Condition 4.14 is to ensure that only waste types approved by this ECA is accepted at the Site.*
17. *The reason for Conditions 4.15 to 4.18 and 4.20 is to ensure that nuisance such as odour, litter, and dust are minimized during landfilling.*
18. *The reasons for Condition 4.19 are the protection of public health and safety and minimization of the potential for damage to environmental control, monitoring and other works at the landfill Site. Scavenging is the uncontrolled removal of material from waste at a landfill Site.*
19. *The reason for Condition 4.21 is to ensure that noise from or related to the operation of the landfill is kept to within Ministry limits and does not result in a hazard or nuisance to any person.*
20. *The reason for Condition 5.1 is to ensure that landfilling operations are conducted in an environmentally acceptable manner. Daily and intermediate cover is used to control potential nuisance effects, to facilitate vehicle access on the Site, and to ensure an acceptable Site appearance is maintained. The proper closure of a landfill Site requires the application of a final cover which is aesthetically pleasing, controls infiltration, and is suitable for the end use planned for the Site.*
21. *The reasons for Conditions 5.2, 5.3 and 5.4 are to ensure proper operation of the leachate collection system. This is to ensure the protection of the environment and public health.*
22. *The reason for Conditions 5.5 and 5.6 is to approve the proposed leachate storage system for improvement to the leachate handling and trucking.*
23. *The reasons for Condition 5.7 and 5.8 is to ensure the Owner is aware that the composting operation will cease by the given date.*
24. *The reason for Condition 5.9 is to approve the proposed phytoremediation system as applied and established operations conditions for the phytoremediation system.*
25. *The reason for Conditions 5.10 and 5.11 is to clarify the responsibilities of the Owner, the requirements of the Ministry, the authority of the Ministry and protects the natural environment and human health.*
26. *The reason for Condition 5.12 is to approve the continued operation of the Waste and Recycling Drop-Off Facility as per the submitted information.*
27. *The reason for Conditions 5.13, 5.14, 5.15 and 5.18 is to ensure the type of waste, the quantity of waste service and removal frequency are clearly identified.*

28. *The reasons for Condition 5.16 and 5.17 is to specify the normal hours of operation for the landfill Site and a mechanism for amendment of the hours of operation and ensure trained staff are present to accept waste*
29. *The reasons for Conditions 5.19 through 5.24 is to ensure the operation is done in a manner that will not cause a nuisance or an adverse effect. This is to ensure the long-term protection of the environment and human health.*
30. *The reason for Conditions 5.25 and 5.26 are to ensure surface water at the site is not impacted by landfill operations. This is to ensure the environment and public health are protected.*
31. *The reason for Condition 6.1 is to ensure that the Site is supervised and operated by properly trained staff in a manner which does not result in a hazard or nuisance to the natural environment or any person.*
32. *The reasons for Conditions 7.1, 7.2 7.3, 7.4, 7.5, 7.6, 7.7, 7.8, 7.9, 7.10, 7.11 and 14.1 are to provide for the proper assessment of effectiveness and efficiency of Site design and operation, their effect or relationship to any nuisance or environmental impacts, and the occurrence of any public complaints or concerns. Record keeping is necessary to determine compliance with this ECA, the EPA and its regulations*
33. *The reasons for Conditions 8.1, 8.2, 8.3, and 8.4 are to ensure protection of the natural environment and the integrity of the groundwater monitoring network.*
34. *The reason for Condition 8.5 is to demonstrate that the landfill Site is performing as designed and the impacts on the natural environment are acceptable. Regular monitoring allows for the analysis of trends over time and ensures that there is an early warning of potential problems so that any necessary remedial/contingency action can be taken.*
35. *The reason for Conditions 8.6.1, 8.6.2, 8.9, and 9.1 is to incorporate the Environmental Review Tribunal Order dated April 14, 2016.*
36. *The reason for Conditions 8.7 and 8.8 is to incorporate the interim orders issued by the Environmental Review Tribunal on July 21, 2015 and August 13, 2015.*
37. *The reason for Conditions 9.2, 9.3, 9.4, 11.1 and 11.2 is to ensure that the Owner follows a plan with an organized set of procedures for identifying and responding to unexpected but possible problems at the Site. A remedial action / contingency plan is necessary to ensure protection of the natural environment.*
38. *The reasons for Condition 9.5 are to ensure there is a public notification plan in the event that any contingency plan is activated or engaged, and to reflect the interim order*

issued by the ERT on April 26, 2013.

39. *The reason for Conditions 10.1, 10.2, 10.3, 10.4, 10.5, 10.6, 10.7, 10.8, 10.9, 10.10, 10.11, 10.12, 10.13, 10.14, 10.15, 10.16, 10.17 and 10.18 is to establish a forum for the exchange of information and public dialogue on activities carried out at the landfill Site. Open communication with the public and local authorities is important in helping to maintain high standards for site operation and environmental protection.*
40. *The reasons for Conditions 12.1 and 12.2 are to ensure that the Ministry is informed of any spills or fires at the Site and to provide public health and safety and environmental protection.*
41. *The reason for Condition 12.3 is to ensure the Emergency Response Manual is updated regularly.*
42. *The reasons for Condition 12.4 are to guarantee that appropriate measures are taken by the Owner to prevent future occurrences of spills or fires at the site and to protect public health and safety and the environment.*
43. *The reasons for Conditions 13.1, 13.2, 13.3, 13.4, 13.5, 13.6, 13.7, 13.8, 13.9, 13.10, 13.11 and 13.12 are to ensure that final closure of the Site is completed in accordance with Ministry requirements, an aesthetically pleasing manner and to ensure the long-term protection of the natural environment.*
44. *Conditions 14.1 and 14.4 is included in the ECA to reflect the interim order issued by the ERT on April 26, 2013.*
45. *The reasons for Conditions 14.2 and 14.3 are to reflect the interim order issued by the ERT on April 26, 2013, and to ensure that regular review of Site development, operations and monitoring data is documented and any possible improvements to Site design, operations or monitoring programs are identified. An annual report is an important tool used in reviewing Site activities and for determining the effectiveness of Site design.*

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). A371203 issued on March 20, 1988

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

- a. The portions of the environmental compliance approval or each term or condition in the environmental compliance

- approval in respect of which the hearing is required, and;
- b. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

1. The name of the appellant;
2. The address of the appellant;
3. The environmental compliance approval number;
4. The date of the environmental compliance approval;
5. The name of the Director, and;
6. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

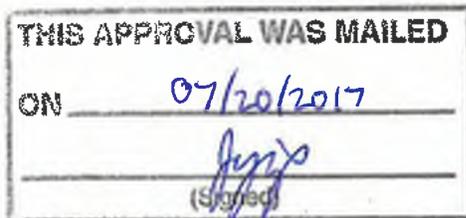
The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment and
Climate Change
135 St. Clair Avenue West, 1st Floor
Toronto, Ontario
M4V 1P5

* Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 326-5370 or www.ert.gov.on.ca

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 14th day of July, 2017



Dale D. Gable

Dale Gable, P.Eng.

Director

appointed for the purposes of Part II.1 of the
Environmental Protection Act

RL/

c: District Manager, MOECC Kingston - District
Beverly Leno/ Peter Brodzikowski, WSP Canada Inc.

APPENDIX

A-2

*ENVIRONMENTAL COMPLIANCE
APPROVAL (SEWAGE WORKS) NO.
1688-8HZNJG, DATED JANUARY 10,
2012*

AMENDED ENVIRONMENTAL COMPLIANCE APPROVALNUMBER 1688-8HZNJG
Issue Date: January 10, 2012

Waste Management Canada Corporation
1271 Beechwood Rd
Rural Route, No. 6
Napanea, Ontario
K7R 3L1

Site Location: Richmond Landfill Site
1271 Beechwood Road, Parts of Lots 1,2, &3, Concession 4, Richmond
Greater Napanea Town, County of Lennox and Addington

You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19 (Environmental Protection Act) for approval of:

leachate collection and disposal facility and stormwater management facility to service the Richmond Landfill Site located on Parts of Lots 1, 2 and 3, Concession 4, in the Town of Greater Napanea as follows:

SEWAGE WORKS APPROVED ON AUGUST 19, 2008:**Stormwater Management Pond - SWM Pond No. 3**

a new stormwater management facility located south of the approved landfill footprint and north of Beechwood Road to service 20 ha drainage area of the Richmond Landfill Site, designed to provide quantity and quality control of stormwater runoff from storm events up to 1:100 return frequency consisting of the following:

- two (2) extended wet detention ponds interconnected by two (2) 750 mm diameter culverts providing a permanent pool storage capacity (including sediment storage) of 19,642 m³ between the elevations of 122.4 m ASL and 124.4 m ASL and active storage capacity of 7,620 m³ between the elevations of 124.4 m ASL and 124.73 m ASL (overall total storage capacity of 27,262 m³);
- each detention pond equipped with a rip rap lined inlet structure, a forebay, and cattails planted in the shallow areas surrounding the permanent pool;

- an outlet structure consisting of one (1) 600 mm x 600 mm precast concrete catch basin equipped with a 100 mm diameter inlet orifice, one (1) 300 mm diameter PVC discharge pipe equipped with one (1) 300 mm diameter gate valve, discharging through a drainage ditch to the Beechwood Road side ditch eventually flowing to Marysville Creek;
- one (1) 3.0 m wide rip rap lined emergency spillway with an invert elevation of 124.73 m ASL, discharging through a drainage ditch to the Beechwood Road side ditch; and
- including all controls and associated appurtenances.

all in accordance with the Application for Approval of Industrial Sewage Works submitted by Waste Management of Canada Corporation dated April 11, 2008, drawings and design specification prepared by Henderson Paddon & Associates Limited, Owen Sound, Ontario and the document listed in Schedule 'B'.

EXISTING LEACHATE MANAGEMENT FACILITY:

- one (1) approximately 504 m long 200 mm diameter perforated PVC or HDPE perimeter leachate collector pipe, installed in a 50 mm clear stone bedding wrapped in geotextile, extending through seven (7) 1200 mm diameter pre-cast concrete service manholes (MH12, MH11, MH10, MH9, MH8, MH7 and MH1) along the west side and north side of landfill footprint discharging to a 22.3 m³ capacity North Concrete Pumping Chamber which is not equipped with pumps;
- one (1) approximately 429 m long 150 mm diameter perforated PVC perimeter leachate collector pipe, installed in a 50 mm clear stone bedding wrapped in geotextile, extending through six (6) 1200 mm diameter pre-cast concrete service manholes (MH6, MH5, MH4, MH3, MH2 and MH1) along the east side and north side of landfill footprint discharging to a 22.3 m³ capacity North Concrete Pumping Chamber which is not equipped with pumps;
- one (1) approximately 393 m long 200 mm diameter perforated PVC perimeter leachate collector pipe, installed in a 50 mm clear stone bedding wrapped in geotextile, extending along the west side and south side of landfill footprint discharging to a leachate pumping station described below;
- one (1) approximately 296 m long 200 mm diameter perforated PVC perimeter leachate collector pipe, installed in a 50 mm clear stone bedding wrapped in geotextile, extending along the east side and south side of landfill footprint discharging to a leachate pumping station described below;
- one (1) side slope riser leachate pumping station equipped with two (2) 80 USGPM capacity submersible pumps and a sump with bottom dimension of 2 m x 2 m filled with 50 mm gravel, discharging to a leachate lagoon described below;

- one (1) 16,245 m³ storage capacity leachate lagoon, lined with clay and HDPE synthetic liner, located north of the landfill footprint used for temporary storage of leachate or leachate contaminated stormwater until disposed off site to a pre-approved sewage treatment plant;
- one (1) leachate storage lagoon located west of the landfill footprint used for collecting leachate and stormwater runoff from a composting facility until it is used for composting operations or disposed off-site to a pre-approved sewage treatment plant;
- including all controls and associated appurtenances.

SEWAGE WORKS APPROVED ON OCTOBER 21, 1991:

Stormwater Management Pond - SWM Pond No. 1

A stormwater management pond constructed on a site approximately 750 m north of Beechwood Road and north of the fill area for a 25 year design storm having a minimum storage volume of 228 m³ to retain surface runoff from an area of 3.38 ha (consisting of fill area) and to discharge at a rate of 70 L/s via a 375 mm diameter outlet pipe (fitted to a drop inlet pipe structure) to a Headwater Tributary of Marysville Creek (Intermittent), together with a drawdown structure, a 1200 mm diameter drop inlet pipe, a 3.5 m wide emergency spill-way channel, rock baffle, erosion and silt control protection;

Stormwater Management Pond - SWM Pond No. 2

A stormwater management pond constructed on a site approximately 750 m north of Beechwood Road and northwest of the fill area for a 25 year design storm having a minimum storage volume of 332 m³ to retain surface runoff from an area of 4.94 ha (consisting of fill area) and to discharge at a rate of 103 L/s via a 375 mm diameter outlet pipe (fitted to a drop inlet pipe structure) to a Headwater Tributary of Marysville Creek (Intermittent), together with a drawdown structure, a 1200 mm diameter drop inlet pipe, a 3.5 m wide emergency spill-way channel, rock baffle, erosion and silt control protection;

all in accordance with the information submitted by Henderson Paddon and Associates Limited Consulting Engineers and the following documents listed in Schedule 'A'.

For the purpose of this environmental compliance approval, the following definitions apply:

“*Approval* ” means this Environmental Compliance Approval and any schedules attached to it, and the application .

“*By-pass*” means any discharge from the *Works* that does not undergo any treatment before it is discharged to the environment;

"*Director*" means a person appointed by the Minister pursuant to section 5 of the *EPA* for the purposes of Part II.1 of the *EPA*.

"*District Manager*" means the District Manager of the Kingston District Office;

"*EPA*" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.

"*Ministry*" means the ministry of the government of Ontario responsible for the *EPA* and *OWRA* and includes all officials, employees or other persons acting on its behalf.

"*Owner*" means Waste Management of Canada Corporation and its successors and assignees;

"*OWRA*" means the Ontario Water Resources Act, R.S.O. 1990, c. O.40, as amended.

"*Substantial Completion*" has the same meaning as "*substantial performance*" in the Construction Lien Act; and

"*Works*" means the sewage works described in the *Owner*'s application, this *Approval* and in the supporting documentation referred to herein, to the extent approved by this *Approval*.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

I - GENERAL

1. GENERAL PROVISIONS

- (1) The *Owner* shall ensure that any person authorized to carry out work on or operate any aspect of the *Works* is notified of this *Approval* and the conditions herein and shall take all reasonable measures to ensure any such person complies with the same.
- (2) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Approval*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Approval*.
- (3) Where there is a conflict between a provision of any submitted document referred to in this *Approval* and the Conditions of this *Approval*, the Conditions in this *Approval* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

- (4) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.
- (5) The requirements of this *Approval* are severable. If any requirement of this *Approval* , or the application of any requirement of this *Approval* to any circumstance, is held invalid or unenforceable, the application of such requirement to other circumstances and the remainder of this *Approval* shall not be affected thereby.

2. EXPIRY OF APPROVAL

The approval issued by this *Approval* will cease to apply to those parts of the *Works* which have not been constructed by August 19, 2013.

3. CHANGE OF OWNER

- (1) The *Owner* shall notify the *District Manager* and the *Director* , in writing, of any of the following changes within 30 days of the change occurring:
 - (a) change of *Owner* ;
 - (b) change of address of the *Owner* ;
 - (c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c. B17 shall be included in the notification to the *District Manager* ;
 - (d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager* ;
- (2) In the event of any change in ownership of the *Works* , other than a change to a successor municipality, the *Owner* shall notify in writing the succeeding owner of the existence of this *Approval* , and a copy of such notice shall be forwarded to the *District Manager* and the *Director* .

4. UPON THE SUBSTANTIAL COMPLETION OF THE WORKS

- (1) Within one year of the *Substantial Completion* of the *Works* , a set of as-built drawings showing the works “as constructed” shall be prepared. These drawings shall be kept up to date

through revisions undertaken from time to time and a copy shall be retained at the *Works* or at operational office of the *Owner* for the operational life of the *Works* .

5. BY-PASSES

- (1) Any *By-pass* of sewage from any portion of the *Works* is prohibited, except where:
 - (a) it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage;
 - (b) the *District Manager* agrees that it is necessary for the purpose of carrying out essential maintenance and the *District Manager* has given prior written acknowledgment of the *By-pass* ; or
- (2) The *Owner* shall maintain a logbook of all *By-pass* events which shall include, at a minimum, the time, location, duration, quantity of *By-pass* , the authority for *By-pass* pursuant to subsection (1), and the reasons for the occurrence.

II - LEACHATE COLLECTION AND DISPOSAL SYSTEM

6. LEACHATE MONITORING AND RECORDING

The *Owner* shall, upon commencement of operation of the *Works* , carry out the following monitoring program:

- (1) All samples and measurements taken for the purposes of this *Approval* are to be taken at a time and in a location characteristic of the quality and quantity of the leachate stream over the time period being monitored.
- (2) For the purposes of this condition, the following definitions apply:
 - (a) Monthly means once every month;
 - (b) Quarterly means once every three months;
 - (c) Semi-annually means once every six months; and
 - (d) Annually means once every twelve months;
- (3) **Leachate grab samples** shall be collected from a designated sampling location at the indicated

monitoring frequency and analyzed for each parameter listed in Table 1 and all results recorded:

Table 1 Leachate Monitoring Sampling Location: North Pumping Chamber		
Sampling Frequency: Quarterly		Sampling Frequency: Annually
Parameter	Parameter	Parameter
Alkalinity	Arsenic	Silver
Dissolved Organic Carbon (DOC)	Cadmium	Aluminum
Hardness	Chromium	Boron
pH	Cobalt	Barium
Total Ammonia Nitrogen	Copper	Beryllium
Nitrate Nitrogen	Mercury	Calcium
Nitrite Nitrogen	Molybdenum	Sodium
Total Kjeldahl Nitrogen	Nickel	Magnesium
Phenols	Lead	Manganese
PAHs	Selenium	Iron
BTEX	Zinc	Total Phosphorus
USEPA 624		Conductivity
		Hydrogen Sulphide
		Sulphate
		BOD5
		Total Trihalomethanes (THM)

- (4) The methods and protocols for sampling, analysis and recording shall conform, in order of precedence, to the methods and protocols specified in the following:
- (a) the Ministry's Procedure F-10-1, "Procedures for Sampling and Analysis Requirements for Municipal and Private Sewage Treatment Works (Liquid Waste Streams Only), as amended from time to time by more recently published editions;
 - (b) the Ministry's publication "Protocol for the Sampling and Analysis of Industrial/Municipal Wastewater" (January 1999), ISBN 0-7778-1880-9, as amended from time to time by more recently published editions;
 - (c) the publication "Standard Methods for the Examination of Water and Wastewater" (21st edition), as amended from time to time by more recently published editions; and
 - (d) the Environment Canada publications "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout" (July 1990) and "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Daphnia

magna" (July 1990), as amended from time to time by more recently published editions.

- (5) The *Owner* shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Approval* .

7. OPERATION AND MAINTENANCE

- (1) The *Owner* shall exercise due diligence in ensuring that, at all times, the *Works* and the related equipment and appurtenances used to achieve compliance with this *Approval* are properly operated and maintained. Proper operation and maintenance shall include effective performance, adequate funding, adequate operator training, including training in all procedures and other requirements of this *Approval* and the *Act* and regulations, process controls and alarms.
- (2) By February 19, 2009, the *Owner* shall prepare an operations manual, that includes, but not necessarily limited to, the following information:
 - (a) operating procedures for routine operation of the *Works* ;
 - (b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;
 - (c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works* ;
 - (d) procedures for the inspection and calibration of monitoring equipment;
 - (e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager* ; and
 - (f) procedures for receiving, responding and recording public complaints, including recording any follow up actions taken.
- (3) The *Owner* shall maintain the operations manual current and retain a copy at the *Works* or *Owner* 's Head Office for the operational life of the *Works* . Upon request, the *Owner* shall make the manual available to *Ministry* staff.
- (4) The *Owner* shall maintain a logbook to record and report the volume of leachate disposed off-site, the date, and the name of the receiving sewage treatment plant;

III - STORMWATER MANAGEMENT FACILITY

8. MONITORING AND RECORDING

The *Owner* shall carry out the following monitoring program:

- (1) All samples and measurements taken for the purposes of this *Approval* are to be taken at a time and in a location characteristic of the quality and quantity of the effluent stream over the time period being monitored.
- (2) The *Owner* shall collect stormwater grab samples from the following designated sampling locations at a **monthly** sampling frequency during spring and fall (**March, April, May, September, October, and November**) and analyse for the parameters listed in Table 2;

Table 2		
Stormwater and Surface Water Monitoring		
Sampling Location: SWM Ponds No. 1, No. 2, and No. 3		
Parameter	Parameter	Field Parameter
pH	Aluminum	pH
Alkalinity	Arsenic	Temperature
Hardness	Barium	Conductivity
Biological Oxygen Demand (CBOD5)	Boron	
Un-ionized Ammonia	Cobalt	
Total Ammonia Nitrogen	Beryllium	
Total Kjeldahl Nitrogen	Cadmium	
Nitrate Nitrogen	Chromium	
Total Phosphorus	Copper	
Total Suspended Solids	Iron	
Total Dissolved Solids	Mercury	
Total Organic Carbon	Nickel	
Chloride	Potassium	
Chemical Oxygen Demand (COD)	Sodium	
Phenols	Selenium	
BTEX	Silver	
Naphthalene	Zinc	

- (3) The *Owner* shall collect stormwater grab samples from **SWM Ponds No. 1, No. 2, and No. 3** sampling locations at a **Quarterly** frequency and conduct acute lethality tests for *Daphnia magna* and Rainbow Trout;
- (4) The methods and protocols for sampling, analysis and recording shall conform, in order of

precedence, to the methods and protocols specified in Condition 6 (4);

- (5) The measurement frequencies specified in subsection (2) in respect to any parameter are minimum requirements which may, after two (2) years of monitoring in accordance with this Condition, be modified by the *District Manager* in writing from time to time.
- (6) The *Owner* shall retain for a minimum of three (3) years from the date of their creation, all records and information related to or resulting from the monitoring activities required by this *Approval* at the *Works* or *Owner*'s Head Office.

9. OPERATION AND MAINTENANCE

- (1) Within six (6) months of the issuance date of this *Approval*, the *Owner* shall prepare a "Stormwater Contingency and Remedial Action Plan" for the *Works* and submit to the *District Manager* for approval.
- (2) The *Owner* shall operate the *Works* (**SWM Pond No. 1, SWM Pond No. 2, and SWM Pond No. 3**) in a **normally open position**.
- (3) Using the monitoring results obtained under Condition 8 (3), the *Owner* shall ensure that the stormwater runoff discharged from the *Works* (**SWM Pond No. 1, SWM Pond No. 2, and SWM Pond No. 3**) is not acutely lethal to *Daphnia magna* and Rainbow Trout.
- (4) In the event that monitoring results obtained under Condition 8 (3) show that the stormwater is acutely lethal either to *Daphnia magna* or Rainbow Trout, then, the *Owner* shall resample within two (2) weeks period after receiving the lab results to confirm the toxicity results.
- (5) In the event that the toxicity results **are not confirmed** during the second round of sampling conducted under Condition 9 (4), then, normal stormwater monitoring shall be resumed.
- (6) In the event that the toxicity results **are confirmed** after the second round of sampling conducted under Condition 9 (4), the *Owner* shall operate the *Works* in a **normally closed position**, notify the *District Manager* forthwith, and conduct acute lethality tests for *Daphnia magna* and Rainbow Trout at a **monthly frequency**.
- (7) While operating the *Works* in a **normally closed position**, the *Owner* shall implement the "Stormwater Contingency and Remedial Action Plan" prepared under Condition 9 (1) and continue conducting the toxicity monitoring program required under Condition 9 (6).
- (8) The *Owner* shall resume operating the *Works* in a **normally open position** if toxicity monitoring results from **two (2) consecutive sampling events** conducted under Condition 9(6) show that the stormwater is not acutely lethal to *Daphnia magna* and Rainbow Trout.

- (9) Discharge of contaminated stormwater from the *Works* to storm sewer/surface water is prohibited, except where it is necessary to avoid loss of life, personal injury, danger to public health or severe property damage;
- (10) The *Owner* shall prepare an operations manual prior to the commencement of operation of the *Works* , that includes, but not necessarily limited to, the following information:
 - (a) operating procedures for routine operation of the *Works* ;
 - (b) inspection programs, including frequency of inspection, for the *Works* and the methods or tests employed to detect when maintenance is necessary;
 - (c) repair and maintenance programs, including the frequency of repair and maintenance for the *Works* ;
 - (d) procedures for the inspection and calibration of monitoring equipment;
 - (e) a spill prevention control and countermeasures plan, consisting of contingency plans and procedures for dealing with equipment breakdowns, potential spills and any other abnormal situations, including notification of the *District Manager* ; and
- (10) The *Owner* shall maintain the operations manual current and retain a copy at the *Works* or *Owner* 's Head Office for the operational life of the *Works* . Upon request, the *Owner* shall make the manual available to *Ministry* staff.
- (11) The *Owner* shall maintain a record of the date and the estimated volume of leachate contaminated stormwater disposed off site under the approved "Stormwater Contingency and Remedial Action Plan" for the *Works* .
- (12) The *Owner* shall notify the *District Manager* orally, as soon as possible, and in writing within seven days of any discharge of leachate contaminated stormwater to receiving surface water including an assessment of the relative extent of leachate contamination, estimated volume of stormwater discharged, and proposed or completed remedial actions.
- (13) The *Owner* shall inspect the *Works* (**SWM Ponds**) at least once a year and, if necessary, clean and maintain the *Works* to prevent the excessive build-up of sediments and/or vegetation.
- (14) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook at the site and/or *Owner's* operational headquarter for inspection by the *Ministry* . The logbook shall include the following:
 - (a) the name of the *Works* ;

- (b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed; and
- (c) the volume of contaminated stormwater disposed off-site, the date, and the name of the receiving sewage treatment plant;

IV - GENERAL

10. REPORTING

- (1) Ten (10) days prior to the date of a planned *By-pass* being conducted pursuant to Condition 5 and as soon as possible for an unplanned *By-pass*, the *Owner* shall notify the *District Manager* (in writing) of the pending start date, in addition to an assessment of the potential adverse effects on the environment and the duration of the *By-pass*.
- (2) In addition to the obligations under Part X of the Environmental Protection Act, the *Owner* shall, within 10 working days of the occurrence of any reportable spill as defined in Ontario Regulation 675/98, bypass or loss of any product, by product, intermediate product, oils, solvents, waste material or any other polluting substance into the environment, submit a full written report of the occurrence to the *District Manager* describing the cause and discovery of the spill or loss, clean-up and recovery measures taken, preventative measures to be taken and schedule of implementation.
- (3) The *Owner* shall, upon request, make all manuals, plans, records, data, procedures and supporting documentation available to *Ministry* staff.
- (4) The *Owner* shall prepare on an annual basis, and submit upon request, a performance report within ninety (90) days following the end of the calendar year being reported upon. The first such report shall cover the period following the commencement of operation of the *Works* and subsequent reports shall be prepared to cover successive calendar years following thereafter. The reports shall contain, but shall not be limited to, the following information:
 - (a) a summary and interpretation of all stormwater monitoring data and a comparison to the Provincial Water Quality Objectives (PWQO), including an overview of the success and adequacy of the *Works* ;
 - (b) a summary of the monthly quantity of leachate disposed off site and corresponding average leachate quality;
 - (c) a description of any operating problems encountered and corrective actions taken;
 - (d) a summary of all maintenance carried out on any major structure, equipment,

- apparatus, mechanism or thing forming part of the *Works* ;
- (e) a summary of the calibration and maintenance carried out on all leachate monitoring equipment; and
 - (f) a summary of any complaints received during the reporting period and any steps taken to address the complaints;
 - (g) a summary of all *By-pass* , spill or abnormal discharge events; and
 - (h) any other information the *District Manager* requires from time to time.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Approval* and the practice that the *Approval* is based on the most current document, if several conflicting documents are submitted for review. The condition also advises the *Owners* their responsibility to notify any person they authorized to carry out work pursuant to this *Approval* the existence of this *Approval* .
2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment.
3. Condition 3 is included to ensure that the *Ministry* records are kept accurate and current with respect to the approved works and to ensure that subsequent owners of the *Works* are made aware of the *Approval* and continue to operate the *Works* in compliance with it.
4. Condition 4 is included to ensure that the *Works* are constructed in accordance with the *Approval* and that record drawings of the *Works* “as constructed” are maintained for future references.
5. Condition 5 is included to indicate that by-passes of untreated sewage to the receiving watercourse is prohibited, save in certain limited circumstances where the failure to *By-pass* could result in greater injury to the public interest than the *By-pass* itself where a *By-pass* will not violate the approved leachate requirements, or where the *By-pass* can be limited or otherwise mitigated by handling it in accordance with an approved contingency plan. The notification and documentation requirements allow the *Ministry* to take action in an informed manner and will ensure the *Owner* is aware of the extent and frequency of *By-pass* events.
6. Conditions 6 and 8 are included to enable the *Owner* to evaluate and demonstrate the performance of the *Works* , on a continual basis, so that the *Works* are properly operated and maintained at a level which is consistent with the design objectives specified in the *Approval* and that the *Works* does not cause any impairment to the receiving watercourse.

7. Conditions 7 and 9 are included to require that the *Works* be properly operated, maintained, funded, staffed and equipped such that the environment is protected and deterioration, loss, damage to any property or injury to any person is prevented. As well, the inclusion of a comprehensive operations manual governing all significant areas of operation, maintenance and repair is prepared, implemented and kept up-to-date by the *Owner* and made available to the *Ministry* .
8. Condition 10 is included to provide a performance record for future references, to ensure that the *Ministry* is made aware of problems as they arise, and to provide a compliance record for all the terms and conditions outlined in this *Approval*, so that the *Ministry* can work with the *Owner* in resolving any problems in a timely manner.

SCHEDULE 'A'

1. Application for the sewage works dated March 20, 1990, signed by 171496 Canada Inc., F.C. Ford, P. Eng., Henderson, Paddon and Associates and Township of Richmond.
2. Report entitled "Tricil Limited Landfill site parts of Lots 1, 2 and 3, Concession IV, Township of Richmond, County of Lennox and Addington" dated September 1988, prepared by Henderson Paddon and Associates Limited.
3. Letter dated July 19, 1990, signed by Dick Van Wyck, Legal Counsel, Laidlav Waste System, addressed to Ranee Mahalingam, Review Engineer, Ministry of the Environment.
4. Letter dated September 6, 1990, signed by J. M. Tomlinson. P.Eng., Henderson Paddon and Associates Limited, addressed to Ranee Mahalingam, Approvals Branch, Ministry of the Environment, together with revised section entitled "Stormwater management facilities" of the report entitled "Tricil Limited Landfill Site Parts of Lots 1, 2 and 3, Concession IV, Township of Richmond, County of Lennox and Addington" dated September 1988, prepared by Henderson Paddon and Associates Limited.
5. Letter dated September 6, 1990, signed by Jay Clark, P.Eng., Henderson Paddon and Associates Limited, addressed to Ranee Mahalingam, P. Eng., Review Engineer, Approvals Branch, Ministry of the Environment.
6. Letter dated April 29, 1991, signed by Ranee Mahalingam. P.Eng., Review Engineer, Approvals Branch, Ministry of the Environment, addressed to J. K. Tomlinson. P.Eng., Henderson Paddon and Associates Limited.
7. Letter dated May 23, 1991, signed by Jay Clark, P.Eng., Henderson Paddon and Associates Limited, addressed to Ranee Mahalingam, P.Eng., Review Engineer, Approvals Branch, Ministry of the Environment.

8. Minutes of the meeting held at Ministry of the Environment, 250 Davisville Avenue, Toronto, on June 25, 1991.
9. Letter dated July 24, 1991, signed by J. M. Tomlinson, P.Eng., Henderson Paddon and Associates Limited, addressed to Bruce W. Metcalfe, Surface Water Technologist, Southeastern Region, Ministry of the Environment.
10. Letter dated July 25, 1991, signed by Bruce W. Metcalfe, Surface Water Technologist, Southeastern Region, Ministry of the Environment, addressed to J. M. Tomlinson, P.Eng., Henderson Paddon and Associates Limited.
11. Letter dated July 29, 1991, signed by J. M. Tomlinson, P. Eng., Henderson Paddon and Associates Limited, addressed to Rane Mahalingan, Approvals Branch, Ministry of the Environment, enclosing a copy of the revised application and revised drawings No. 8570A (1, 2, 3, 4) and 8570 -7.
12. Application for Approval of Sewage Works dated May 19, 2011, submitted by Waste Management of Canada and prepared by Genivar Inc., Owen Sound, Ontario.

SCHEDULE 'B'

1. "Final Report - 2007 Annual Monitoring Report, Waste Management of Canada Richmond Landfill, Town of Napanee, Ontario" dated March 2008, prepared by Water and Earth Science Associates Ltd. (WESA), Kingston, Ontario.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 5268-7E8LJW issued on August 19, 2008

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

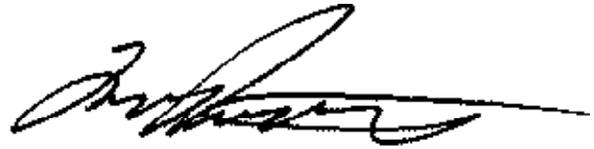
AND

The Director appointed for the purposes of
Part II.1 of the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 10th day of January, 2012



Ian Parrott, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

SH/

c: District Manager, MOE Kingston - District
Jeff Armstrong, GENIVAR Inc.

APPENDIX

A-3

*CERTIFICATE OF APPROVAL
(INDUSTRIAL SEWAGE) NO. 4 – 0129-
64-956 (OIL/SEDIMENT
INTERCEPTOR), DATED JANUARY
24, 1995*



Ministry of
Environment
and Energy

Ministère de
l'Environnement
et de l'Énergie

CERTIFICATE OF APPROVAL
INDUSTRIAL SEWAGE
NUMBER 4-0129-94-956

Page 1 of 3

Laidlaw Waste Systems (Canada) Ltd.
3410 South Service Road
Burlington, Ontario
L7R 3Y8

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

Establishment of sewage works for the collection, transmission, treatment and disposal of stormwater from Laidlaw Landfill, Richmond Township, Ontario, consisting of the following:

- collection and transmission of stormwater and other drainage from a petroleum hydrocarbon contaminated soils storage area of 3,200 square metres, with collected drainage discharging at a maximum rate of 15,000 Litres per hour, via a catch basin and 150 millimetre diameter piping to a three chambered oil/sediment interceptor,
- one oil interceptor with three interconnected chambers, with each chamber having dimensions of 1.15 metres length, 1.34 metre width, and a liquid depth of 0.925 metres, discharging via 150 millimetre diameter piping to the sediment control ditch leading to the downstream sedimentation pond,
- all other controls, electrical equipment, instruments, piping, pumps, valves and appurtenances essential for the proper operation of the aforementioned sewage works,

all in accordance with the Application for Approval of Industrial Sewage Works dated November 11, 1994 signed by J. Pullen, P.Eng. (Regional Manager, Engineering and Compliance), Laidlaw Waste Systems (Canada) Ltd. ("the Owner"), and all supporting documentation and information.

You are hereby notified that this approval is issued subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. OPERATION

- (1) The Owner shall prepare a draft operations manual prior to the commencement of operation of the works and shall revise and implement the operations manual within six (6) months of the commencement of operation of the works.



Ministry of
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et de l'Énergie

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- (2) The Owner shall ensure that both the draft and revised manuals include as a minimum:
- (a) operating procedures for routine operation of the works, including but not limited to, routine inspection of the oil interceptor chambers, and removal of accumulating solid and liquid wastes;
 - (b) operating procedures for operation of the works during spills, fires, equipment malfunction, power outages, and other emergency or abnormal operating conditions, including notification procedures for the Ministry;
 - (c) best management practices to minimize contaminant discharges to the oil interceptor; and,
 - (d) any other procedures the Owner deems necessary for the proper operation of the works.
- (3) The Owner shall maintain the operations manual, as revised from time to time, at the location of the works for so long as it is in operation, and shall make the manual available to Ministry personnel for inspection and copying, upon request.
- (4) The Owner shall keep the operations manual up to date through revisions undertaken from time to time, so as to reflect any changes in described operation and maintenance procedures for the works or any newly introduced operation and maintenance procedures made necessary by good engineering practice, this certificate or the requirements of the Ministry.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition No. 1 is included to ensure certain operation procedures are followed to prevent deleterious effects on the environment.

You may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter O.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.



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The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the sewage works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

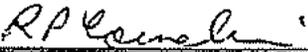
The Secretary,
Environmental Appeal Board,
112 St. Clair Avenue West,
Suite 502,
Toronto, Ontario.
M4V 1N3

AND

The Director,
Section 53, Ontario Water Resources Act,
Ministry of Environment and Energy,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 24th day of January 1995



R. P. Cornelius, P. Eng.
Director
Section 53
Ontario Water Resources Act

AA/pm

cc District Manager, MOEE Kingston District Office

APPENDIX

A-4 *CERTIFICATE OF APPROVAL NO.
A710003 (SOIL RECYCLING), DATED
DECEMBER 20, 1993*



PROVISIONAL CERTIFICATE OF APPROVAL
FOR A WASTE DISPOSAL SITE

CERTIFICAT D'AUTORISATION PROVISOIRE
DE DÉCHARGE

Provisional Certificate Number A710003
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Under the Environmental Protection Act and Regulations, and subject to the limitations thereof, this Provisional Certificate of Approval is issued to:
Aux termes de la Loi sur la protection de l'environnement et des règlements et sous réserve des restrictions qui y sont stipulées, le présent certificat provisoire d'autorisation est délivré à:

Laidlaw Waste Systems (Canada) Ltd.
3410 South Service Road
BURLINGTON, Ontario
L7R 3Y8

the use and operation of a waste processing facility

..ll in accordance with the plans and specifications:

1. Application for a Certificate of Approval for a Waste Disposal Site (Processing) dated August 30, 1993.
2. Letter from Laidlaw Waste Systems Ltd. to the Ministry of Environment and Energy, dated July 12, 1993, briefly describing the proposal for recycling petroleum contaminated soils and listing supporting documentation.
3. Letter from Laidlaw Waste Systems Ltd. to the Ministry of Environment and Energy, dated July 12, 1993, explaining the soil recycling process. Supporting information includes District Office Notification Form - Mobile Soil Reclamation, Certificate of Insurance, letter of credit, site plan and layout drawings, and detail drawings of sediment/oil interceptor system for quality control of leachate run-off.
4. Letter and supporting documentation from Laidlaw Waste Systems Ltd. to the Ministry of Environment and Energy dated November 5, 1993 providing additional information on emergencies and contingencies, public information (including public notice and newspaper advertisement), hours of operation, and a monitoring plan for the soil storage pad at the Laidlaw landfill site in Richmond Township.

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5. Memo to the Ministry of Environment and Energy from Laidlaw Waste Systems Ltd. dated November 9, 1993, providing list of property owners which received a hand delivered public notice explaining the proposal.
6. Letter from the Richmond-Tyendinaga Environmental Association to the Ministry of Environment and Energy dated September 23, 1993 providing support for the soil recycling proposal.
7. Letter from the Township of Richmond to the Ministry of Environment and Energy dated October 8, 1993 and Resolution No. 316/93, dated October 4, 1993, providing Council's support for the proposal.

Ontario Ministry of Environment and Energy Provisional Certificate of Approval for a Waste Disposal Site A210222 dated September 18, 1992, or as amended.

8. Ontario Ministry of Environment and Energy Provisional Certificate of Approval for a Waste Management System A840681 dated March 18, 1992, or as amended.
9. Ontario Ministry of Environment and Energy Certificate of Approval (Air) Number 8-3212-88-919 dated April 23, 1992, or as amended.

located in: Township of Richmond
Part of Lot 2, Concession IV
(Beechwood Road)

and is subject to the following definitions and conditions:

Definitions:

"Certificate" means the entire certificate of approval including its schedules, if any, issued in accordance with Section 27, Part V of the Environmental Protection Act;

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"Director" means Director of the Southeastern Region of the Ministry or his appointee;

"District Manager" means the District Manager of Kingston District Office, Southeastern Region of the Ministry;

"Ministry" means the Ontario Ministry of Environment and Energy;

"Owner" means Laidlaw Waste Systems (Richmond) Ltd.;

"Operator" means Laidlaw Waste Systems (Canada) Ltd.; its officers, employees, agents or contractors;

"Site" means the area(s) on landfill site, Certificate of Approval No. J71203, to be used by the processing facility described in this Certificate.

General Conditions

1. The requirements of this Certificate are imposed pursuant to Part V of the Environmental Protection Act. The issuance of this Certificate in no way abrogates the operator's legal obligations to take all reasonable steps to avoid violating other applicable provisions of this legislation and other legislation and regulations.
2. (1) The requirements of this Certificate are severable. If any requirement of this Certificate, or the application of any requirement of this Certificate to any circumstance, is held invalid, the application of such requirement to other circumstances and the remainder of this Certificate shall not be affected thereby.

(2) In all matters requiring the interpretation and implementation of this Certificate, the conditions of the certificate shall take precedence, followed in descending order by the application and the documentation, referred to in this Certificate, which is submitted in support of the application.

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3. The operator must ensure compliance with all the terms and conditions of this Certificate. Non-compliance constitutes a violation of the Environmental Protection Act and is grounds for enforcement.
4. (1) The operator shall, forthwith upon the request of the Director or District Manager, furnish any information requested concerning compliance with this Certificate including any records required to be kept by this Certificate.

(2) In the event the operator provides to the Ministry information, records, documentation of notification in accordance with this Certificate,
 - (a) the receipt of said information by the Ministry;
 - (b) the acceptance by the Ministry of the information's completeness or accuracy; or,
 - (c) the failure of the Ministry to prosecute the operator, or to require the operator to take any action, under this Certificate of any statute or regulation in relation to said information;

shall not be construed as the approving, excusing or justifying by the Ministry of any act or omission of the operator relating to said information, amounting to non-compliance with this Certificate or any statute or regulation.
- (3) All records referred to in this Certificate shall be retained on file in a secure manner for a period not less than two years.
5. The owner/operator shall allow Ministry personnel, or a Ministry authorized representative(s) to:
 - (1) carry out any and all inspections authorized by Section 156, 157 or 158 of the Environmental Protection Act, as amended from time to time, of any place to which this Certificate relates; and, without restricting the generality of the foregoing, to:

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- (a) enter at reasonable times upon the premises, or the location where the records required by the conditions of this Certificate are kept;
 - (b) have access to and copy, at reasonable times, any records required by the conditions of this Certificate;
 - (c) inspect at reasonable times any facilities, equipment, practices, or operations required by the conditions of this Certificate; and
 - (d) sample and monitor at reasonable times for the purpose of assuring compliance with the conditions of this Certificate.
6. (1) The owner/operator shall notify the District Manager in writing of any change in ownership, name of corporation, the operator, or termination of the facility within 30 days of the change occurring.
- (2) In the event the facility is permanently closed a Provincial Officer shall inspect the site and the site shall not be used for any other purpose prior to the inspection and written clearance by the District Manager.
- (3) The operator shall ensure that all communications made pursuant to this condition will refer to this Certificate's number.
7. (1) In accordance with Section 19(4) of the Environmental Protection Act this Certificate, the application filed to obtain and documentation referred to in the certificate which may be reasonably necessary for a proper reading and understanding of it, with the exclusion of those documents marked "confidential" by the operator shall be made available for public inspection at the request of any person.
- (2) Additional information to that set out in subcondition (1) relating to this Certificate and contained in Ministry files may be made available to the public in accordance with the provisions of the Freedom of Information and Protection of Privacy Act.

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8. Except as specified in this Certificate the site shall be operated in accordance with the application for this Provincial Certificate of Approval dated August 30, 1993 and its supporting information described in items 1 to 10 on pages 1 and 2 of this Certificate.
9. (1) The operation of this site is limited to the storage and processing of non hazardous waste soils contaminated with petroleum hydrocarbons, liquid waste classes 211, 212, 213, 221, 222, 251, 252, 253 and 254 as defined in the Ministry of the Environment "New Ontario Waste Classes" document, dated January, 1986 from the Province of Ontario.
- (2) No wastes other than those listed in subcondition (1) shall be collected and stored at this site without amendment to this Certificate.
- (3) No wastes contaminated with halogenated organics, including PCBs, with concentrations greater than two (2) micrograms per gram shall be accepted at this site.
- (4) No waste mixing or diluting with uncontaminated soil shall occur at the site. No waste mixed or diluted with uncontaminated soil shall be accepted at the site.
- (5) No users outside the areas listed in subcondition (1) shall use this site without amendment to this Certificate.
10. (1) The operator shall ensure that site personnel, trained in contingency measures are on duty at all times during normal operating hours or during any additional hours the facility may be open. Public access to the site shall be restricted.

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(2) All site personnel shall have practical knowledge of the waste material to be handled under this Certificate and shall be fully trained and knowledgeable about all aspects of the site operation including the requirements of this Certificate which relate to the work they are doing and their safety on the site.

(3) Prior to operating the site the operator shall prepare an operation manual for use by site personnel which shall contain, but not necessarily be limited to the following:

- (a) an outline of the responsibilities of site personnel;
- (b) operation and receiving procedures;
- (c) storage, handling, sorting and shipping procedures;
- (d) contingency procedures to be followed by personnel in the event of fire and other emergencies.

(4) A copy of the manual shall be placed in a central location on the site and this manual shall be accessible to all site personnel during operating hours.

(5) Within 30 days of the issuance date of this Certificate a copy of the operation manual shall be submitted to the District Manager.

11. (1) The operator shall establish a record system for all waste received at the site which shall include, but not necessarily be limited to, the documentation of quantities received and processed at the site each month; source of generation; receiving and shipping dates and volumes of wastes or processed soils shipped to approved markets, transfer/processing facilities and waste landfill sites; and documentation of environmental and other problems experienced in operating this site.

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(2) The information collected under subcondition (1) shall be submitted in a report to the District Manager on or before the first day of December during each year of operation or until the Director or the District Manager has given notice in writing that these submissions are no longer required.

12. (1) The operator shall ensure that the site is operated in a safe and secure manner; that the operation of this site does not impede or is impeded by the landfilling operation on which this site is located; and that the wastes are properly handled, contained, stored, tested and processed at the site; so as not to pose a threat to the general public, site personnel and the environment.

(2) The operator shall ensure that wastes received at the facility are processed and moved from the site to approved markets, processing facilities and landfill sites on a regular basis; and that waste processing does not exceed 5,000 tonnes per day and waste storage on site does not exceed 40,000 tonnes.

(3) Notwithstanding Condition 1 the operator shall ensure that the processing operation is in compliance with noise, hours of operation, fire regulations and any other applicable by-laws of the local municipality/regional governments; and the requirements of Ontario Provisional Certificate of Approval for a Waste Disposal Site A210222; and Ontario Provisional Certificate of Approval for a Waste Management System A840681 described in items 8 and 9 on page 2 of this Certificate.

(4) The operator shall take all necessary measures possible to contain and minimize all emissions, including air emissions caused by the operation of the processing equipment, waste storage and the processed soil storage; and shall comply with Ontario Certificate of Approval (Air) 8-3212-88-919 described in item 10 on page 2 of this Certificate; and all other applicable legislation governing emissions.

(5) Any waste water collected in the catchment basin for the soil storage pad described in item 3 on page 1 of this Certificate shall be disposed of in a proper manner under Section 53 of the Ontario Water Resources.

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- (6) Only waste processing equipment as approved under Certificates of Approval A210222 and 8-3212-88-919 described in items 8 and 10 on page 2 of this Certificate shall be used at this site.
13. The local fire department shall be informed of the processing facility and this Certificate.
14. (1) Processed waste which contains Total Volatile Hydrocarbons above (100) micrograms per gram which are not reprocessed or soil waste which is not processed shall be taken from the site for disposal to approved landfill sites or to approved transfer or processing sites for further processing shall be transported under a approved waste management system.
- (2) Testing of waste soils and processed soils on this site shall be carried out as specified in Certificates of Approval A210222 and 8-3212-88-919 described in items 8 and 10 on page 2 of this Certificate.
15. This Certificate expires with the termination of the site; when all the wastes have been removed from the site; and the restoration of the site has been approved, in writing, by the District Manager.
16. (1) Within 90 days of the date of this Certificate the operator shall provide financial security for the closure of the site in an amount acceptable to the Director. The security can be in the form of a fund, bond, an irrevocable letter of credit or any other form as may be acceptable to the Director. The amount of financial assurance shall be established based on current costs for cleaning up the site and the assessed value of the fund, bond, or letter of credit shall be approved by the Director, in writing, before being submitted to the Ministry. The assessed value submitted to the Director for approval shall be an independent estimate which shall include, but not necessarily be limited to:

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- i) trucking, disposal and labour costs for removal of all waste from the site;
- ii) costs of equipment dismantling and cleaning on the site.
- iii) any legal and contractual costs associated with the closure of the site.

(2) In the event the financial assurance is scheduled to expire or notice is received that it will not be renewed and a replacement in a form satisfactory to the Director is not received at least 60 days before the expiry or renewal date, the operator shall forthwith replace it with a cash deposit.

(3) The operator shall review the closure costs as specified in subcondition (1) on a yearly basis and shall increase, or may decrease the financial assurance when instructed, in writing, by the Director. A copy of the review assessment shall be provided in the report specified in Condition 11(2).

(4) The operator shall at all times while the site is operating maintain the ten million dollars (\$10,000,000) third party liability insurance described in item 3 on page 1 of this Certificate and a copy of the policy shall be submitted to the Director within 30 days of the date of this Certificate.

17. The obligations imposed by the terms and conditions of this Certificate of Approval are obligations of due diligence.

The reasons for the imposition of these condition are as follows:

1. Conditions 1, 2, 3, 4 and 7 are to clarify the legal rights and obligations of this Provisional Certificate of Approval.

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2. Condition 5 is to ensure that the appropriate Ministry staff have ready access to the waste disposal site to inspect the operations that are approved under this Provisional Certificate of Approval. The condition is supplementary to the powers of entry afforded a Provincial Manager pursuant the Environmental Protection Act, as amended.
3. Conditions 6, 8 and 15 are to ensure that the waste disposal site is operated in accordance with the application for this Certificate and supporting information and not under any name or in any way which the Director has not been asked to consider; and to ensure the property is cleaned up and restored to the satisfaction of the Ministry prior to closure.
4. Condition 9 is to ensure that this site is used only to collect, handle and transport waste within the limitations approved under this Provisional Certificate of Approval.
5. Conditions 10 and 12 are to ensure that the waste recycling site is properly managed in an organized manner by adequately trained persons, in order to prevent environmental detriment; and to ensure the safety of the general public and site personnel.
6. Condition 11 is to provide both the operator and the Ministry of Environment and Energy with an assessment of the waste recycling site.
7. Condition 13 is to ensure fire personnel are informed of the this waste processing site and the type of waste which is stored on this site.
8. Condition 14 is to ensure that the collection, handling, and transportation of all waste materials are conducted in an environmentally acceptable manner in accordance with provincial regulations.

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9. Condition 16 is to ensure funds are available from the operator for site closure in the event the site needs to be closed and the operator is not able to do the work; and to clean up any environmental impairment should the operator be unable or refuse to do so. The use and operation of the site without this condition would not be in the public interest.
10. Condition 17 is required to clarify that the terms and conditions of this Certificate of Approval impose a standard of due diligence and not absolute liability.

You may, by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Certificate, require a hearing by the Board. Section 142 of the Environmental Protection Act, R.S.O. 1990 c. E-19, as amended, provides that the notice requiring the hearing shall state:

1. The portion of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the notice should include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

and the notice should be signed and dated by the appellant.

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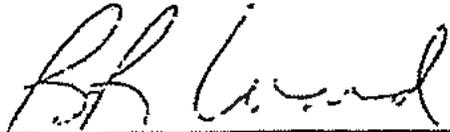
This notice should be served upon:

The Secretary
Environmental Appeal Board
112 St. Clair Avenue West
5th Floor
TORONTO, Ontario
M4V 1N3

AND

The Director
Section 39, E.P.A.
Ministry of Environment and Energy
133 Dalton Avenue, Box 820
KINGSTON, Ontario
K7L 4X6

ated at Kingston this 20th day of December, 1993.



Director
Section 39, E.P.A.
Ministry of Environment and Energy

(Pour obtenir une copie du présent document certificat en français,
communiquer le Ministère de l'Environnement et de l'Énergie 613
549-4000.)

APPENDIX

A-4-1 AMENDMENT TO CERTIFICATE OF APPROVAL NO. A710003 DATED AUGUST 25, 1999, REGARDING NOTIFICATION OF CHANGE OF NAME



Ontario

Ministry of the Environment
Ministère de l'Environnement

NOTICE
Page 1 of 2

Canadian Waste Services Inc.
1275 North Service Road, Suite 700
Oakville, Ontario
L6M 3G4

You are hereby notified that the Provisional Certificate of Approval No. A 710003, dated December 20, 1993, which was issued to Laidlaw Waste Systems (Canada) Ltd., as amended, is further amended as follow:

The Name and Address of the Company have changed:

FROM: Laidlaw Waste Systems (Canada) Ltd.
3410 South Service Road
Burlington, Ontario
L7R 3Y8

TO: Canadian Waste Services Inc.
1275 North Service Road, Suite 700
Oakville, Ontario
L6M 3G4

The following definitions in "Definitions" are revoked and replaced with:

"Operator" means Canadian Waste Services Inc.; its officers, employees, agents or contractors; and

"Owner" means Canadian Waste Services Inc.

The list of Plans and Specifications is hereby amended, by adding the following:

1. Letter and its attachment dated June 22, 1999, from Michael J. Pullen, Director, Canadian Waste Services Inc., to Geoff Carpentier, Ministry of the Environment (MOE), notifying the Ministry of a change in Corporate name, address and providing list of their officers.

The reason for the imposition of these conditions is as follows:

1. The reason for the above changes is to acknowledge the letter regarding the notification of name and address change, dated June 22, 1999.

All other conditions on the original Certificate and as amended, not affected by this amendment, remain in effect.



In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990 c. E-19, you may by written notice served upon me and the Environmental Appeal Board within 15 days after receipt of this Notice, require a hearing by the Board. Section 142 of the Environmental Protection Act, as amended provides that the Notice requiring a hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

In addition to these legal requirements, the Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the waste disposal site is located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary,*
Environmental Appeal Board,
2300 Yonge St., 12th Floor,
P.O. Box 2382
Toronto, Ontario.
M4P 1E4

AND

The Director,
Section 39, Environmental Protection Act,
Ministry of the Environment,
250 Davisville Avenue, 3rd Floor,
Toronto, Ontario.
M4S 1H2

*Further information on the Environmental Appeal Board's requirements for an appeal can be obtained directly from the Board by: Tel: (416) 314-4600, Fax: (416) 314-4506 or e-mail: www.ert.gov.on.ca.

DATED AT TORONTO this 25th day of August, 1999.

A. Dominski, P. Eng.
Director
Section 39
Environmental Protection Act

MK/lf
c: District Manager, Kingston

APPENDIX

A-4-2 AMENDMENT TO CERTIFICATE OF APPROVAL NO. A710003 DATED MARCH 26, 2004, REGARDING NOTIFICATION OF CHANGE OF NAME

Ministry of the Environment
 Environmental Assessment and
 Approvals Branch
 Floor 12A
 2 St Clair Ave W
 Toronto ON M4V 1L5
 Fax: (416)314-8452
 Telephone: (416) 314-7902

Ministère de l'Environnement
 Direction des évaluations et des
 autorisations environnementales
 Étage 12A
 2 av St Clair O
 Toronto ON M4V 1L5
 Télécopieur: (416)314-8452
 Téléphone : (416) 314-7902



March 26, 2004

Jessica Campbell, Director, Regulatory Affairs & Environmental Compliance
 Waste Management of Canada Corporation
 5045 South Service Road, Suite 300
 Burlington, Ontario
 L7L 5Y7

Dear Sir/Madam:

Re: Notification of Change of Name
MOE Reference Number 9673-5XFSHB

The Ministry of the Environment (the "Ministry") acknowledges receipt of your letter dated February 2, 2004 requesting a change in company name:

FROM: Canadian Waste Services Inc.

TO: Waste Management of Canada Corporation

By this letter, the Ministry advises you that your notification of change in company name has been registered in our records for the following Certificate(s) of Approval:

Certificate(s) of Approval for Waste Disposal Sites, Section 27, EPA:

A230901 East Gwillimbury
 A230701 Hwy 48
 A230201 Aurora
 A032006 Blackwell LF
 A380103 Kingston - St. Remy Place
 A100144 Brant St. Hamilton
 A620042 Sarina MacGregor Rd.
 A210237 Mavis, Mississauga
 A031810 LaSalle LF
 A021601 Ridge LF
 8602-4HQZW Trenton, Chester Rd.
 A253001 Tecumseth LF
 A100130 Lottridge - Hamilton

A440109 California Ave. - Brockville
A120138 Cushman Rd. - St. Catharines
A030309 Petrolia MRF
A140327 Conrad Place, Waterloo
A580730 Timmins - De loro
A580731 Timmins - Ogden
A580732 Timmins - German
A170404 Mount Forest - Sligo Rd.
A100139 Lansdowne Ave - Hamilton
A450707 Carleton Place
A010128 Maidstone
A230615 Bowes Rd.
A680243 Esandar
A210622 Brydon
A461002 Ottawa LF
A032203 Warwick LF
A030303 Petrolia LF
A021603 Blenheim LF
A040213 Exeter Rd. - London
A280229 Unwin
A210328 New Toronto
4458-5QTLS3 Timmins MRF
A250111 Saunders Rd - Barrie
1308-5HNRV6 Wentworth - Brampton
A371203 Richmond LF
A710003 Richmond LF

The Ministry will not be providing you with an amended certificate(s) to reflect the change in company name. Therefore, this letter must be appended to its corresponding Certificate(s) of Approval. The name change will be included in any future amended Certificate(s) of Approval.

If you have any questions regarding the above, please contact me at the above phone number.

Yours truly,

Sanja Jankovic
Sanja Jankovic
Application Processor

cc: District Manager, MOE York-Durham
District Manager, MOE, Sarnia
District Manager, MOE Kingston
District Manager, MOE Hamilton
District Manager, MOE Halton-Peel
District Manager, MOE Peterborough

District Manager, MOE Barrie
District Manager, MOE Niagara
District Manager, MOE Guelph
District Manager, MOE Timmins
District Manager, MOE Ottawa
District Manager, MOE Toronto
District Manager, MOE London
Area Manager, MOE Windsor
Area Manager, MOE Belleville

File Storage Number: 230901, 230701, 230201, 032006, 380103, 100144, 620042, 210237,
031810, 021601, 0209, 253001, 100130, 440109, 120138, 030309, 140327, 580730, 580731,
580732, 170404, 100139, 450707, 010128, 230615, 680243, 210622, 461002, 032203, 030303,
021603, 040213, 280229, 210328, 0822, 250111, 0611, 371203

APPENDIX

A-5 *ENVIRONMENTAL COMPLIANCE
APPROVAL (AIR) NO. 5970-9HKP3V
(LANDFILL GAS COLLECTION AND
FLARING SYSTEM, INCLUDING
CANDLESTICK FLARE) DATED APRIL
29, 2014*


AMENDED ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER 5970-9HKP3V

Issue Date: April 29, 2014

Waste Management of Canada Corporation
 117 Wentworth Crt
 Brampton, Ontario
 L6T 5L4

Site Location: Richmond Landfill
 1271 Beechwood Road, RR #6 Lots 1,2 and 3, Conc.4, Reference Plan 29R-6605, Geo. Twp. of
 Richmond
 Greater Napanee Town, County of Lennox and Addington
 K7R 3L1

*You have applied under section 20.2 of Part II.1 of the Environmental Protection Act, R.S.O. 1990, c. E. 19
 (Environmental Protection Act) for approval of:*

- one (1) enclosed flare used to incinerate the landfill gases from an expanded landfill gas collection system to include landfill gas collection from a maximum of 54 landfill gas wells, 12 leachate manhole and 9 cleanouts, having a landfill gas burning capacity of 0.61 standard cubic metre per second with the combustible levels ranging from 30 to 55 percent by volume. The flare has a maximum heat input of 41 gigajoules per hour, exhausting into the atmosphere through a stack, having an exit diameter of 2.1 metres, extending 12.2 metres above grade;

- one (1) backup candlestick flare used to incinerate the landfill gases from an expanded landfill gas collection system, having a landfill gas burning capacity of 0.354 cubic metres per second with the combustible levels ranging from 30 to 50 percent by volume, exhausting into the atmosphere through a stack, having an exhaust tip diameter of 0.15 metres, extending 6.7 metres above grade;

all in accordance with the Application for Approval (Air & Noise) submitted by Waste Management of Canada Corporation, dated August 5, 2011 and signed by Reid Cleland, Director of Disposal Operations; and the supporting information, including the Emission Summary and Dispersion Modelling Report, submitted by Comcor Environmental Limited, dated September 16, 2011 and signed by Jonathan Petsch, and additional information provided by Comcor Environmental Limited, dated March 21, 2014, and signed by Jonathan Petsch.

For the purpose of this environmental compliance approval, the following definitions apply:

1. "Approval" means this Environmental Compliance Approval, including the application and supporting documentation listed above.
2. "CEM System" means the continuous monitoring and recording system used to optimize the operation of the Equipment to minimize the emissions from the Equipment, as described in the Company's application, this Approval, including Schedule "A", and in the supporting documentation referred to herein, to the extent approved by this Approval;
3. "Company" means Waste Management of Canada Corporation that is responsible for the construction or operation of the Facility and includes any successors and assigns.
4. "District Manager" means the District Manager of the appropriate local district office of the Ministry, where the Facility is geographically located.
5. "EPA" means the Environmental Protection Act, R.S.O. 1990, c.E.19, as amended.
6. "Equipment" means the equipment and processes described in the Company's application, this Approval and in the

supporting documentation referred to herein, to the extent approved by this Approval.

7. "Facility" means the entire operation on the property where the Equipment is located.

8. "Manual" means a document or a set of documents that provides written instructions to staff of the Company.

9. "Ministry" means the ministry of the government of Ontario responsible for the EPA and includes all officials, employees or other persons acting on its behalf.

10. "Publication NPC-232" means the Ministry Publication NPC-232, "Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)", October, 1995, as amended.

You are hereby notified that this environmental compliance approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

PERFORMANCE REQUIREMENTS

1. The Company shall ensure that the noise emissions from the Facility comply with the limits determined in accordance with Publications NPC-232.

2. The Company shall operate the Equipment in such a manner that the minimum temperature shall be 900 degrees Celsius at a point representing a minimum retention time of 0.75 second, at all times the landfill gases are flowing to the enclosed flare system.

3. The Company shall operate the Equipment in such a manner that a flame is present at all times when landfill gases are flowing to the candlestick flare system.

OPERATION AND MAINTENANCE

4. The Company shall ensure that the Facility and the Equipment, including the CEM System, is properly operated and maintained at all times. The Company shall:

(1) prepare, not later than three (3) months after the date of this Approval, and update, as necessary, a Manual outlining the operating procedures and a maintenance program for the Facility and the Equipment, including:

(a) routine operating and maintenance procedures in accordance with good engineering practices, and as recommended by the Equipment and CEM System supplier;

(b) emergency procedures;

(c) procedures for any record keeping activities relating to the operation and maintenance of the Facility and the Equipment, including the CEM System;

(d) all appropriate measures to minimize noise and odourous emissions from all potential sources;

(e) periodic inspection of the Equipment which is to be conducted by individuals experienced with the Equipment; and timetables for work to be carried out;

(f) procedures for recording and responding to environmental complaints relating to the operation of the Facility; and

(g) operator training which is to be provided by an individual experienced with the Equipment; and,

(2) implement the recommendations of the Manual;

RECORD RETENTION

5. The Company shall retain, for a minimum of two (2) years from the date of their creation, all records and information related to or resulting from the recording activities required by this Approval, and make these records available for review by staff of the Ministry upon request. The Company shall retain:

- (1) all records on maintenance, repair and inspection of the Facility, the Equipment, and the CEM System;
- (2) all records produced by the CEM System;
- (3) all records on operator training;
- (4) all records on the environmental complaints, including:
 - (a) a description, time and date of the incident;
 - (b) wind direction and other weather conditions at the time of the incident; and,
 - (c) a description of the measures taken to address the cause of the incident and to prevent a similar occurrence in the future, and the outcome of the measures taken; and,
- (5) all records of any upset conditions associated with the operation of the Equipment;

NOTIFICATION OF COMPLAINTS

6. The Company shall notify the District Manager, in writing, of each environmental complaint within two (2) business days of the complaint. The notification shall include:

- (1) a description of the nature of the complaint;
- (2) the time, date and location of the incident; and,
- (3) the wind direction and other weather conditions at the time of the incident;

The reasons for the imposition of these terms and conditions are as follows:

- 1. Condition Nos. 1 to 3 inclusively are included to provide the minimum performance requirements considered necessary to prevent an adverse effect resulting from the operation of the Facility.
- 2. Condition No. 4 is included to emphasize that the Facility must be maintained and operated according to a procedure that will result in compliance with the EPA, the regulations and this Approval.
- 3. Condition No. 5 is included to require the Company to keep records and to provide information to the Ministry so that compliance with the EPA, the regulations and this Approval can be verified.
- 4. Condition No. 6 is included to require the Company to notify/report to the Ministry so that compliance with the EPA, the regulations and this Approval can be verified.

SCHEDULE "A"

This Schedule "A" forms part of this Approval.

CONTENT COPY OF ORIGINAL

PARAMETER:	Temperature (enclosed flare system)
	LOCATION:
	PERFORMANCE:
	DATA RECORDER:
	RELIABILITY:

The sample point for the continuous temperature monitoring and recording system shall be located at a location in the combustion chamber where the minimum retention time of the combustion gases at a minimum temperature of 900 degrees Celsius for at least 0.75 second is achieved.

The continuous temperature monitoring and recording system shall meet the following minimum performance specifications for the following parameters.

PARAMETERS	SPECIFICATION
Type:	shielded "K" type thermocouple, or equivalent
Accuracy:	±1.5 percent of the minimum gas temperature

The data recorder must be capable of registering continuously the measurement of the monitoring system without a significant loss of accuracy and with a time resolution of 1 minute or better.

The monitoring system shall be operated and maintained so that accurate data is obtained during a minimum of 95 percent of the time for each calendar quarter.

PARAMETER:	Temperature (candlestick flare system)
	LOCATION:
	PERFORMANCE:
	DATA RECORDER:
	RELIABILITY:

The sample point for the continuous temperature monitoring and recording system shall be located as close to the combustion zone of the candlestick flare as possible.

The continuous temperature monitoring and recording system shall meet the following minimum performance specifications for the following parameters.

PARAMETERS	SPECIFICATION
Type:	shielded "K" type thermocouple, or equivalent
Accuracy:	±1.5 percent of the minimum gas temperature

The data recorder must be capable of registering continuously the measurement of the monitoring system without a significant loss of accuracy and with a time resolution of 2 minutes or better.

The monitoring system shall be operated and maintained so that accurate data is obtained during a minimum of 95 percent of the time for each calendar quarter.

Upon issuance of the environmental compliance approval, I hereby revoke Approval No(s). 1355-5LRN9N issued on May 8, 2003

CONTENT COPY OF ORIGINAL

In accordance with Section 139 of the Environmental Protection Act, you may by written Notice served upon me, the Environmental Review Tribunal and in accordance with Section 47 of the Environmental Bill of Rights, 1993, S.O. 1993, c. 28 (Environmental Bill of Rights), the Environmental Commissioner, within 15 days after receipt of this Notice, require a hearing by the Tribunal. The Environmental Commissioner will place notice of your appeal on the Environmental Registry. Section 142 of the Environmental Protection Act provides that the Notice requiring the hearing shall state:

1. The portions of the environmental compliance approval or each term or condition in the environmental compliance approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

Pursuant to subsection 139(3) of the Environmental Protection Act, a hearing may not be required with respect to any terms and conditions in this environmental compliance approval, if the terms and conditions are substantially the same as those contained in an approval that is amended or revoked by this environmental compliance approval.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The environmental compliance approval number;
6. The date of the environmental compliance approval;
7. The name of the Director, and;
8. The municipality or municipalities within which the project is to be engaged in.

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, Suite 1500
Toronto, Ontario
M5G 1E5

AND

The Environmental Commissioner
1075 Bay Street, Suite 605
Toronto, Ontario
M5S 2B1

AND

The Director appointed for the purposes of Part II.1 of
the Environmental Protection Act
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at:
Tel: (416) 212-6349, Fax: (416) 314-4506 or www.ert.gov.on.ca**

This instrument is subject to Section 38 of the Environmental Bill of Rights, 1993, that allows residents of Ontario to seek leave to appeal the decision on this instrument. Residents of Ontario may seek leave to appeal within 15 days from the date this decision is placed on the Environmental Registry. By accessing the Environmental Registry at www.ebr.gov.on.ca, you can determine when the leave to appeal period ends.

The above noted activity is approved under s.20.3 of Part II.1 of the Environmental Protection Act.

DATED AT TORONTO this 29th day of April, 2014

Ian Greason, P.Eng.
Director
appointed for the purposes of Part II.1 of the
Environmental Protection Act

AB/
c: District Manager, MOE Kingston - District
Jonathan Petsch, Comcor Environmental Limited

APPENDIX

B

MEMORANDUM: NORTH
LAGOON AND
GROUNDWATER SAMPLING
RESULTS, PREPARED BY
BLUMETRIC
ENVIRONMENTAL INC.



MEMORANDUM

DATE: December 10, 2020
TO: Bill McDonough and Chris Prucha, Waste Management (WM)
FROM: François Richard and Madeleine Corriveau, BluMetric Environmental Inc.
PROJECT NO: 190222-07
SUBJECT: North Lagoon and Groundwater Sampling Results, Waste Management
Richmond Landfill, Town of Greater Napanee

This memorandum provides sampling results related to the North Lagoon Investigation at the Waste Management (WM) Richmond Landfill (the Site) in the Town of Greater Napanee. The sampling included:

- Quarterly groundwater samples from monitoring wells M217 and M218, two shallow groundwater monitoring wells installed immediately downgradient from the North Lagoon; and,
- North Lagoon samples collected from surface and from 0.4 m below surface.

The groundwater samples were collected in compliance with Condition 8.5(c)iv from the Environmental Compliance Approval (no. A371203) for the site, which states that newly installed groundwater monitoring wells shall be tested a minimum of four times on a quarterly basis during the first year after being established. The surface water samples collected from the North Lagoon were collected at the request of the Ministry of the Environment, Conservation and Parks (MECP).

The results are summarized and discussed below.

GROUNDWATER SAMPLING

Groundwater samples were collected from shallow groundwater monitoring wells M217 and M218 on January 23, April 20, July 31 and November 3, 2020. Both wells are poor producers and were purged dry prior to sampling following recovery. The samples were analyzed for the general/inorganic parameters and volatile organic compounds (VOCs) outlined in Tables 3 and 4



Tel. 613-531-2725
Fax. 613-531-1852

BluMetric Environmental Inc.
The Tower, The Woolen Mill, 4 Cataragui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

from the Environmental Monitoring Plan (EMP) dated April 2016. Results are presented in Table 1 at the end of the text. 1,4-dioxane was not detected in any of the groundwater samples.

With the exception of xylenes at M218 in November, which were detected at just above the detection limit (0.00011 mg/L), no VOCs were measured above the laboratory's reportable detection limit (RDL) in any of the groundwater samples.

NORTH LAGOON SAMPLING

Two samples were collected from the North Lagoon on November 3, 2020: one from surface and one from a depth 0.4 m below the surface, taking care not to disturb the bottom sediments. Results are presented in Table 1 at the end of the text. Water quality results for the North and South Chamber leachate sumps from samples, collected on May 13, 2020 as part of the EMP monitoring program, are also included in the table for comparison purposes.

As expected, the results were very similar for both North Lagoon samples (at surface and 0.4 m depth). 1,4-dioxane was not detected in either of the North Lagoon samples. Leachate indicator parameters were generally lower in the North Lagoon samples compared to previous results (from October 2019).

DISCUSSION

Shallow groundwater quality observed at monitoring wells M217 and M218, immediately downgradient from the North Lagoon, is consistent with background concentrations¹ in the shallow groundwater flow zone. For most leachate indicator parameters (i.e. ammonia, boron, chloride, DOC, potassium and sodium), concentrations were up to an order of magnitude lower in the groundwater monitoring well samples when compared to concentrations in the North Lagoon samples, with the exception of the November 2020 results for M218 which had higher concentrations for some parameters compared to the groundwater samples from previous events (ammonia, chloride, TDS, boron, manganese, sodium). The concentrations observed are still generally low, however the relatively higher mineralization observed is consistent with the low permeability conditions observed locally (slow recovery wells).

¹ Environmental Monitoring Plan, Richmond Landfill, BluMetric Environmental Inc., April 2016.

Of significant note, 1,4-dioxane, the primary leachate indicator for the Site, was not detected in any of the samples collected from the new monitoring wells. Groundwater quality results do not indicate the presence of leachate impacts in the shallow groundwater flow zone downgradient of the North Lagoon.

We trust the above is satisfactory. If you have any questions or need further information please do not hesitate to contact the undersigned.

Respectfully submitted,
BluMetric Environmental Inc.



Francois Richard, Ph.D. P.Geo.
Senior Hydrogeologist



Madeleine Corriveau, M.Sc. P.Geo.
Senior Geoscientist

TABLES



Table 1: North Lagoon and Groundwater Chemistry

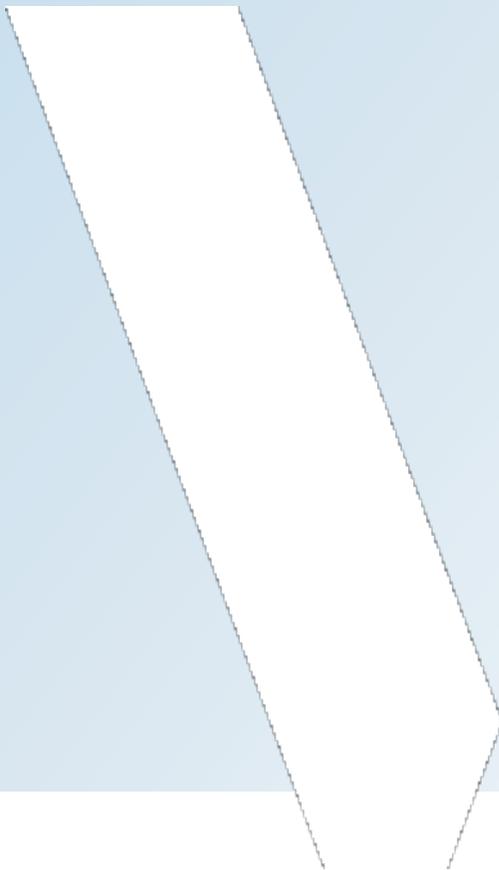
Reading Name	Units	Lagoons		North Lagoons			Groundwater Monitoring Wells							
		North Chamber 2020-05-13	South Chamber 2020-05-13	North Lagoon 2019-10-03	North Lagoon 2020-11-03	North Lagoon 0.4 m 2020-11-03	M217 2020-01-23	M217 2020-04-20	M217 2020-07-31	M217 2020-11-03	M218 2020-01-23	M218 2020-04-20	M218 2020-07-31	M218 2020-11-03
General/Inorganic														
Alkalinity	mg/L	1600	2000	460	250	260	340	350	380	360	360	350	400	410
Ammonia	mg/L	181	261	10.7	0.42	0.41	< 0.15	< 0.15	0.16	< 0.15	< 0.15	< 0.15	0.2	0.39
Biochemical Oxygen Demand	mg/L	13	18		< 2	< 2								
Chemical Oxygen Demand	mg/L	210	280		42	41								
Chloride	mg/L	340	720	140	120	120	< 1	1.4	2.6	2	1.1	< 1	3.1	69
Conductivity	µS/cm	2900	5700	1300	810	860	620	650	700	740	660	660	700	970
Dissolved Organic Carbon	mg/L	94	94	28	16	17	1.8	2.2	3.5	2	1.5	1.4	1.5	2.1
Hardness	mg/L	280	290		180	180								
Naphthalene	mg/L	0.0087	0.00098		< 0.00005	< 0.00005								
Nitrate	mg/L	< 0.1	< 0.2	< 0.1	0.17	0.16	0.56	0.57	0.21	0.11	0.19	0.19	0.17	< 0.1
Nitrite	mg/L	< 0.01	< 0.02	< 0.01	0.024	0.022	< 0.01	< 0.01	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
N-nitrosodimethylamine	mg/L	< 0.1	< 10.5		< 2.13	< 2.13								
pH (Lab)	unitless	7.42	7.87		8.13	8.13								
Phenol	mg/L	< 0.008	0.0063		< 0.004	< 0.004								
Phosphorus (Total)	mg/L	0.68	0.73		< 0.03	0.034								
Salinity	mg/L	< 1	< 1	< 1	1.1	< 1	6.7	6.2	7.2	5.4	2.5	20	28	46
Total Chloride Solids	mg/L	1230	2170	745	390	425	320	330	355	410	360	345	365	535
Total Kjeldahl Nitrogen	mg/L	150	260		1.1	1.3								
Metals														
Boron	mg/L	1.5	2.9	0.53	0.32	0.32	< 0.02	0.016	0.11	0.11	0.065	0.06	0.076	0.38
Cadmium	mg/L	< 0.0001	< 0.0001		< 0.0001	< 0.0001								
Calcium	mg/L			68			43	48	55	71	59	62	66	67
Chromium (Total)	mg/L	0.009	0.015		< 0.005	< 0.005								
Cobalt	mg/L	0.0056	0.01		< 0.0005	< 0.0005								
Copper	mg/L	< 0.002	0.002		< 0.002	< 0.002								
Iron	mg/L	32	5.5	< 0.1	0.36	0.69	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Lead	mg/L	< 0.0005	< 0.0005		< 0.0005	< 0.0005								
Magnesium	mg/L			17			49	51	48	47	45	45	48	49
Manganese	mg/L	0.14	0.1	0.052	0.009	0.033	0.007	0.011	0.037	0.059	0.014	0.007	0.012	0.099
Nickel	mg/L	0.034	0.063		0.005	0.006								
Potassium	mg/L	89	150	35	20	20	0.51	1.1	3	3.9	3.1	3.2	3	6.6
Sodium	mg/L	370	370	130	95	100	16	19	28	23	19	19	18	82
Zinc	mg/L	0.014	0.28		< 0.01	< 0.01								
Volatile Organic Compounds (VOCs)														
1,1,1,2-Tetrachloroethane	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,1,2-Trichloroethane	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,2-Trichloroethane	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1-Dichloroethane	mg/L	0.00059	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1-Dichloroethylene	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,2-Dichlorobenzene (cl)	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L	0.0025	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	0.0067	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dioxane	mg/L	0.031	0.01	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzene	mg/L	0.0058	0.0063	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chlorobenzene	mg/L	0.0054	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L	0.0023	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chloroethane	mg/L	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chloroform	mg/L	< 0.0025	0.035	< 0.0025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L	0.013	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
m,p-Xylene	mg/L	0.036	0.0086	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
o-Xylene	mg/L	0.0098	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Styrene	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L	< 0.0012	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Xylenes	mg/L	0.045	0.0086	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L	< 0.001	< 0.001	< 0.001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002



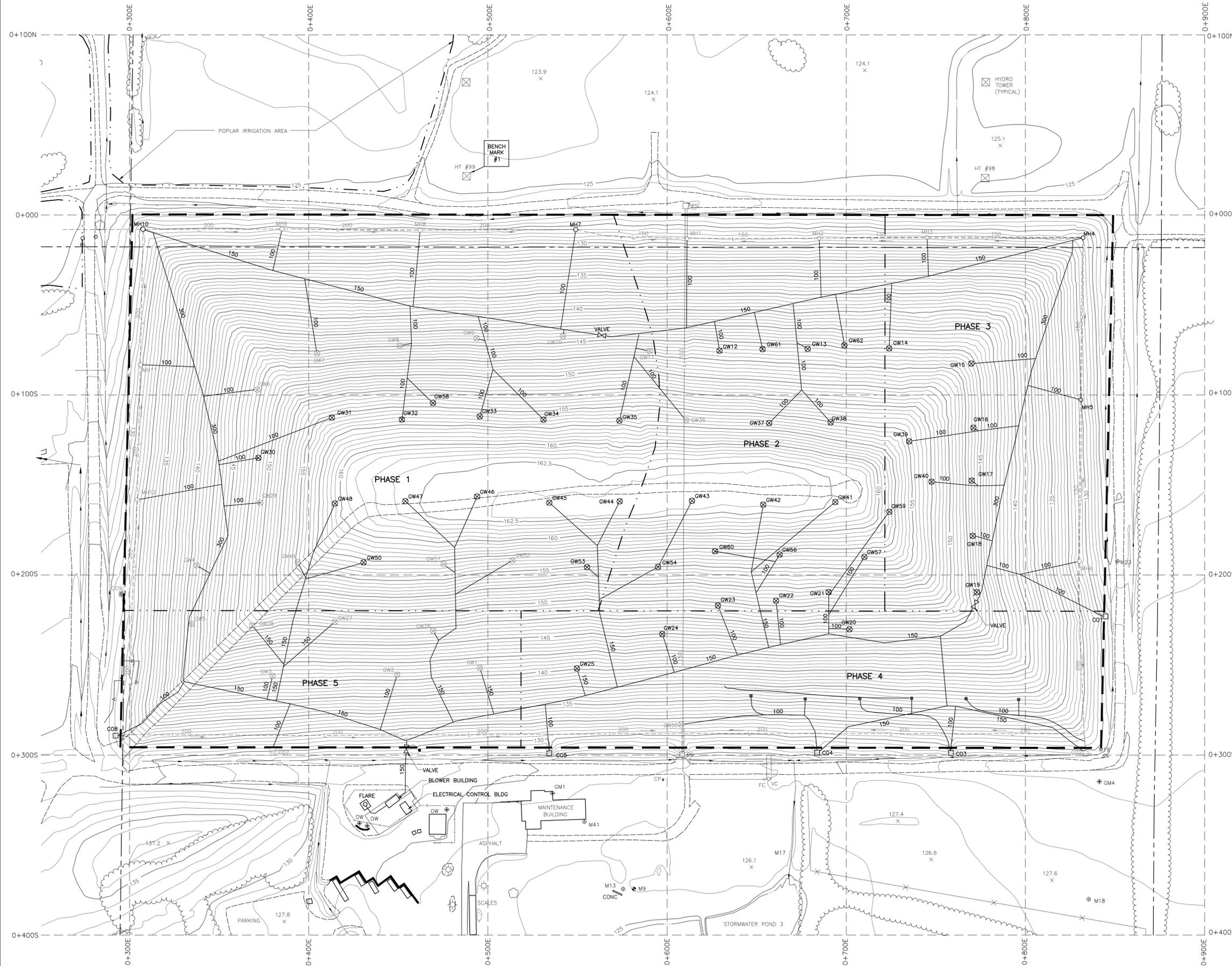
APPENDIX

C

LANDFILL GAS COLLECTION
SYSTEM AS BUILT DRAWING
TO DECEMBER 2020



G:\1985\8570\DRAWINGS\2021\FINAL_8570_GAS_AS-BUILT to December 2020.dwg Mar 19, 2021 - 8:10am



LEGEND:

- 125— EXISTING GROUND
- INTERIOR CONTOURS
- - - REFERENCE GRID LINE
- - - LEGAL BOUNDARIES
- - - APPROVED LIMIT OF LANDFILL
- - - EXISTING DRAINAGE DITCH
- - - EXISTING FENCE LINE
- - - EXISTING TREE LINE
- EXISTING TREE
- ⊗ HT #98 EXISTING HYDRO TOWER (ID #)
- EXISTING HYDRO POLE
- - - EXISTING ROAD EDGE
- MH3 EXISTING LEACHATE MANHOLE
- 150 EXISTING GAS HEADER & DIAMETER (mm)
- 100 EXISTING GAS LATERAL & DIAMETER (mm)
- ⊕ GAS MONITOR
- ⊕ GROUNDWATER MONITOR
- ⊗ GW62 ACTIVE VERTICAL EXTRACTION GAS WELL
- ⊗ GW52 NON-ACTIVE VERTICAL EXTRACTION GAS WELL
- MH4 ACTIVE GAS EXTRACTION MANHOLE
- MH3 NON-ACTIVE GAS EXTRACTION MANHOLE
- CO4 ACTIVE GAS EXTRACTION CLEANOUT
- CO2 NON-ACTIVE GAS EXTRACTION CLEANOUT

NOTES:

- 1) EXISTING GROUND CONTOURS AND TOPOGRAPHIC FEATURES SHOWN ON THIS PLAN ARE BASED ON INFORMATION OBTAINED FROM AERIAL PHOTOGRAPHY FLOWN ON JUNE 27, 2009 BY BASE MAPPING AND FIELD SURVEY DATA BY SMC TO JUNE 1, 2017.
- 2) CONTOUR INTERVAL SHOWN IS 0.5m.
- 3) THE LOCAL SITE GRID IS BASED ON 0+000N BEING THE NORTH LANDFILL LIMIT. THE NORTH-WEST CORNER OF THE LANDFILL LIMIT IS 0+300E AND IS PERPENDICULAR TO THE EAST/WEST GRID LINE. THE WEST LIMIT OF THE LANDFILL IS LOCATED ALONG THE LOT LINE BETWEEN LOTS 1 AND 2, CONCESSION 4.
- 4) AS-BUILT INFORMATION SHOWN FOR HDPE GAS PIPING WAS PROVIDED BY WM AND IS APPROXIMATE ONLY. THE LOCATION OF ALL THE GAS WELLS SHOWN ON THIS PLAN ARE BASED ON FIELD SURVEY DATA OBTAINED BY WSP (FORMERLY GENIWAR INC) ON NOVEMBER 17, 2011. LOCATION OF GAS WELLS 59 THROUGH 62 AND ASSOCIATED LATERALS WAS PROVIDED BY WM AND IS APPROXIMATE ONLY.
- 5) WM REPORTS NO GAS COLLECTION WELLS WERE INSTALLED IN 2020. WM ALSO REPORTS THAT THE PRESENT SYSTEM COLLECTS GAS FROM FIVE (5) LEACHATE CLEANOUTS, FOUR (4) LEACHATE COLLECTION MANHOLES AND 42 VERTICAL GAS WELLS. 20 DECOMMISSIONED VERTICAL GAS WELLS ARE ALSO PRESENT ON THE LANDFILL MOUND.

B.M. #1 ELEV. = 124.667
 TOP OF BRACKET, NORTH WEST LEG OF HYDRO TOWER No. 99, LOCATED ±25m NORTH AND ±180m EAST OF NORTH WEST CORNER OF APPROVED LANDFILL LIMIT.

B.M. #2 ELEV. = 125.146
 TOP OF BRACKET, NORTH WEST LEG OF HYDRO TOWER No. 100, LOCATED ±25m NORTH AND ±80m WEST OF NORTH WEST CORNER OF APPROVED LANDFILL LIMIT.



LANDFILL GAS COLLECTION SYSTEM
AS BUILT DRAWING TO DECEMBER 2020
RICHMOND LANDFILL
NAPANEE, ONTARIO

WASTE MANAGEMENT OF CANADA CORP.
 DRAWING NO. **8570 - 2020 GAS AS BUILT**

SHEET
2020GAB

DATE	DESCRIPTION	APP BY

APPENDIX

D

MEMORANDUM: 2020
STORMWATER
MANAGEMENT PONDS AND
LEACHATE MONITORING
RESULTS, PREPARED BY
BLUMETRIC
ENVIRONMENTAL INC.



MEMORANDUM

Date: 16 March 2021
To: Bill McDonough, Waste Management (WMCC)
Cc: Chris Prucha and Jim Forney (WMCC) and Beverly Leno, WSP Canada Inc.
From: François Richard and Madeleine Corriveau, BluMetric Environmental Inc.
Project No: 210166-03
Re: 2020 Stormwater Management Ponds and Leachate Monitoring Results
WMCC Richmond Landfill, Town of Greater Napanee, Ontario

The purpose of this memorandum is to provide a summary and interpretation of the stormwater and leachate monitoring data collected from the Waste Management of Canada Corporation (WMCC) Richmond Landfill in 2020, in accordance with Conditions 6 and 8 of Environmental Compliance Approval (ECA) No. 1688-8HZNJG issued January 10, 2012. This memorandum is prepared in accordance with Conditions 10(4)(a) and (b) of the ECA.

STORMWATER MANAGEMENT PONDS

A summary of the stormwater monitoring results is attached in **Table 1**. Samples were collected during six events in 2020, conducted in March, April, May, September, October and November, from the discharge points of each of the three stormwater management ponds: Northeast (NE) Pond, Northwest (NW) Pond and Southwest (SW) Pond. No sample was collected from the NE Pond during the September 2020 sampling event because it was dry.

The results of the chemical analyses are compared to the Provincial Water Quality Objectives (PWQO) in **Table 1** and were consistent with historical results. The concentrations of the following parameters exceeded the PWQO on occasion: aluminum, unionized ammonia, copper, iron, pH and total phosphorus.



Tel. 613-531-2725

Fax. 613-531-1852

BluMetric Environmental Inc.

The Tower, The Woolen Mill, 4 Cataragui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

The results from the surface water monitoring program of the receiving waters for these ponds (Marysville Creek and Beechwood Ditch), as reported in the Spring and Fall 2020 Semi-Annual Monitoring Reports dated July 2020 and January 2021, respectively, indicate that there are no measurable impacts to water quality from landfill-related activities, including operation of the stormwater management ponds.

Samples were also collected from the stormwater management ponds and analyzed for acute lethality of Rainbow Trout (RBT) and Daphnia magna (DM) on a quarterly frequency, in accordance with Condition 8.(3) of the ECA. Condition 14.3(xii) of ECA No. A371203 for the waste disposal site requires that the Annual Report includes a discussion of the results of the toxicity testing which includes potential impacts to the groundwater by the stormwater management ponds. The results are summarized below; there was no mortality of any test organisms observed in the samples.

Percent Mortality of Rainbow Trout (RBT) and Daphnia Magna (DM) in Stormwater Management Pond Samples, 2020

	March 18, 2020		June 9, 2020		Sept. 17, 2020		December 7, 2020	
	RBT	DM	RBT	DM	RBT	DM	RBT	DM
SW Pond	0	0	0	0	0	0	0	0
NE Pond	0	0	0	0	Dry – not sampled		0	0
NW Pond	0	0	0	0	0	0	0	0

Consistent with previous years, the acute lethality results from the 2020 samples indicate that the stormwater management ponds were operating as designed, and discharging non-lethal effluent to the receiving waters. The data do not indicate any potential impacts to shallow groundwater from the stormwater management ponds.

Based on the 2020 stormwater management data, as well as the results from the semi-annual surface water monitoring program, it is our opinion that the stormwater management ponds at the WMCC Richmond Landfill are adequate.

LEACHATE MONITORING

The requirements for leachate monitoring under ECA No. 1688-8HZNJG are presented in Condition 6 and Table 1 of the ECA. The leachate monitoring results for 2020 are presented in the attached **Table 2**. The results are indicative of the leachate quality that is disposed off-site.

We trust you will find this evaluation of the 2020 stormwater and leachate monitoring data for the WMCC Richmond Landfill site to be satisfactory. If you have any questions regarding the above information, please contact the undersigned anytime.

Respectfully submitted,
BluMetric Environmental Inc.



François A. Richard, P.Geo., Ph.D
Senior Hydrogeologist



Madeleine Corriveau, M.Sc., P.Geo.
Senior Geoscientist

Encl.

TABLES



WM-Richmond Landfill
 ECA 1688-8HZNJG
 Table 1: 2020 Pond Sampling Results

Parameter	Units	PWQO	NE Pond 2020-03-18	NW Pond 2020-03-18	SW Pond 2020-03-18	NE Pond 2020-04-20	NW Pond 2020-04-20	SW Pond 2020-04-20	NE Pond 2020-05-19	NW Pond 2020-05-19	SW Pond 2020-05-19
Alkalinity	mg/L		120	190	190	250	190	220	290	140	200
Aluminum	mg/L	0.075	< 0.02	< 0.02	< 0.02	0.066	0.025	< 0.02	0.027	< 0.02	< 0.02
Ammonia	mg/L		< 0.15	0.75	< 0.15	< 0.15	< 0.15	< 0.15	0.76	< 0.15	< 0.15
Unionized Ammonia	mg/L	0.02	< 0.001	0.0048	< 0.00061	< 0.00056	< 0.0018	< 0.0014	0.027	< 0.041	< 0.0027
Arsenic	mg/L	0.1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Barium	mg/L		0.026	0.048	0.043	0.049	0.035	0.04	0.054	0.014	0.036
Benzene	mg/L	0.1	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Beryllium	mg/L	1.1	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Biochemical Oxygen Demand	mg/L		< 2	< 2	< 2	2	2	< 2	< 2	< 2	< 2
Boron	mg/L	0.2	0.043	0.072	0.052	0.073	0.072	0.031	0.11	0.097	0.034
Cadmium	mg/L	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chemical Oxygen Demand	mg/L		31	16	29	24	21	13	33	36	28
Chloride	mg/L		6.6	23	23	20	30	26	20	26	23
Chromium (III)	mg/L	0.0089	(note 1)			< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium (Total)	mg/L		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium (VI)	mg/L	0.001	(note 1)			< 0.0005	< 0.0005	< 0.0005	0.00065	0.00054	< 0.0005
Cobalt	mg/L	0.0009	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.005	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
Dissolved Oxygen	mg/L		5.21	5.37	8.42	7.14	11.9	9.69	4.13	5.18	8.31
Ethylbenzene	mg/L	0.008	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Field Conductivity	µS/cm		350.4	390.2	353.2	402	379	407	543	347	457
Field Temperature	°C		5.1	4.9	4.3	6.3	7	6.6	14.91	14.71	12.16
Hardness	mg/L		100	160	180	140	150	200	240	98	750
Iron	mg/L	0.3	< 0.1	< 0.1	< 0.1	0.18	< 0.1	< 0.1	0.16	0.14	0.2
m+p-Xylene	mg/L	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Mercury	mg/L	0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Naphthalene	mg/L	0.007	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Nickel	mg/L	0.025	< 0.001	0.002	0.001	0.002	0.002	0.001	0.002	0.003	0.001
Nitrate	mg/L		< 0.1	0.32	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
o-Xylene	mg/L	0.04	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
pH (Field)	-	6.5-8.5	7.64	7.63	7.31	7.35	7.82	7.72	8.05	9.04	7.83
pH (Lab)	-	6.5-8.5	7.84	8	7.74	8.06	8.33	8.18	8.12	8.86	7.96
Phenols	mg/L	0.001	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Phosphorus (total)	mg/L	0.03	0.15	0.036	0.038	0.032	< 0.03	< 0.03	< 0.03	< 0.03	< 0.03
Potassium	mg/L		1.9	3.9	2.9	4	3.3	2.8	4.7	2.3	2.6
Selenium	mg/L	0.1	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silver	mg/L	0.0001	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Sodium	mg/L		10	27	20	27	39	24	32	42	22
Toluene	mg/L	0.0008	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Dissolved Solids	mg/L		110	225	250	275	250	270	370	205	250
Total Kjeldahl Nitrogen	mg/L		< 0.7	1	< 0.7	< 0.7	< 0.7	< 0.7	0.8	0.8	< 0.7
Total Organic Carbon	mg/L		6.4	5.9	4.8	9.4	9.6	6.1	12	11	7.4
Total Suspended Solids	mg/L		58	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Total Xylenes	mg/L		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc	mg/L	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

PWQO: Provincial Water Quality Objectives
 Highlighted values indicate PWQO exceeded
 Note 1: results for Cr-III and Cr-VI not available

WM-Richmond Landfill
 ECA 1688-8HZNJG
 Table 1: 2020 Pond Sampling Results

Parameter	Units	PWQO	NE Pond 2020-09-17	NW Pond 2020-09-17	SW Pond 2020-09-17	NE Pond 2020-10-21	NW Pond 2020-10-21	SW Pond 2020-10-21	NE Pond 2020-11-04	NW Pond 2020-11-04	SW Pond 2020-11-04
Alkalinity	mg/L			200	130	110	160	170	210	260	180
Aluminum	mg/L	0.075		0.16	0.19	0.057	0.62	0.34	< 0.02	0.34	0.065
Ammonia	mg/L			< 0.15	< 0.15	< 0.15	0.22	3.09	< 0.15	1.18	< 0.15
Unionized Ammonia	mg/L	0.02		< 0.00061	< 0.00061	< 0.00061	< 0.00061	0.0037	< 0.00061	0.0014	< 0.00061
Arsenic	mg/L	0.1		0.002	< 0.001	< 0.001	0.001	< 0.001	< 0.001	0.002	< 0.001
Barium	mg/L			0.084	0.036	0.1	0.057	0.046	0.092	0.13	0.046
Benzene	mg/L	0.1		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Beryllium	mg/L	1.1		< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006
Biochemical Oxygen Demand	mg/L			4	< 2	3	7	4	< 2	6	5
Boron	mg/L	0.2		0.12	0.027	0.074	0.061	0.034	0.084	0.091	0.041
Cadmium	mg/L	0.0002		< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chemical Oxygen Demand	mg/L			68	23	35	54	35	27	52	35
Chloride	mg/L			39	25	61	26	26	40	44	27
Chromium (III)	mg/L	0.0089		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium (Total)	mg/L			< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chromium (VI)	mg/L	0.001		0.00063	0.00071	0.00074	< 0.0005	0.00085	< 0.0005	0.0005	0.0006
Cobalt	mg/L	0.0009		0.0006	< 0.0005	< 0.0005	0.0006	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Copper	mg/L	0.005		< 0.002	< 0.002	0.007	0.002	< 0.002	0.006	< 0.002	< 0.002
Dissolved Oxygen	mg/L	.		5.81	2.39	5.92	6.38	7.37	6.01	5.81	9.21
Ethylbenzene	mg/L	0.008		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Field Conductivity	µS/cm			665	352	299.3	382.1	378.2	537	885	431.2
Field Temperature	°C			17.2	18	9.4	9.3	10.01	4.8	4.5	4.1
Hardness	mg/L			280	110	510	170	150	520	370	160
Iron	mg/L	0.3		0.68	0.26	< 0.1	0.91	0.59	< 0.1	0.71	0.11
m+p-Xylene	mg/L	0.002		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Mercury	mg/L	0.0002		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Naphthalene	mg/L	0.007		< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Nickel	mg/L	0.025		0.002	0.001	0.003	0.002	0.002	0.003	0.003	0.001
Nitrate	mg/L			< 0.1	< 0.1	7.47	< 0.1	< 0.1	0.21	< 0.1	< 0.1
o-Xylene	mg/L	0.04		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
pH (Field)	-	6.5-8.5		6.73	6.72	6.81	6.6	6.72	7.12	6.91	6.77
pH (Lab)	-	6.5-8.5		7.88	8.28	7.7	7.68	7.83	7.84	7.84	7.97
Phenols	mg/L	0.001		< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004
Phosphorus (total)	mg/L	0.03		0.087	< 0.03	0.062	0.15	0.048	< 0.03	0.13	0.061
Potassium	mg/L			8.2	2.6	3.3	8.9	2.9	4.2	13	3.2
Selenium	mg/L	0.1		< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Silver	mg/L	0.0001		< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004
Sodium	mg/L			52	28	37	25	25	38	50	30
Toluene	mg/L	0.0008		< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Dissolved Solids	mg/L			505	185	755	270	220	770	600	240
Total Kjeldahl Nitrogen	mg/L			2.1	0.7	0.8	1.5	1	< 0.7	2.2	0.8
Total Organic Carbon	mg/L			24	9.8	16	16	12	12	17	13
Total Suspended Solids	mg/L			51	< 10	< 10	28	10	< 10	14	< 10
Total Xylenes	mg/L			< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Zinc	mg/L	0.03		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

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PWQO: Provincial Water Quality Objectives
 Highlighted values indicate PWQO exceeded
 Note 1: results for Cr-III and Cr-VI not available



Table 2: 2020 Leachate Sampling Results

Quarterly List					
Reading Name	Units	North Chamber 2020-03-18	North Chamber 2020-06-16	North Chamber 2020-09-17	North Chamber 2020-12-07
1,1,1,2-Tetrachloroethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,1,1-Trichloroethane	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
1,1,2,2-Tetrachloroethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,1,2-Trichloroethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,1-Dichloroethane	mg/L	0.00094	< 0.0025	< 0.0005	< 0.0005
1,1-Dichloroethylene	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
1,2-Dibromoethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,2-Dichlorobenzene (o)	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,2-Dichloroethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,2-Dichloropropane	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
1,3,5-Trimethylbenzene	mg/L	0.0021	< 0.005	< 0.001	0.0019
1,3-Dichlorobenzene (m)	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
1,4-Dichlorobenzene (p)	mg/L	0.0075	< 0.005	< 0.001	0.006
1-Methylnaphthalene	mg/L	0.00051	0.00042	< 0.00005	0.00041
2-Methylnaphthalene	mg/L	0.0006	0.00053	< 0.00005	0.00052
Acenaphthene	mg/L	0.0005	0.00055	< 0.00005	0.00047
Acenaphthylene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Alkalinity	mg/L	1200	1100	280	1200
Ammonia	mg/L	94.3	107	6.72	96.4
Anthracene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Arsenic	mg/L	0.002	0.002	0.001	0.002
Benzene	mg/L	0.0068	0.0027	< 0.0005	0.0053
Benzo(a)anthracene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Benzo(a)pyrene	mg/L	< 0.00001	< 0.000009	< 0.000009	< 0.000009
Benzo(b)fluoranthene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Benzo(e)pyrene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Benzo(g,h,i)perylene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Benzo(k)fluoranthene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Biphenyl	mg/L	0.00016	0.00016	< 0.00005	0.00013
Bromodichloromethane	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Bromoform	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Bromomethane	mg/L	< 0.0013	< 0.013	< 0.0025	< 0.0025
Cadmium	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Carbon Tetrachloride	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Chlorobenzene	mg/L	0.0055	0.0027	< 0.0005	0.0039
Chloroethane	mg/L	0.0028	< 0.005	< 0.001	0.0023
Chloroform	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Chloromethane	mg/L	< 0.0013	< 0.013	< 0.0025	< 0.0025
Chromium	mg/L	0.005	0.006	< 0.005	< 0.005
Chrysene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Cis-1,2-Dichloroethylene	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Cis-1,3-Dichloropropylene	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Cobalt	mg/L	0.0029	0.004	0.0006	0.0035
Copper	mg/L	0.003	< 0.002	< 0.002	0.008
Dibenzo(a,h)anthracene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Dibromochloromethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Dichloromethane	mg/L	< 0.0013	< 0.013	< 0.0025	< 0.0025
Dissolved Organic Carbon	mg/L	38	59	19	48
Ethylbenzene	mg/L	0.01	0.0046	< 0.0005	0.0094
Fluoranthene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Fluorene	mg/L	0.00023	0.00024	< 0.00005	0.00022
Hardness	mg/L	660	450	160	710
Indeno(1,2,3-cd)pyrene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Lead	mg/L	0.0007	< 0.0005	< 0.0005	0.0008
m+p-Xylene	mg/L	0.033	0.021	0.0005	0.031
Mercury	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
Naphthalene	mg/L	0.0068	0.0061	0.0001	0.0054
Nickel	mg/L	0.014	0.019	0.006	0.018
Nitrate	mg/L	< 0.1	< 0.1	< 0.1	< 0.1

Table 2: 2020 Leachate Sampling Results

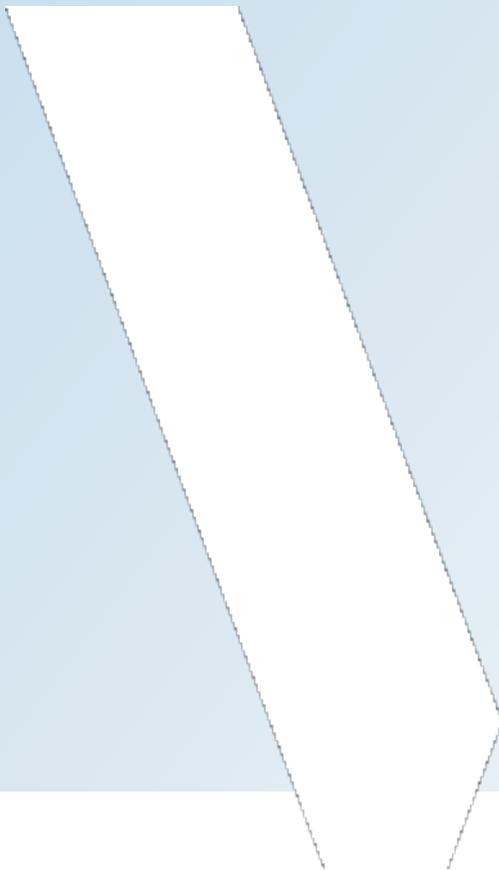
Quarterly List					
Reading Name	Units	North Chamber 2020-03-18	North Chamber 2020-06-16	North Chamber 2020-09-17	North Chamber 2020-12-07
Nitrite	mg/L	< 0.01	0.029	0.017	0.066
o-Xylene	mg/L	0.0098	0.0049	< 0.0005	0.0063
Perylene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
pH (Lab)	unitless	6.97	7.1	8.29	7.12
Phenanthrene	mg/L	0.00018	0.00021	< 0.00003	0.00021
Phenols	mg/L	0.004	< 0.008	< 0.004	< 0.004
Pyrene	mg/L	< 0.00005	< 0.00005	< 0.00005	< 0.00005
Selenium	mg/L	< 0.005	< 0.005	< 0.005	< 0.005
Styrene	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Tetrachloroethylene	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Toluene	mg/L	0.0046	< 0.005	< 0.001	0.0019
Total Kjeldahl Nitrogen	mg/L	93	94	7.5	97
Total Xylenes	mg/L	0.042	0.026	0.0005	0.037
Trans-1,2-dichloroethylene	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Trans-1,3-dichloropropylene	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Trichloroethylene	mg/L	< 0.00025	< 0.0025	< 0.0005	< 0.0005
Trichlorofluoromethane	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Vinyl Chloride	mg/L	< 0.0005	< 0.005	< 0.001	< 0.001
Zinc	mg/L	0.011	< 0.01	< 0.01	< 0.01

Annual List		
Reading Name	Units	North Chamber 2020-07-13
Aluminum	mg/L	0.081
Barium	mg/L	0.093
Beryllium	mg/L	< 0.0006
Biochemical Oxygen Demand	mg/L	6
Boron	mg/L	0.88
Calcium	mg/L	56
Conductivity	$\mu\text{S}/\text{cm}$	2000
Iron	mg/L	3.7
Magnesium	mg/L	36
Manganese	mg/L	0.2
Phosphorus (total)	mg/L	0.24
Silver	mg/L	< 0.0004
Sodium	mg/L	180
Sulphate	mg/L	< 1
Sulphide	mg/L	< 0.02
Total Trihalomethanes	mg/L	< 0.001

APPENDIX

E

MECP PROVINCIAL
OFFICER'S REPORT AND
ORDER – JANUARY 2020



APPENDIX

E-1 *MECP PROVINCIAL OFFICER'S
REPORT NO. 3623-BL33DW, DATED
JANUARY 23, 2020, REGARDING
JANUARY 14, 2020 SPILL OF
LANDFILL LEACHATE; AND
OVERFLOW OF LEACHATE FROM
THE LANDFILL COLLECTION
SYSTEM*

Provincial Officer's Report

Order Number
3623-BL33DW

Waste Management of Canada Corporation
1271 Beechwood Rd
Napanea, Ontario, K7R 3L1
Canada

Site

1271 Beechwood Rd, Lots 1 2 and 3 Concession 4 Richmond
Greater Napanea, County of Lennox and Addington

Observations

1. Definitions:

For the purposes of this Order, the following terms shall have the meanings described below:

"EPA" means the Environmental Protection Act, R.S.O. 1990, c. E.19.

"Ministry" means the Ontario Ministry of the Environment, Conservation and Parks.

"Leachate Storage Lagoon" means the 16, 245 m³ lined leachate lagoon as described in Environmental Compliance Approval 1688-8HZNJG

"North Chamber" means one of two (2) leachate collection sumps at the Site

"Orderee" means Waste Management of Canada Corporation

"OWRA" means Ontario Water Resources Act, R.S.O. 1990, c. O. 40.

"Provincial Officer" means the undersigned Provincial Officer or, in the event that the Provincial Officer is unable to act, any other Provincial Officer authorized to act pursuant to the EPA or OWRA.

"Qualified Consultant" means a person who has obtained the appropriate education and training and has demonstrated experience and expertise in the areas relating to the work required to be carried out in this Order and a person meets the qualifications to be a qualified consultant if a) the person holds a licence, limited licence or temporary licence under the Professional Engineers Act; or b) the person holds a certificate of registration under the Professional Geoscientists Act, 2000 and is a practising member, temporary member or limited member of the Association of Professional Geoscientists of Ontario.

"Site" means the property described as 1271 Beechwood Road, Part of Lots 1, 2 & 3, Concession 4, Town of Greater Napanee on which the Richmond Landfill site is located

"South Chamber" means one of two (2) leachate collection sump pumps at the Site

"Southern Stormwater Management Pond" means the stormwater pond located at the Site that is described in Environmental Compliance Approval 1688-8HZNJG as SWM Pond No. 3

"WMCC" means Waste Management of Canada Corporation.

2. Description of the Site and the Orderee

WMCC owns/operates the Richmond Landfill, municipally located at 1271 Beechwood Rd. in the Town of Greater Napanee, County of Lennox and Addington (the 'Site'). The Site includes an approximately 16 hectare waste disposal site within a total area of approximately 140 hectares consisting of the closed and capped waste landfill mound, associated leachate and landfill gas collection infrastructure, stormwater collection/management network, operational/administration facilities as well as contaminant attenuation lands.

The Site is regulated under the authorization of Environmental Compliance Approvals A371203 (Waste) and 1688-8HZNJG (Stormwater/Leachate Management) which approve in part a leachate collection system consisting of perimeter drainage within the waste mound, two (2) collection sumps hereafter referred to as the North Chamber and South Chamber, and an adjacent 16,245 m³ capacity HDPE-lined storage lagoon. Leachate collected at the Site is pumped directly from the North and South Chambers into approved trucks for offsite disposal, or in emergency situations where off-Site disposal isn't immediately available, to the adjacent storage lagoon via temporary overland piping or truck transfer.

3. Summary of Events leading to issuance of this Order

This Provincial Officer's Report and Order concerns two matters:

- January 14, 2020 Spill of Landfill Leachate, and
- Overflow of Leachate from the Landfill Collection System

i) January 14, 2020 Spill of Landfill Leachate

On January 16, 2020 I spoke via telephone with Bill McDONOUGH, Senior Project Manager with WMCC who advised that on January 14, 2020 approximately 13,000L of landfill leachate was intentionally spilled to ground from a truck hauling the liquid waste to the adjacent storage lagoon. This incident had not previously been reported to the Ministry. Mr. McDONOUGH further advised that the liquid waste had reportedly fully infiltrated into the ground and WMCC would be retaining an environmental consulting firm to attend the Site, assess the spill and conduct sampling to evaluate for impacts. This work is ongoing as of the authoring of this Order.

On January 17, 2020 I attended the Site, spoke with Site foreman/supervisor Stan WALLBANK and inspected the spill area. Upon questioning, Mr. WALLBANK advised that while at the Site on January 12, 2020 he observed elevated levels of leachate within the North and South Chambers corresponding to recent wet weather events. Mr. WALLBANK advised that WMCC was restricted at that time from hauling leachate to the municipal treatment plant in the Town of Greater Napanee. He advised that the Site was only equipped with one portable pump and associated piping and advised that he began to pump leachate from the North Chamber overland via temporary piping into the adjacent storage lagoon.

Mr WALLBANK further advised that because of colder conditions the portable pump and piping froze and so on January 14, 2020 he retained Sutcliffe Septic Service to pump out a load of approximately 13,000L of landfill leachate from the leachate collection system at the Site with the intention of manually transferring the waste via truck to the adjacent storage lagoon. During that transfer Mr. WALLBANK advised that he was contacted by the Sutcliffe Septic Service driver who reportedly determined they would be unable to access the lagoon due to soft ground conditions near the lagoon entrance and further that the driver did not have time to drive the liquid waste into the City of Kingston for disposal at an approved municipal wastewater treatment facility. Mr. WALLBANK advised me that he then instructed the driver to spill the entire 13,000L of leachate to the ground contrary to the *Environmental Protection Act* and associated Environmental Compliance Approval(s) issued for the Site. This was not reported to the Ministry until my telephone conversation with Mr. McDONOUGH two days later.

The intentional spill was reportedly done so that the truck would be free to leave the site and avoid the contents freezing inside the vehicle tank. Based upon my observations and information provided from Mr. WALLBANK however it was apparent other alternatives were not reasonably considered, for instance returning to the collection site and emptying the truck contents back into the leachate collection system, or retaining a second approved hauler to transfer the leachate onto a second vehicle for proper disposal, or re-establishing access to the leachate storage lagoon so that the truck contents could be safely disposed of in the originally intended manner.

Based upon the information obtained surrounding this incident there are concerns identified not only with the incident itself and the potential for impacts to the natural environment resulting from the deposit of approximately 13,000L of leachate onto the ground surface but also concerns with operational matters at the Site with respect to the use of the leachate storage lagoon and related operational deficiencies, including: failure to obtain and maintain sufficient equipment for temporary transfers of leachate to said lagoon, lack of properly engineered infrastructure to safely manage direct leachate transfers on a longer term/permanent basis, failure to inspect and properly

maintain hauling routes, failure to develop appropriate contingencies/protocols in the event of exigent circumstances, along with associated training of staff in relation to contingency measures and reporting requirements.

ii) Overflow of Leachate from the Landfill Collection Sytem

During my discussions with Mr. WALLBANK on January 17, 2020 he further advised that while at the Site on January 12, 2020 he observed leachate from the South Chamber overflowing the sump pit and discharging overland from the South Chamber structure to an area immediately adjacent the Southern Stormwater Management Pond where he advised that it reportedly was infiltrating into the ground. This was not reported to the Ministry forthwith contrary to the requirements of the *Environmental Protection Act* and associated Environmental Compliance Approval(s) issued for the Site.

Per Environmental Compliance Approval 1688-8HZNJG this Southern Stormwater Management Pond passively discharges offsite via drainage ditching to nearby surface water features and ultimately to the local "Marysville Creek" watercourse further downstream. Mr. WALLBANK advised that the Site was only equipped with enough equipment to temporarily pump leachate from one of the chambers at a time and as a result this overflow condition at the South Chamber occurred during his entire time on Site on January 12, 2020 and remained ongoing upon his arrival back on Site on January 13, 2020. He was unable to advise when the overflow began as the Site is not staffed on a 24/7 bases. Mr. WALLBANK advised that on January 13, 2020 he retained the company Sutcliffe Septic Service to pump out one load of approximately 13,000L of landfill leachate from the South Chamber into a truck and manually deposit it into the North Chamber which reportedly stopped the overflow condition from the South Chamber at that time.

Upon further questioning Mr. WALLBANK advised that he had personally observed repeated incidents in the recent past where leachate was found to be overflowing the South Chamber, including on or about January 2, 2020 where he made similar observations of leachate discharging overland from the South Chamber structure and infiltrating into the ground in the vicinity of the adjacent Southern Stormwater Management Pond which flows off the Site. He was again unable to confirm the duration of the spill and this incident was also not reported to the Ministry or publicly per the requirements of the *Environmental Protection Act* and associated Environmental Compliance Approvals issued for the Site.

Mr. WALLBANK advised that excessive leachate volumes in the South Chamber during wet weather events is a recurring issue which he has reportedly raised with senior WMCC officials and believed were likely as a result of excessive precipitation infiltration through the engineered landfill cap or otherwise entering the landfill through the subsurface. This suggestion was supported in a subsequent conversation with Bill McDONOUGH on January 17, 2020 who also advised that WMCC suspected that degradation of the engineered cap was allowing excessive precipitation to infiltrate into the landfill mound resulting in corresponding increases in volumes of leachate generated.

From the information provided from WMCC officials in relation to the leachate collection system at the Site, there are concerns identified with the respect to excessive water infiltration into the landfill mound, potential integrity of the landfill cap and the apparent corresponding increase in the volumes of leachate being produced as a result. 2019 monthly analytical results for combined leachate samples from the North and South Chambers provided by WMCC in response to these incidents were reviewed by Ministry surface and groundwater specialists as part of the Ministry's assessment, and results showed significant elevations of numerous parameters at levels capable of impairing water quality. While weather conditions at the time of these incidents may have resulted in some dilution of the leachate released to the environment, based upon my observations and subsequent discussion with Ministry technical specialists it is the ministry's position that the repeated, uncontrolled and unreported releases of leachate from the South Chamber have the potential to impact the water quality in the adjacent Southern Stormwater Management Pond and impair adjacent surface water features through the passive offsite discharge.

4. Conclusions and Reasons for Order

I am of the opinion, based on reasonable and probable grounds, that WMCC is currently the owner and is in charge, management and control of the Site and the activities thereon.

I am of the opinion, based on reasonable and probable grounds, that WMCC is currently the owner and is in charge, management and control of contaminants, namely landfill leachate, that has and continues to be generated at, on, in or under the Site.

I have reviewed provincial waste databases and determined that regular removal and off Site disposal of landfill leachate is a frequent and continuous activity by WMCC at this Site.

I am of the opinion based upon my observations, information/statements provided by WMCC officials and opinions by Ministry technical specialists that there is an ongoing potential for continued spills from the leachate collection system and migration of leachate contaminants in surface and groundwater which have the potential to adversely affect off Site surface water receptors in the vicinity of the Site, and additionally that WMCC currently lacks the proper equipment, contingencies, operational protocols and training to adequately prevent further environmental incidents with respect to the continued use of the leachate storage lagoon.

For the reasons set out in this Report, I am of the reasonable belief that the Orderee, through ownership and care/control of the Site and of the closed landfill located at the Site, has caused or may cause the discharge of a contaminant, namely landfill leachate, into the natural environment where it has the potential to cause adverse effects in terms of impairment to surface waters.

I reasonably believe that the requirements specified in this Order are necessary or advisable so as to prevent the likelihood of continued spills of landfill leachate and possible offsite migration of potentially impacted stormwater from the Site.

I reasonably believe that WMCC is contravening the provisions, terms or conditions noted below

in the Suspected Violation(s)/Offence(s) section of this Provincial Officer's Report. I also believe that the requirements specified in the attached Order are necessary to address the contraventions.

This Order is being issued pursuant to Sections 157 and 157.1 of the *Environmental Protection Act, R.S.O. 1990* and Sections 16 and 16.1 of the *Ontario Water Resources Act, R.S.O. 1990*. The requirements specified in the order are reasonable and necessary to address the current and potential impacts and adverse effects associated with the continued use of the leachate storage lagoon and control/management of the leachate collection system and associated volumes of leachate generated on Site, and to address the identified contraventions and implement preventative measures to protect public health and the local water resources.

Offence(s)

Suspected Violation(s)/Offence(s):
<p>Act - Regulation - Section, Description {General Offence}</p> <p>1) EPA - 40, No person shall deposit, or cause, permit or arrange for the deposit of, waste upon, in, into or through any land or land covered by water or in any building that was not a waste disposal site for which an environmental compliance approval or renewable energy approval has been issued or a registration under Part II.2 is in effect and except in accordance with the terms and conditions of the approval or the regulations made for the purposes of Part II.2. {186 (1)}</p> <p>2) EPA - 186 (3), Every person who fails to comply with the terms and conditions of an environmental compliance approval, certificate of property use or renewable energy approval or of a licence or permit under this Act or who fails to comply with the terms of a report under section 29 is guilty of an offence {}</p> <p>3) OWRA - 30 (1), discharging or causing or permitting the discharge of a material into a watercourse or in any waters or on any shore or bank thereof or into or in any place, which said discharge may impair the quality of the water of any waters {107 (1)}</p> <p>4) EPA - 92 (1) (a), Every person having control of a pollutant that is spilled and every person who spills or causes or permits a spill of a pollutant shall forthwith notify the following persons of the spill, of the circumstances thereof, and of the action that the person has taken or intends to take with respect thereto: the Ministry. {186 (1)}</p> <p>5) EPA - 93 (1), The owner of a pollutant and the person having control of a pollutant that is spilled and that causes or is likely to cause an adverse effect shall forthwith do everything practicable to prevent, eliminate and ameliorate the adverse effect and to restore the natural environment. {186 (1)}</p>



David Arnott
Provincial Officer
Badge Number:
Date: 2020/01/23
District Office: Kingston District Office

APPENDIX

E-2

*MECP PROVINCIAL OFFICER'S
ORDER NO. 3623-BL33DW, ISSUED
JANUARY 23, 2020*

Provincial Officer's Order

Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA)
Ontario Water Resources Act, R.S.O. 1990, c. O.40 (OWRA)
Pesticides Act, R.S.O. 1990, c. P.11 (PA)
Safe Drinking Water Act, 2002, S.O. 2002, c.32 (SDWA)
Nutrient Management Act, 2002, S.O. 2002, c.4 (NMA)

Order Number
3623-BL33DW

Incident Report No.
5065-BKVRAQ

To: Waste Management of Canada Corporation
1271 Beechwood Rd
Napane, Ontario, K7R 3L1
Canada

Site: 1271 Beechwood Rd Lots 1 2 and 3 Concession 4 Richmond
Greater Napane, County of Lennox and Addington

Pursuant to my authority under OWRA Section 16.1, EPA Section 157.1, OWRA Section 16 and EPA Section 157, I order you to do the following:

Work Ordered

Item No. 1	Compliance Date	2020/01/31 (YYYY/MM/DD)
------------	-----------------	----------------------------

Submit to the Provincial Officer an Action Plan outlining the measures to be taken, and the proposed dates those measures will be taken, to ensure proper assessment, management and handling of landfill leachate generated at the Site (the 'Action Plan'). The Action Plan shall include, but not necessarily be limited to: A) immediate and short-term (no longer than 3 month implementation timeframe) measures to properly assess and manage current leachate volumes generated at the Site including i) appropriate Site staffing to properly monitor the leachate collection system during periods of higher risk such as prolonged weather-related influences, ii) provision of additional equipment to safely handle and transport leachate on-Site to the adjacent Leachate Storage Lagoon in emergency circumstances, iii) contracting of approved waste haulers capable of responding and transporting/disposing of landfill leachate to Ministry-approved facilities, iv) provision of additional training to WMCC Site staff on provincial spills reporting and relevant waste management legislation including the requirements of all Environmental Compliance Approvals issued for the Site, and B) longer-term measures to properly manage, assess and reduce leachate volumes produced at the Site including i) submission of applications for amendments to the Environmental Compliance Approvals for the Site to include any additional works to the existing collection system that may be advisable eg. permanent infrastructure to properly convey leachate from collection system to on-site storage lagoon,

installation of overflow/reserve leachate storage tanks etc. ii) a formal assessment of landfill infiltration including an evaluation of the existing landfill cap by a third party Qualified Person(s) to assess for settlement, shear or tension cracks, landfill gas, or other indications of compromised integrity.

Item No. 2 **Compliance Date** 2020/01/23
(YYYY/MM/DD)

Forthwith discontinue further deposits of landfill leachate to the Leachate Storage Lagoon until such time as the Ministry has given clearance to resume.

Item No. 3 **Compliance Date** 2020/01/27
(YYYY/MM/DD)

Retain the services of a Qualified Person(s) to assess potential groundwater and surface water impacts related to the identified spills of leachate from the South Chamber, and undertake the following work: i) obtain a surface water grab sample from the Southern Stormwater Management Pond and conduct analysis for all parameters identified in Table 2 of Environmental Compliance Approval 1688-8HZNJG in addition to analysis for the compound 1,4-dioxane and Acute Lethality Testing for *Daphnia Magna* and Rainbow Trout, and ii) obtain multi-level groundwater samples from monitoring wells M41, M109 and M9 for the full list of contaminants of concern, including 1,4-dioxane, specified in the current Environmental Monitoring Program for the Site.

Item No. 4 **Compliance Date** 2020/02/10
(YYYY/MM/DD)

Submit to the undersigned Provincial Officer a report prepared by the Qualified Person(s) summarizing and interpreting the results from the sampling conducted in accordance with Item No. 3 above and provide conclusions/recommendations for further assessment if required.

- A. While this Order is in effect, a copy or copies of this order shall be posted in a conspicuous place.
- B. While this Order is in effect, report in writing, to the District or Area office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.
- C. Unless otherwise specified, all requirements of this Order are effective upon service of this Order.

This Order is being issued for the reasons set out in the annexed Provincial Officers Report which forms part of this Order.

Issued at Kingston this 23 rd day of January, 2020.



David Arnott

Badge No:
Kingston District Office
Tel: (613) 540-6899

REQUEST FOR REVIEW

You may request that this Order be reviewed by a Director.

Your request must be made (i) in writing (or if made orally, with written confirmation) and (ii) served on the Director at the address below within seven (7) calendar days after being served with a copy of this Order.

In the written request or written confirmation of an oral request, you must include:

- (a) the portions of the Order in respect of which the review is requested;
- (b) any submissions that you wish the Director to consider; and
- (c) an address for service to be used by the Director.

In response to your request for review, the Director may confirm, alter or revoke this Order and will serve you with a copy of the Director's decision or Order.

A request for review does not automatically stay this Order. If you wish to have the Director stay the Order you must also include this in your request and the Order is not stayed unless the Director makes an order granting a stay.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision on your request for review within (7) calendar days of receipt of your request, and the Director has not stayed the Order, this Order shall be deemed to be confirmed by order of the Director and deemed to be served upon you.

In the case of a deemed confirmation, you may require a hearing before the Environmental Review Tribunal (Tribunal), if, within fifteen (15) calendar days from the deemed date of service of the Director's order, you serve written notice of your appeal on the Tribunal and the Director. Your notice must state:

- (a) the portion(s) of the Order in respect of which the hearing is required; and
- (b) the grounds on which you intend to rely at the hearing.

Except with leave of the Tribunal, you are not entitled to appeal a portion of the Order or to rely on a ground that is not stated in the notice requiring the hearing. Unless stayed by the Tribunal, the Order remains in effect from the date of service.

Written notice requiring a hearing can be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 326-5370
Email: ERTTribunalsecretary@ontario.ca

and

Director
Ministry of the Environment, Conservation and Parks
Kingston District Office
1259 Gardiners Rd, Unit 3
Kingston, ON
K7P 3J6
Fax: (613) 548-6920
Tel: (613)549-4000

Further information on the Tribunal and requirements for an appeal can be obtained directly from the Tribunal by:

Tel: (416) 212-6349 or 1(866) 448-2248
TTY 1-800-855-1155 via Bell Relay

Fax: (416) 326-5370 or 1(844) 213-3474
Web: www.ert.gov.on.ca

FOR YOUR INFORMATION

The following is for your information:

Service of the documentation referred to above can be made personally, by mail, by fax, by commercial courier or by email in accordance with the legislation under which the Order is made and any corresponding Service Regulation. Further information can be obtained from e-Laws at www.e-laws.gov.on.ca. Please note that choosing service by mail does not extend any of the

above mentioned timelines.

Unless stayed, this Order is effective from the date of service. Non-compliance with the requirements of this Order constitutes an offence.

The requirements of this Order are minimum requirements only and do not relieve you from complying with the following:

- (a) any applicable federal legislation,
- (b) any applicable provincial legislation or requirements that are not addressed in this Order, and
- (c) any applicable municipal law.

The requirements of this Order are severable. If any requirement of this Order or the application of any requirement to any circumstances is held invalid, the application of such requirement to other circumstances and the remainder of the Order are not affected.

Further orders may be issued in accordance with the legislation as circumstances require.

The procedures and other information provided above are intended as a guide. The legislation and/or regulations should be consulted for additional details and accurate reference.

APPENDIX

E-3

*AMENDMENT TO MECP PROVINCIAL
OFFICER'S ORDER NO. 3623-
BL33DW, ISSUED JANUARY 27, 2020*

Provincial Officer's Order

Environmental Protection Act, R.S.O. 1990, c. E.19 (EPA)
Ontario Water Resources Act, R.S.O. 1990, c. O.40 (OWRA)
Pesticides Act, R.S.O. 1990, c. P.11 (PA)
Safe Drinking Water Act, 2002, S.O. 2002, c.32 (SDWA)
Nutrient Management Act, 2002, S.O. 2002, c.4 (NMA)

Order Number
3623-BL33DW-1

Incident Report No.
5065-BKVRAQ

To: Waste Management of Canada Corporation
1271 Beechwood Rd
Napanea, Ontario, K7R 3L1
Canada

Site: 1271 Beechwood Rd Lots 1 2 and 3 Concession 4 Richmond
Greater Napanea, County of Lennox and Addington

Pursuant to my authority under OWRA Section 16.1, EPA Section 157.1, OWRA Section 16 and EPA Section 157, I order you to do the following:

Work Ordered

Item No.	Compliance Date
4	2020/02/17 (YYYY/MM/DD)

By February 17, 2020 submit to the undersigned Provincial Officer a report prepared by the Qualified

Person(s) summarizing and interpreting the results from the sampling conducted in accordance with Item No. 3 of Provincial Officer's Order 3623-BL33DW and provide conclusions/recommendations for further assessment if required.

- A. While this Order is in effect, a copy or copies of this order shall be posted in a conspicuous place.
- B. While this Order is in effect, report in writing, to the District or Area office, any significant changes of operation, emission, ownership, tenancy or other legal status of the facility or operation.
- C. Unless otherwise specified, all requirements of this Order are effective upon service of this Order.

This Order amends and constitutes part of Provincial Officer Order Number 3623-BL33DW, issued on 01/23/2020.

This Order is being issued for the reasons set out in the annexed Provincial Officers Report which forms part of this Order.

Issued at Kingston this 27th day of January, 2020.

A handwritten signature in black ink, appearing to read 'David Arnott', with a stylized flourish at the end.

David Arnott

Badge No:

Kingston District Office

Tel: (613) 540-6899

REQUEST FOR REVIEW

You may request that this Order be reviewed by a Director.

Your request must be made (i) in writing (or if made orally, with written confirmation) and (ii) served on the Director at the address below within seven (7) calendar days after being served with a copy of this Order.

In the written request or written confirmation of an oral request, you must include:

- (a) the portions of the Order in respect of which the review is requested;
- (b) any submissions that you wish the Director to consider; and
- (c) an address for service to be used by the Director.

In response to your request for review, the Director may confirm, alter or revoke this Order and will serve you with a copy of the Director's decision or Order.

A request for review does not automatically stay this Order. If you wish to have the Director stay the Order you must also include this in your request and the Order is not stayed unless the Director makes an order granting a stay.

DEEMED CONFIRMATION OF THIS ORDER

If you do not receive oral or written notice of the Director's decision on your request for review within (7) calendar days of receipt of your request, and the Director has not stayed the Order, this Order shall be deemed to be confirmed by order of the Director and deemed to be served upon you.

In the case of a deemed confirmation, you may require a hearing before the Environmental Review Tribunal (Tribunal), if, within fifteen (15) calendar days from the deemed date of service of the Director's order, you serve written notice of your appeal on the Tribunal and the Director. Your notice must state:

- (a) the portion(s) of the Order in respect of which the hearing is required; and
- (b) the grounds on which you intend to rely at the hearing.

Except with leave of the Tribunal, you are not entitled to appeal a portion of the Order or to rely on a ground that is not stated in the notice requiring the hearing. Unless stayed by the Tribunal, the Order remains in effect from the date of service.

Written notice requiring a hearing can be served upon:

The Secretary
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto ON
M5G 1E5
Fax: (416) 326-5370
Email: ERTTribunalsecretary@ontario.ca

and

Director
Ministry of the Environment, Conservation and Parks
Kingston District Office
1259 Gardiners Rd, Unit 3
Kingston, ON
K7P 3J6
Fax: (613) 548-6920
Tel: (613)549-4000

Further information on the Tribunal and requirements for an appeal can be obtained directly from the Tribunal by:

Tel: (416) 212-6349 or 1(866) 448-2248
TTY 1-800-855-1155 via Bell Relay

Fax: (416) 326-5370 or 1(844) 213-3474
Web: www.ert.gov.on.ca

FOR YOUR INFORMATION

The following is for your information:

Service of the documentation referred to above can be made personally, by mail, by fax, by commercial courier or by email in accordance with the legislation under which the Order is made and any corresponding Service Regulation. Further information can be obtained from e-Laws at www.e-laws.gov.on.ca. Please note that choosing service by mail does not extend any of the

above mentioned timelines.

Unless stayed, this Order is effective from the date of service. Non-compliance with the requirements of this Order constitutes an offence.

The requirements of this Order are minimum requirements only and do not relieve you from complying with the following:

- (a) any applicable federal legislation,
- (b) any applicable provincial legislation or requirements that are not addressed in this Order, and
- (c) any applicable municipal law.

The requirements of this Order are severable. If any requirement of this Order or the application of any requirement to any circumstances is held invalid, the application of such requirement to other circumstances and the remainder of the Order are not affected.

Further orders may be issued in accordance with the legislation as circumstances require.

The procedures and other information provided above are intended as a guide. The legislation and/or regulations should be consulted for additional details and accurate reference.

APPENDIX

F

DETAILED CHRONOLOGY OF
SIGNIFICANT LANDFILL
DESIGN AND OPERATION,
AND LAND USE CHANGES,
AND POTENTIAL VOLATILE
ORGANIC COMPOUND
SOURCES AT THE SITE

**Detailed Chronology of Significant Landfill Design & Operation,
and Land Use Changes
Richmond Landfill Site**

8570

Date	Description
1954	• Landfill operations began at the site under Sutcliffe Sanitation Services Limited.
1971	• Service area expanded to include the Town of Napanee and Desoronto.
1971	• Ministry of the Environment (MOE) issued Provisional Certificate of Approval (C of A) No. A371203 for a 10.1 hectare landfill footprint.
1974	• Burning operations ceased at the site.
1979	• Service area increased to include the Town of Picton, Richmond Township, Township of Tyendinaga, North Fredericksburg, Adolphustown and Sophiasburgh. Waste tonnage was also increased.
August 11, 1987	• Landfill site expansion approved to 16.2 hectares and to include the site service area with the Counties of Lennox and Addington, Prince Edward, Hastings and Frontenac.
January 1988	• Tricil Limited purchased the landfill site from Sutcliffe Sanitation Services Limited.
September 1989	• From Aerial photography - landfilling in Phase 1. Sewage lagoon is present and located in Phase 4. All farm buildings exist.
1990	• The site came under ownership of Laidlaw as a result of the acquisition of Tricil Limited.
December 1990	• Landfill operations began in the Phase 2 cell area on prepared clay base.
1991	• Leachate holding lagoon was constructed north of the hydro corridor.
Summer 1993	• Contaminated soil pad constructed to the east of the maintenance building.
1993	• Phase 3 landfill base was constructed during the summer with waste placed in the fall.
September 2, 1994	Notice to amend C of A (Waste) No. A371203 was issued by MOE. The amendment approved the construction and operation of a composting facility.
December 1994	• From aerial photography - landfilling is being completed in Phase 3. Compost pad and sedimentation pond in the northeast (Pond 1) and south (Pond 3) is being constructed; northwest is not constructed and soil stockpile exists on top of Phase 1.
January 24, 1995	C of A (Industrial Sewage No. 4-0129-94-956) issued by MOE. Approval was granted for the oil/water separator at the contaminated soil stockpile.
1995	• Phase 4 Cell was constructed in the summer/fall of 1995 with landfilling commencing in the summer of 1996.
August 1, 1995	Notice to amend C of A (Waste) No. A371203 was issued by MOE. The amendment prohibited leachate recirculation in Phases 1, 2, and 3.
December 1995	• From Aerial photography - landfilling is occurring on the top of Phase 3. Phase 4 recently constructed. Soil stockpile is being constructed on top of Phase 1.
September 1996	• Leachate haulage to Napanee started.
September 11, 1996	Notice to amend C of A (Waste) No. A371203 was issued by MOE. The amendment approved the expansion of the leaf and yard waste facility to an organic waste composting facility.
November 1996	• From Aerial mapping - active area is Phase 4 with soil stockpiled on Phases 1, 2 and 3.
1997	Change in ownership - Canadian Waste Services Inc.
January 1997	• North Leachate Pump chamber installed.
February 1997	• First phase of leachate recirculation system installed in Phase 4.
November 1997	• Landfilling is occurring on the top portion of Phase 4. Contaminated soil stockpile on top of Phase 1 is in place. Sedimentation pond in northwest corner (Pond 2) is not yet constructed.
1998	• Last level of recirculation piping installed in Phase 4.
Summer 1998	• Phase 5 constructed.
Fall 1998	• Installation of temporary gas collection and flaring system to establish gas generation rates - two (2) temporary vertical gas extraction wells, a temporary gas collection trench, and temporary flaring/mechanical system.
November 5, 1998	• Small landfill fire in Phase 5 waste. Soil sampling of adjacent properties indicated no impact to surrounding environment.
December 1998	• From aerial photography - Phase 5 has been constructed and waste placement has begun in Phase 5. Soil is being stockpiled on top of Phases 1, 2 and 3.
1999	• Two (2) levels of leachate recirculation installed in Phase 5
Summer 1999	• Northwest sedimentation pond (Pond 2) constructed.
November 1999	• From Aerial photography - landfilling is occurring in Phase 5. Northwest sedimentation pond (Pond 2) has been constructed. Landfill flare is not in place.
December 21, 1999	C of A (Air) No. 8-4076-99-006 issued by MOE. The certificate was issued for a permanent, enclosed flare.

**Detailed Chronology of Significant Landfill Design & Operation,
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Date	Description
2000	<ul style="list-style-type: none"> • First loads of biosolids received at compost pad for composting.
April to May 2000	<ul style="list-style-type: none"> • Installation of 24 vertical gas extraction wells in landfill mound. Throughout the year, connection of 12 cleanouts and nine (9) leachate manholes, along with the landfill gas wells, to the system occurred.
August 29, 2000	<ul style="list-style-type: none"> • C of A issued by MOE, approving installation of the Phase 1 leachate collection system.
Fall 2000	<ul style="list-style-type: none"> • Leachate collector installed on north and west sides of Phase 1.
December 2000	<ul style="list-style-type: none"> • From aerial photography - landfilling on top of Phase 3. Soil stockpile on top of Phase 1 is being depleted. The peripheral leachate collector on Phase 1 has been constructed. Sedimentation pond in northwest corner (Pond 2) is in place. Flare has been installed.
February 2001	<ul style="list-style-type: none"> • Landfill gas collection and flaring started.
Summer 2001	<ul style="list-style-type: none"> • Leachate collector replaced between Manhole 1 to 4.
July 10, 2001	<ul style="list-style-type: none"> • Landfilling on the north slope of Phase 2.
2002	<ul style="list-style-type: none"> • Condensate drain traps were installed at low points in the gas collection system to reduce the amount of moisture at the flare.
Summer 2002	<ul style="list-style-type: none"> • Leachate collector replaced between Manhole 1 and 7.
July 2002	<ul style="list-style-type: none"> • Landfilling is occurring on the north face of Phase 1. Contaminated soil stockpile on top of Phase 1 is nearly completed.
2003	<ul style="list-style-type: none"> • Change in ownership - Waste Management of Canada Corporation.
2003	<ul style="list-style-type: none"> • High pressure odour misting system installed.
2003	<ul style="list-style-type: none"> • 10 new vertical gas collection well installed.
May 8, 2003	<ul style="list-style-type: none"> • C of A (Air) No. 1355-5LRN9N issued, which revoked the previous C of A. The notice approved the operation of the flare and gas collection system, comprising of a maximum of 54 wells, 12 leachate manholes and 9 cleanouts.
2004	<ul style="list-style-type: none"> • Six (6) new vertical gas collection wells installed.
Spring 2004	<ul style="list-style-type: none"> • Leachate receiving station was constructed in Napanee.
2006	<ul style="list-style-type: none"> • Final year of odour spray system operation.
June 18, 2007	<ul style="list-style-type: none"> • Submission of final closure plan to MOE
2007	<ul style="list-style-type: none"> • three (3) new vertical gas collection wells installed, and five (5) vertical gas collection wells were redrilled. Pumps were also placed in select wells to lower leachate levels and improve gas collection.
Summer 2008	<ul style="list-style-type: none"> • Five (5) vertical gas collection wells were redrilled, and the gas header pipe on the east and west slopes was upgraded from 150mm diameter to 300mm diameter to improve flow and decrease friction loss. Isolation valves were also added at various locations on the gas header.
August 19, 2008	<ul style="list-style-type: none"> • C of A (Industrial Sewage Works) No. 5268-7E8LJW issued, approving upgrades/construction to the south sedimentation pond (Pond 3).
Fall 2008 through Summer 2009	<ul style="list-style-type: none"> • Upgrades/construction of south sedimentation pond (Pond 3).
2009	<ul style="list-style-type: none"> • Landfilling in old access road area - south slope.
July through September 2009	<ul style="list-style-type: none"> • Installation of seven (7) vertical gas extraction wells over the crest of the landfill mound, and redrilling of 12 wells on the upper north, east, and south slopes.
2010	<ul style="list-style-type: none"> • Decommissioning of leachate holding lagoon north of landfill mound.
March 31, 2010	<ul style="list-style-type: none"> • Notice 5 to C of A No. A371203, issued by MOE. The amendment approved the final closure plan, listed a date of closure for the landfill, and dates for completion of final cover installation for various phases of the landfill. The notice also requested the submission of a revised financial assurance calculation, contingency plans, design for the final cover system, design for low permeability liner for compost pad and pond, and revised environmental monitoring plan, by June 30, 2010.
June 25, 2010	<ul style="list-style-type: none"> • Submission of financial assurance plan, final cover construction quality assurance plan, contingency plans for the leachate and landfill gas collection systems, design for low permeability liner for compost pad and pond, and odour monitoring plan, to MOE to satisfy various conditions from March 31, 2010 C of A amendment.
June 29, 2010	<ul style="list-style-type: none"> • Submission of environmental monitoring plan and groundwater/surface water contingency plan, to MOE to satisfy various conditions from March 31, 2010 C of A amendment.
August 25, 2010	<ul style="list-style-type: none"> • Notice 6 to C of A No. A371203, issued by MOE. The amendment approved the construction quality assurance plan for the final cover system.
August 27, 2010	<ul style="list-style-type: none"> • Start of installation of final cover system on Phase 1.

**Detailed Chronology of Significant Landfill Design & Operation,
and Land Use Changes
Richmond Landfill Site**

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Date	Description
October 28, 2010	<ul style="list-style-type: none"> Completion date of final cover placed on entire Phase 1 portion of landfill.
December 2010	<ul style="list-style-type: none"> Submission of phytoremediation plan for northwest corner of property.
Spring 2011	<ul style="list-style-type: none"> Installation of three (3) vertical gas extraction wells.
May 2, 2011	<ul style="list-style-type: none"> Notice 8 to C of A No. A371203, issued by MOE. The amendment approved the construction/operation of the phytoremediation system in the northwest corner of the property.
May 25, 2011	<ul style="list-style-type: none"> Application submitted to MOE requesting continued operation of the public drop off facility.
May 25, 2011	<ul style="list-style-type: none"> Application submitted to MOE requesting that the operation of the stormwater ponds be as designed (free flowing).
June 30, 2011	<ul style="list-style-type: none"> Last load of waste accepted and disposed in landfill mound. Closure of the public drop off facility. Decommissioning of contaminated soil pad.
July 4, 2011	<ul style="list-style-type: none"> Start of installation of final cover system on Phases 2, 3, 4, and 5.
August 2011	<ul style="list-style-type: none"> Decommissioning of compost pad and pond completed.
September 23, 2011	<ul style="list-style-type: none"> Final cover system over entire Phases 2, 3, 4, and 5 completed.
January 9, 2012	<ul style="list-style-type: none"> MOE issues Environmental Compliance Approval (ECA) No. A371203, consolidating the previous C of A and amendments. The permit also approved several submissions from June 2010, subject to various conditions. MOE issues amendment to ECA No. A371203, approving the re-opening of the public drop off facility, subject to conditions.
January 10, 2012	<ul style="list-style-type: none"> MOE issues ECA No. 1688-8HZNJG, consolidating the previous C of As and amendments for Industrial Sewage Works. Approval also granted to allow the stormwater management ponds to operate in a free flowing manner.
February 1, 2012	<ul style="list-style-type: none"> The public drop off facility re-opened to the public, subject to the conditions listed under the amendment to ECA A371203 issued January 9, 2012.
May 3, 2013	<ul style="list-style-type: none"> MOE issues amendment to ECA No. A371203, reflecting the Environmental Review Tribunal (ERT) settlement of five (5) of the seven (7) conditions of the January 9, 2012 ECA that were appealed by the Concerned Citizens' Committee of Tyendinaga and Environs (CCCTE). The notice amended and added conditions regarding the assessment of groundwater monitoring wells, odour monitoring and abatement activities (including frequency of surface emission surveys after 2014), public notification plan, semi-annual and annual monitoring reporting, additional information pertaining to site compliance, and removal of information from the annual monitoring report. Odour monitoring and reporting will follow the "Odour Monitoring Plan - Revision No. 1" and "Odour Survey Protocol" submitted in March 2012 and February 2013, respectively, while implementation of the Public Notification Plan will occur in accordance with the "Public Notification Plan - February 2013".
October 4, 2013	<ul style="list-style-type: none"> MOE issues amendment to ECA No. A371203, approving the March 2013 financial assurance submission, as revised in July 2013. Conditions regarding the amounts of financial assurance to be posted through 2016 were amended.
February 28, 2014	<ul style="list-style-type: none"> The public drop off facility was closed by WM. All approvals remain in place should WM elect to re-open the facility in the future.
April 29, 2014	<ul style="list-style-type: none"> MOE issues ECA (Air) No. 5970-9HKP3V, approving the operation of a candlestick flare. The candlestick flare installation addresses a contingency plan for the landfill gas collection system, in that it would be operational only when the enclosed flare is shut down for maintenance or repair.
June 12, 2014	<p>Application to amend ECA No. A371203 is submitted by WM, for the approval of a cleaning and maintenance schedule for the ditches, culverts, and leachate collection system at the landfill.</p>
January 2015	<ul style="list-style-type: none"> Application to amend ECA No. A371203 is submitted by WM, for the approval of a leachate storage tank to be constructed onsite.
August 14, 2015	<ul style="list-style-type: none"> Ministry of Environment and Climate Change (MOECC) issues Notice 3 to amend ECA No. A371203 reflecting the ERT interim order regarding one of the conditions of the January 9, 2012 ECA that was appealed by the CCCTE. The notice amended the former Environmental Monitoring Plan (EMP) condition, and also Conditions 8.5 (a) i, ii, and iii (EMP and Replacement/Installation/Testing of Monitoring Wells), and adding two (2) conditions to the ECA for protocols of reporting exceedances to the MOECC District Manager, and the reporting of 1,4-dioxane levels.

**Detailed Chronology of Significant Landfill Design & Operation,
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Richmond Landfill Site**

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Date	Description
November 5, 2015	<ul style="list-style-type: none"> MOECC issues Notice 4 to amend ECA No. A371203, reflecting the ERT interim order to amend of the conditions of the January 9, 2012 ECA that was appealed by the CCCTE. The notice amended the date of completion of testing of groundwater monitoring wells M-187 through M-190 to December 1, 2015.
December 24, 2015	<ul style="list-style-type: none"> The ERT issues a decision with an accompanying order regarding the appeal of the January 9, 2012 ECA No. A371203 by the CCCTE. The ERT has ordered that additional field work be completed and a report prepared that is to be provided to all parties to the hearing. The report is to be completed by April 15, 2016. After the report is reviewed, the parties will meet to discuss the contents. After reviewing input from all parties, the MOECC will determine if the Contaminant Attenuation Zone (CAZ) has been adequately defined. If the MOECC agrees the CAZ has been adequately defined, WM will submit the CAZ application. If the MOECC does not agree the CAZ has been adequately defined, more field work will be ordered. The ERT also found that it is unnecessary to maintain a further supervisory role in the matter once the wording of the ECA conditions and EMP provisions has been finalized.
April 14, 2016	<ul style="list-style-type: none"> The ERT issues a decision with an accompanying order regarding the appeal of the January 9, 2012 ECA No. A371203 by the CCCTE. The order included the ERT's acceptance of the final wording of the remaining appealed ECA conditions and EMP provisions that was proposed on consent of all parties. The ERT concluded that it was not necessary to include one additional sentence that was proposed by the CCCTE. The ERT granted a request by WM to extend the date set out in Condition 8.5(e) from April 15, 2016 to June 15, 2016 to allow WM to complete the work required under that condition without being out of compliance. The ERT also directed the MOECC Director to make amendments to the ECA in accordance with the ERT's decision.
April 15, 2016	<ul style="list-style-type: none"> MOECC issues Notice 5 to amend ECA No. A371203. This Notice revoked and replaced Conditions 8.2 (groundwater well assessment) and 8.5 d (odour monitoring plan references). The Notice also replaces Items 56, 57, and 58 in Schedule 'A' with Items 56 (November 2014 Odour Monitoring Plan) and Item 57 (February 2013 Odour Monitoring Plan).
June 15, 2016	<ul style="list-style-type: none"> MOECC issues Notice 6 to amend ECA No. A371203. This Notice is based on the ERT order issued on April 14, 2016, and addresses the remaining conditions in the appeal of the January 9, 2012 ECA No. A371203 by the CCCTE. The Notice includes the submission of a revised EMP based on the August 2015 Interim EMP and updated to include (1) one year conductivity monitoring of Marysville Creek; (2) if specified parameters listed in the EMP are detected, assessment of the need to install additional nested monitoring wells in the vicinity of Marysville Creek; (3) the need for testing of domestic and agricultural wells on properties south of Highway 401 at locations and for paraters listed in the EMP; (4) a revision in the timing of confirmation resampling as listed under groundwater trigger mechanisms in the EMP; and (5) the establishment of a Reasonable Use Limit for 1,4-dioxane. Monitoring of the site now follows the schedule listed in the Interim EMP. Along with conditions outlining the process of delineating offsite leachate impacted groundwater or surface water, and meetings and timeframes with the MOECC and interested parties to discuss the delineation process, a condition was included ordering WM to complete a study on the hydrogeological impacts of a pipeline running under the northern part of the properties present south of the site and the submission of a report of the findings by June 15, 2016. The Notice also address compliance criteria, water supply to specified residences, approves groundwater and surface water contingency plans, and denies the use of a fracture trench as listed in the Leachate Collection System Contingency Plan. Finally, the notice stated the ERT was no longer required to supervise or participate in the CCCTE appeal of the ECA, subject only to the ERT's determination of the final wording of the ECA conditions and EMP provisions as outlined in the order. MOECC issues Notice 6 to amend ECA No. A371203. In addition to the order issued by the ERT as listed above, the Notice also addressed the approval of two (2) ECA applications pertaining to cleaning of the leachate collection system, ditches and culverts, and the proposed leachate storage tank construction. The Notice includes the approval of a leachate storage tank, revises the cleaning and inspection frequency of the leachate collection system along with ditches and culverts, and updates the condition number pertaining to odour monitoring. Several items were also added to Schedule 'A', including the ERT order.

**Detailed Chronology of Significant Landfill Design & Operation,
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Richmond Landfill Site**

8570

Date	Description
June 24, 2016	Application to amend ECA No. A371203 is submitted by WM, requesting a reduction in the frequency of surface emission events conducted at the site. The request is permitted under a condition of the aforementioned ECA, so long as readings from 2013 and 2014 surface emission survey events do not exceed 500 parts per million by volume of methane.
July 14, 2017	<ul style="list-style-type: none"> • MOECC issues consolidated ECA No. A371203. This ECA consolidates all amendments issued since January 9, 2012, and revoked/replaced the previous ECA. The ECA also approved the financial assurance re-evaluation submitted by WM on March 30, 2016, and revised Conditions 2.5, 2.6, and 2.7, pertaining to amounts of financial assurance to be posted within 20 days of ECA issuance and for calendar years 2018, 2019 and 2020, and also revised the condition which specifies the date of submission for the next updated financial assurance re-evaluation. • MOECC issues consolidated ECA No. A371203. In addition to the items listed previously under this date, the MOECC issues approval of the June 24, 2016 application to reduce the frequency of surface emission events conducted at the site. The consolidated ECA includes the addition of "Odour Monitoring Plan - Revision No. 3" (included as part of the June 2016 application package) to Schedule "A" items, and permits WM to no longer perform surface emission events three (3) times per calendar year. A condition was added to the ECA that in the event of odour detection at or greater than three (3) "intensity units" (based on the scale listed in the Odour Monitoring Plan), and the landfill mound is determined to be the source of the odour, repairs will be undertaken and a surface emission event will be performed to confirm there are no exceedances of the 500 ppmv methane threshold emitting from the repaired area.
August 2019	<ul style="list-style-type: none"> • WM receives approval to discharge leachate at the Ravensview sewage treatment plant in Kingston, ON. This facility will be used as a contingency should the Napanee sewage treatment plant not be available.
January 14, 2020	<ul style="list-style-type: none"> • Application to amend ECA No. A371203 is submitted by WM, for the approval of amendments (removal/revisions) of several ECA conditions, to better reflect the operation of a closed landfill site.
April 15, 2020	<ul style="list-style-type: none"> • Application to amend ECA No. A371203 is submitted by WM, to request approval of the forcemain between pumping chamber PS2 and the leachate holding lagoon.
April 30, 2020	<ul style="list-style-type: none"> • Application to amend ECA No. A371203 is submitted by WM, to request approval of various changes to the previously approved leachate storage system under Condition 5.5. Changes include an increase in the size and type of storage tank, among other items.

The potential sources of Volatile Organic Compounds (VOCs) on the landfill site include the following:

- The unlined Phase 1 area of the landfill, operated since 1954 until site closure in 2011;
- Maintenance shop located south of the landfill footprint (date of initial operation unknown);
- Sewage lagoon operated by Sutcliffe Sanitation, located on the south side of the landfill in the area now covered by Phase 4 (date of initial operation unknown, but decommissioned in 1990 prior to Phase 2 construction of the landfill);
- Stormwater runoff from the contaminated soil pad constructed in 1993, located to the east of the maintenance shop;
- Historic sporadic leachate seep breakouts (typically along the south and northwest sides of the landfill);
- Septic sewage systems with distribution tile fields, located east of the scalehouse and maintenance shop (dates of installation unknown); and
- Former abattoir located immediately south of the site (operated from the mid-1960s to early 2000s).

During 2020, work was completed to confirm the integrity of the leachate holding lagoon. Development of a Contaminant Attenuation Zone with the MECP is ongoing.

APPENDIX

G

STATEMENT OF
COMPLIANCE - 2020
ENVIRONMENTAL
MONITORING AND
REPORTING, PREPARED BY
BLUMETRIC
ENVIRONMENTAL INC.



MEMORANDUM

Date: 16 March 2021
To: Bill McDonough, Waste Management (WMCC)
Cc: Chris Prucha and Jim Forney (WMCC) and Beverly Leno, WSP Canada Inc.
From: François Richard and Madeleine Corriveau, BluMetric Environmental Inc.
Project No: 210166-03
Re: Statement of Compliance, 2020 Environmental Monitoring and Reporting
WMCC Richmond Landfill, Town of Greater Napanee, Ontario

Condition 14.3 paragraph xxi of Environmental Compliance Approval (ECA) No. A371203 dated July 14, 2017 for the Waste Management of Canada Corporation (WMCC) Richmond Landfill requires that the Annual Report includes a statement of compliance with all conditions of the ECA and other relevant Ontario Ministry of Environment, Conservation and Parks (MECP) groundwater and surface water requirements. BluMetric Environmental Inc. is contracted by WMCC to complete the environmental monitoring program at the landfill, and to prepare the Semi-Annual Monitoring Reports as required by Condition 14.1 of the ECA. The purpose of this memorandum is to provide a statement of compliance with the environmental monitoring and reporting requirements of the ECA.

During the 2020 calendar year, the environmental monitoring program was conducted in accordance with the Environmental Monitoring Plan (EMP) for the site (Interim EMP revision 05, dated April 15, 2016). Any specific exceptions to the sampling program (i.e., dry or damaged monitoring wells, dry surface water locations, etc.) are described in the Spring and Fall 2020 Semi-Annual Monitoring Reports dated July 2020 and January 2021, respectively.

Both 2020 Semi-Annual Monitoring Reports were submitted to MECP and other stakeholders in compliance with Condition 14.1 of the ECA. The reports were also posted by WMCC on a publicly accessible website.

The Semi-Annual Monitoring Reports include an assessment with regard to the compliance of groundwater quality in comparison to MECP Guideline B-7. The reports also include a statement of compliance of the monitoring well conditions to Ontario Regulation 903.



Tel. 613-531-2725
Fax. 613-531-1852

BluMetric Environmental Inc.

The Tower, The Woolen Mill, 4 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

We trust you will find this statement of compliance with the environmental monitoring and reporting requirements of ECA No. A371203 to be satisfactory.

If you have any questions regarding the above information, please contact the undersigned anytime.

Respectfully submitted,
BluMetric Environmental Inc.



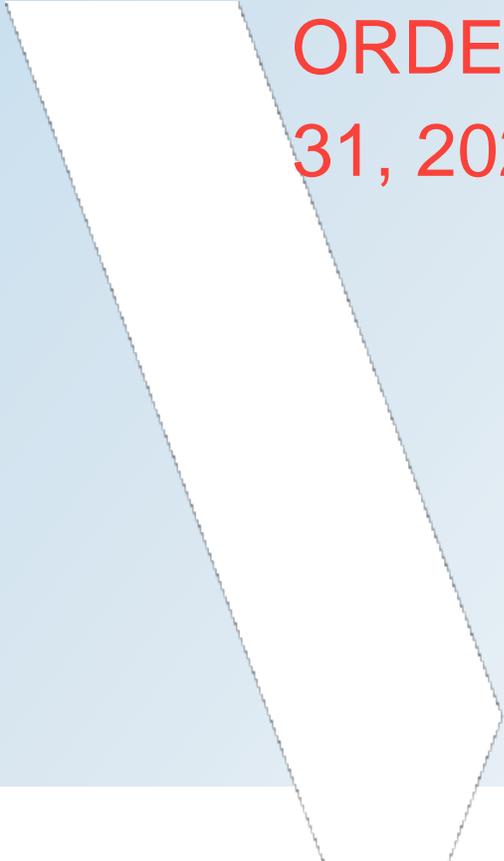
François A. Richard, P.Geo., Ph.D.
Senior Hydrogeologist



Madeleine Corriveau, M.Sc., P.Geo.
Senior Geoscientist

APPENDIX

H WM ACTION PLAN IN
RESPONSE TO MECP
PROVINCIAL OFFICER'S
ORDER, DATED JANUARY
31, 2020





January 31, 2020

Waste Management Richmond Landfill

1271 Beechwood Road

Napanee, ON K7R 3L1

Waste Management of Canada Corporation (“Waste Management”) response to Provincial Officer’s Order 3623-BL33DW (“POO”)

Incident Report 5065-BKVRAQ

In response to requirements in the POO, listed below are the items requiring a response on January 31, 2020. The MECP identified requirements are in *italics* followed by Waste Management’s response in normal text.

Item #1 – Compliance Date January 31, 2020

Short Term Action Plan

- i) *Additional site staffing to monitor the leachate collection system during prolonged adverse weather events:*

When site staff are not available during such events, a knowledgeable consultant or contractor will be available to monitor the leachate sumps to ensure that the necessary steps are taken to avoid having them overflow. Until such time as an automated control system that has automatic alarms to notify off-site staff is in place for the leachate collection system, site staff will record sump leachate levels on a daily basis Monday through Friday. Sutcliffe is available to haul leachate to Napanee on Saturday and Sunday when it is necessary.

- ii) *Provision of additional equipment to safely handle and transport leachate on-site to the adjacent leachate storage lagoon in emergency circumstances:*

Currently the only feasible way to get leachate to the storage lagoon is by pumping the leachate through a pipe. This pipe is above ground and freezes in the winter. When the lagoon was constructed there was a gravel road connecting the lagoon to Derseronto Road. The base of the old road is still in place to some degree and allows trucks to reach the lagoon during times of the year when the

field is dry to remove leachate from the lagoon. Waste Management will evaluate the feasibility of restoring the road to the lagoon to a roadway that can be used year around. Until the road is upgraded it can only be used to transport leachate when weather conditions allow.

In the short-term Waste Management is renting two frac tanks, a pump, and hoses to be placed near the front sump. This equipment will provide 150 m3 of leachate storage to be used in emergencies when nothing else is available. The two frac tanks, pump and hoses are on-site as of Friday, January 31.

As part of our longer term plans Waste Management is submitting an ECA application to be able to bury the pipe to the lagoon so that it can be used all year and pump leachate both to the lagoon from the landfill and back to the leachate storage tank on the south side of the landfill for removal from the site to an approved WWTP. As directed by the MECP, Waste Management will not be using the leachate lagoon until its use is approved by the MECP.

iii) Contracting of approved waste haulers capable of responding and transporting/disposing of landfill leachate to Ministry-approved facilities:

Tomlinson Environmental, an MECP approved waste hauler, out of Kingston has been contracted as an additional hauler to remove leachate from the Richmond Landfill. They have been on-site and removing leachate since January 20, 2020. They will haul the leachate to the Kingston Ravensview WWTP or to Napanee. They will haul leachate as necessary to maintain capacity in the landfill for rainfall events. Ravensview is available Monday through Friday from 8:30 AM to 3:30 PM.

Sutcliffe Septic Tank Pumping has been hauling leachate from the landfill to Napanee since the leachate collection system was installed. They are located just to the east of the landfill. They will continue hauling leachate from the landfill to Napanee as our primary leachate hauler. They will haul up to 8 loads a day. Each load is about 15 m3. Napanee is available daily and on weekends, with advance notice, except when they must shut us off due to high flows into their treatment plant.

iv) Provision of additional training to Waste Management site staff on provincial spills reporting and relevant waste management legislation including requirements of all Environmental Compliance Approvals issued for the site:

Waste Management on-site staff that are associated with the landfill will be retrained on all aspects of provincial spill reporting and relevant waste management legislation including requirements of all ECA's issued for the site. In addition, all contractors working on the landfill site will be required to have the

same training. Employees will be required to be retrained by February 7, 2020 and all contractors working on the landfill site will be required to be trained before starting work on the site.

Longer Term Measures to manage, assess, and reduce leachate volumes produced at the Site

- i) *Submission of applications for amendments to the Environmental Compliance Approval for the site to include any additional works to the existing leachate collection system that may be advisable such as permanent infrastructure to convey leachate from collection system to on-site storage lagoon and installation of overflow/reserve leachate storage tanks:*

Waste Management has MECP approval for installation of the leachate system upgrade and the installation of a leachate storage tank. This work is anticipated to be completed by the end of 2020. In addition, WSP has been retained by Waste Management to prepare an ECA application and construction plans for a permanent buried pipe to convey leachate from the landfill to the lagoon and back. WSP has also been retained to prepare an ECA application and design and construction plans for a second underground storage tank to increase the on-site storage, if it is determined that is necessary. WSP has targeted April 15, 2020 as the date to submit the ECA application for these two items.

- ii) *Formal assessment of landfill infiltration including an evaluation of the existing landfill cap by a third party qualified person to assess for settlement, shear or tension cracks, landfill gas or other indications of compromised integrity:*

BluMetric has been retained by Waste Management to evaluate the integrity of the existing landfill cap. The evaluation will include an examination of infiltration of precipitation into the landfill. This evaluation will occur after the spring thaw once the cap has dried out. BluMetric has committed to have the evaluation completed by June 15, 2020.

If you have any additional comments or questions, please let me know.

Bill McDonough

Senior Project Manager

wmcdonou@wm.com

Waste Management

8039 Zion Line

Watford ON N0M 2S0

Cell: 226 280-1795

APPENDIX

I

WM RESPONSE TO ITEMS 3
AND 4 OF MECP PROVINCIAL
OFFICER'S ORDER NO. 3623-
BL33DW

APPENDIX

I-1

WM NOTICE TO LOCAL COMMUNITIES AND SURROUNDING NEIGHBOURS, DATED FEBRUARY 3 AND 4, 2020, WITH INITIAL TEST RESULTS PERTAINING TO LEACHATE OVERFLOWS AND SPILLS AT RICHMOND LANDFILL; AND RESULTS OF MOST RECENT SURFACE WATER SAMPLING EVENTS COMPLETED ON JANUARY 16, 17, AND 23, 2020



Notice to Local Communities and Surrounding Neighbors

February 3, 2020

Regarding leachate overflows and spills at Richmond Landfill

With initial test results

You are receiving this letter to notify you that due to heavy rains in early January of this year Richmond landfill experienced overflows of its south leachate sump. The overflows started on January 2, 2020 and January 12, 2020. The site had over 50 mm of rain on January 11, 2020. The quantity of leachate that overflowed and the duration are not know.

The overflow was observed to go into a wetland area south of the sump and then into on-site stormwater ponds. The ponds have been sampled. Final results will be provided to the MECP and the public when they are received.

Initial test results that have been received concerning the spill on January 14, 2020 and the overflows in January indicate that there are no off-site impacts on any neighboring property or in Marysville Creek or Beechwood ditch with the exception of a slight ammonia exceedance in Marysville Creek.

If you have comments or questions on this you contact by letter, email, or phone.

Bill McDonough, Site Manager

Richmond Closed Landfill

1271 Beechwood Road

Napanee, ON K7R 3L1

Email: wmcdonou@wm.com

Cell Phone: 226 280-1795



February 4, 2020

Dear All:

You are receiving this communication to keep you apprised of the status of the ongoing environmental monitoring activities associated with the closed Waste Management (WM) Richmond Landfill property.

Under the Environmental Compliance Approval conditions set forth in the Environmental Monitoring Plan dated April 15, 2016, WM has notified the District Manager and the Ministry of the Environment, Conservation and Parks (MECP) of the results from the most recent surface water sampling events conducted on January 16, 17 and 23, 2020.

As members of the community, we would like to provide you with a summary of these findings, which are as follows:

There were no exceedances to Provincial Water Quality Objectives (PWQO) at the downstream surface water sampling locations, with the exception of two locations that measured slightly above their respective PWQO limits for non-health related parameters. These include unionized ammonia at two locations (0.021 and 0.028 mg/L compared to the PWQO of 0.02 mg/L) and total phosphorus at the same location as one of the unionized ammonia exceedances (0.036 mg/L vs. PWQO of 0.03 mg/L). Similar results for these constituents have been observed sporadically in the past during surface water sampling, including background sampling locations, upstream from the landfill.

Regards,

Bill McDonough, Site Manager
Richmond Closed Landfill
Waste Management of Canada Corporation
Email: wmcdonou@wm.com
Cell Phone : 226 280-1795

APPENDIX

I-2

*MEMORANDUM: REPORT TO
SATISFY ITEM NO. 4 OF PROVINCIAL
OFFICER'S ORDER 3623-BL33DW,
WASTE MANAGEMENT RICHMOND
LANDFILL, TOWN OF GREATER
NAPANEE, PREPARED BY
BLUMETRIC ENVIRONMENTAL AND
DATED FEBRUARY 17, 2020*



MEMORANDUM

DATE: 17 February 2020
TO: Chris Prucha, Bill McDonough and Jim Forney, Waste Management (WM)
CC:
FROM: Madeleine Corriveau & François Richard, BluMetric Environmental Inc.
PROJECT NO: 200172-03
SUBJECT: Report to Satisfy Item No. 4 of Provincial Officer's Order 3623-BL33DW,
Waste Management Richmond Landfill, Town of Greater Napanee

This report has been prepared as required by Item No. 4 of Provincial Officer's Order (POO) 3623-BL33DW issued on January 23, 2020 and amended on January 27, 2020. It provides a summary and interpretation of results from the sampling conducted in accordance with Item No. 3 of the POO, as well as conclusions and recommendations for further assessment. Note that additional sampling requested by MECP Provincial Officer David Arnett (email dated January 30, 2020) was completed on January 31, 2020. Results from this sampling event are expected by February 18, 2020 and will be reported as soon as possible thereafter.

Item No. 3 of the POO required the following sampling and analyses, associated with the South Chamber leachate sump:

- Surface water grab sample from the Southern Stormwater Management Pond (SW Pond) for analysis of Table 2 from ECA 1688-8HZNJG; 1,4-dioxane; and, acute lethality testing for Rainbow Trout and *Daphnia magna*.
- Groundwater samples from monitoring wells M9-2, M9-3, M41, M109-1 and M109-2 for analysis of Tables 3 and 4 from the latest Environmental Monitoring Program for the Site¹.

All sampling was completed on January 27, 2020.

¹ *Environmental Monitoring Plan, WM Richmond Landfill, Town of Greater Napanee, Ontario, rev. No.05*, prepared by BluMetric Environmental Inc., dated April 2016



Tel. 613-531-2725

Fax. 613-531-1852

BluMetric Environmental Inc.

The Tower, The Woolen Mill, 4 Cataragui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

RESULTS & INTERPRETATION

Surface Water

Surface water quality results for the SW Pond are summarized in Table 1. The concentration of total phosphorous was slightly above PWQO. All other parameters were within PWQO. 1,4-dioxane was less than the reportable detection limit of 0.001 mg/L. Based on historical monitoring results, total phosphorus has been shown to exceed PWQO limits sporadically, in the SW Pond and at surface water monitoring station S5 (Attachment 1) located upstream of the SW Pond. The slight exceedance in the SW pond is consistent with historical observations and is likely not attributed to landfill leachate impacts which would otherwise be indicated by the presence of elevated concentrations of other leachate constituents.

Acute Lethality Testing results for the SW Pond indicated 0% mortality for both Rainbow Trout and *Daphnia magna* (see Attachment 2).

Groundwater

Groundwater quality results for monitoring wells M9-2, M9-3, M41, M109-1 and M109-2 (see Figure 1) are summarized in Table 2 and time-series graphs presenting historical data for select parameters are provided in Attachment 1. Results for this sampling event are consistent with historical groundwater monitoring results.

Table I: Surface Water Quality Results

Parameter	Units	PWQO	SW Pond 2020-01-27	Parameter	Units	PWQO	SW Pond 2020-01-27
Inorganic/General Parameters				Metals			
Alkalinity	mg/L		180	Aluminum	mg/L		0.063
Ammonia	mg/L		< 0.15	Arsenic	mg/L		< 0.001
Ammonia (unionized)	mg/L	0.02	< 0.00061	Barium	mg/L		0.037
Carbonaceous BOD	mg/L		< 2	Beryllium	mg/L		< 0.0006
Chemical Oxygen Demand	mg/L		8.9	Boron	mg/L	0.2	< 0.02
Chloride	mg/L		17	Cadmium	mg/L		< 0.0001
Dissolved Oxygen	mg/L		6.41	Chromium (III)	mg/L	0.0089	< 0.005
Naphthalene	mg/L	0.007	< 0.00005	Chromium (Total)	mg/L		< 0.005
Nitrate	mg/L		< 0.1	Chromium (VI)	mg/L	0.001	< 0.0005
pH (Lab)	unitless	6.5-8.5	7.64	Cobalt	mg/L	0.0009	< 0.0005
Phenols	mg/L	0.001	< 0.004	Copper	mg/L	0.005	< 0.002
Phosphorus (total)	mg/L	0.03	0.039	Iron	mg/L	0.3	0.14
Total Dissolved Solids	mg/L		225	Mercury	mg/L		< 0.0002
Total Kjeldahl Nitrogen	mg/L		< 0.7	Nickel	mg/L	0.025	< 0.001
Total Organic Carbon	mg/L		4.8	Potassium	mg/L		2.8
Total Suspended Solids	mg/L		< 10	Selenium	mg/L		< 0.005
Volatile Organic Compounds (VOCs)				Silver	mg/L		< 0.0004
1,4-Dioxane	mg/L	0.02	< 0.001	Sodium	mg/L		16
Benzene	mg/L		< 0.0002	Zinc	mg/L	0.02	< 0.01
Ethylbenzene	mg/L		< 0.0002	Field Parameters			
m+p-Xylene	mg/L		< 0.0002	pH (Field)	unitless		6.31
o-Xylene	mg/L		< 0.0002	Field Conductivity	µS/cm		310
Toluene	mg/L		< 0.0002	Field Temperature	Celsius		1.2
Total Xylenes	mg/L		< 0.0002	Toxicity			
Exceeds PWQO				Rainbow Trout Mortality*	%		0
				Daphnia magna Mortality**	%		0
				*96-hour 100% Effluent Concentration Acute Lethality Test			
				**48-hour 100% Effluent Concentration Acute Lethality Test			



Table 2: Groundwater Quality Results

Parameter	Units	M109-1	M109-2	M41	M9-2	M9-3
		2020-01-27	2020-01-27	2020-01-27	2020-01-27	2020-01-27
General/Inorganic Parameters						
Alkalinity	mg/L	560	260	440	500	350
Ammonia	mg/L	1.33	1.57	< 0.15	0.85	0.96
Boron	mg/L	0.33	0.99	0.057	0.23	0.38
Calcium	mg/L	140	35	150	120	66
Chloride	mg/L	150	110	160	110	94
Conductivity	µS/cm	1400	880	1500	1300	970
Dissolved Organic Carbon	mg/L	7.6	1.5	3.1	6.2	2.9
Iron	mg/L	14	< 0.1	0.33	10	2
Magnesium	mg/L	42	25	78	31	29
Manganese	mg/L	0.33	0.002	0.042	0.38	0.094
Nitrate	mg/L	< 0.1	< 0.1	2.02	< 0.1	< 0.1
Nitrite	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Potassium	mg/L	6.9	14	14	5.4	15
Sodium	mg/L	100	95	46	77	68
Sulphate	mg/L	1.4	9	98	3.6	2.9
Total Dissolved Solids	mg/L	820	460	885	700	490
Volatile Organic Compounds (VOCs)						
1,1,1,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,1-Trichloroethane	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,2-Trichloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1-Dichloroethane	mg/L	< 0.0001	< 0.0001	0.00014	0.00038	0.0002
1,1-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001	0.00011	< 0.0001
1,2-Dichlorobenzene (o)	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dioxane		0.021	< 0.001	< 0.001	0.015	0.005
Benzene	mg/L	0.00014	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chlorobenzene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L	0.0088	< 0.0002	< 0.0002	0.021	0.0074
Chloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dichloromethane	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
m+p-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
o-Xylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Styrene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Xylenes	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L	< 0.0002	< 0.0002	< 0.0002	0.00025	< 0.0002

CONCLUSIONS & RECOMMENDATIONS

Results from this sampling program indicate no adverse impact to surface water or groundwater as a result of leachate overflow from the South Chamber.

Weekly surface water sampling at location S8R has been initiated by WM. Sampling location S8R is located along Beechwood Ditch near the downstream property boundary. Samples are being analyzed for the list of surface water parameters from the Environmental Monitoring Plan (EMP Table 8)¹. Results from this sampling location represent surface water quality leaving the site. It is recommended that weekly sampling continue for a period of six weeks at which point the need to continue weekly sampling will be re-evaluated and discussed with MECF.

It is recommended that each of the five monitoring wells sampled as part of this investigation be sampled for the same suite of parameters during the next routine monitoring event (typically scheduled for April) to ensure no significant concentration increases resulting from the leachate overflow are identified. Intermediate groundwater monitoring wells M9-2, M9-3 and M109-1 are part of the routine semi-annual EMP monitoring program; shallow groundwater monitoring well M41 and intermediate groundwater monitoring well M109-2 will be added to this monitoring event.

CLOSING

We trust the above is satisfactory at this time. If you have any questions or need further information please do not hesitate to contact the undersigned.

Respectfully submitted,
BluMetric Environmental Inc.



Francois Richard, Ph.D. P.Geo.
Senior Hydrogeologist



Madeleine Corriveau, M.Sc., P.Geo.
Senior Geoscientist

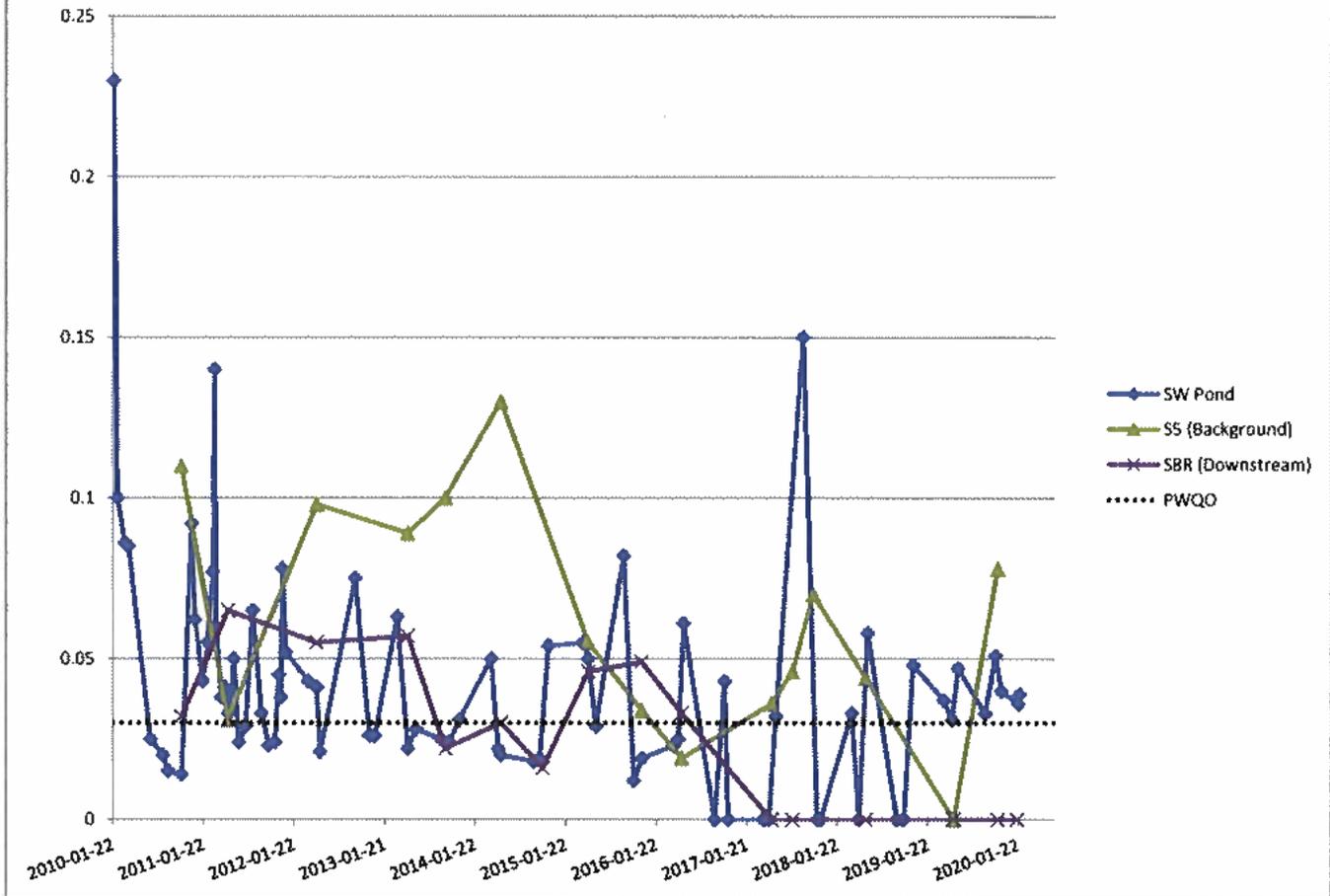
Encl.
Figure 1: Site Plan and Sampling Locations
Attachment 1: Historical Water Quality Results
Attachment 2: Acute Lethality Bioassay Report

FIGURE

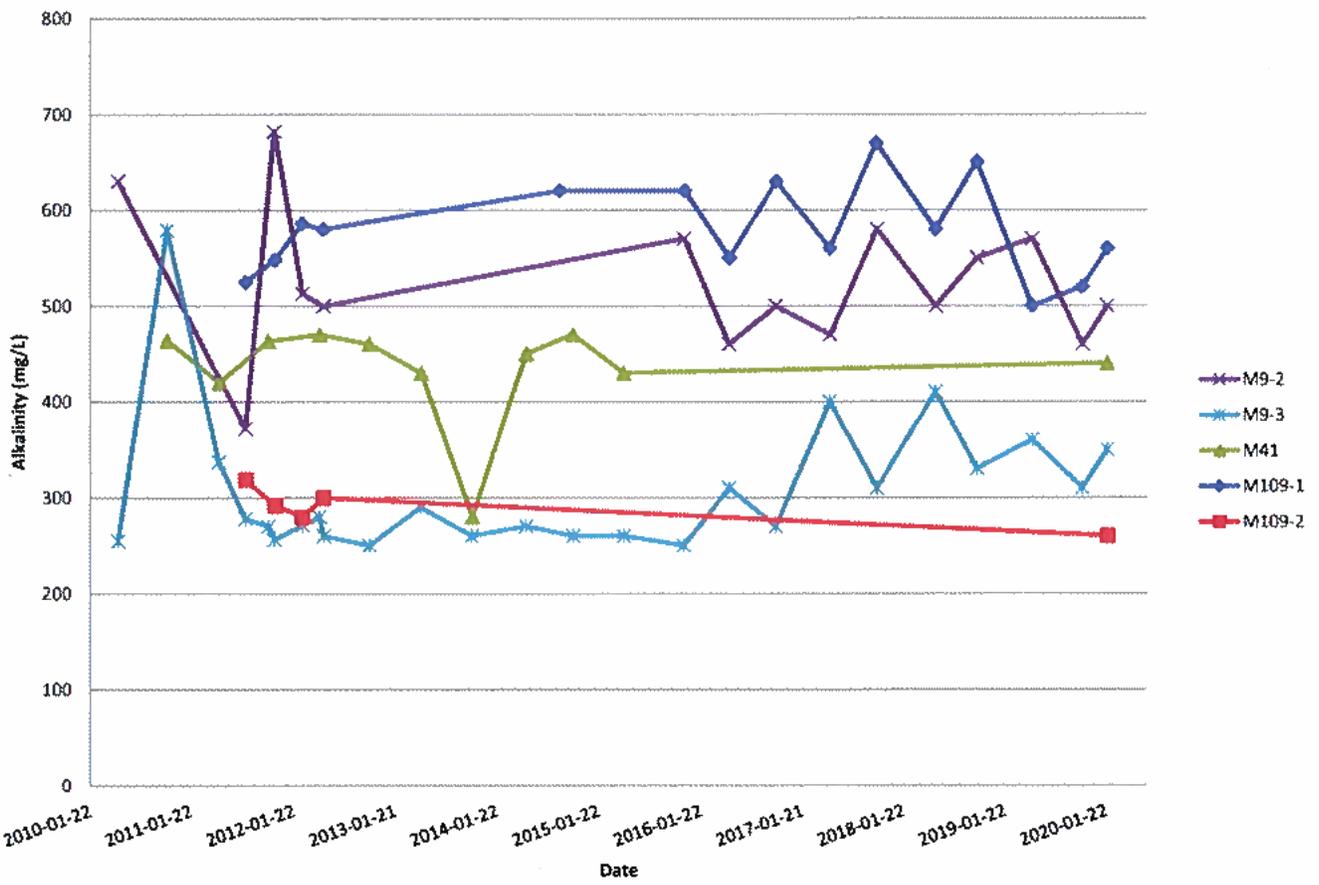
ATTACHMENT 1

Historical Water Quality Results

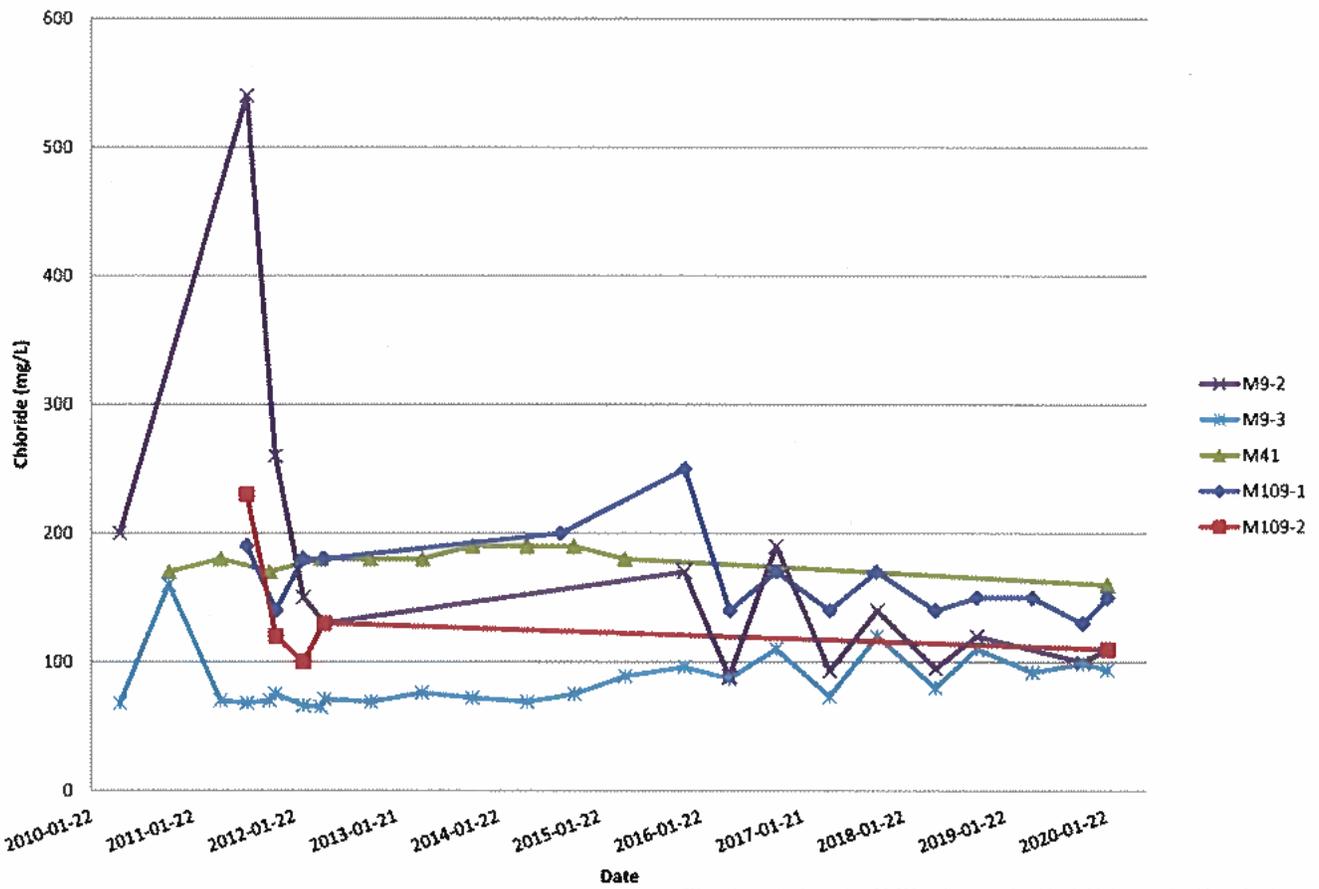
Total Phosphorous



Alkalinity

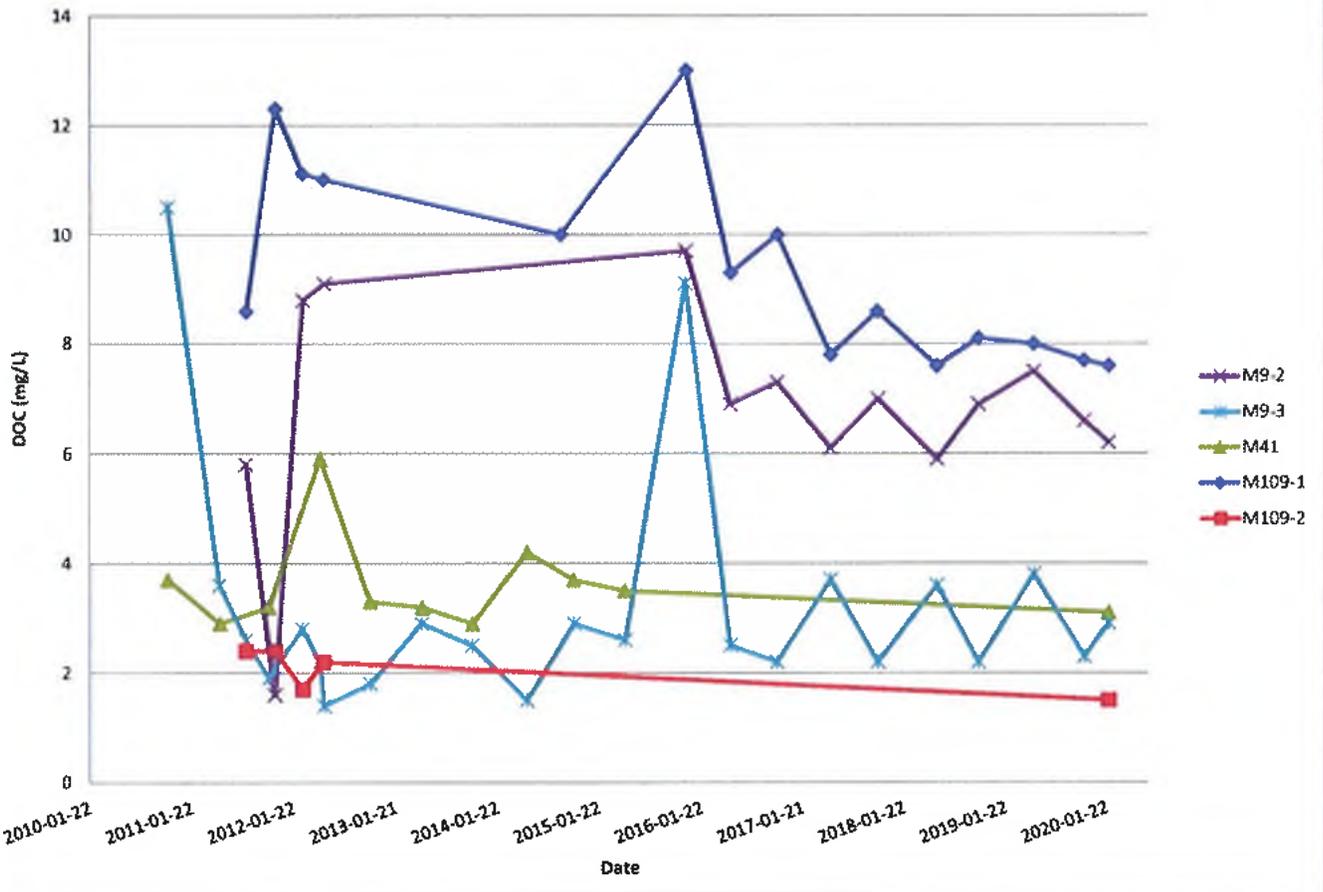


Chloride

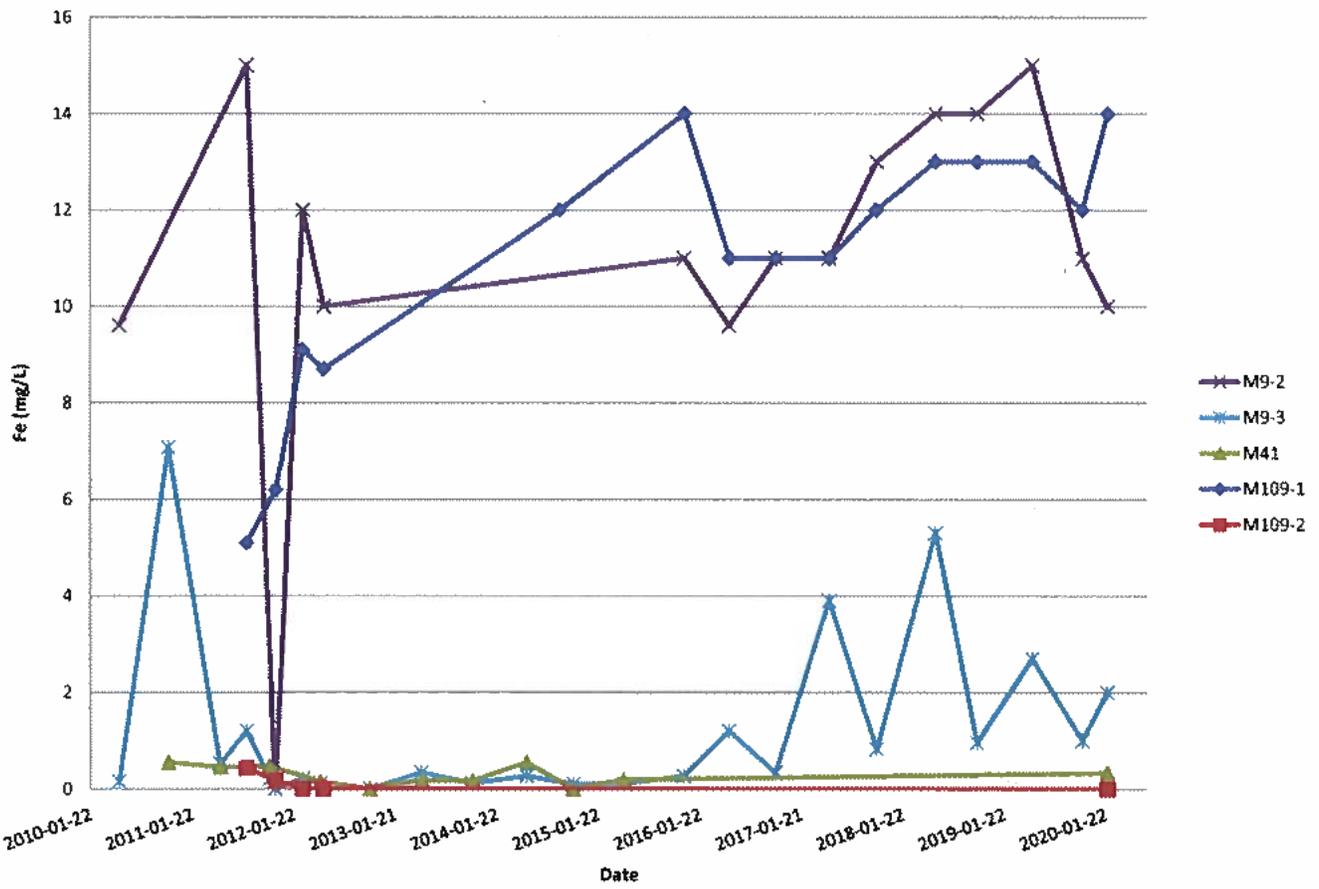


*Note: An outlier data point of 2,700 mg/L reported on May 2, 2019 was omitted from the chart.

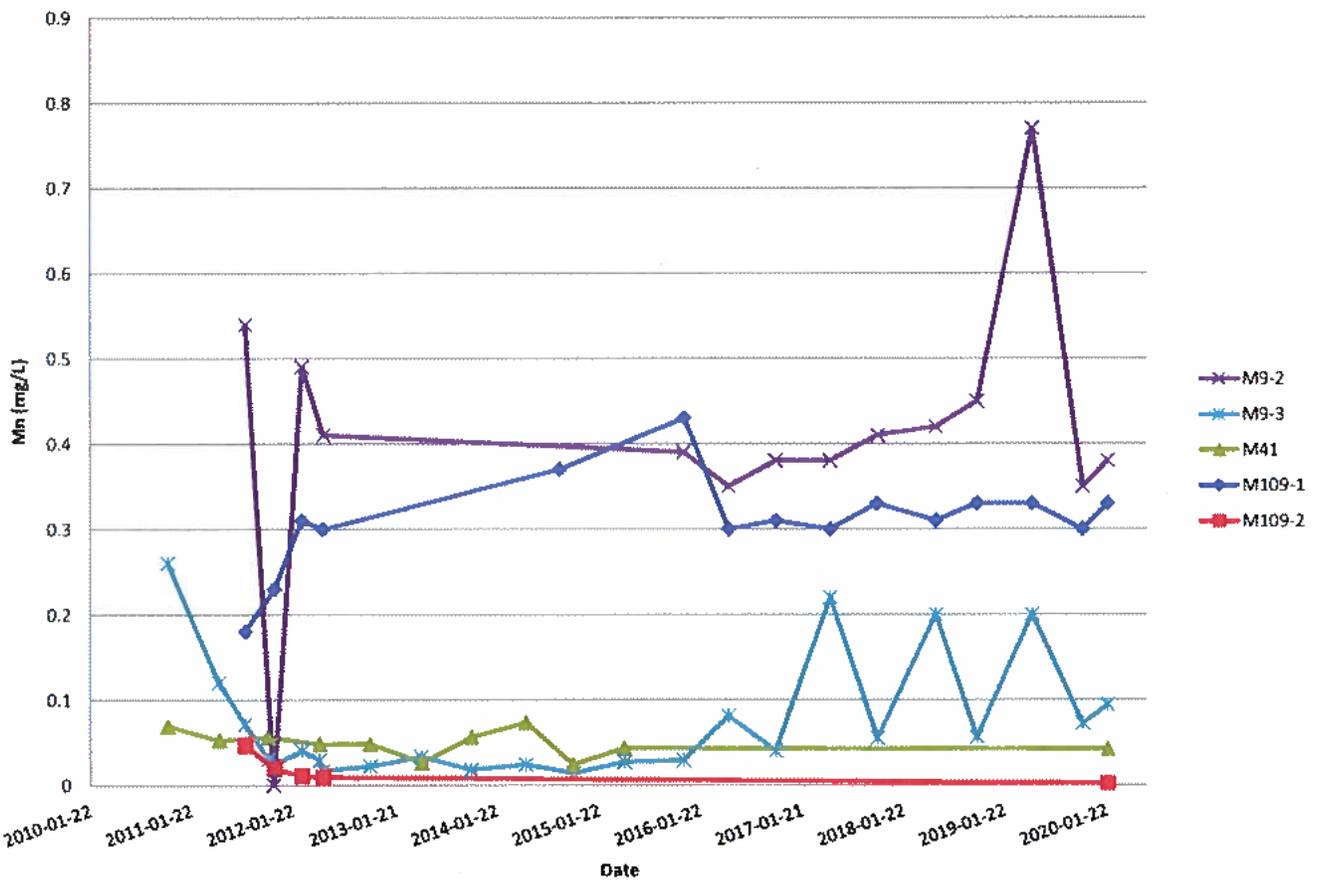
Dissolved Organic Carbon



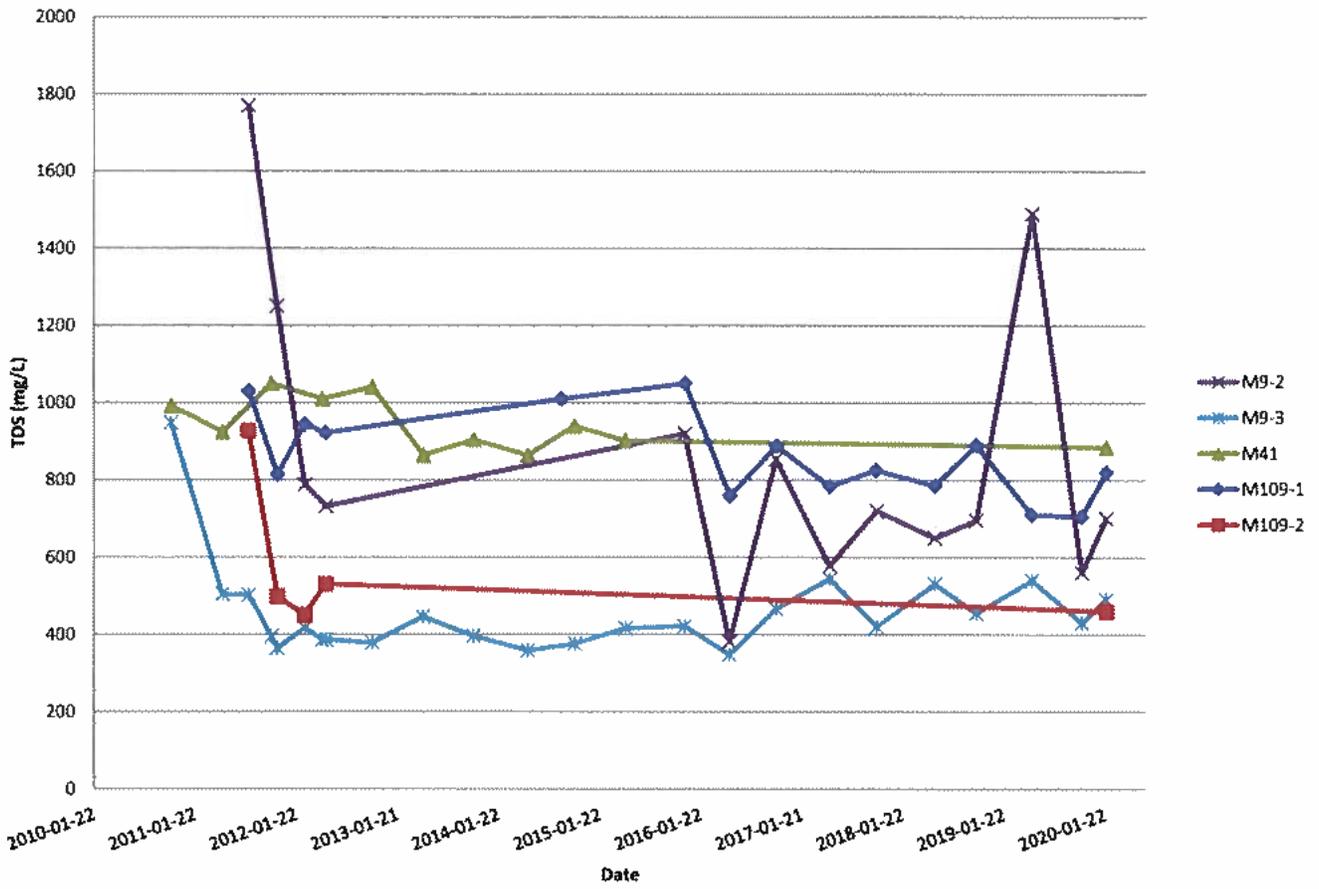
Iron



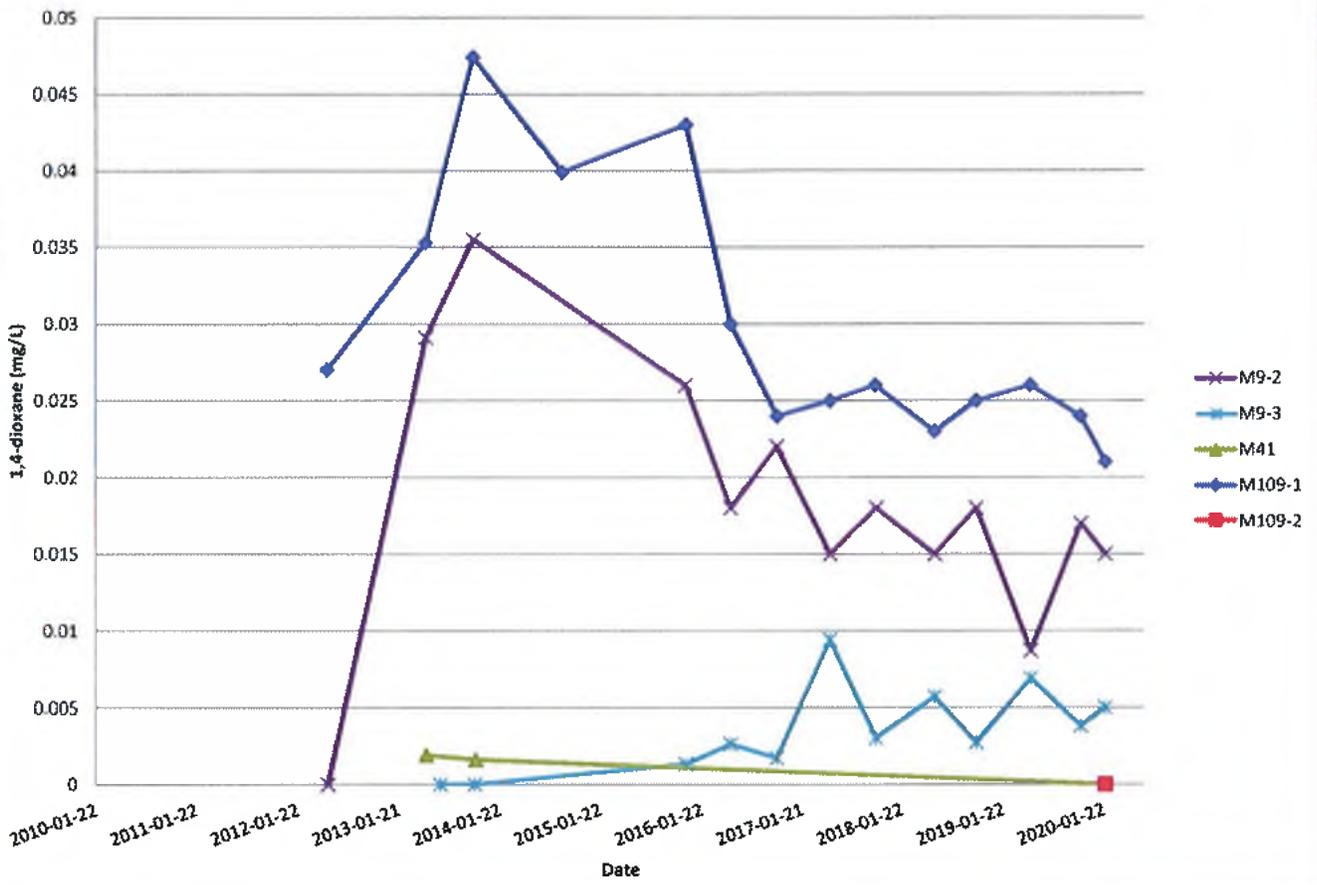
Manganese



Total Dissolved Solids



1,4-dioxane



ATTACHMENT 2

Acute Lethality Bioassay Report

Certificate of Analysis

**ACUTE LETHALITY BIOASSAY REPORT
(Single-Concentration Test)**

CLIENT:

Francois Richard, BluMetric Environmental Inc, 4 Cataraqui St, Kingston, ON K7K 1Z7

TEST RESULTS:

Sample Name ¹	Sample Number	Date Collected (M/D/Y)	Date Received (M/D/Y)	Date Tested (M/D/Y)	Test Species ²	Percent Mortality ³	Method Deviations
SW Pond	8602-0022001	01/27/20	01/28/20	01/30/20 01/28/20	RBT DM	0% 0%	None None

1 - Results relate only to the sample tested. Tested as received from client.

2 - Test Type and Species RBT = Rainbow Trout 96-hour 100% Effluent Concentration Acute Lethality Test

DM = *Daphnia magna* 48-hour 100% Effluent Concentration Acute Lethality Test

3 - Most regulations regard ≤50% mortality to be a "pass". Check your applicable regulatory requirements.

TEST PROTOCOLS:

Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to Rainbow Trout", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/13 Second Edition - December 2000, including May 2007 and February 2016 Amendments. (Pollutech Test Method RT-SC-R1.5)

Environment Canada, "Biological Test Method: Reference Method for Determining Acute Lethality of Effluents to *Daphnia magna*", Environmental Technology Centre, Ottawa, Ontario, Report EPS 1/RM/14 Second Edition - December 2000, including February 2016 Amendments. (Pollutech Test Method DM-SC-R1.6)

TESTING PERFORMED BY:

Rainbow Trout Bioassay: B. Steven / K. Kramer / K. Ferguson
Daphnia magna Bioassay: K. Kramer / K. Ferguson

TESTING FACILITY:

Pollutech EnviroQuatics Limited, 704 Mara St., Suite 122, Point Edward, Ontario, N7V 1X4
This laboratory is accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA).
All of the tests included in this report are within the scope of this laboratory.



REFERENCE/HEALTH DATA:

Trout

Date Reference Test Initiated: 12/19/19 Reference Chemical: Phenol Fish Lot #: RS120219
96-Hour LC50: 9.33 mg/L 95% Confidence Limits: 7.53 mg/L; 11.57 mg/L
Historic Geometric Mean LC50: 9.63 mg/L Historic Warning Limits (± 2 Standard Deviations): 5.99 mg/L; 15.48 mg/L

Daphnia magna

Date Reference Test Initiated: 01/21/2020 Reference Chemical: Phenol
48-Hour LC50: 23.60 mg/L 95% Confidence Limits: 19.37 mg/L; 28.74 mg/L
Historic Geometric Mean LC50: 13.30 mg/L Historic Warning Limits (± 2 Standard Deviations): 5.75 mg/L; 29.53 mg/L

TEST RESULTS APPROVED BY:

Date: 02/03/20
(M/D/Y)

R. Clay Ferguson, B.Sc. (Hon.)
Laboratory Manager

Y:\bioassays\2020\8000\8602-002\8602-002ja1 TD

bringing clarity to your environment

POLLUTECH ENVIROQUATICS RAINBOW TROUT TOXICITY TEST BENCH SHEET

Sample Information		Sample Method	Composite	Grab	Other	Test Information		7	type	Single Concentration	LC50	TIE	Screen
Account # 8002-000	Sample Number 8002-00001	Date/Time Started	01-30-10	12:00	Analyst Starting Test	K. Kramer							
Client BioMetric	Sample Name SW Tuna	Date/Time Ended	01-30-10	14:5	Fish Lot #	R5 120219-1							
Person Collecting Sample nrl	Temperature Upon Receipt	9.5 °C	Test Volume	30 L Per Vessel	Number of Fish Per Vessel	10	Number of Vessels Per Conc.	3	2				
Date/Time Collected	01-27-10	1:00	Pre-Aeration	No	Pre-Aeration Duration	min	Pre-Aeration Rate	6.5 ±0.26 ml/min L					
Date/Time Received in Lab	01-28-10	1:30	Rate of Aeration During Test	6.5 ±0.26 ml/min L	Dilution Water	deion	Sample pH Adjustment	No	Yes				
Sample Description	Sample Type Description		SW Tuna	Sample Point Description	MISA	Other	Storage Temperature	4.0 °C					

Initial Sample Measurements Before Aeration - Cond 337 umhos D.O. 9.0 mg/L 91.1% Temp: 15.5 °C pH 7.7 Air Flow Meter Reading 0.225 L/min
 Instrument Identification - M/P # 812 M/P # 614 M/P # 1182 Meter # 7

TOXICANT	CONC %	TOTAL NUMBER DEAD # OF HOURS FROM START OF TEST				Initial Measurements After Pre-Aeration					Meter/Probe			Initials	Final Measurements					Meter/Probe		Initials			
		24	48	72	96	Time	Cond (umhos)	D.O. (mg/L)%	°C	pH (units)	Cond	D.O./Temp	pH		Date	Time	°C	D.O. (mg/L)%	pH (units)	D.O./Temp	pH				
Control		0	0	0	0	11:45	214	10.4	101.7	14.0	8.2	6.7	6.4	11.82	KC	01-30-10	14:5	14.7	9.9	6.8	6.4	6.4	12.02	✓	
3	100%	0	0	0	0	↓	304	7.3	95.2	15.4	7.7	↓	↓	↓	KC	"	"	15.0	8.5	6.4	8.5	"	"	✓	
Time Initials		8:15 KC	08:15 AS	10:20 K	11:15 T	Number of Control Fish Showing Atypical Behaviour: <24h: 0 24h: 0 48h: 0 72h: 0 96h: 0																			

Percent Mortality	0 %	LENGTH (mm)	WEIGHT (g)	Initials	Holding Mortalities 7-days Preceding Test	Number of Fish in Batch at Day (-) 7 85
LC50 (Lower, Upper Limit)	-	Mean (SD) 425 (59)	Mean (SD) 0.90 (0.17)		Number Dead (recorded daily for 7 days)	Total Number Dead for 7 days Preceding Test
Method	-	Min/Max 37 / 47	Min/Max 0.65 / 1.26		0+0+0+0+0+0+0	= 0
Verified By (initials)	Ryf	Sample Size 10	Loading Density 0.30 g/L		7-Day Holding Mortality ((total number dead/number of fish in batch) x 100)	0

Observations and notes:

Pollutech EnviroQuatics Daphnia magna Toxicity Test Bench Sheet

Sample Information	Sample Method: Composite Grab Other	Test Information	Test Type: <u>Single Concentration</u> LC50
Account Number: 8602-002	Sample #: 8602-0022001	Date Started/Time: 01-28-20	11:10
Client: <u>BlwMetric</u>	Sample Name: <u>SW Pond</u>	Date Ended/Time: 01-28-20	11:55
Person Collecting Sample: <u>M.Lloyd</u>	Temperature Upon Receipt: 9.5 °C	Test Volume: 250 mL/Vessel	mL Solution/Daphnid: 25 mL
Date/Time Sampled: 01-28-20 01-27-20 10:30		Pre-aeration: <input checked="" type="checkbox"/> yes	Pre-aeration Duration: _____ min
Date/Time Received: 01-28-20 13:20		Pre-aeration Rate: _____ mL/min L	Sample Hardness Adjustment: <input checked="" type="checkbox"/> yes
Sample Description: <u>Clear green</u>		Dilution H ₂ O #: <u>DW2007</u>	Sample pH Adjustment: <input checked="" type="checkbox"/> yes
Sample Type Description: <u>water</u>		Sample Point Description: <u>MW other</u>	Storage Temperature: <u>N/A</u>
LC50 Randomization Template		Test Row(s): <u>5</u>	

Initial Sample Measurements	pH: <u>7.5</u>	Dissolved O ₂ : <u>8.2</u> mg/L <u>93.6</u> %	Conductivity: <u>430</u> µmhos	Temperature: <u>20.9</u> °C
Instrument Identification	Meter/Probe #: <u>2/02</u>	Meter/Probe #: <u>6/4</u>	Meter/Probe #: <u>6/9</u>	Meter/Probe #: <u>6/4</u>

Concentration (% Volume)	pH			Dissolved Oxygen			Cond (µmhos)	Hard (mg/L)	Temperature (°C)			
	Initial	Final	Final M/P	Initial (mg/L)	Final (%)	Final M/P			Initial	Initial	Initial	Final
Control	8.0	7.9	10/30	8.5	96.3	7.6	5/5	625	200	21.1	20.5	5/5
100%	7.5	8.4	"	8.2	93.6	7.8	"	430	204	20.9	20.4	"
Initials	<u>ML</u>	<u>Y</u>		<u>KK</u>	<u>E</u>			<u>KK</u>	<u>KK</u>	<u>KK</u>	<u>E</u>	

NEONATE SOURCE AND OBSERVATIONS OF NUMBER IMMOBILE AND DEAD

BROOD CULTURE HEALTH INFORMATION				
Brood Culture #	<u>63%</u>			
Culture age (days)	<u>22</u>			
Days to 1 st Brood (±12)	<u>8</u>			
Average # of Neonates/Brood (±15)	<u>33</u>			
Previous 7 Days Mortality in Culture (±25%)	<u>0</u>			

	Control				100%				Initial
	A	B	C	D	A	B	C	D	
Brood culture #	<u>63%</u>				<u>63%</u>				<u>KK</u>
24-Hr # Immobile	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>KK</u>
48-Hr # Immobile	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>KK</u>
48-Hr # Dead	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>KK</u>
Total # Immobile			<u>0</u>				<u>0</u>		<u>KK</u>
Total # Dead			<u>0</u>				<u>0</u>		<u>KK</u>

% Mortality: 0 % Standard Deviation of Control Survival: _____ Standard Deviation of Test Survival: _____ Verified By (Initials): ML Notes: _____

APPENDIX

J

ADDITIONAL SAMPLING
REQUESTED BY MECP
PERTAINING TO PROVINCIAL
OFFICER'S ORDER 3623-
BL33DW

APPENDIX

J-1 *MECP PROVINCIAL OFFICER'S EMAIL TO WM, DATED JANUARY 30, 2020, REQUESTING ADDITIONAL SAMPLING IN THE AREA OF THE JANUARY 14, 2020 SPILL OF LANDFILL LEACHATE*

Leno, Bev

From: McDonough, William <wmcdonou@wm.com>
Sent: March 10, 2021 4:07 PM
To: Leno, Bev
Subject: FW: Additional sampling

Bev,
January 30, 2020 email from MECP requesting additional sampling. FYI

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

5768 Nauvoo Road
Watford, ON N0M 2S0

Cell 226 280-1795

From: Arnott, David (MECP) <David.Arnott@ontario.ca>
Sent: Thursday, January 30, 2020 11:20 AM
To: McDonough, William <wmcdonou@wm.com>
Subject: [EXTERNAL] Additional sampling

Hi Bill, I've heard back from Kyle and Victor and they would like to see a single monitoring event at wells M60-1, M60-2, M60-3, M60-4, M128-2 and M134-2 for the same groundwater parameter list identified in the Order (Work Item No. 3). As it's our understanding from my on site observations and discussions with Stan that the leachate spilled fully infiltrated into the ground, samples from these wells will help to assess for any residual subsurface impacts and determine whether any additional investigative work around the spill site is required.

As reiterated in our discussion earlier this morning, the requirement to publicly notify regarding the leachate overflow conditions at the site remains outstanding, placing WMCC in ongoing non-compliance with the ECA. From our conversation I understand that WMCC is awaiting sample results to include in the notification. As this is a matter of continued non-compliance I'll remind again of the reporting requirements contained within the current PNP and strongly suggest to WMCC that notification on this event(s) be made as soon as possible.

With Regards,

David Arnott
Provincial Officer #827
Ontario Ministry of the Environment, Conservation and Parks
Eastern Region

Phone: 613-549-4000 x 2693
Spills Action Centre: 1-800-268-6060
Pollution Hotline (Anonymous): 1-866-MOE-TIPS

APPENDIX

J-2

*MEMORANDUM: LEACHATE
RELEASE GROUNDWATER
SAMPLING RESULTS, WASTE
MANAGEMENT RICHMOND
LANDFILL, PREPARED BY
BLUMETRIC ENVIRONMENTAL INC.
AND DATED FEBRUARY 21, 2020*

MEMORANDUM

DATE: 21 February 2020
TO: Chris Prucha, Bill McDonough and Jim Forney, Waste Management (WM)
CC:
FROM: Madeleine Corriveau & François Richard, BluMetric Environmental Inc.
PROJECT NO: 200172-03
SUBJECT: Leachate Release Groundwater Sampling Results, Waste Management Richmond Landfill, Town of Greater Napanee

This memorandum has been prepared to report on sampling requested by MECP Provincial Officer David Arnott (email dated January 30, 2020). The requested sampling was in addition to the sampling required by Item No. 3 of Provincial Officer's Order (POO) 3623-BL33DW issued on January 23, 2020 and amended on January 27, 2020. Results from the sampling required in the POO were reported to MECP on February 17, 2020.

The additional sampling requested by MECP was for:

- Groundwater samples from monitoring wells M60-1, M60-2, M60-3, M60-4, M128-2 and M134-2 for analysis of Tables 3 and 4 from the latest Environmental Monitoring Program (EMP) for the Site¹.

Sampling was completed on January 31, 2020. No sample was collected from monitoring well M134-2 because it was frozen. Samples were analyzed for the parameters set out in EMP Tables 3 and 4.

RESULTS

Monitoring well locations are shown on Figure 1 and sampling results are summarized in Table 1.

1,4-dioxane, the primary leachate indicator for the site, was less than the reportable detection limit of 0.001 mg/L for all monitoring wells sampled as part of this investigation.

¹ *Environmental Monitoring Plan, WM Richmond Landfill, Town of Greater Napanee, Ontario, rev. No.05, prepared by BluMetric Environmental Inc., dated April 2016*

Elevated mineralization was observed in monitoring wells M60-1, M60-2, M60-3 and M128-2. These are consistent with historical results at these locations where available (provided as Attachment 1) and other monitoring wells installed in the intermediate bedrock flow zone in some areas of the Site. Elevated concentrations of some constituents (e.g., chloride, sodium, conductivity and total dissolved solids), as well as the presence of BTEX constituents (benzene, toluene, ethylbenzene and xylenes), are indicative of naturally poor groundwater quality associated with connate water found in low permeability bedrock.

CONCLUSIONS & RECOMMENDATIONS

Results from the sampling event conducted on January 31, 2020 indicate no adverse impact to groundwater as a result of the leachate release that occurred on January 14, 2020 to the west of the North Lagoon.

Weekly surface water sampling at location S3 has been initiated by WM. Sampling location S3 is located in Marysville Creek near the downstream property boundary. Samples are being analyzed for the list of surface water parameters from the Environmental Monitoring Plan (EMP Table 8)¹. Results from this sampling location represent surface water quality leaving the site. It is recommended that weekly sampling continue for a total period of 6 weeks at which point the need to continue weekly sampling will be re-evaluated and discussed with MECP.

It is recommended that each of the five monitoring wells sampled as part of this investigation, as well as monitoring well M134-2, be sampled for the same suite of parameters during the next routine monitoring event (typically scheduled for April) to verify that there are no impacts associated with the leachate release.

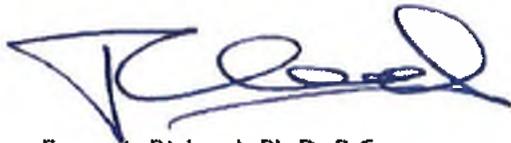
Table 1: Groundwater Quality Results (January 31, 2020)

Reading Name	Units	Sam Date	M60-1	M60-2	M60-3	M60-4	M128-2
General/Inorganic Parameters							
Alkalinity	mg/L	2020-01-31	220	340	360	310	390
Ammonia	mg/L	2020-01-31	0.89	0.66	0.52	< 0.15	< 0.15
Boron	mg/L	2020-01-31	0.83	0.28	0.36	< 0.02	1.7
Calcium	mg/L	2020-01-31	64	73	29	110	30
Chloride	mg/L	2020-01-31	230	280	330	9.6	33
Conductivity	µS/cm	2020-01-31	1600	1800	1900	640	1200
Dissolved Organic Carbon	mg/L	2020-01-31	2.2	1.7	1.8	1.5	4.4
Iron	mg/L	2020-01-31	< 0.1	0.25	< 0.1	< 0.1	0.2
Magnesium	mg/L	2020-01-31	14	34	22	14	31
Manganese	mg/L	2020-01-31	0.029	0.16	0.019	< 0.002	0.02
Nitrate	mg/L	2020-01-31	< 0.1	< 0.1	1.61	4.64	0.86
Nitrite	mg/L	2020-01-31	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Potassium	mg/L	2020-01-31	12	8.6	11	0.31	10
Sodium	mg/L	2020-01-31	240	230	200	2.1	190
Sulphate	mg/L	2020-01-31	180	100	34	3.9	180
Total Dissolved Solids	mg/L	2020-01-31	855	905	935	355	725
Volatile Organic Compounds (VOCs)							
1,1,1,2-Tetrachloroethane	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,1-Trichloroethane	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1,2,2-Tetrachloroethane	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1,2-Trichloroethane	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,1-Dichloroethane	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,1-Dichloroethylene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
1,2-Dichlorobenzene (o)	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,2-Dichloroethane	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3,5-Trimethylbenzene	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,3-Dichlorobenzene (m)	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dichlorobenzene (p)	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
1,4-Dioxane	mg/L	2020-01-31	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Benzene	mg/L	2020-01-31	0.008	0.0041	0.004	< 0.0001	< 0.0001
Chlorobenzene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Chloroethane	mg/L	2020-01-31	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Chloromethane	mg/L	2020-01-31	< 0.001	< 0.001	< 0.001	< 0.0005	< 0.0005
Cis-1,2-Dichloroethylene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Dichloromethane	mg/L	2020-01-31	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Ethylbenzene	mg/L	2020-01-31	< 0.0001	0.00016	0.00026	< 0.0001	< 0.0001
m+p-Xylene	mg/L	2020-01-31	0.00034	< 0.0001	0.0015	< 0.0001	< 0.0001
o-Xylene	mg/L	2020-01-31	0.00021	0.00012	0.00064	< 0.0001	< 0.0001
Styrene	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Tetrachloroethylene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Toluene	mg/L	2020-01-31	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Total Xylenes	mg/L	2020-01-31	0.00054	0.00012	0.0021	< 0.0001	< 0.0001
Trans-1,2-dichloroethylene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Trichloroethylene	mg/L	2020-01-31	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Vinyl Chloride	mg/L	2020-01-31	< 0.0002	0.00022	< 0.0002	< 0.0002	< 0.0002

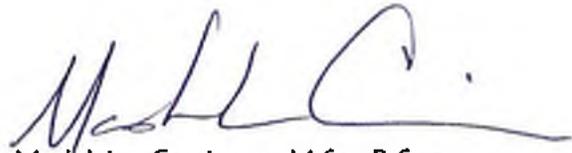
CLOSING

We trust the above is satisfactory at this time. If you have any questions or need further information please do not hesitate to contact the undersigned.

Respectfully submitted,
BluMetric Environmental Inc.



Francois Richard, Ph.D. P.Geo.
Senior Hydrogeologist



Madeleine Corriveau, M.Sc., P.Geo
Senior Geoscientist

Encl.
Figure 1: Site Plan and Sampling Locations
Attachment 1: Historical Groundwater Chemistry Results

FIGURE



ATTACHMENT 1

Historical Groundwater Quality Results



Historical Groundwater Chemistry Results at M60-1, M60-2, M60-3 and M60-4

Reading Name	Reading Group	Units	M60-1				M60-2				M60-3		M60-4			
			25-Jun-98	3-Dec-99	26-Nov-09	31-Jan-20	24-Jun-98	1-Jul-98	3-Dec-99	31-Jan-20	24-Jun-98	31-Jan-20	24-Jun-98	1-Jul-98	3-Dec-99	31-Jan-20
General and Inorganic Parameters																
Alkalinity	chem - general	mg/L	171	101	132	220	260		287	340	259	360	239		288	310
Ammonia	chem - ions	mg/L	3.1	7.3	1.33	0.89	0.46		0.71	0.66	0.26	0.52	0.23		0.16	< 0.15
Boron	chem - metals	mg/L			0.99	0.83				0.28		0.36				< 0.02
Calcium	chem - metals	mg/L	125	10	13	64		80	80	73	99	29		126	114	110
Chloride	chem - ions	mg/L	61	141	180	230	46		127	280	31	330	4		6	9.6
Conductivity	chem - general	µS/cm	1390	1280	1280	1600	916		1580	1800	801	1900	516		618	640
Dissolved Organic Carbon	chem - ions	mg/L		45.4	10.3	2.2			14.2	1.7		1.8			2.1	1.5
Iron	chem - metals	mg/L	0.08	0.05	< 0.1	< 0.1		0.07	ND	0.25	0.2	< 0.1		0.58	ND	< 0.1
Magnesium	chem - metals	mg/L	1	1	4	14		19	29	34	20	22		16	17	14
Manganese	chem - metals	mg/L			0.003	0.029				0.16		0.019				< 0.002
Nitrate	chem - ions	mg/L	0.28	ND	0.4	< 0.1	3.4		ND	< 0.1	1.36	1.61	4.11		6.41	4.64
Nitrite	chem - ions	mg/L	ND	ND	0.34	< 0.01	ND		ND	< 0.01	0.8	< 0.01	ND		ND	< 0.01
Potassium	chem - metals	mg/L	38	57	17	12		5	9	8.6	6	11		2	ND	0.31
Sodium	chem - metals	mg/L	97	192	230	240		101	240	230	53	200		29	7	2.1
Sulphate	chem - ions	mg/L	247	241	210	180	153		332	100	121	34	17		19	3.9
Total Dissolved Solids	chem - general	mg/L			804	855				905		935				355
Volatile Organic Compounds (VOCs)																
1,1,1,2-Tetrachloroethane	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,1,1-Trichloroethane	chem - VOCs	mg/L			< 0.0001	< 0.0001				< 0.0001		< 0.0001				< 0.0001
1,1,2,2-Tetrachloroethane	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,1,2-Trichloroethane	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,1-Dichloroethane	chem - VOCs	mg/L			< 0.0001	< 0.0001				< 0.0001		< 0.0001				< 0.0001
1,1-Dichloroethylene	chem - VOCs	mg/L			< 0.0001	< 0.0001				< 0.0001		< 0.0001				< 0.0001
1,2-Dichlorobenzene (o)	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,2-Dichloroethane	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,3,5-Trimethylbenzene	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,3-Dichlorobenzene (m)	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,4-Dichlorobenzene (p)	chem - VOCs	mg/L			< 0.0002	< 0.0002				< 0.0002		< 0.0002				< 0.0002
1,4-Dioxane	chem - VOCs	mg/L				< 0.001				< 0.001		< 0.001				< 0.001
Benzene	chem - VOCs	mg/L	0.0043	ND	0.0017	0.008	ND	ND	0.0041	ND	0.004	ND		ND		< 0.0001
Chlorobenzene	chem - VOCs	mg/L				< 0.0001				< 0.0001		< 0.0001				< 0.0001
Chloroethane	chem - VOCs	mg/L				< 0.005				< 0.005		< 0.005				< 0.005
Chloromethane	chem - VOCs	mg/L				< 0.001				< 0.001		< 0.001				< 0.0005
Cis-1,2-Dichloroethylene	chem - VOCs	mg/L				< 0.0001				< 0.0001		< 0.0001				< 0.0001
Dichloromethane	chem - VOCs	mg/L				< 0.0005				< 0.0005		< 0.0005				< 0.0005
Ethylbenzene	chem - VOCs	mg/L	ND	ND	< 0.0001	< 0.0001	ND	ND	0.00016	ND	0.00026	ND		ND		< 0.0001
m-p-Xylene	chem - VOCs	mg/L	0.0035	ND	0.0004	0.00034	ND	ND	< 0.0001	ND	0.0015	ND		ND		< 0.0001
o-Xylene	chem - VOCs	mg/L	0.0012	ND	< 0.0001	0.00021	ND	ND	0.00012	ND	0.00064	ND		ND		< 0.0001
Styrene	chem - VOCs	mg/L				< 0.0002				< 0.0002		< 0.0002				< 0.0002
Tetrachloroethylene	chem - VOCs	mg/L				< 0.0001				< 0.0001		< 0.0001				< 0.0001
Toluene	chem - VOCs	mg/L	0.0413	0.003	0.0021	< 0.0002	ND	ND	< 0.0002	ND	< 0.0002	0.0013		ND		< 0.0002
Total Xylenes	chem - VOCs	mg/L			0.0004	0.00054				0.00012		0.0021				< 0.0001
Trans-1,2-dichloroethylene	chem - VOCs	mg/L				< 0.0001				< 0.0001		< 0.0001				< 0.0001
Trichloroethylene	chem - VOCs	mg/L				< 0.0001				< 0.0001		< 0.0001				< 0.0001
Vinyl Chloride	chem - VOCs	mg/L				< 0.0002				0.00022		< 0.0002				< 0.0002

ND: Below Laboratory Reporting Limit



APPENDIX

J-3

*WM NOTICE TO LOCAL
COMMUNITIES AND SURROUNDING
NEIGHBOURS, DATED FEBRUARY
26, 2020, REGARDING RICHMOND
LANDFILL LEACHATE UPDATE*



February 26, 2020

Notice to Local Communities and Surrounding Neighbors
Richmond Landfill Leachate Update

You are receiving this letter to notify you that the results from the sampling data collected as part of the January 2020 Richmond Landfill leachate investigation have been submitted to the Ministry of the Environment, Conservation and Parks. Results from the sampling program are consistent with historical monitoring results and indicate no on-site or off-site environmental impact as a result of the leachate release or overflows.

We will continue to keep open lines of communication with our neighbours, the public and the regulators.

If you have comments or questions, please don't hesitate to contact me by letter, email, or phone.

Regards,

Bill McDonough, Site Manager
Richmond Closed Landfill
Waste Management of Canada Corporation

1271 Beechwood Road
Napanee, ON K7R 3L1
Email: wmcdonou@wm.com
Cell Phone: 226 280-1795

APPENDIX

K

WM UPDATE TO LOCAL
COMMUNITIES AND
SURROUNDING
NEIGHBOURS ISSUED
MARCH 26, 2020
REGARDING ACTIONS
REQUIRED UNDER MECP
PROVINCIAL OFFICER'S
ORDER 3623-BL33DW



March 26, 2020

Update to Local Communities and Surrounding Neighbours
Richmond Landfill

The purpose of this letter is to update you on activities at the closed landfill.

We have completed all actions required by WM of the Provincial Officer Order issued on January 23, 2020. Results of our testing have shown no impact to the environment either on-site or off-site from the releases.

Our 2019 Annual Report has been delivered to the MECP and is now available online, and by request using my information below.

We are in the bidding process for upgrades to the landfill which will include new pumps and an on-site leachate storage tank. Our current plan is to have this work completed by the end of 2020 or early 2021.

If you have comments or questions, please don't hesitate to contact me by letter, email, or phone.

Regards,

Bill McDonough, Site Manager
Richmond Closed Landfill
Waste Management of Canada Corporation

1271 Beechwood Road
Napanee, ON K7R 3L1
Email: wmcdonou@wm.com
Cell Phone: 226 280-1795

APPENDIX

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REPORT: LANDFILL COVER
INTEGRITY STUDY, WASTE
MANAGEMENT RICHMOND
LANDFILL SITE, PREPARED
BY BLUMETRIC
ENVIRONMENTAL INC. AND
DATED DECEMBER 2020



LANDFILL COVER INTEGRITY STUDY

**Waste Management
Richmond Landfill Site**

Submitted to:



Waste Management of Canada Corporation
1271 Beechwood Road
R.R. #6 Napanee, ON K7R 3L1

Prepared by:

BluMetric Environmental Inc.
4 Cataraqui Street
The Woolen Mill, The Tower
Kingston, ON K7K 1Z7

Project Number: 190222-08

December 2020

LANDFILL COVER INTEGRITY STUDY

**WASTE MANAGEMENT
RICHMOND LANDFILL SITE**

Submitted to:



WASTE MANAGEMENT OF CANADA CORPORATION

1271 Beechwood Road
R.R. #6 Napanee, ON K7R 3L1

Prepared by:



BluMetric Environmental Inc.
The Tower, The Woolen Mill
4 Cataraqui Street
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December 2020

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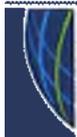
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1. INTRODUCTION

1.1 BACKGROUND

This report has been prepared by BluMetric Environmental Inc. (BluMetric) to address Item 1(B)(ii) in the *Provincial Officer's Order* No. 3623-BL33DW (Incident Report No. 5065-BKVRAQ) issued by the Ontario Ministry of the Environment, Conservation and Parks (MECP) to Waste Management of Canada Corporation (WM) on January 23, 2020.

Item 1(B)(ii) in the *Provincial Officer's Order* required:

“a formal assessment of landfill infiltration including an evaluation of the existing landfill cap by a third party Qualified Person(s) to assess for settlement, shear or tension cracks, landfill gas, or other indications of compromised integrity.”

This report also considers the proposed *Action Plan* prepared by WM, as outlined in a letter from WM to MECP dated January 31, 2020 and MECP review comments and WM responses communicated via an email exchange on February 4 and February 11, 2020, respectively.

The WM *Action Plan* included the following Item related to Item 1(B)(ii) of the *Provincial Officer's Order*.

“BluMetric has been retained by Waste Management to evaluate the integrity of the existing landfill cap. The evaluation will include an examination of infiltration of precipitation into the landfill. This evaluation will occur after the spring thaw once the cap has dried out.”

In the email correspondence following submission of the *Action Plan* to MECP, WM confirmed that the potential for excessive subsurface (groundwater) infiltration into the landfill would also be considered as part of the investigation to be carried out by BluMetric.

A brief summary of the principal elements of landfill development and historical data relevant to the present investigation is presented below, followed by a description of the field investigation, a presentation and discussion of the results, as well as summary and conclusions.

1.2 SITE DEVELOPMENT

The Richmond Landfill is located within the Town of Greater Napanee, as shown on **Figure 1**. The municipal solid waste landfill operated from 1954 until site closure in June 2011. Initially, the landfill was relatively small and landfilling operations increased in 1988 when the site was sold and changed hands several times until it was purchased in 2003 by the current owner (WM).



The landfill consists of a staged development in five phases as shown on **Figure 2**. As summarized in the final closure report¹ for the facility, the landfill base was prepared differently for various phases of the landfill development as follows:

- The Phase 1 portion of the landfill is an unlined section in the northwest portion of the landfill footprint. Very few records exist with regard to the base preparation for Phase 1. It is believed that no significant excavation was undertaken with waste landfilled near the original ground elevation after removal of topsoil. A perforated perimeter collector was installed in 2001 along the western and northern sides of Phase 1 and retrofitted to the leachate collection system;
- Phases 2 and 3 are lined with compacted clay and have a perimeter drain / leachate collection system along the toe of the landfill (see **Appendix A** for as-built drawings²); and
- Phases 4 and 5 are lined with clay and a HDPE membrane, and have an underdraining leachate collection system beneath the waste.

The perimeter leachate collector system consists of perforated pipes, with gravel backfill around the pipes to promote drainage and prevent clogging of the pipes. Leachate drains to two collection sumps identified on **Figure 2** as the North Chamber (collecting leachate from Phases 1 to 3) and the South Chamber (leachate collection from Phases 4 and 5). Landfill leachate is removed from the collection sumps and hauled off-site to approved treatment facilities.

The final cover system (landfill cap), generally consisting of compacted clay, topsoil and vegetation, was installed starting in August 2010, and took place gradually until September 2011 when the last area of capping was completed and the waste mound reached its final contours (see **Figure 2**).

1.3 HISTORICAL DATA

Historical records were compiled for the 10-year period starting in January 2010, about 18 months prior to the last date waste was received in June 2011, and until the end of 2019. These include:

- Daily temperature and precipitation data from the Environment Canada weather station located at Belleville, Ontario, about 30 km west of the Richmond landfill;

¹ Richmond Sanitary Landfill Site, Final Closure Plan, Henderson Paddon & Associates Ltd, June 2007.

² Richmond Landfill Phase 1 Leachate Collector Drawings, Henderson Paddon & Associates Ltd, May 2000.



- Monthly leachate volumes removed from the two collection sumps as documented in annual reports for the site; and
- Shallow groundwater elevations from environmental monitoring reports for the site.

These datasets are presented and discussed in the following sections.

1.3.1 Weather

Average daily temperature and precipitation records were obtained for the 2010-2019 period from the Environment Canada³ weather station located in Belleville, Ontario, about 30 km west of the Richmond landfill.

The daily records were compiled and are provided as monthly averages in **Appendix B**.

As shown in **Table 1** the total annual precipitation during this period was 845 mm, ranging between 665 mm in 2012 to a maximum of 1110 mm in 2017.

Mean monthly temperature for the 2010-2019 period is shown in **Table 2**

Table 1: Total Annual Precipitations in Belleville, ON (2010-2019)

Year	Total Precipitation (mm)
2010	757
2011	947
2012	665
2013	802
2014	827
2015	769
2016	758
2017	1110
2018	991
2019	819
Average:	845 mm/yr

³ https://climate.weather.gc.ca/historical_data/search_historic_data_e.html



Table 2: Average Monthly Temperature in Belleville, ON (2010-2019)

Month	Mean Temperature (°C)
January	-5.9
February	-5.3
March	-0.4
April	6.8
May	14.8
June	19.0
July	22.6
August	21.4
September	17.6
October	11.0
November	3.4
December	-2.1

1.3.2 Leachate Volumes and Chemistry

Leachate quantities generated by the landfill are estimated from daily hauling manifests available from site records and documented in semi-annual and annual monitoring reports in accordance with the site Environmental Compliance Approval (ECA).

The monthly leachate volumes between 2010 and 2019 are summarized in **Table 3** and shown graphically on **Text Figure 1**. Total annual leachate volumes during this period ranged between 13,772 m³ in 2015 and 23,710 m³ in 2017, with an annual average of 18,860 m³. The leachate volumes were on average 16,312 m³/yr for the first five years following site closure in 2011 (2012-2016), compared to 22,381 m³/yr in the last three years (2017-2019), higher than the last full year when the landfill was active (2010) and before construction of the final cover system had started. This represents a significant increase (37%) in leachate volumes in the last three years compared to the previous five years.

Leachate samples are collected annually from the North and South Chamber sumps as part of the monitoring requirements, and reported in semi-annual reports. Historical average leachate chemistry results for the period between 2010 and 2019 are included in **Appendix C**. It should be noted that, for all constituents but a few exceptions (e.g., hardness, iron, manganese and zinc), concentrations in samples from the North Chamber are consistently lower than those collected from the South Chamber.

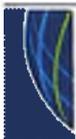
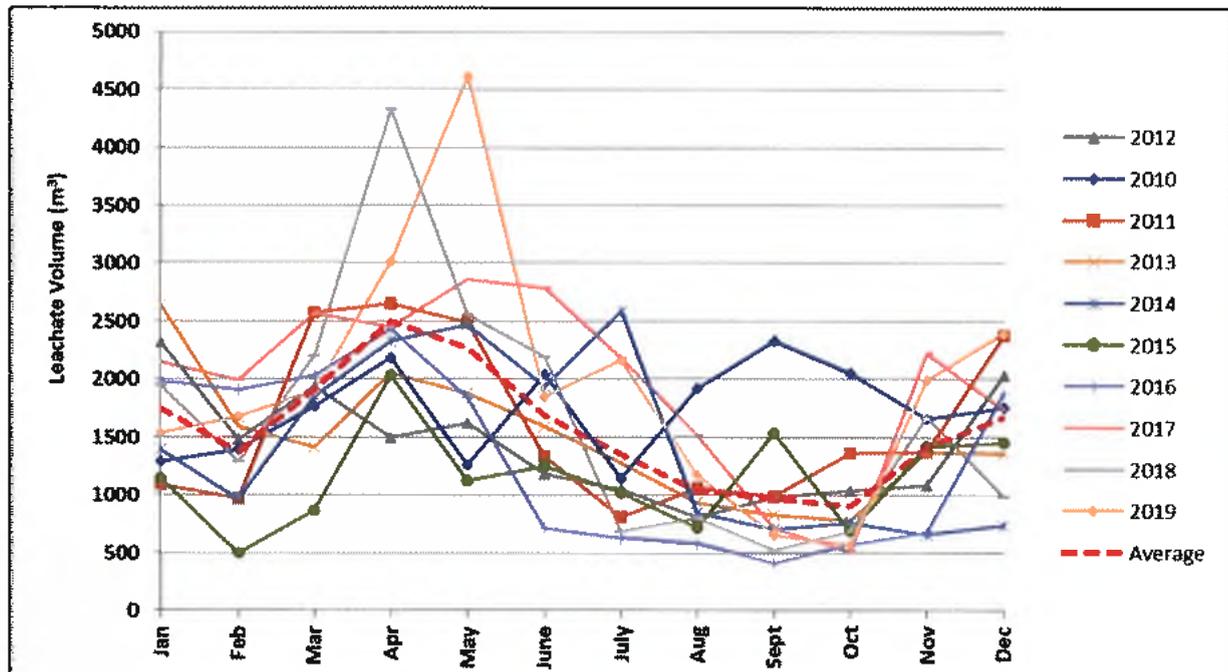


Table 3: Monthly and Annual Leachate Volumes (2010-2019).

Month	Year										Avg.
	2010	2011*	2012	2013	2014	2015	2016	2017	2018	2019	
Jan.	1,290	1,086	2,322	2,642	1,396	1,148	1,985	2,152	1,947	1,537	1,750
Feb.	1,393	975	1,484	1,591	966	502	1,910	1,995	1,287	1,677	1,378
Mar.	1,767	2,573	1,938	1,417	1,854	867	2,034	2,564	2,209	1,895	1,912
April	2,188	2,655	1,497	2,051	2,332	2,031	2,436	2,448	4,325	3,016	2,498
May	1,265	2,490	1,627	1,882	2,471	1,131	1,841	2,858	2,557	4,611	2,273
June	2,039	1,335	1,184	1,591	1,939	1,251	720	2,788	2,192	1,849	1,689
July	1,152	811	1,054	1,280	2,585	1,023	629	2,181	690	2,165	1,357
Aug.	1,920	1,065	812	941	855	717	581	1,519	807	1,171	1,039
Sept.	2,332	991	989	831	713	1,536	418	722	527	663	972
Oct.	2,049	1,364	1,044	781	771	693	576	513	690	565	905
Nov.	1,663	1,371	1,087	1,378	665	1,422	678	2,227	1,678	1,998	1,417
Dec.	1,755	2,372	2,031	1,358	741	1,450	1,884	1,742	986	2,391	1,671
Total	20,813	19,086	17,069	17,743	17,287	13,772	15,690	23,710	19,895	23,538	18,860

* Site closure in June 2011, final capping in September 2011



Text Figure 1: Monthly Leachate Volumes (2010-2019).



1.3.3 Groundwater Elevations

The shallow groundwater flow zone is defined in the site conceptual model (SCM) developed from past hydrogeological investigations⁴ and summarized in semi-annual monitoring reports. This hydrostratigraphic unit comprises the saturated portion of overburden and upper 1-2 m of bedrock.

Groundwater elevations and flow patterns in the shallow flow zone are very consistent between monitoring events, generally higher in the spring and lowest in summer with fall typically in between these two extremes. **Figure 3** provides representative examples showing interpolated shallow groundwater contours from the spring monitoring events in 2017 and 2019. These dates were selected because of the unusually high precipitations observed in spring 2017 and higher than normal leachate volumes recorded in spring 2017 and 2019.

The Empey Hill drumlin southwest from the landfill creates a flow divide, with shallow groundwater being directed both to the north and the south towards areas of lower hydraulic heads. North of the landfill, shallow groundwater converges towards Marysville Creek in the area immediately east of County Road 10 (Deseronto Road), while shallow groundwater flow in the southern portion of the site converges on Beechwood Ditch and the southern pond system. The relationship and potential correlations between leachate generation, precipitation and groundwater elevations are discussed in Section 4.

2. FIELD INVESTIGATION

2.1 SITE RECONNAISSANCE

BluMetric staff met with WM personnel on-site on May 4, 2020 to carry out a site reconnaissance. The purpose of this reconnaissance was to observe the general condition of the landfill cover across the entire site and to record the following key visual observations:

- Areas of noticeable settlement or depressions;
- Areas of cracking or desiccation;
- Areas of thin cover and/or poor vegetative growth;
- Any evidence of leachate seeps;

⁴ Site Conceptual Model Report, WM Richmond Landfill, B. Kueper & Assoc. Ltd. and WESA Inc., October, 2009



- Any evidence of surface water infiltration;
- Any evidence of significant erosion; and
- Any evidence of landfill gas venting.

Based on these observations, appropriate locations for the excavation of test pits were selected for the purpose of further investigating cover soil characteristics (i.e., thickness, soil type(s), relative degree of compaction) and to collect soil samples for further characterization and laboratory analysis. The locations of the test pits were specifically selected during the site reconnaissance to investigate the cover soils in areas with poorer surficial conditions (i.e., stressed vegetation, depressions, erosion, etc.) as well as typical areas with good surficial conditions, in addition to providing good spatial distribution across the entire cover area. The photos included in the Record of Test Pits (**Appendix D**) illustrate the general cover conditions observed in the area of each test pit.

2.2 TEST PITTING PROGRAM

A test pitting program was carried out under the supervision of BluMetric staff between May 20-22, 2020, during which time a total of 25 test pits were excavated through the cover soils. All excavation work was carried out by R.W. Tomlinson Limited using a Kubota KX080 track-mounted excavator.

Test pits were advanced through the cover soils, generally until garbage/waste materials were encountered. Four test pits were terminated within the cover soils: TP10-20 and TP23-20 were terminated due to excessively thick cover soils (>1.70 metres and >1.50 metres, respectively); TP16-20 was terminated at a depth of 0.70 metres due to encountering liquid infiltration into the test pit; and TP20-20 was terminated at a depth of 1.30 metres due to encountering buried pipe, believed to be an inactive landfill gas collection pipe. Care was taken so as not to damage the buried pipe encountered in TP20-20.

Grab soil samples were collected from each visibly distinguishable soil layer at each test pit location. The grab soil samples were placed in labelled Ziploc bags for further inspection and possible laboratory testing. In addition, twenty (20) samples were collected at various test pit locations using thin-walled shelly tube samplers, pushed vertically into the undisturbed soils and retrieved by the excavator, in an attempt to collect relatively undisturbed soil samples for laboratory testing.

GPS locations and photos were taken at each test pit location. Test pit locations are illustrated in plan on **Figure 2**. A Record of Test Pits, including photographs, is provided in **Appendix D**. All test pits were backfilled and re-compacted with the cover soil materials in lifts of approximately 300 millimetres using the excavator following logging and sampling at each test pit location.



2.3 BOREHOLE DRILLING PROGRAM

A shallow borehole drilling program was carried out on May 27, 2020 along the inside shoulder of the ring road that surrounds the perimeter of the landfill for the purpose of characterizing the overburden soils, depth to bedrock and degree of moisture/presence of groundwater just outside the alignment of the groundwater collector pipe that was previously installed around the northwest corner of the landfill. Borehole locations are illustrated on **Figure 2**. Drilling was completed by GET Drilling Ltd. of Napanee, Ontario using a truck-mounted CME55 rotary drill rig with 200 millimeter diameter hollow stem augers. Supervising BluMetric staff made notes regarding stratigraphy and any presence of groundwater encountered during drilling. Borehole logs are provided in **Appendix D**.

Boreholes were drilled to depths ranging from 2.74 to 8.63 metres and terminated at auger refusal, presumed to be the bedrock surface. Continuous overburden soil samples were collected from each borehole using a 50-millimetre diameter split spoon sampler. The soil samples were visually described in the field and placed in Ziplock bags for further examination and classification.

Upon completion of soil sampling and drilling activities, each borehole was backfilled with one bag of holeplug at the bottom of the borehole, followed by soil cuttings from the drilling (packed into the borehole with the drill rig auger), followed by one bag of holeplug near the surface of the borehole, covered with original road base material.

3. RESULTS

3.1 FIELD OBSERVATIONS

During the site reconnaissance carried out on May 4, 2020, the landfill cover was observed to be in generally good condition with strong vegetative growth in most areas. A few areas with vegetation stress or where evidence of some previous cap repair activity were noted. In areas where cap maintenance was apparent, surficial soils appeared to be well graded with a mix of fine (silt/clay) particles and sand and gravel. Clear liquid was observed seeping out of the cover soil materials in a few locations (i.e., north central slope and northeast corner) with some evidence of minor erosion of cover soils in these areas. A liquid seep was observed in a relatively small, central area of the south slope with some orange/black staining (i.e., in the area of test pit TP16-20). This seepage did not appear to be migrating down the full length of the slope at the time of the reconnaissance.



Areas with stressed vegetation, possible disturbance from cap repairs and liquid seepage were noted and targeted for test pit locations. Other test pit locations were selected to provide a representative distribution of investigation locations across the entire landfill cover. General observations on the surficial ground conditions at each test pit location are noted in the Record of Test Pits in **Appendix D** and the general condition of the landfill cover adjacent to each test pit can be observed in the photos included on each test pit record. In addition to the test pit locations, the approximate limits of the last area where final cover was completed in 2011 is illustrated on **Figure 2**. It is understood that there was a construction quality control/quality assurance (QC/QA) program carried out during installation of this last final cover area.

A detailed description of the soil stratigraphy encountered in each test pit is provided in the Record of Test Pits in **Appendix D**, along with depth intervals for each general soil layer encountered. The sampling depth interval and length of soil samples recovered are also provided in the Record of Test Pits for test pit locations where shelly tube sampling was carried out as well as a listing of laboratory analyses that were requested for select test pit locations and depth intervals.

The subsurface conditions in the test pits (from top to bottom) were generally observed to include a topsoil layer (ranging in thickness from 0.12 to 0.60 metres), a fine-grained “barrier soil layer”, primarily described as silty clay or clayey silt (ranging in thickness from 0.20 to >1.20 metres) and a variable fill layer. It is noted that negligible barrier layer soil was observed at test pit TP22-20 where only sandy silt fill material was encountered below the topsoil layer. The overall thickness of all cover soils encountered in the test pits was observed to range from 0.45 to greater than 1.70 metres.

Contour plots illustrating the interpreted total cover soil thickness, the total cover soil thickness excluding topsoil and the interpreted thickness of the barrier soil layer are provided, respectively on **Figures 4, 5 and 6**. In general, the barrier cover soil layer over the eastern half to two-thirds of the site was visually described as a silty clay, whereas this layer was often described more as a clayey silt or glacial till-like material in test pits located over the western one-third of the site.

Based on the field observations and descriptions in the Record of Test Pits and on the thickness contours for the interpreted barrier soil layer (**Figure 6**), the site was divided roughly into three zones with similar cover soil conditions. These zones are illustrated on **Figure 7**. The surface area and average topsoil, barrier soil layer and total cover thicknesses in each of these zones were calculated for use in the percolation modelling (presented in Section 3.3), as summarized in **Table 4**.



Table 4: Cover Soil Zones Characteristics.

Zone	Area (m ²)	Average Topsoil Thickness (m)	Average Barrier Layer Thickness (m)	Average Total Cover Thickness (m)
1	103,666	0.23	0.84	1.30
2	47,118	0.21	0.45	0.98
3	11,371	0.16	0.18	0.80

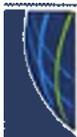
Borehole logs for the borehole drilling program that was carried out on the inside shoulder of the ring road around the northwest corner of the landfill are provided in **Appendix D** and include a description of the soil layers encountered based on visual observations from continuous split spoon sampling. The soils encountered beneath the surficial topsoil and/or granular road base materials were described as various fill materials with various proportions of clay, silt, sand and gravel sized particles extending to a depth below ground surface of between 1.07 and 3.05 metres. Native sandy silt glacial till soils were encountered in each borehole beneath the fill layers, extending to auger refusal on what was assumed to be the bedrock surface at depths ranging from 2.74 to 8.63 metres below ground surface. Moist to wet conditions were generally described in the glacial till soils, starting at depth between approximately 2.3 and 3.0 metres.

3.2 LABORATORY ANALYSES

As described in the Record of Test Pits in **Appendix D**, representative samples collected during the test pitting program were submitted for laboratory testing to confirm soil classifications and in-situ conditions. A total of 8 grab samples were submitted for grain-size analyses (sieve and hydrometer testing), 10 grab samples were submitted for natural moisture content and density testing and 4 shelby tube samples were submitted for hydraulic conductivity testing. Thurber Engineering Ltd. in Ottawa, Ontario conducted the grain-size, natural moisture content and density testing. Golder Associates Ltd. in Mississauga, Ontario conducted the hydraulic conductivity testing.

3.2.1 Grain Size, Natural Moisture Content and Density

The results of the grain-size analyses (sieve and hydrometer testing) are provided in **Appendix E**. The samples submitted for grain-size analyses were collected from the barrier soil layer at select test pits across the site. The grain-size curves illustrate that most samples had greater than 80% fines (silt and clay size particles). Two (2) of the samples analyzed for grain-size distribution had less than 80% fines with approximately 68% of the sample from test pit TP9-20 within the fines fraction and 60% of the sample from TP19-20 in the fines fraction. TP9-20 is located along the north slope in Phase 1 in the western half of the site; TP19-20 is located along the south slope in Phase 2 in the southwest portion of the site. The grain-size results are consistent with visual



observations at these locations during the test pitting and consistent with the description provided above in Section 3.1 that the barrier layer soil in the eastern half to two-thirds of the site was more clayey compared to the more silty or till-like barrier layer soils found in most test pits in the western one-third of the site.

The results of the natural moisture content and density testing are also provided in **Appendix E**. All samples submitted were reported to have a Unified Soil Classification System (USCS) symbol of "CL-ML", denoting clays and silts with low plasticity. All samples had 85% or greater fines and natural moisture contents of between 23.2% and 32.0% with the exception of the samples analyzed from TP13-20 and TP21-20 which exhibited 70% and 80% fines, respectively, and had respective natural moisture contents of 11.4% and 19.8%. The soil sample collected from TP13-20 (located in the northwest portion of the site) was visually described as a sandy silty glacial till with some gravel and cobbles, whereas the soil sample from TP21-20 (located along the west slope of the landfill) was visually described as a clayey silt material.

Dry density values for the submitted soil samples were generally similar, ranging from 1,425 kg/m³ to 1,649 kg/m³, with the exception of the soil sample from TP13-20 which had a dry density of 2,047 kg/m³. This is consistent with the higher sand and gravel content measured in the lab and observed in the field at test pit TP13-20.

3.2.2 Hydraulic Conductivity

The results of the hydraulic conductivity testing that was carried out on four (4) shelly tube samples collected during the test pitting program are provided in **Appendix E**. Hydraulic conductivity testing was carried out using a flexible wall permeameter under an effective consolidation stress of 35 kPa during the hydraulic conductivity stage of the test. Testing was repeated for one of the samples (sample ST1 from TP14-20) under a lower effective consolidation stress of 5 kPa during the hydraulic conductivity stage to investigate the sensitivity of this test parameter on the resulting hydraulic conductivity. The shelly tube samples from test pit TP14-20 were selected as representative of full-depth samples through the barrier layer soils in the most recently capped portion of the site, using silty clay materials installed with a construction QA/QC program. The shelly tube samples from test pits TP13-20 and TP22-20 were selected as representative of barrier layer soils in areas with less clayey and more silty or till-like materials in the western portion of the site.

Measured hydraulic conductivity values are as shown in **Table 5**.



Table 5: Hydraulic Conductivity Results from Test Pit Samples.

Test Pit, Sample	Location (see Figure 2)	Effective Consolidation Stress (kPa)	Hydraulic Conductivity (m/s)
TP13-20, ST2	Phase 1, northwest portion of site	35	8.41×10^{-10}
TP14-20, ST1	Phase 2, top portion of site, east of centre	35	1.10×10^{-10}
TP14-20, ST2	Phase 2, top portion of site, east of centre	35	6.87×10^{-11}
TP22-20, ST1	Phase 1, west slope of landfill	35	7.04×10^{-11}
TP14-20, ST1*	Phase 2, top portion of site, east of centre	5	1.17×10^{-9}

* Repeat test to investigate the sensitivity of the Effective Consolidation Stress on the test results.

Based on these test results, it is noted that the barrier layer soils exhibited relatively low hydraulic conductivity values and were at or below the maximum hydraulic conductivity value of 1×10^{-9} m/s required for the engineered clayey liner portions of the generic liner design options in the MECP Landfill Standards (MECP, January 2012) and Ontario Regulation 232/98. These bottom liner requirements do not apply to final landfill covers or cover systems but are offered here as a reference for comparison and discussion purposes only. It is noted that even the barrier layer soil samples from test pits completed in areas of the site with less clayey and more silty or till-like soils (i.e., TP13-20 and TP22-20) exhibited low hydraulic conductivity. Repeating the hydraulic conductivity test for sample ST1 from TP14-20 at a lower effective consolidation stress showed an increase in hydraulic conductivity by approximately one order of magnitude and therefore shows that these test results can be affected by the effective consolidation stress. It is considered that the laboratory hydraulic conductivity testing under an effective consolidation stress of 35 kPa would be lower than typical pressures exerted on a clay liner at the base of a landfill cell. As such, comparison of these test results to the maximum hydraulic conductivity values in the MECP Landfill Standards is conservative. It is also noted that an effective consolidation stress of 5 kPa (used on the repeat test for sample ST1 at TP14-20) is very low and could introduce some error into the test results as flow between the membrane surrounding the soil sample and the sample could preferentially occur instead of through the sample itself.

In addition to investigating the sensitivity of the test results to the effective consolidation stress applied during the test, the repeat test for sample ST1 from TP14-20 was also carried out due to the tendency of shelly tube samples to underestimate field hydraulic conductivities. This is discussed further in the following Section and the related report in **Appendix F**. As noted in the report in **Appendix F**, the hydraulic conductivity of the barrier layer soils used in the percolation modelling was conservatively assumed to be even higher (more permeable) than the results achieved in the lab under an effective consolidation stress of 5 kPa.



3.3 PERCOLATION MODELLING

Miles V. Khire, Ph.D., P.E., BCEE was retained to carry out percolation modelling and to assess the potential effects of time-dependent settlement of the landfill and related leachate generation predictions. The percolation model was developed and calibrated using data collected by BluMetric during the field investigation and based on results obtained from the laboratory testing on soil samples collected during the test pitting program, as described in the preceding sections. Dr. Khire's letter report summarizing his assumptions, modelling methodology and conclusions is provided in **Appendix F**.

4. DISCUSSION

Based on observations made during the site reconnaissance and test pitting program, the landfill cover soils at the Richmond Landfill Site were observed to be in generally good condition. Surficial conditions for the most part exhibited strong established vegetation with only minor localized areas of differential settlement and depressions, relatively minor surficial erosion and only a few areas where small amounts of liquid was observed draining out of the cover soils. The soil layers encountered during test pit excavation generally included a surficial topsoil layer underlain by a fine-grained barrier soil layer and fill materials. No obvious landfill gas venting or areas with surface water infiltration were observed while on-site. The results of limited hydraulic conductivity testing carried out on relatively undisturbed barrier soil layer samples indicated low hydraulic conductivity values at equal to or less (i.e., better) than would be required under Ontario Regulation 232/98 for the engineered clayey liner portions of the generic designs for groundwater protection systems provided in the MECP Landfill Standards (MECP, January 2012).

4.1 PERCOLATION ASSESSMENT

Based on the Percolation Assessment letter report from Dr. Khire (**Appendix F**), assuming a barrier soil layer hydraulic conductivity of 1×10^{-8} m/s (1×10^{-6} cm/s), which is conservatively one order of magnitude higher (i.e., more permeable) than the lowest results obtained from laboratory hydraulic conductivity testing on the shelly tube samples collected during the test pitting investigation (to account for paedogenesis from wetting and drying cycles and typical underestimation of field hydraulic conductivity in shelly tube samples), the predicted annual percolation rates for Zones 1, 2 and 3 were 3.1, 3.8 and 5.6 cm/year, respectively, using 2011 precipitation data and 3.4, 4.0 and 5.9 cm/year using 2019 precipitation data. Precipitation data from 2011 was modelled as a representative 'wetter than average' year (73rd percentile) whereas precipitation data from 2017 was modelled as an 'extremely wet' year (99th percentile). Predicted



annual percolation rates using a barrier soil layer hydraulic conductivity value of 1×10^{-9} m/s (1×10^{-7} cm/s) were less than 0.5 cm/year for Zones 1 and 2 and less than 1.0 cm/year for Zone 3 using either 2011 or 2019 precipitation data.

The above modelled percolation values represent only approximately 4% to 50% of the measured leachate volumes at the site. As such, a settlement analysis was carried out by Dr. Khire to estimate the effect of time-dependent settlement on leachate generation volumes during the post-closure period from 2011 to 2019. Based on this analysis, Dr. Khire estimated that the settlement rate of the waste at the Richmond Landfill Site is somewhere between 19 cm/year and 34 cm/year and that this degree of settlement could be expected to expel leachate volumes that would make up the balance between the volumes estimated from the percolation modelling and actual leachate volumes that have been measured. Additional details on the settlement analysis and corresponding leachate generation are provided in **Appendix F**.

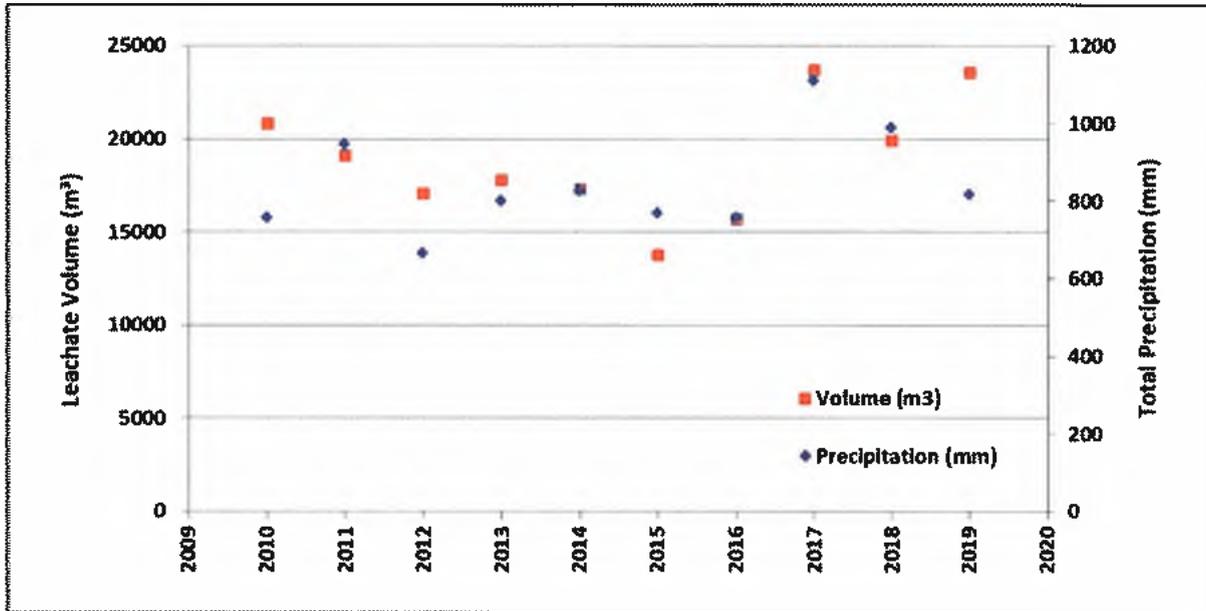
4.2 ASSESSMENT OF PRECIPITATION COMPARED TO LEACHATE VOLUMES

A comparison between annual leachate volumes and precipitation is presented graphically on **Text Figure 2** in order to evaluate possible correlations for the period between 2010 and 2019. A direct correlation generally exists between total annual leachate generation and precipitation, including for example 2017 when the highest precipitations and leachate volumes were recorded in the 2010-2019 period.

However, there are notable deviations to this trend during some years. This is particularly apparent in 2010 when precipitation was below the annual average of 845 mm/y while leachate volume was above the annual average of 18,854 m³/yr. This inverse relationship (higher than average leachate volumes vs. lower than average precipitation) was also observed in 2012 and was particularly apparent in 2019 when precipitation was slightly below average but volume generation was significantly higher than normal, almost as high as in 2017.

It is believed that the higher than anticipated leachate volumes result from the contribution from shallow groundwater infiltration via the perforated perimeter collector pipe installed along the western and northern sides of Phase 1 of the landfill, as discussed in the next section.





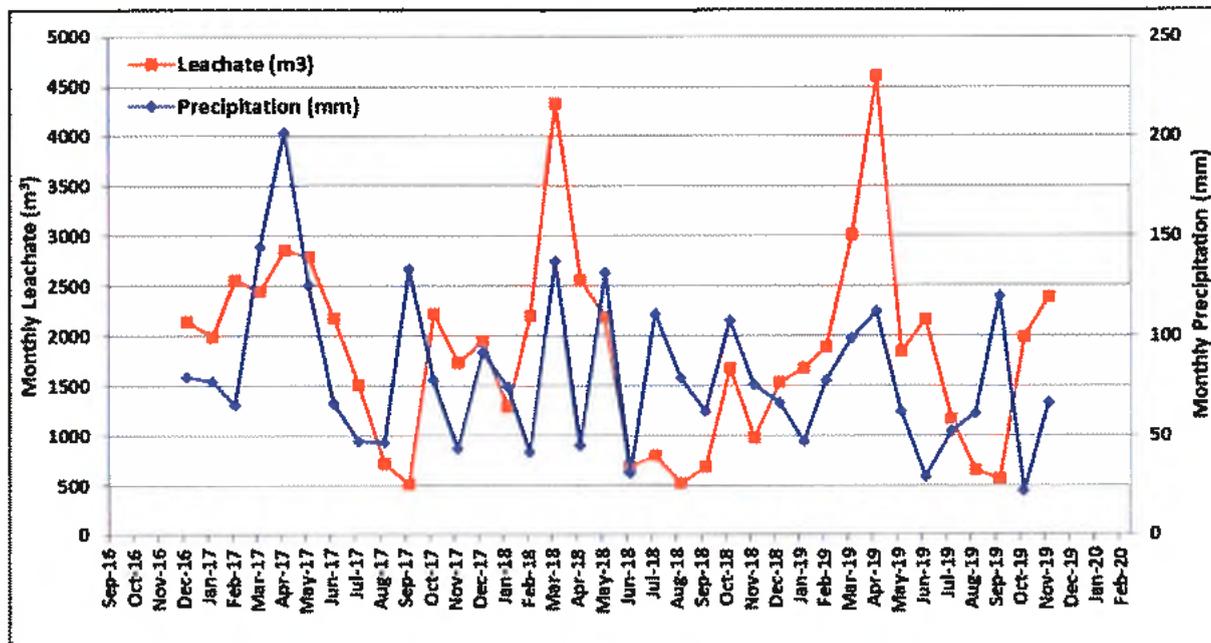
Text Figure 2: Total Annual Leachate Volume and Precipitation (2010-2019).

4.3 ASSESSMENT OF GROUNDWATER INFILTRATION COMPARED TO LEACHATE VOLUMES

As noted in Section 1.3, the highest leachate volumes over that past 10 years were observed in 2017 and 2019. While total precipitation was higher than normal in 2017, they were slightly below the annual average in 2019. **Text Figure 3** summarizes the monthly records for the last three years (2017 to 2019) in order to further evaluate the relationship between precipitation and leachate volumes during this period.

As expected, leachate generation between 2017 and 2019 was consistently highest during and shortly after the spring freshet which typically occurs in March-April, while it is lowest during the late summer months (August-September), increasing through the late fall and early winter months (November-December). While precipitation was also highest in the spring in 2017, there were no clear patterns or trends in other months during this period, with monthly precipitation fluctuating up and down through 2018 and 2019.





Text Figure 3: Monthly Leachate Volumes vs. Precipitation (2017-2019).

A similar seasonal pattern observed from leachate volumes is also apparent from shallow groundwater elevations recorded as part of the spring, summer and fall monitoring events, and documented in semi-annual monitoring reports over the past several years. **Figure 8** provides the interpolated shallow groundwater elevations in the vicinity of the northwest portion of the landfill (i.e., unlined Phase 1 with retrofit perimeter collector), as reported in the 2017 to 2019 semi-annual reports for the site.

As described in Section 1.2, a perimeter drain (perforated pipe) was installed in a ditch excavated at the foot of the waste mound along the west and north sides of the unlined portion of the landfill (Phase 1, see **Figure 2**) and connected to the leachate collection system collecting leachate from Phases 2 and 3 of the landfill, and reporting to the North Chamber leachate sump. Similar to leachate volumes, shallow groundwater elevations are also typically highest in the spring, lowest in the summer and intermediate in the fall.

Figure 9 provides vertical cross-sections along the west and north sides of Phase 1 of the landfill, showing the elevations of the interpolated shallow groundwater surface from monitoring events conducted in spring, summer and fall between 2017 and 2019 (also shown in plan view on



Figure 8), in relation to the perimeter drain from as-built drawings⁵. It is obvious that shallow groundwater is higher than the perforated perimeter drain during certain times of the year when water levels are highest (typically in spring and to a lesser degree in fall, as shown on **Figures 8 and 9**). This is particularly apparent in the northwest corner and along the northern side of Phase 1 of the landfill.

While groundwater elevations are only available for specific snapshots in time (spring, summer and fall each year), and the shallow groundwater contours are interpolated from discrete monitoring locations some distance away from the perimeter drain, the example cross-sections provided on **Figure 9** demonstrates that the leachate volume removed from the North Chamber includes a contribution from shallow groundwater during some times of the year.

Groundwater infiltration into the leachate collection system via the perimeter drain also results in dilution of constituent concentrations in leachate (see **Appendix C**). Leachate concentrations are consistently lower in samples from the North Chamber sump, relative to results from the South Chamber leachate sump that collects leachate from HDPE lined Phases 4 and 5 of the landfill.

While it cannot be quantified, the contribution to leachate volumes from shallow groundwater is assumed to be significant at times, in particular during extended periods of sustained precipitations and spring freshet, when shallow groundwater elevations are expected to be at their highest.

5. CONCLUSIONS & RECOMMENDATIONS

Based on the results from the field investigation activities, laboratory testing, percolation modelling, as well as comparison between historical precipitation and leachate volume data and between groundwater elevations and the invert elevation of the perimeter drain, the following conclusions and recommendations can be drawn:

- The landfill cover was observed to be in generally good condition with well-established vegetation and minimal evidence of erosion, cracking, desiccation, vegetation stress or localized significant differential settlement. The cover soils at the test pit locations were generally observed to include a topsoil layer, a fine-grained barrier soil layer and a fill layer. The average thickness of the barrier layer was observed to be between 0.45 and 0.84 metres over approximately 93% of the site (i.e., Zones 1 and 2) with an average of

⁵ Richmond Landfill Phase 1 Leachate Collector Drawings, Henderson Paddon & Associates Ltd, May 2000



0.16 metres thick over the remaining 7% (i.e., Zone 3). Laboratory permeability testing on Shelby tube samples collected during the test pitting investigation indicated hydraulic conductivity values of lower than 1×10^{-9} m/s, even in samples collected from barrier layer soils with lower clay apparent clay content.

- Percolation modelling results have been presented that suggest between 4% and 50% of the measured leachate volumes may be the result of percolation through the cap materials.
- An analysis was carried out to estimate the volume of leachate that could be expected to be expelled as a result of settlement within the waste mound. This assessment concluded that this volume of liquid could make up the balance between the volumes estimated from the percolation modelling and actual measured leachate volumes.
- There is a good correlation between annual precipitation and leachate generation, as would be expected, however there are some notable deviations. Although difficult to quantify, shallow groundwater infiltration appears to be contributing to leachate volumes during significantly wet times of the year based on a comparison of the invert elevations of the perforated perimeter collector drain installed along the west and north sides of Phase 1 to adjacent groundwater levels. It is considered that the intensity and duration of precipitation events may influence groundwater contributions to leachate generation volumes more directly than overall average annual precipitation rates.

Leachate generation from shallow groundwater infiltration and from settlement within the waste mound are difficult to control. In time, the contribution from waste settlements would be expected to decrease. It is considered that continuation of the existing regular cap inspection and maintenance program is sufficient to minimize the contribution of percolation through the landfill cover to leachate generation volumes.

Respectfully submitted.

BluMetric Environmental Inc.



P. Andrew B. Benson, M.Eng., P.Eng.
VP, Senior Environmental Engineer

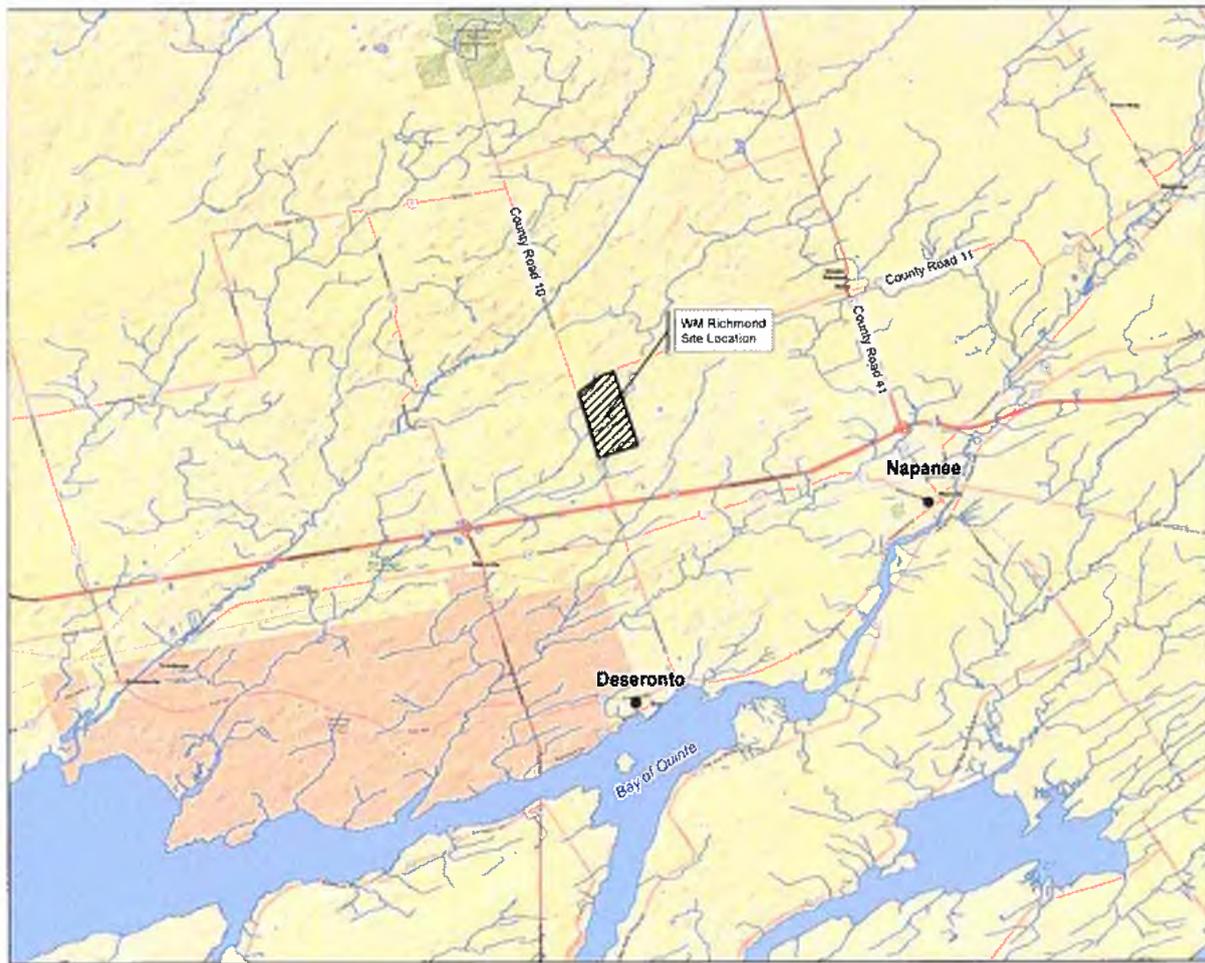


Francois Richard, P.Geo., Ph.D.
Senior Hydrogeologist

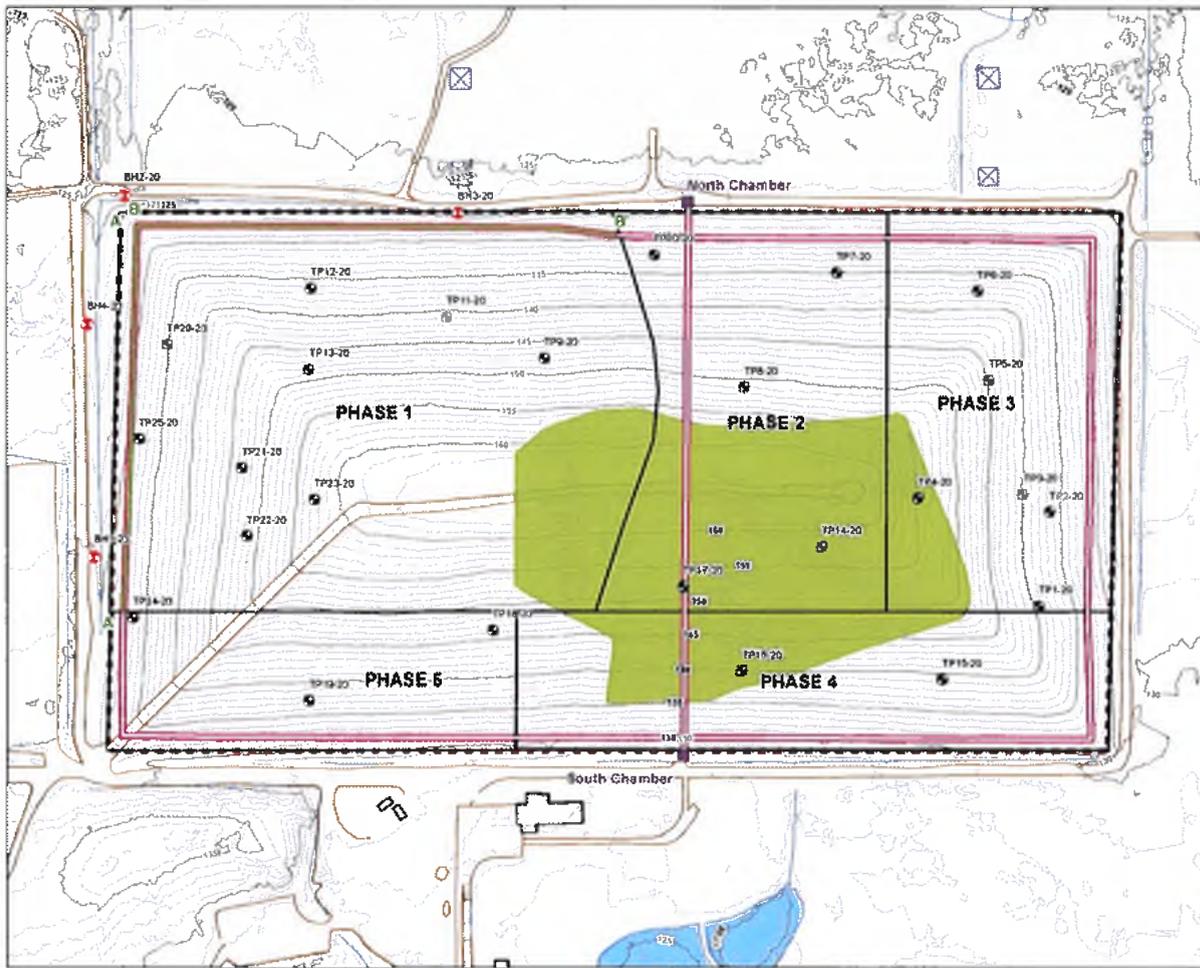


FIGURES





LEGEND			
	Site Location		
	Streams		
	Water bodies		
REV.			
1			
REFERENCES			
<p>As shown on this map, the site is located on the north side of County Road 11, approximately 1.5 km west of Napanee, Ontario. The site is situated on a hillside overlooking the Bay of Quinte. The site is bounded to the north by County Road 11, to the east by County Road 9, and to the south by the Bay of Quinte.</p>			
<p>Scale: 1:100,000</p>			
CLIENT			
PROJECT			
Waste Management Richmond Landfill Cover Integrity Assessment			
TITLE			
Site Location			
<p>The Tower - The Woolen Mill, 4 Colshaw St., Kingston, Ontario K7K 1L7 TEL: (613) 531-2725 FAX: (613) 531-1852 Email: info@blumetric.ca Web: http://www.blumetric.ca</p>			
PROJECT #		DATE	
190222-08		November 12, 2020	
DRAWN	CHECKED	FILED	REV
GM	FR	01	0



LEGEND

- Borehole
- Test Pit
- Hydro Tower
- Leachate Pumping Station
- Class Section Assignments
- Leachate Collector
- Landfill Phasing Limits
- Limit of Existing Landfill
- Final Cap Area (Seps. 2011)
- Separation/Collection
- Major Contour - 5m
- Minor Contour - 1m

REV.	DESCRIPTION	APPROVED BY	CHK.
1			

REFERENCES

1. Ministry of the Environment, 2011. *Final Cap Area (Seps. 2011)*.
 2. Ministry of the Environment, 2011. *Final Cap Area (Seps. 2011)*.
 3. Ministry of the Environment, 2011. *Final Cap Area (Seps. 2011)*.



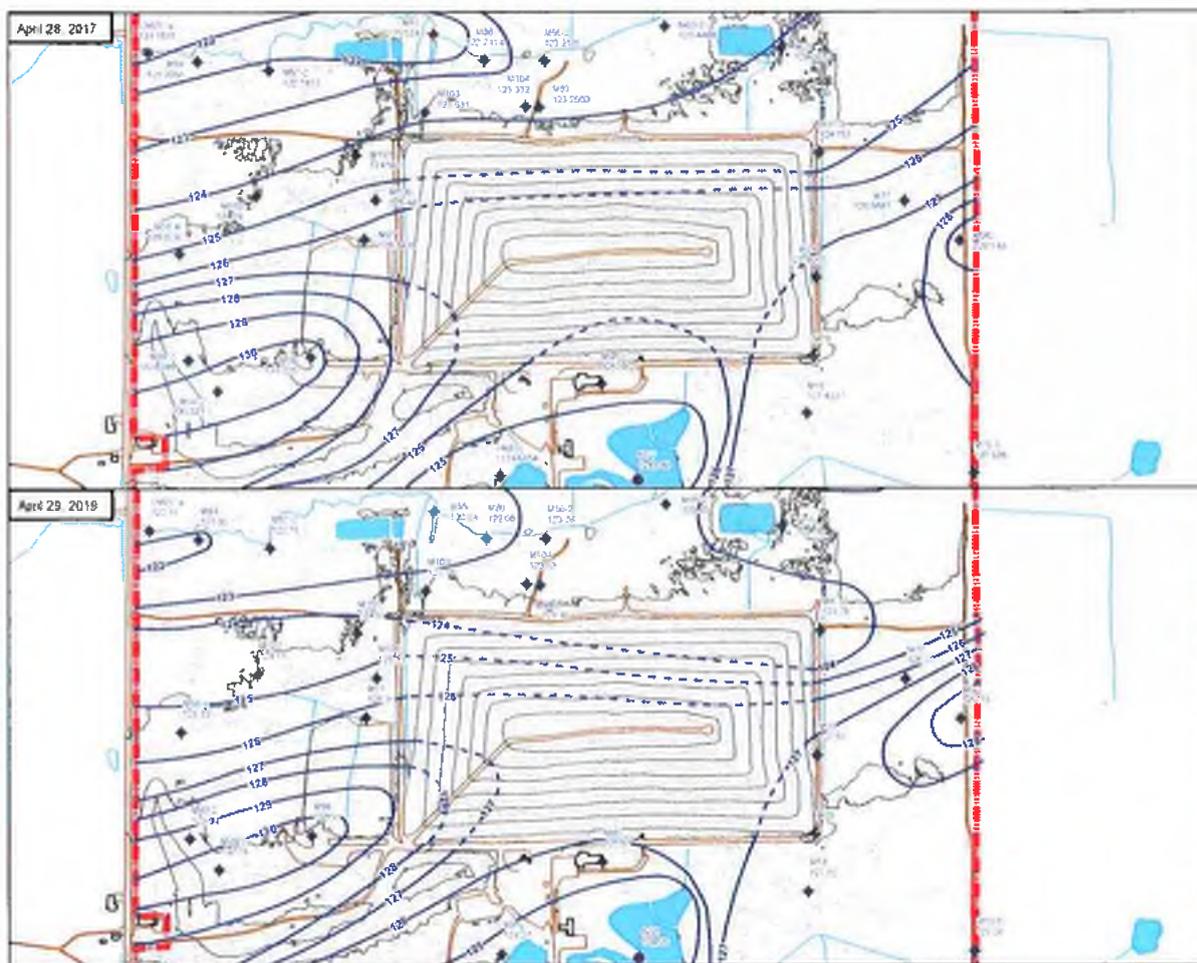
PROJECT
WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT

TITLE
Site Plan

BluMetric Environmental
 The Tower - The Woolen Mill
 4 Catherine St.
 Kingston, Ontario K7R 1E7
 TEL: (613) 531-2725
 FAX: (613) 531-1852
 Email: info@blumetric.ca
 Web: http://www.blumetric.ca

PROJECT #	DATE
190222-09	December 17, 2020

DRAWN	CHECKED	FIG. NO.	REV.
CM	FR	02	0



LEGEND

- Planimetry to Date (2017)
- Topog. Contour Lines (3 m)
- Topog. Contour Lines (2 m)
- Surface Water
- Property Boundaries
- Process Cell Boundaries
- Shallow Groundwater Elevation Monitors
- Process Cell Boundaries
- Process Cell Boundaries
- Staff Camp Location

REV	DESCRIPTION	YY/MM/DD	BY	CHK
1	ISSUED			

REFERENCES

Waste Management Richmond Landfill Cover Integrity Assessment

SCALE

0 50 100 Meters

1:1,000

CLIENT

WM
WASTE MANAGEMENT

PROJECT

Waste Management Richmond Landfill Cover Integrity Assessment

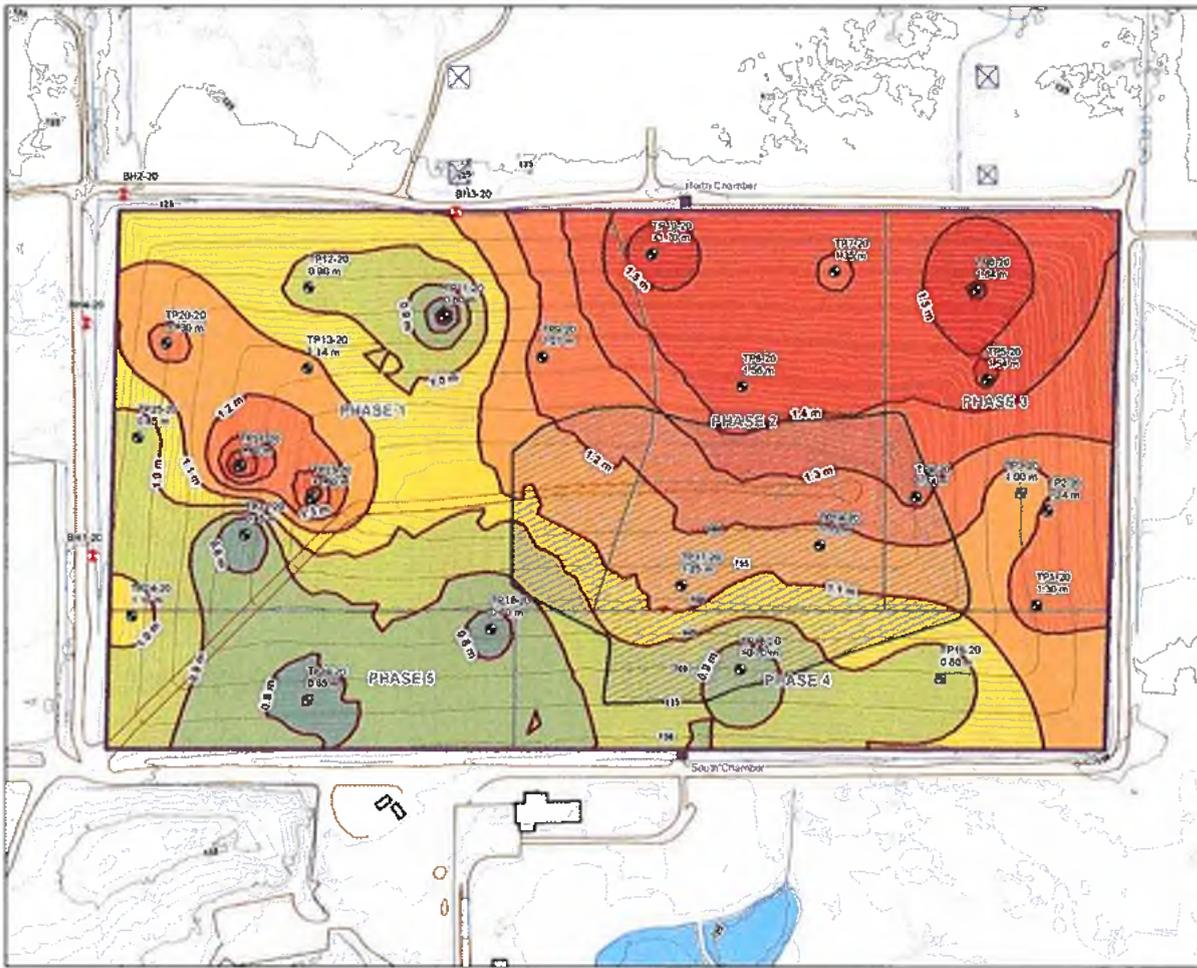
TITLE

Shallow Groundwater Elevation Contours

BluMetric Environmental

The Tower - The Woolen Mill,
Kingston, Ontario K1K 1Z7
TEL: (613) 531-1125
FAX: (613) 531-1852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE		
190222-08	November 12, 2020		
DRAWN	CHECKED	PLT. NO.	REV.
GM	FR	03	0



LEGEND

Symbol	Description	Total Cover Soil Thickness
Red square	Boundary	0.45 - 0.5
Black square	Test Pit	0.5 - 0.6
Blue square	Leachate Pumping Station	0.6 - 0.7
Green square	Approved Landfill Limits	0.7 - 0.8
Yellow square	Landfill Reclaim Limits	0.8 - 0.9
Orange square	Total Cover Soil Thickness Contour (0.1 m)	0.9 - 1.0
Red square	Final Cap Area (East)	1 - 1.1
Green square	Topographic Contour (1 m)	1.1 - 1.2
Blue square	Major Contour (5 m)	1.2 - 1.3
Yellow square	Minor Contour (1 m)	1.3 - 1.4
Orange square	Surface Water	1.4 - 1.5
Red square	Property Boundary	1.5 - 1.6
Black square	Proposed CAZ Boundary	1.6 - 1.7

REV	DESCRIPTION	BY	CHK	DATE
1				

REFERENCES

WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT

CLIENT

WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT

PROJECT

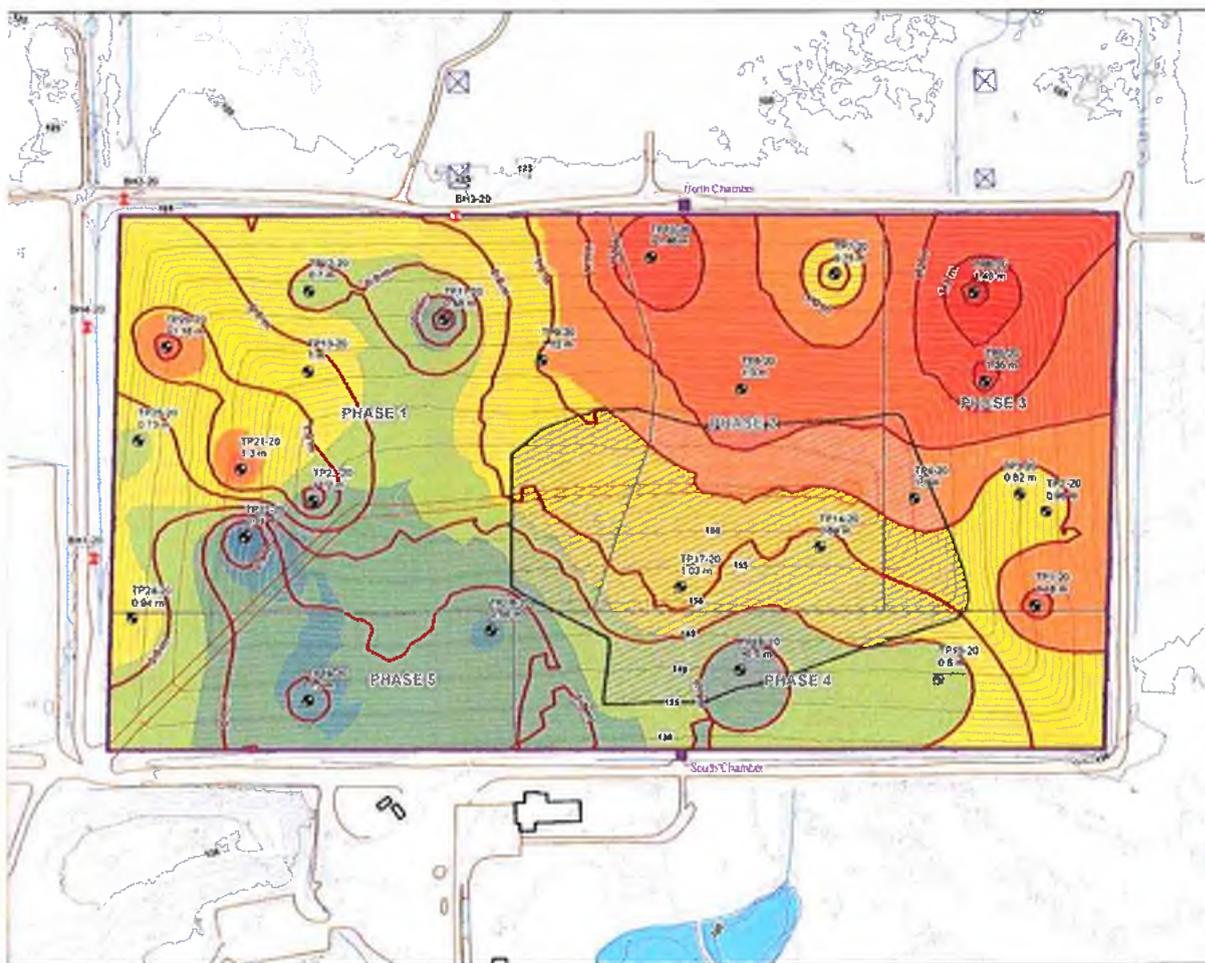
Interpreted Total Cover Thickness Contours

BluMetric Environmental

The Tower - The Woolen Mill,
4 Cataract St.,
Kingston, Ontario K7K 1Z7
TEL: (613) 531-2725
FAX: (613) 531-1832
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT #	DATE
190222-08	December 15, 2020

DRAWN	CHECKED	FIG. NO.	REV.
CM	MS	04	0



LEGEND

	Borehole		Cover Soil Thickness
	Test Pit		0.4 - 0.5
	Leachate Pumping Station		0.5 - 0.6
	Approved Landfill Limits		0.6 - 0.7
	Landfill Working Limits		0.7 - 0.8
	Cover Soil Thickness Contour (0.1 m)		0.8 - 0.9
	Final Cap Area (Sept. 2015)		0.9 - 1
	Topographic Contour (1 m)		1 - 1.1
	Major Contour (5 m)		1.1 - 1.2
	Minor Contour (1 m)		1.2 - 1.3
	Surface Water		1.3 - 1.4
	Property Boundary		1.4 - 1.40
	Proposed CAZ Boundary		

REV	DESCRIPTION	IN/OUT	DD	BY	CHK
1					

REFERENCES:
 WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT REPORT (REVISED) (2010)
 WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT REPORT (REVISED) (2010)
 WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT REPORT (REVISED) (2010)

CLIENT:

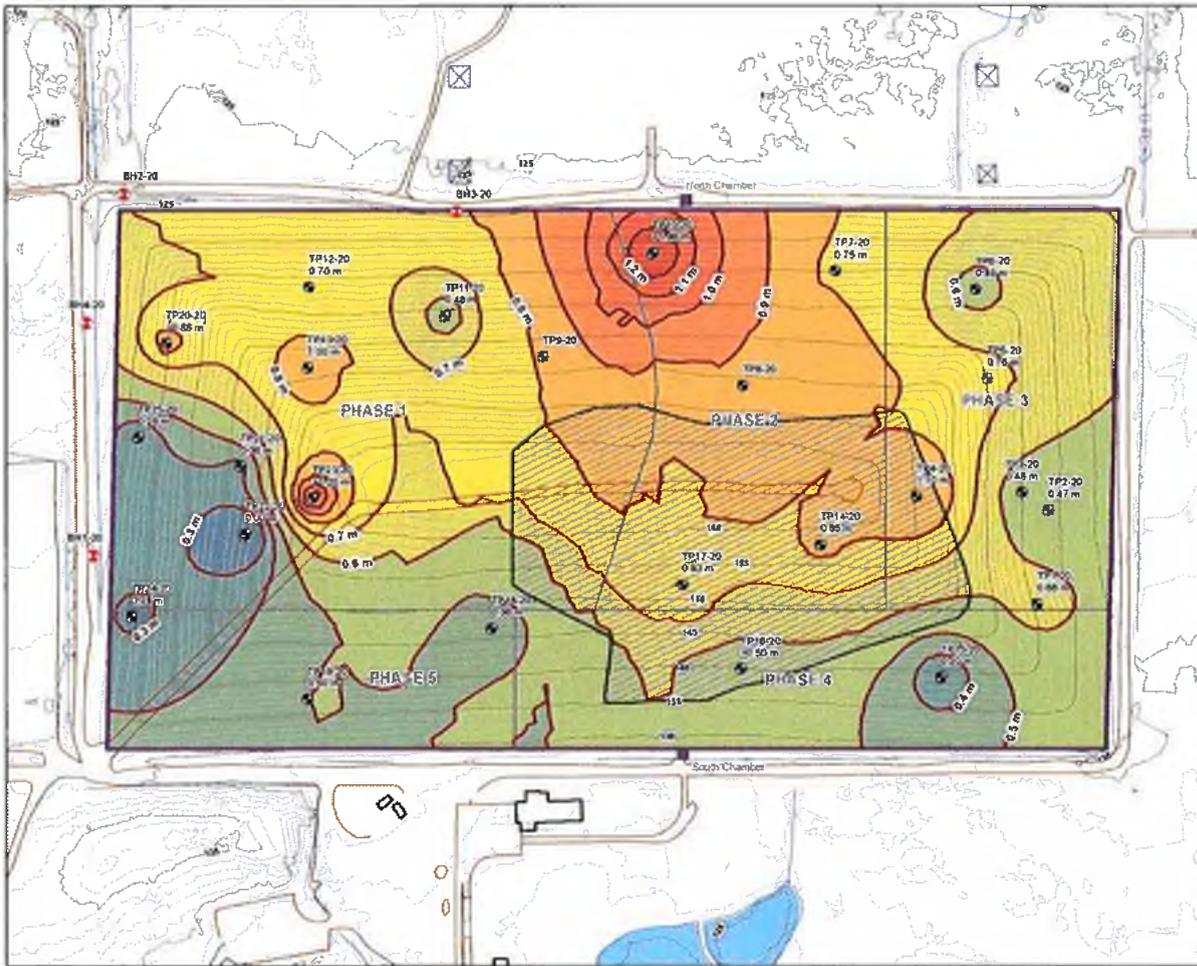
PROJECT:
 WASTE MANAGEMENT RICHMOND LANDFILL COVER INTEGRITY ASSESSMENT

TYPE:
 Interpreted Cover Soil Thickness Contours (Excluding Topsoil)

PREPARED BY:

THE TOWER - THE WASTE MGMT. CONSULTANTS LTD.
 4 Cataraqui St.
 Kingston, Ontario K7K 1E7
 TEL: (613) 531-2135
 FAX: (613) 531-1852
 Email: info@blumetric.ca
 Web: http://www.blumetric.ca

PROJECT #	DATE		
190222-08	December 15, 2020		
ISSUED	CHANGED	FIG. NO.	REV.
GM	AB	05	0



LEGEND

●	Borehole	■	Interpreted Barrier Layer Thickness
●	Test Pit	■	0 - 0.1
●	Leachate Pumping Station	■	0.1 - 0.2
■	Approved Landfill Units	■	0.2 - 0.3
■	Landfill Phasing Limits	■	0.3 - 0.4
■	Bottom Layer Thickness Contour (0.1 m)	■	0.4 - 0.5
■	Final Cap Area (Sept. 2011)	■	0.5 - 0.6
■	Topographic Contour (1 met)	■	0.6 - 0.7
■	Major Contour (5 m)	■	0.7 - 0.8
■	Major Contour (2 m)	■	0.8 - 0.9
■	Surface Water	■	0.9 - 1.0
■	Property Boundary	■	1.0 - 1.1
■	Proposed CAZ Boundary	■	1.1 - 1.2
■		■	1.2 - 1.3
■		■	1.3 - 1.4
■		■	1.4 - 1.5

REV	DESCRIPTION	BY/APP'D	DATE	CHK
1				

REFERENCES

Interpreted Barrier Layer Thickness Contours

1:1000

CLIENT

WM
WASTE MANAGEMENT

PROJECT

Waste Management Richmond Landfill Cover Integrity Assessment

TITLE

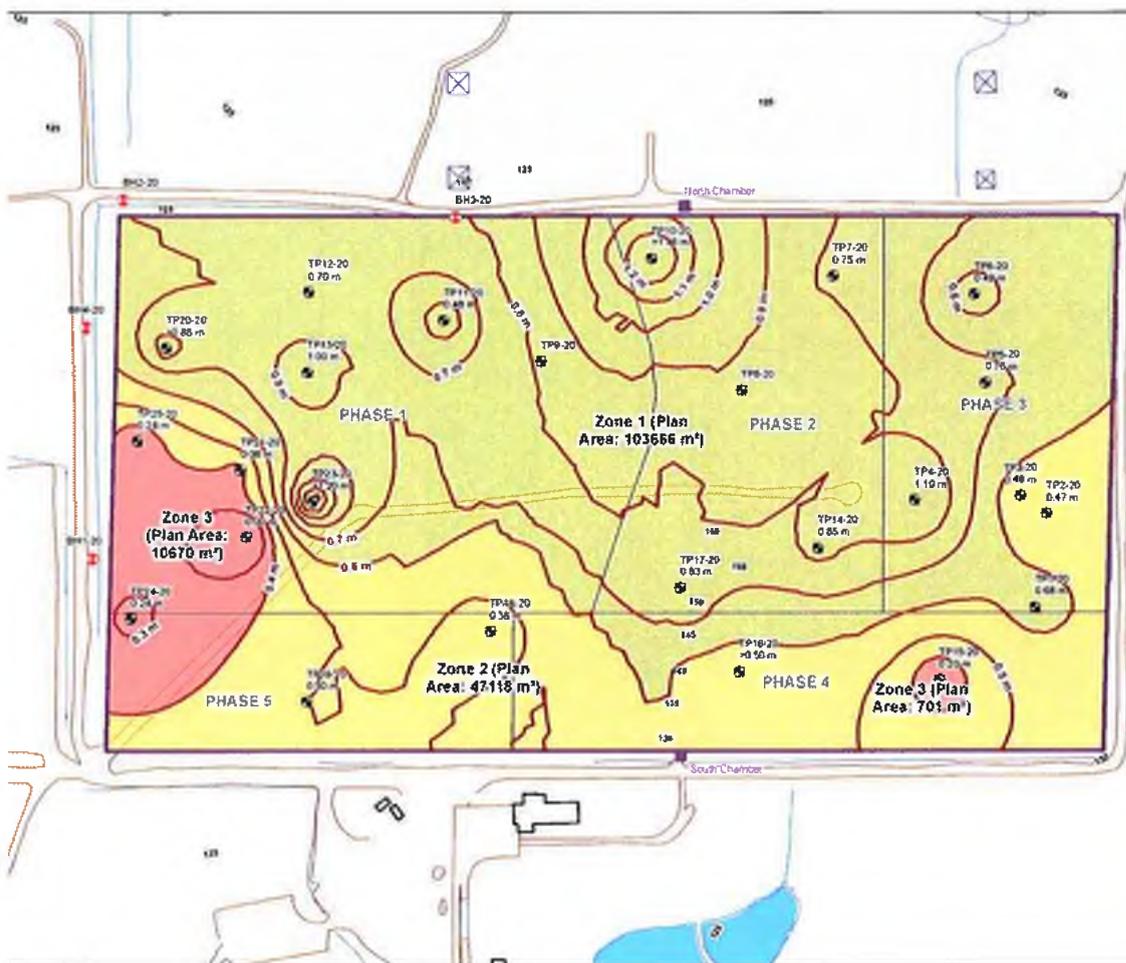
Interpreted Barrier Layer Thickness Contours

BluMetric Environmental

The Tower - The Woolen Mill,
4 Catherine St.,
Kingston, Ontario K7K 1L7
TEL: (613) 531-2725
FAX: (613) 531-7852
Email: info@blumetric.ca
Web: http://www.blumetric.ca

PROJECT # 190222-08 **DATE** December 15, 2020

DRAWN	CHECKED	FIG NO	REV
CM	AB	06	0



Legend

- Borehole
- Test Pit
- Leachate Pumping Station
- Approved Landfill Limits
- Landfill Phasing Limits
- Barrier Layer Thickness Contour (0.1 m)
- Cover Soil Zone 1 (> 0.8 m Barrier Layer Thickness)
- Cover Soil Zone 2 (0.4m - 0.8m Barrier Layer Thickness)
- Cover Soil Zone 3 (< 0.4 m Barrier Layer Thickness)

REV	DESCRIPTION	BY	CHK
1			

REFERENCES

SCALE

COMPANY

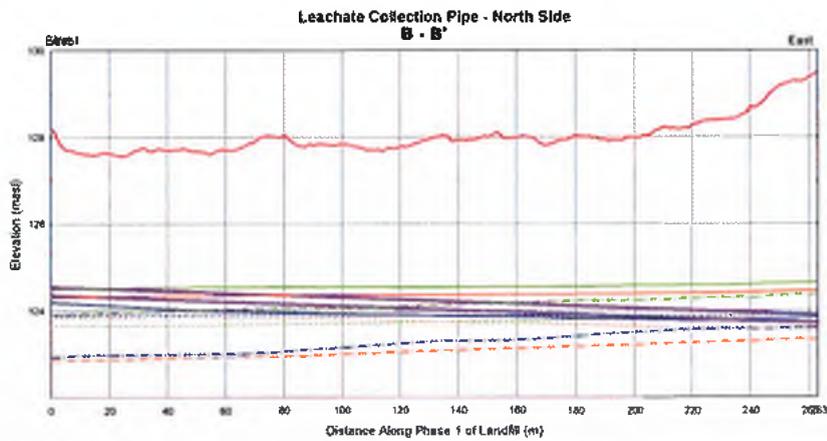
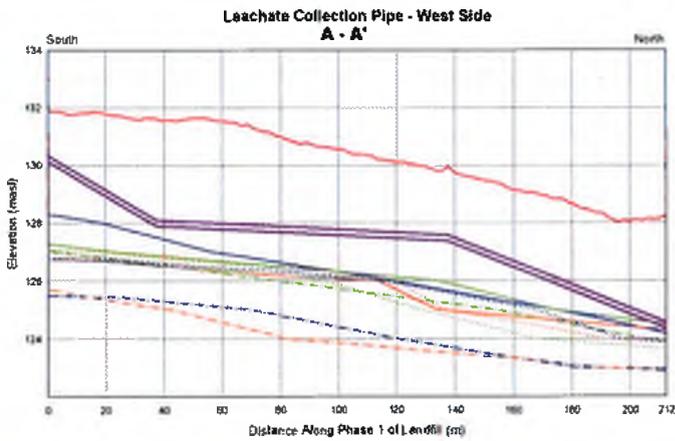
PROJECT
 Waste Management Richmond Landfill
 Cover Integrity Assessment

TITLE
 Cover Soil Zones

Client:
 The Tower - The Woodlands Ltd.
 4 Cedarblom St.,
 Kuylenburg, Ontario K7K 0Z7
 TEL: (613) 531-2725
 FAX: (613) 531-1852
 Email: info@blumetric.ca
 Web: http://www.blumetric.ca

PROJECT # 190222-08 **DATE** December 15, 2020

DESIGN	CHECKED	ISSUED	APP
GM	AB	07	0

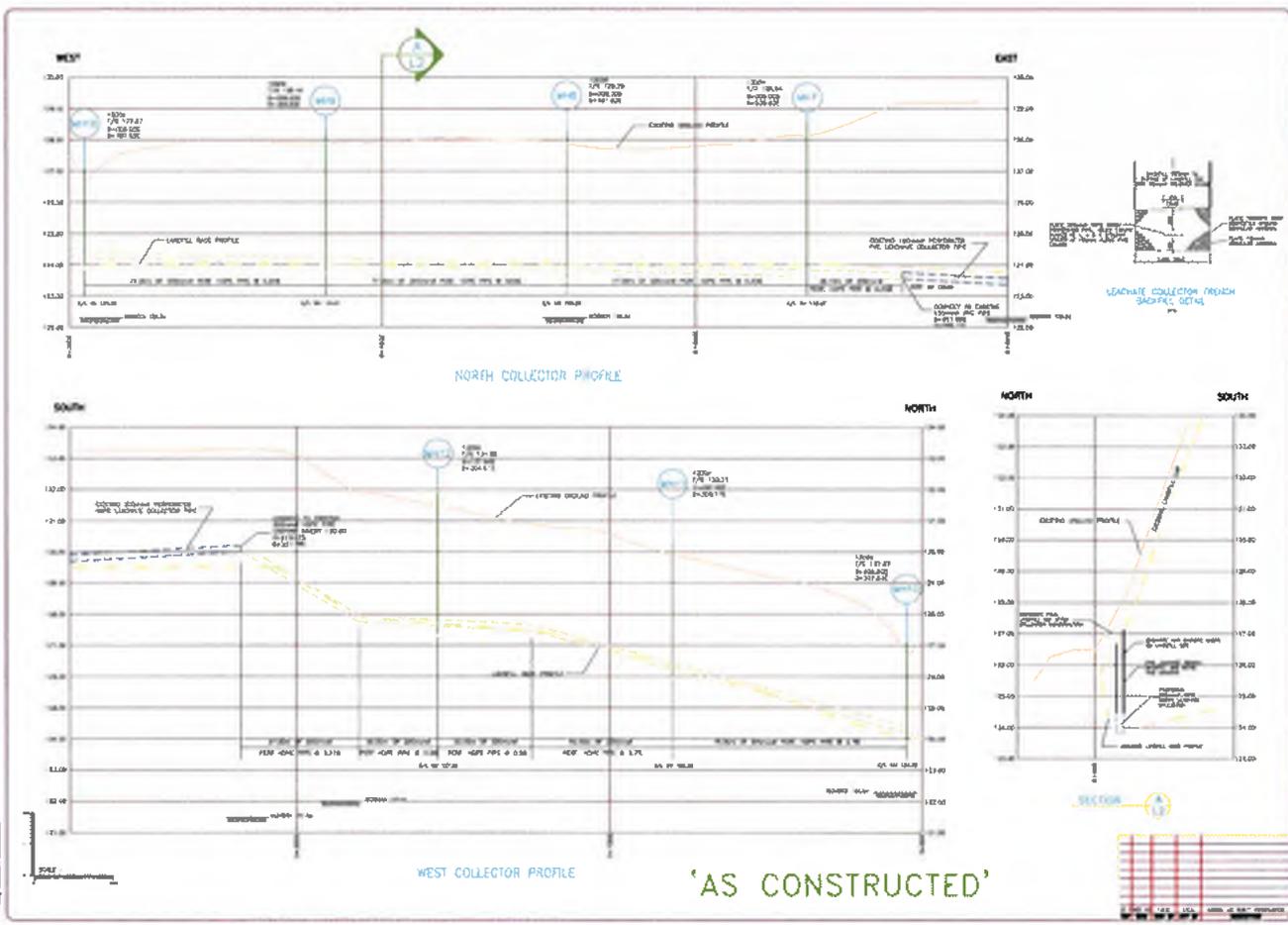


<p>Legend</p> <ul style="list-style-type: none"> — Topographic Surface - 2019 (BLM) - - - Groundwater Level - Apr 28, 2019 (BLM) - - - Groundwater Level - Sep 11, 2019 (BLM) - - - Groundwater Level - Oct 28, 2019 (BLM) - - - Groundwater Level - May 14, 2018 (BLM) - - - Groundwater Level - Sep 13, 2018 (BLM) - - - Groundwater Level - Oct 12, 2018 (BLM) - - - Groundwater Level - Apr 28, 2017 (BLM) - - - Groundwater Level - Aug 01, 2017 (BLM) - - - Groundwater Level - Oct 13, 2017 (BLM) — Leachate Collector 			
<p>Waste Management Richmond Landfill Cover Integrity Assessment</p> <p>Leachate Collector Profiles and Groundwater Elevations Around Unlined Phase 1 of Landfill</p>			
<p>BluMetric Environmental 190222-08 November 11, 2020</p>			
GM	FR	DP	0

APPENDIX A

Richmond Landfill Leachate Collector Drawings





NORTH COLLECTOR PROFILE

WEST COLLECTOR PROFILE

'AS CONSTRUCTED'

PROJECT NO. 1000-1000-1000
 DATE: 10/10/2010
 DRAWN BY: J. J. J. J. J. J.
 CHECKED BY: J. J. J. J. J. J.
 APPROVED BY: J. J. J. J. J. J.

CANADIAN WASTE
 A waste treatment company

PHASE 1 'AS BUILT'
 LEACHATE COLLECTOR PROFILE
 NAHANCE LANDFILL
 SUDBURY, ONTARIO

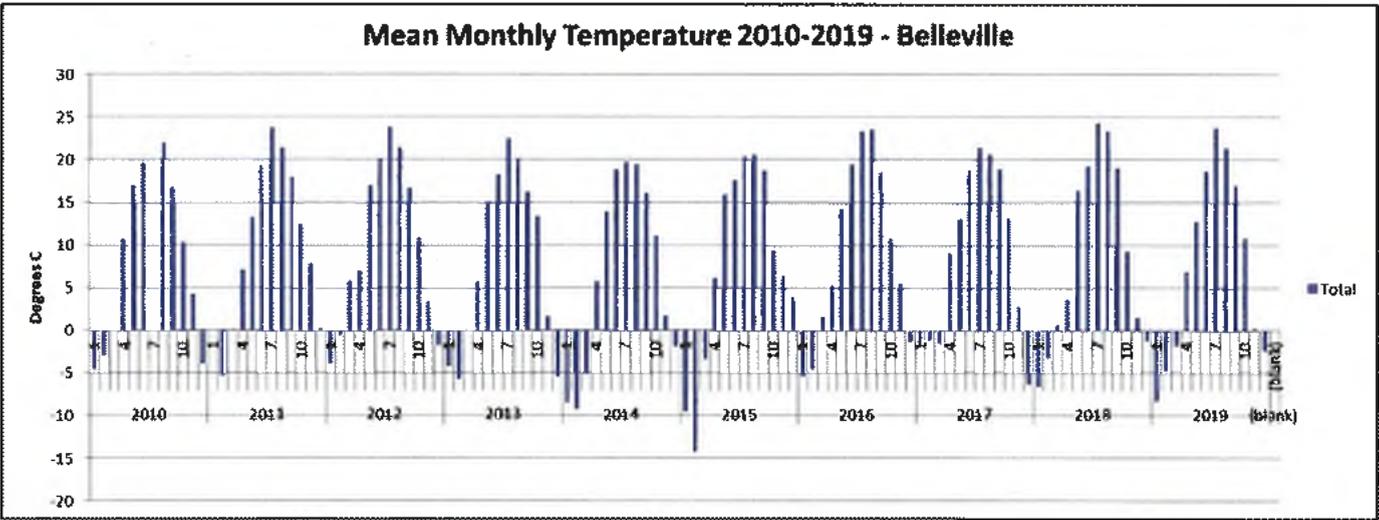
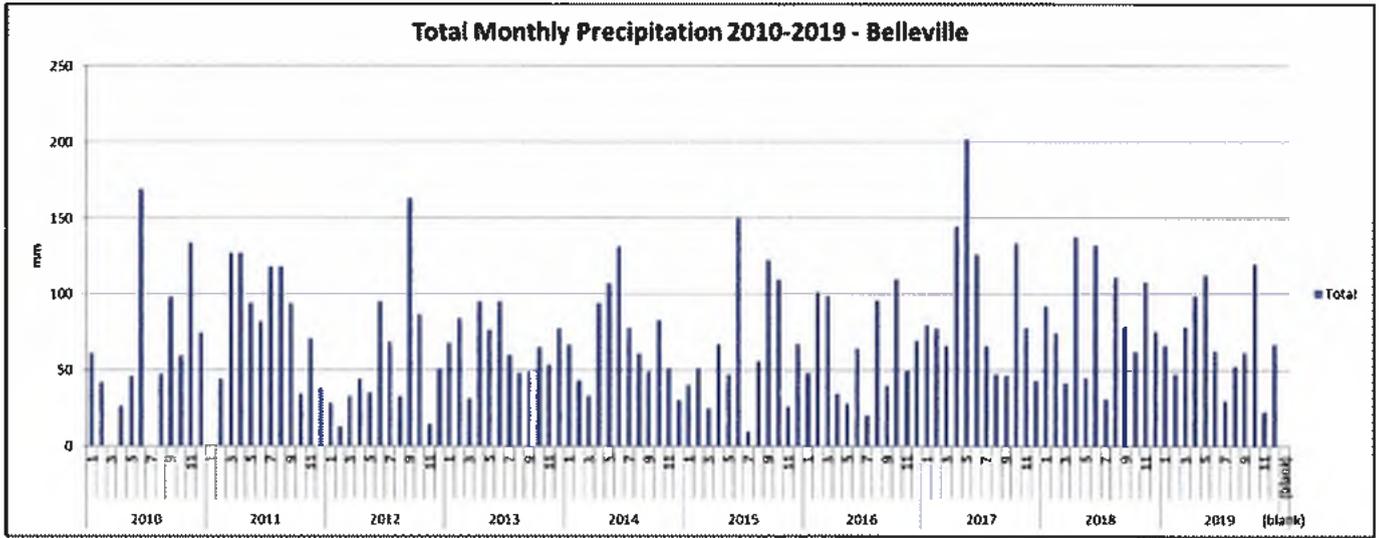
CONSUM WASTE SERVICES, INC.
 PROJECT NO. 1000-1000-1000

L2

APPENDIX B

Historical Weather Data (2010-2019)





Source: Environment Canada (https://climate.weather.gc.ca/historical_data/search_historic_data_e.html)

Total Monthly Precipitation (2010-2019) - Belleville, ON

2010

1	61.2
2	42.1
3	
4	26.5
5	46.1
6	168.9
7	
8	47.2
9	97.8
10	59.2
11	133.8
12	74.4
Total	757.2

2013

1	67.9
2	84.1
3	31.2
4	94.8
5	76.5
6	95
7	59.8
8	47.8
9	48.8
10	65.1
11	53.8
12	77.5
Total	802.3

2016

1	48
2	101
3	98.6
4	34.6
5	27.6
6	64
7	20.2
8	96
9	39.8
10	109.6
11	49.2
12	69.5
Total	758.1

2019

1	66.6
2	47.2
3	78.2
4	98.9
5	112.6
6	62.5
7	29.6
8	52.4
9	61.5
10	120
11	22.6
12	67
Total	819.1

2011

1	
2	44.2
3	127.2
4	126.9
5	93.9
6	81.8
7	117.7
8	118
9	94.1
10	34.5
11	70.5
12	38.1
Total	946.9

2014

1	66.3
2	43.2
3	33.2
4	94.3
5	107.1
6	131.4
7	77.8
8	60.9
9	49
10	82.5
11	51.2
12	30
Total	826.9

2017

1	79.8
2	77.5
3	65.8
4	144.4
5	201.7
6	125.9
7	66.1
8	47.3
9	46.6
10	133.7
11	77.8
12	43.2
Total	1109.8

2012

1	28.5
2	12.8
3	32.8
4	44
5	35.2
6	94.8
7	69
8	32.8
9	163.4
10	86.5
11	14.7
12	50.9
Total	665.4

2015

1	40.4
2	51.1
3	24.9
4	66.9
5	46.8
6	150.2
7	9.6
8	55.4
9	122.2
10	109.3
11	25.8
12	66.7
Total	769.3

2018

1	92.1
2	74.5
3	41.8
4	137.6
5	45.2
6	132.1
7	31.4
8	111.4
9	79
10	62.3
11	107.7
12	75.7
Total	990.8

Mean Monthly Temperature (2010-2019) - Belleville, ON

2010

1	-4.6
2	-2.9
3	n/a
4	10.8
5	17.1
6	19.8
7	n/a
8	21.9
9	16.9
10	10.3
11	4.2
12	-4.0
Average	8.9

2013

1	-4.3
2	-5.7
3	0.0
4	5.8
5	14.9
6	18.3
7	22.5
8	20.0
9	16.2
10	13.4
11	1.6
12	-5.5

2016

1	-5.5
2	-4.6
3	1.7
4	5.3
5	14.2
6	19.4
7	23.3
8	23.5
9	18.6
10	10.8
11	5.5
12	-1.4

2019

1	-8.3
2	-4.7
3	-1.8
4	6.8
5	12.7
6	18.7
7	23.7
8	21.3
9	16.9
10	10.8
11	0.2
12	-2.4

2011

1	n/a
2	-5.4
3	0.0
4	7.1
5	13.2
6	19.4
7	23.7
8	21.4
9	17.9
10	12.4
11	7.9
12	0.3

2014

1	-8.5
2	-9.3
3	-5.2
4	5.7
5	13.9
6	18.8
7	19.7
8	19.5
9	16.1
10	11.1
11	1.7
12	-1.9

2017

1	-1.8
2	-1.2
3	-1.5
4	9.1
5	13.2
6	18.9
7	21.4
8	20.5
9	18.9
10	13.2
11	2.9
12	-6.4

2012

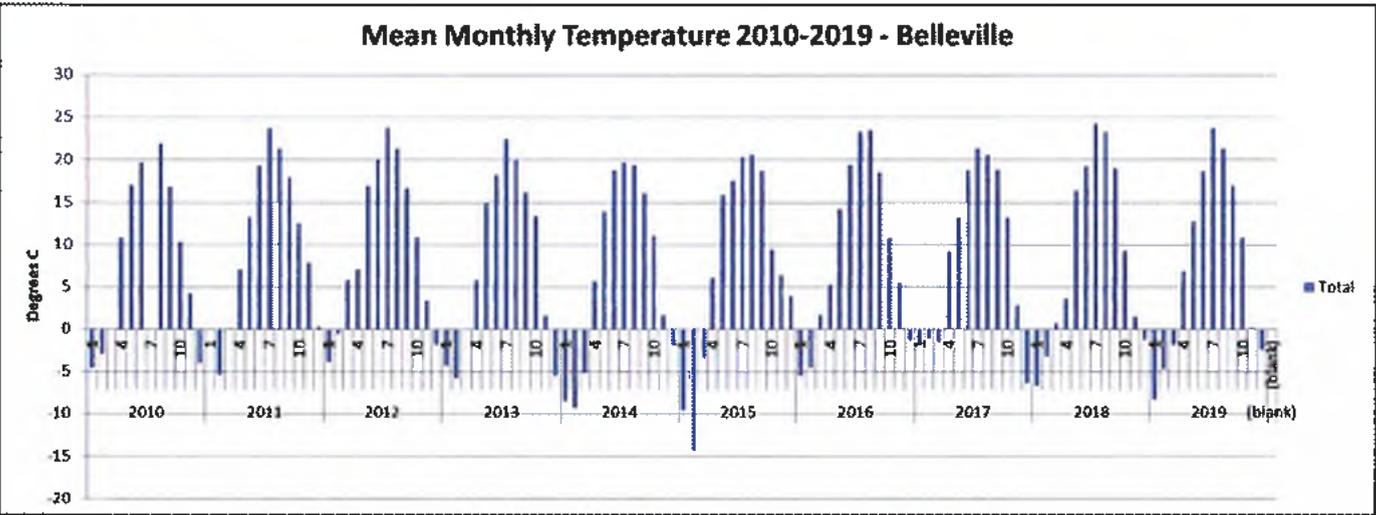
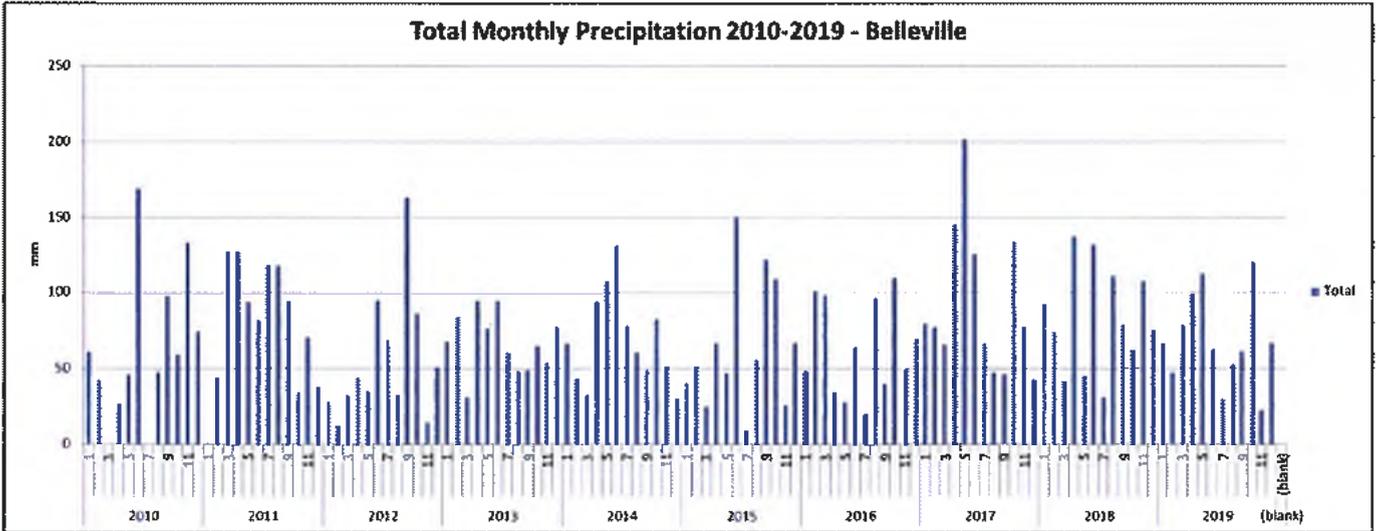
1	-3.9
2	-0.6
3	5.8
4	7.1
5	16.9
6	20.1
7	23.8
8	21.4
9	16.6
10	10.9
11	3.4
12	-1.8

2015

1	-9.6
2	-14.3
3	-3.4
4	6.1
5	15.9
6	17.6
7	20.4
8	20.6
9	18.8
10	9.4
11	6.4
12	3.9

2018

1	-6.6
2	-3.2
3	0.7
4	3.7
5	16.4
6	19.2
7	24.3
8	23.3
9	19.0
10	9.2
11	1.5
12	-1.3



Source: Environment Canada (https://climate.weather.gc.ca/historical_data/search_historic_data_e.html)

Total Monthly Precipitation (2010-2019) - Belleville, ON

2010

1	61.2
2	42.1
3	
4	26.5
5	46.1
6	168.9
7	
8	47.2
9	97.8
10	59.2
11	133.8
12	74.4
Total	757.2

2013

1	67.9
2	84.1
3	31.2
4	94.8
5	76.5
6	95
7	59.8
8	47.8
9	48.8
10	65.1
11	53.8
12	77.5
Total	802.3

2016

1	48
2	101
3	98.6
4	34.6
5	27.6
6	64
7	20.2
8	96
9	39.8
10	109.6
11	49.2
12	69.5
Total	758.1

2019

1	66.6
2	47.2
3	78.2
4	98.9
5	112.6
6	62.5
7	29.6
8	52.4
9	61.5
10	120
11	22.6
12	67
Total	819.1

2011

1	
2	44.2
3	127.2
4	126.9
5	93.9
6	81.8
7	117.7
8	118
9	94.1
10	34.5
11	70.5
12	38.1
Total	946.9

2014

1	66.3
2	43.2
3	33.2
4	94.3
5	107.1
6	131.4
7	77.8
8	60.9
9	49
10	82.5
11	51.2
12	30
Total	826.9

2017

1	79.8
2	77.5
3	65.8
4	144.4
5	201.7
6	125.9
7	66.1
8	47.3
9	46.6
10	133.7
11	77.8
12	43.2
Total	1109.8

2012

1	28.5
2	12.8
3	32.8
4	44
5	35.2
6	94.8
7	69
8	32.8
9	163.4
10	86.5
11	14.7
12	50.9
Total	665.4

2015

1	40.4
2	51.1
3	24.9
4	66.9
5	46.8
6	150.2
7	9.6
8	55.4
9	122.2
10	109.3
11	25.8
12	66.7
Total	769.3

2018

1	92.1
2	74.5
3	41.8
4	137.6
5	45.2
6	132.1
7	31.4
8	111.4
9	79
10	62.3
11	107.7
12	75.7
Total	990.8

Mean Monthly Temperature (2010-2019) - Belleville, ON

2010	
1	-4.6
2	-2.9
3	n/a
4	10.8
5	17.1
6	19.8
7	n/a
8	21.9
9	16.9
10	10.3
11	4.2
12	-4.0
Average	8.9

2013	
1	-4.3
2	-5.7
3	0.0
4	5.8
5	14.9
6	18.3
7	22.5
8	20.0
9	16.2
10	13.4
11	1.6
12	-5.5

2016	
1	-5.5
2	-4.6
3	1.7
4	5.3
5	14.2
6	19.4
7	23.3
8	23.5
9	18.6
10	10.8
11	5.5
12	-1.4

2019	
1	-8.3
2	-4.7
3	-1.8
4	6.8
5	12.7
6	18.7
7	23.7
8	21.3
9	16.9
10	10.8
11	0.2
12	-2.4

2011	
1	n/a
2	-5.4
3	0.0
4	7.1
5	13.2
6	19.4
7	23.7
8	21.4
9	17.9
10	12.4
11	7.9
12	0.3

2014	
1	-8.5
2	-9.3
3	-5.2
4	5.7
5	13.9
6	18.8
7	19.7
8	19.5
9	16.1
10	11.1
11	1.7
12	-1.9

2017	
1	-1.8
2	-1.2
3	-1.5
4	9.1
5	13.2
6	18.9
7	21.4
8	20.5
9	18.9
10	13.2
11	2.9
12	-6.4

2012	
1	-3.9
2	-0.6
3	5.8
4	7.1
5	16.9
6	20.1
7	23.8
8	21.4
9	16.6
10	10.9
11	3.4
12	-1.8

2015	
1	-9.6
2	-14.3
3	-3.4
4	6.1
5	15.9
6	17.6
7	20.4
8	20.6
9	18.8
10	9.4
11	6.4
12	3.9

2018	
1	-6.6
2	-3.2
3	0.7
4	3.7
5	16.4
6	19.2
7	24.3
8	23.3
9	19.0
10	9.2
11	1.5
12	-1.3

APPENDIX C

Historical Leachate Chemistry Data (2010-2019)



Average Leachate Chemistry 2010-2019*

	South Chamber		North Chamber		Difference
	Count	Average	Count	Average	North vs. South
General/Inorganic					
Alkalinity	17	5845	88	3986	-32%
Ammonia	17	1045	88	623	-40%
Biochemical Oxygen Demand	15	228	23	97	-57%
Chemical Oxygen Demand	13	1876	13	898	-52%
Chloride	16	1895	20	1228	-35%
Conductivity	15	15283	23	8934	-42%
Dissolved Organic Carbon	17	627	88	331	-47%
Hardness	15	760	86	863	14%
Naphthalene	17	0.02	88	0.01	-52%
Phenols	16	1.12	88	0.34	-70%
Phosphorus (total)	15	8.45	23	3.33	-61%
Sulphate	16	86	27	36	-59%
Total Dissolved Solids	16	7213	19	5359	-26%
Total Kjeldahl Nitrogen	17	1141	87	659	-42%
Metals					
Boron	15	8.7	23	5.0	-43%
Cadmium	16	0.033	86	0.001	-98%
Calcium	16	111	27	170	53%
Chromium (Total)	17	0.2	87	0.1	-42%
Cobalt	12	0.08	83	0.04	-52%
Copper	16	0.05	86	0.03	-39%
Iron	14	4.1	22	13.2	220%
Lead	16	0.04	86	0.01	-80%
Magnesium	16	125	27	120	-4%
Manganese	16	0.31	24	0.68	122%
Nickel	12	0.23	83	0.16	-30%
Potassium	16	466	22	346	-26%
Sodium	17	1739	28	1085	-38%
Zinc	16	0.09	82	0.22	149%

* Reportable Detection Limit (RDL) used for results below detection

APPENDIX D

Record of Test Pits and Borehole Logs



TEST PIT LOGS AND PHOTOGRAPHS



Test Pit ID: TP1-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335566
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903010

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.12	TOPSOIL - root system extending to 0.18m. Moist.	0.12		0.00-0.70	0.26	Density/Natural Moisture Content
0.12-0.80	SILTY CLAY - grey brown, moist.		1.18			
0.80-1.30	FILL - Grey, Brown, Black fill with trace garbage, large rock pieces. Small seep observed in bottom of TP.			0.70-1.25	0.18	Density/Natural Moisture Content

Comments:
 Grab sample collected from 0.20 - 0.60 m bgs.

Photos:



Test Pit ID: TP2-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335555
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903061

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoli Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample interval (m bgs)	Recovery (m)	Analyses
0 - 0.28	TOPSOIL - root system extending to 0.15m. Dry.	0.28				
0.28-0.75	SILTY CLAY - grey, dry.		0.96			
0.75-1.24	FILL - Large rock pieces with cobbles, some garbage. Dry.					
1.24-1.40	FILL - Garbage, dry.					

Comments:
 TP2 was excavated in area previously repaired. Surface material was dry with no grass growth.

Photos:



Test Pit ID: TP3-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335538
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903065

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoli Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.18	TOPSOIL - root system extending to 0.08m. Dry.	0.18		0-0.70	0.23	Grain size (sieve/hydrometer), Density/Natural Moisture Content
0.18-0.66	SILTY CLAY - brown, grey. Dry.		0.82			
0.66-1.40	FILL - Silty clay, some birck and rocks. Mixed with garbage at 1.0m bgs. Dry.			0.3-1.0	0.30	

Comments:
 Possible waste visible at surface. Grass covered. Grab sample collected from 0.20 - 0.60 m bgs.

Photos:

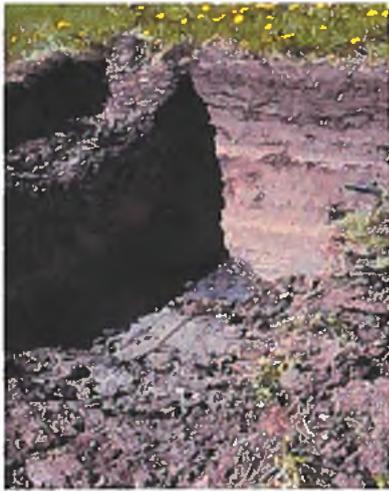


Test Pit ID: TP4-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335484
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903044

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.24	TOPSOIL - root system extending to 0.32m	0.24				
0.24-1.34	CLAY- Brown, grey, Dry. Garbage encountered at 1.34m bgs.		1.10	0-0.70	0.29	Grain size (sieve/hydrometer), Density/Natural Moisture Content
				0.70-1.4	0.37	

Comments:
 Grass at surface. Very consistent clay layer.

Photos:



Test Pit ID: TP5-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335500
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903118

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.18	TOPSOIL - root system extending to 0.20m.	0.18				
0.18-0.78	FILL - silty clay with gravel, large rock pieces and garbage (plastic, fabric, metal).		1.36			
0.78-1.54	CLAY - Brown, turning to grey at 1.30m bgs.					

Comments:
 Grassy surface. Grab samples collected from 0.30 - 0.50 m bgs and 1.00 - 1.40 m bgs.

Photos:



Test Pit ID: TP6-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335478
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903163

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.15	TOPSOIL - Brown, root system extending to 0.10m.	0.15		0.0-0.70	0.32	Grain size (sieve/hydrometer), Density/Natural Moisture Content
0.15-0.64	CLAY - Grey, blocky, trace gravel, dry.		1.49			
0.64-1.64	FILL - soil with some garbage (plastic and brick)			0.70-1.40	n/a	Density/Natural Moisture Content

Comments:
 Stressed vegetation observed at surface. Grab sample collected from 0.20 - 0.40 m bgs. No grab sample in lower portion of test pit due to presence of hydrocarbon or landfill gas.



Test Pit ID: TP7-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335402
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903148

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Sheiby Tube Sample Interval (m bgs)	Recovery (m)	Analyses
0 - 0.60	TOPSOIL - some fill, silt, clay and wood trace plastics. Rooting extends to 0.25m	0.60				
0.60-1.35	CLAY- brown, grey. Dry.		0.75			

Comments:
 Grassy surface. Garbage at 1.35m. Grab samples collected from 0.20 - 0.40 m bgs and 0.80 - 1.00 m bgs.

Photos:



Test Pit ID: TP8-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335374
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903071

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.26	TOPSOIL - root system extending to 0.20m	0.26				
0.26-0.80	FILL - Brown/grey/black fill with silty clay and gravel.		1.30			
0.80-1.56	CLAY - Grey, some garbage (plastic and metal)					

Comments:

Grassy surface. Dug through big "O" drainage pipe surrounded by clear stone gravel at 0.90m depth. Large boulder also located at this depth. Repair made to big "O" pipe on May 21st. Grab samples collected from 0.35-0.60 m bgs and 1.10-1.40 m bgs.

Photos:



Test Pit ID: TP9-20 Date: 2020-05-20
 Excavated by: Tomlinson Environmental Easting: 335265
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903051

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.25	TOPSOIL - trace garbage. Root system extending to 0.30m.	0.25				
0.25-0.65	FILL- Brown fill with silt, clay and garbage (plastic).		1.02	0.0-0.70m	0.29	Grain size (sieve/hydrometer), Density/Natural Moisture Content
0.65-1.27	CLAY- Grey, some garbage (plastic).			0.70-1.40m	0.19	

Comments:

Grassy surface. Grab samples from 0.20-0.80m bgs and 1.10-1.40m bgs.

Photos:



Test Pit ID: TP10-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335304
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903125

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsail Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.24	TOPSOIL - root system extending to 0.50m	0.24				
0.24-0.67	SILTY CLAY- Brown, grey, blocky. Dry.		1.46			
0.67-1.70	CLAY- Brown, stiff. Dry. Ended hole at 1.70m bgs (no garbage encountered).					Grain size (sieve/hydrometer)

Comments:
 Grassy surface with some vegetative stress and slight depression. Grab samples collected at 0.35-0.55 m bgs and 1.10-1.40 m bgs.

Photos:



Test Pit ID: TP11-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335207
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903056

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.12	TOPSOIL - root system extending to 0.15m.	0.12		0-0.70	0.25	Density/Natural Moisture Content
0.12-0.60	SILTY CLAY- Grey, black fill with trace waste and trace gravel.		0.48			

Comments:
 Grassy surface with some vegetative stress. Grab sample collected 0.20-0.40m bgs.

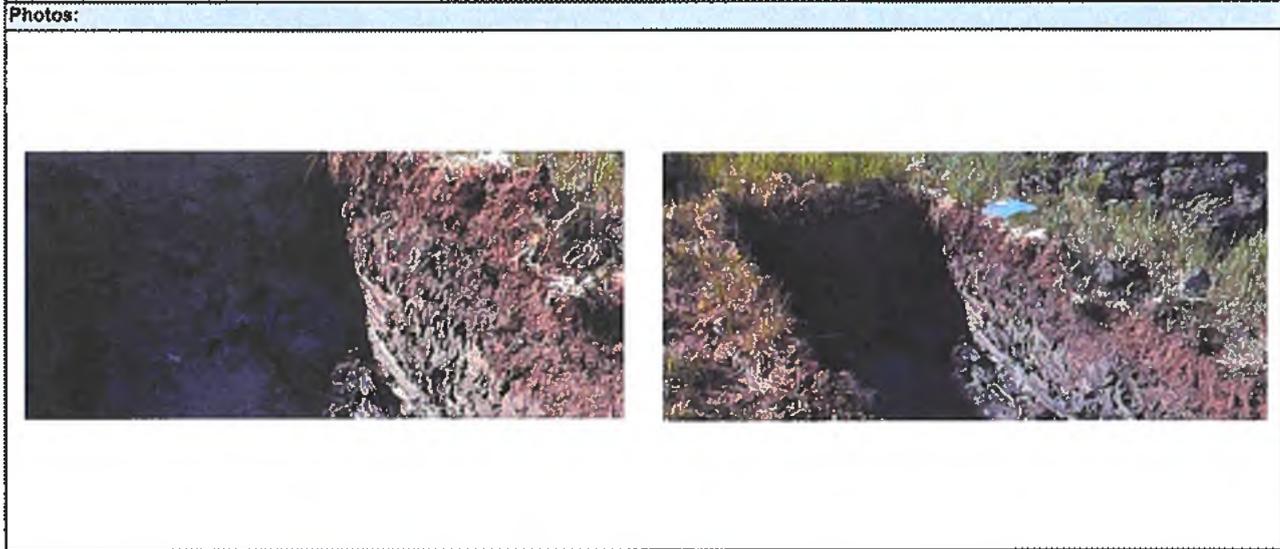
Photos:



Test Pit ID: TP12-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335132
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903047

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.20	TOPSOIL - Brown topsoil. Root system extending to 0.25m. Dry.	0.2				
0.20-0.40	SILTY CLAY- Brown, grey. Blocky. Dry.		0.7			
0.40-0.90	CLAY- Grey. Moist. Garbage encountered at 0.90m.					

Comments:
 Vegetation stress at surface in an area with visible settlement/depression. Ended hole at 0.90m in waste. Seepage observed at bottom of test pit. Grab sample collected from 0.30-0.70m bgs.



Test Pit ID: TP13-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335145
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903004

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	Analyses
0 - 0.14	TOPSOIL - Brown, Dry.	0.14				
0.14-1.14	TILL - Soft, sandy and silty with some gravel and cobbles. Wet with water seepage into test pit. Black decomposed garbage encountered at 1.14m.		1.00	0.0-0.70	0.22	Density/Natural Moisture Content
				0.70-1.40	0.43	Hydraulic Conductivity (flexible wall permeameter), Density/Natural Moisture Content
Comments: Grassy surface with some vegetative stress (brown).						
Photos:						
						

Test Pit ID: TP14-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335442
 Method: Kubota KX080 Track-mounted Excavator Northing: 4903002

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoli Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	Analyses
0 - 0.30	TOPSOIL - Dry. Root system extending to 0.25m.	0.30		0.0-0.70	0.41	Hydraulic Conductivity (flexible wall permeameter), Density/Natural Moisture Content
0.30-1.15	CLAY- Firm, brown. Dry. Waste encountered at 1.15m.		0.84	0.70-1.40	0.3	Hydraulic Conductivity (flexible wall permeameter), Density/Natural Moisture Content

Comments:
 Grassy surface with some vegetative stress (brown) in an area with visible settlement/depression. Grab sample collected at 0.50-0.75 m bgs

Photos:



Test Pit ID: TP15-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335529
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902954

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsail Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.20	TOPSOIL - Brown. Root system extending to 0.35m. Dry.	0.20		0.0-0.60	0.35	Density/Natural Moisture Content
0.20-0.40	CLAY - Firm, gray, brown, trace silt and garbage. Blocky, dry.		0.60			
0.40-0.80	FILL - soil mixed with waste. Waste encountered @ 0.80m					

Comments:
 Grassy surface with vegetative stress (brown). Grab sample collected from 0.30-0.40 m bgs.

Photos:



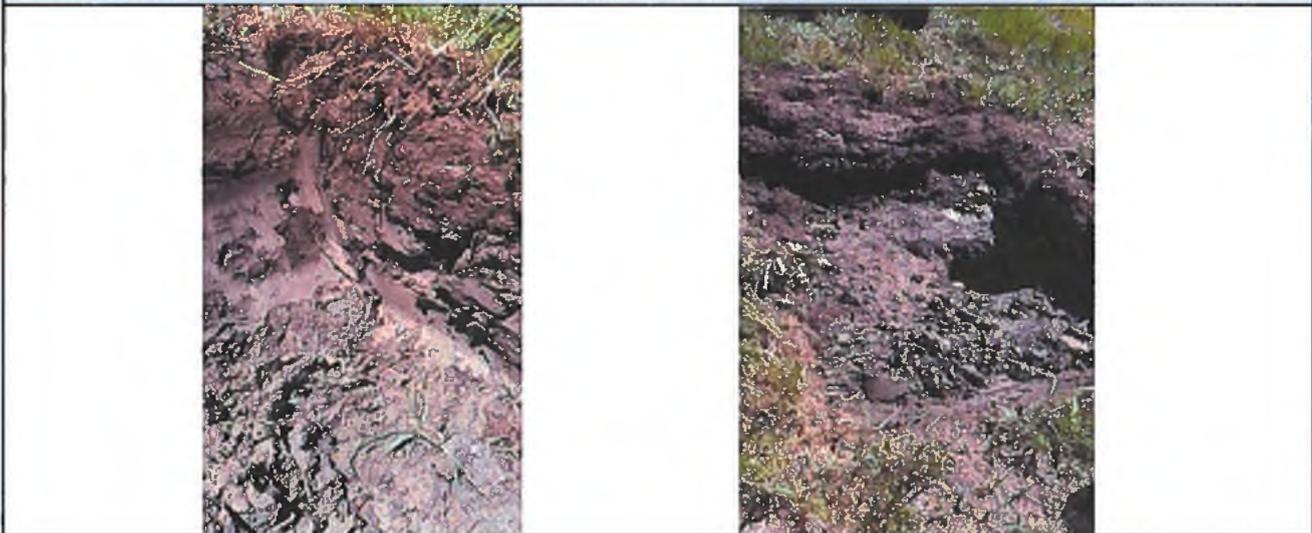
Test Pit ID: TP18-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335423
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902924

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsail Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.20	TOPSOIL - Brown. Root system extending to 0.25m. Dry.	0.20				
0.20-0.70	CLAY - Grey, brown with silt. Blocky. Test hole ended so hole did not fill with water.		>0.50			Grain size (sieve/hydrometer)

Comments:

Area with stressed vegetation and active seep with venting landfill gas (gas and water bubbling up through soils to surface). Grab sample collected from 0.30-0.50m bgs.

Photos:

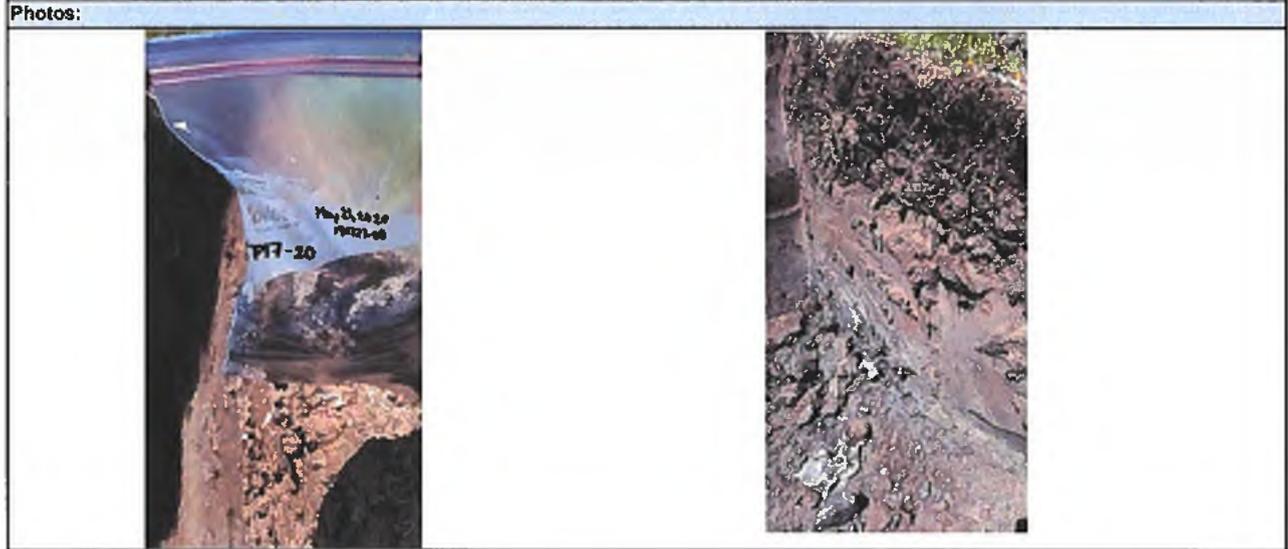


Project No.: 190222-08
 WM Richmond - Napanee, Ontario

Test Pit ID: TP17-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335378
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902957

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.22	TOPSOIL - Root system extending to 0.26m.	0.22				
0.22-1.05	CLAYEY SILT - Brown, grey. Blocky.		1.03			Grain size (sieve/hydrometer)
1.05-1.25	FILL, mixed with waste.					

Comments:
 Grassy surface with healthy vegetation. Grab sample collected from 0.60-0.80 m bgs.



Test Pit ID: TP18-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335287
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902901

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.14	TOPSOIL - Dry. Root system extending to 0.20m.	0.14				Density/Natural Moisture Content
0.14-0.50	CLAYEY SILT- Grey, dry, blocky. Trace gravel.		0.56	0.0-0.70	0.22	
0.50-0.70	FILL, mixed with waste. Waste encountered at 0.70.					

Comments:

Grassy surface with healthy vegetation. Grab sample collected from 0.30-0.40 m bgs. Shelby tube slipped during initial sampling attempt; cleaned and re-used.

Photos:



Test Pit ID: TP19-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335204
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902831

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.15	TOPSOIL - Grass over topsoil, root system extending to 0.20m. Dry.	0.15		0.0-0.70	0.22	Grain size (sieve/hydrometer), Density/Natural Moisture Content
0.15-0.65	CLAYEY SILT- Grey, dry, blocky. Trace gravel.		0.5			

Comments:

Area disturbed with surface cracking; Possible former repair area Grab sample collected from 0.30-0.50 m bgs

Photos:



Test Pit ID: TP20-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335067
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902992

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoli Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.12	TOPSOIL - Dry. Root system extending to 0.22m.	0.12				
0.12-0.43	CLAYEY SILT - Grey, brown. Moist.		>1.18			
0.43-1.00	SILTY CLAY - Grey, brown. Moist.					
1.00-1.30	CLAYEY SILT - Grey with coarse gravel and cobbles.					

Comments:
 Area with visible surface rutting and an exposed large cobble. Exposed 300mm vacuum line so test pit terminated. No damage to pipe (hand shoveled). No waste encountered. Grab sample collected from 0.50-0.80m bgs.

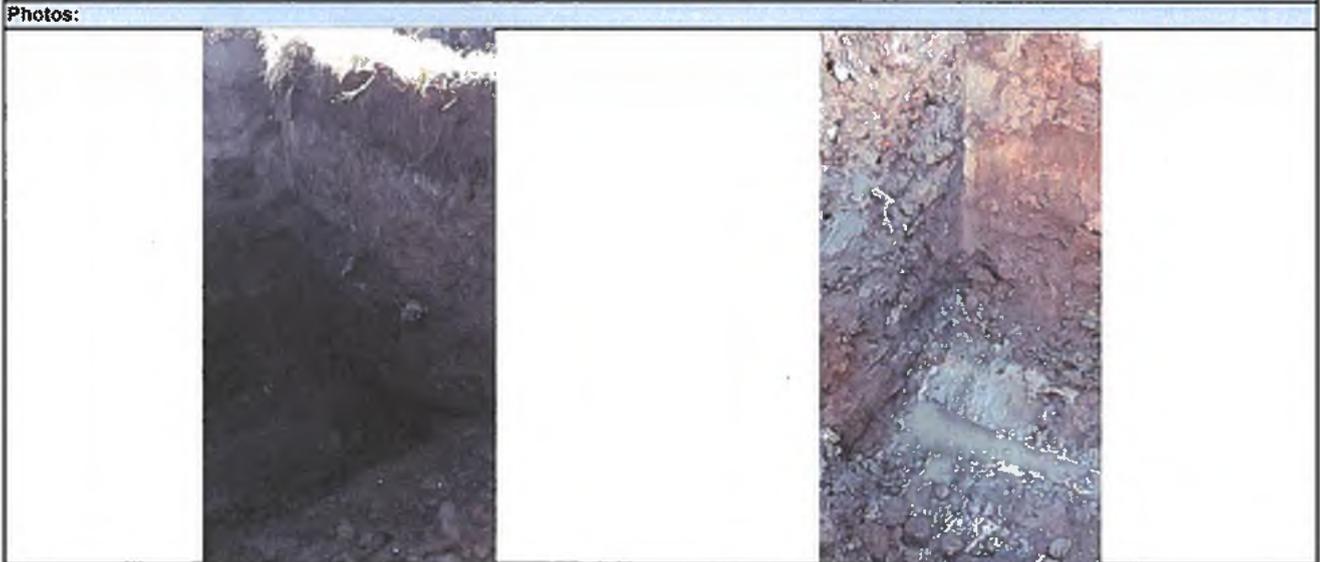
Photos:



Test Pit ID: TP21-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335128
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902941

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample interval (m bgs)	Recovery (m)	Analyses
0 - 0.30	TOPSOIL - Brown. Dry. Root system extending to 0.40m.	0.15				
0.30-0.66	CLAYEY SILT- Grey with trace gravel. Moist.		1.3	0.0-0.60	0.26	Density/Natural Moisture Content
0.66-1.60	FILL - Silt, gravel and cobbles, some clay, trace garbage. Possible contaminated soil. Moist.			0.60-1.20	0.34	Density/Natural Moisture Content

Comments:
 Grassy surface with healthy vegetation. Grab sample collected from 0.40-0.55 m bgs. Water observed entering test pit at a depth of 1.52 m.



Test Pit ID: TP22-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335142
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902906

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoli Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.14	TOPSOIL - Silty, brown Dry. Root system extending to 0.15m.	0.14		0.00-0.70	0.38	Hydraulic Conductivity (flexible wall permeameter), Density/Natural Moisture Content
0.14-0.45	FILL - Sandy silt, trace clay with some coarse gravel and cobbles. Moist		0.31			
0.45-1.52	Garbage.					

Comments:
 Grassy surface with stressed vegetation (brown) in disturbed area with coarse stones showing. Grab sample collected at 0.20-0.30 m bgs. Seepage observed into test pit at depth of 0.30 m.



Test Pit ID: TP23-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335171
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902937

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.30	TOPSOIL - Silty sand with some gravel, brown. Dry. Root system extending to 0.50m.	0.3				
0.30-1.50	SILTY CLAY- Stiff, grey ,brown, blocky. Moist. Increasing moisture and softer with depth.		>12			

Comments:

Grassy surface with healthy vegetation in an area with a small depression. Garbage not encountered in test pit. Grab sample collected from 0.50-0.90m bgs.

Photos:



Test Pit ID: TP24-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335098
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902844

Interval Depth (m bgs)	Stratigraphy	Sample				Analyses
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	
0 - 0.16	TOPSOIL - Brown with sand and gravel. Root system extending to 0.25m.	0.16				
0.16-0.40	CLAYEY SILT - Grey, blocky, moist.		0.94			
0.40-1.10	FILL - Sandy silt with gravel, wood debris and garbage.					

Comments:
 Grassy surface with stressed (brown) vegetation and visible coarse stones showing. Garbage encountered at a depth of 1.10m. Grab samples collected from 0.20-0.30m bgs and 0.60-0.80m bgs.

Photos:



Test Pit ID: TP25-20 Date: 2020-05-21
 Excavated by: Tomlinson Environmental Easting: 335069
 Method: Kubota KX080 Track-mounted Excavator Northing: 4902938

Interval Depth (m bgs)	Stratigraphy	Sample				
		Topsoil Thickness (m)	Cover Soil Thickness (m)	Shelby Tube Sample Interval (m bgs)	Recovery (m)	Analyses
0 - 0.12	TOPSOIL - Brown with sand and gravel. Dry. Root system extending to 0.18m.	0.12				
0.12-0.40	CLAYEY SILT and SILTY CLAY - Blocky, moist		0.73			
0.40-0.90	TILL - Grey, silt with coarse gravel and cobbles.					

Comments:
 Grassy surface with some vegetative stress and minor settlement/depression. Waste encountered at depth of 0.85m. Grab samples collected from 0.20-0.35m bgs and 0.50-0.80m bgs.



BOREHOLE LOGS





Borehole/Well ID: BH1-20

Project No.: 190222-08

Northing: 4902869

Client: Waste Management

Easting: 335066

Location: Napanee, ON

Project Manager:

SUBSURFACE PROFILE				SAMPLE			CGD Headspace Reading			Well Completion Details
Depth	Symbol	Description	Depth/Elev.	Number	Type	Recovery %	% LEL			
							25	50	75	
							PPM			
							125	250	375	
0		Ground Surface	0.00							
0		- Gravel road base	0.00							
1		<i>Fill</i>		1		53				
2		Silt fill (fill like) with small gravel.	-0.76							
3		<i>Fill</i>	0.76							
4		Silt (fill like) over clayey silt. Wet near bottom of spoon..	-1.52	2		100				
5		<i>Fill</i>	1.52							
6		Brown, Sandy silt, with small to medium grained gravel. Grey, moist near bottom of spoon.	-2.29	3		100				
7		<i>Fill</i>	2.29							
8		Grey, moist, Clayey silt with small gravel.	-3.05	4		67				
9		<i>Till</i>	3.05							
10		Grey, soft, wet Silt with small gravel.	-6.10	5		30				
11			6.10							
12				6		100				
13										
14				7		100				
15										
16				8		100				
17										
18				9		100				
19										
20		- moist to wet.	-6.86	10		0				
21			6.86							
22		- cobbles	-7.62	11		100				
23			7.62							
24		- wet	-8.63	12		100				
25			8.63							
26										
27										
28										
29		End of Borehole								
30										
31										

Drilled By: GET Drilling Ltd.

Hole Size: 8"/0.2m

Drill Method: HSA

Datum:

Template: BLM drilling field tem

Drill Date: May 27, 2020

Supervised By: B.M.

Sheet: 1 of 1



Borehole/Well ID: BH2-20

Project No.: 190222-08

Northing: 4903063

Client: Waste Management

Easting: 335018

Location: Napanee, ON

Project Manager: A.B.

SUBSURFACE PROFILE				SAMPLE			CGD Headspace Reading			Well Completion Details
Depth	Symbol	Description	Depth/Elev.	Number	Type	Recovery %	% LEL			
							25	50	75	
							PPM			
							125	250	375	
0		Ground Surface	0.00							
0		<i>Fill</i> Brown topsoil fill with silt, organics, dry, soft.	0.00							
1		<i>Fill</i> cobble in road base.	-0.30 0.30	1		53				
2										
3		<i>Fill</i> Brown topsoil mixed with clay, silt and sand.	-0.76 0.76							
4		<i>Till</i> Grey, moist, Sandy silt.	-1.07 1.07	2		100				
5										
6				3		100				
7										
8				4		100				
9		End of Borehole	-2.74 2.74							
10										
11										
12										

Drilled By: GET Drilling Ltd.

Hole Size: 8"/0.2m

Drill Method: HSA

Datum:

Template: BLM drilling field tem

Drill Date: May 27, 2020

Supervised By: B.M.

Sheet: 1 of 1



Borehole/Well ID: BH3-20

Project No.: 190222-08

Northing: 4903112

Client: Waste Management

Easting: 335194

Location: Napanee, ON

Project Manager: A.B.

SUBSURFACE PROFILE				SAMPLE		CGD Headspace Reading		Well Completion Details	
Depth	Symbol	Description	Depth/Elev.	Number	Type	Recovery %	% LEL		
							25		50
							PPM		
							125	250	375
0		Ground Surface	0.00						
1		Fill Brown, damp. Silt, some sand and clay.	0.00	1		100			
3		Fill Brown, to grey. Sandy silt, and gravel.	-0.76 0.76	2		100			
6		Fill Sandy silt and gravel, some waste (string, sponge and plastic).	-1.52 1.52	3		71			
8		Till Grey, wet. Silt with small gravel.	-2.29 2.29	4		17			
11		Till Wet, silt, some organics, leachate odour at 3.35m.	-3.05 3.05	5		37			
13		Till Silt, wet, odours present.	-3.81 3.81	6		100			
14		End of Borehole							

Drilled By: GET Drilling Ltd.

Hole Size: 8"/0.2m

Drill Method: HSA

Datum:

Template: BLM drilling field tem

Drill Date: May 27, 2020

Supervised By: B.M.

Sheet: 1 of 1



Borehole/Well ID: BH4-20

Project No.: 190222-08

Northing: 4902988

Client: Waste Management

Easting: 335020

Location: Napanee, ON

Project Manager: A.B.

SUBSURFACE PROFILE				SAMPLE			CGD Headspace Reading		Well Completion Details
Depth	Symbol	Description	Depth/Elev.	Number	Type	Recovery %	% LEL		
							25	50	
							PPM		
							125	250	375
0		Ground Surface	0.00						
0		Fill Silt, gravel, some sand and cobbles.	0.00						
1				1		60			
2									
3									
4				2		67			
5									
6									
7				3		0			
8			-2.29						
8		Till Brownish grey, Silt, trace clay, moist to wet.	2.29						
9				4		100			
10			-3.05						
10		Till Brownish grey, silt, trace clay, moist.	3.05						
11		- cobble 3.35m.	-3.35						
11			3.35	5		100			
12									
13				6		100			
14		End of Borehole	-4.16						
14			4.16						
15									

Drilled By: GET Drilling Ltd.

Hole Size: 8"Ø0.2m

Drill Method: HSA

Datum:

Template: BLM drilling field tem

Drill Date: May 27, 2020

Supervised By: B.M.

Sheet: 1 of 1

APPENDIX E
Laboratory Test Results

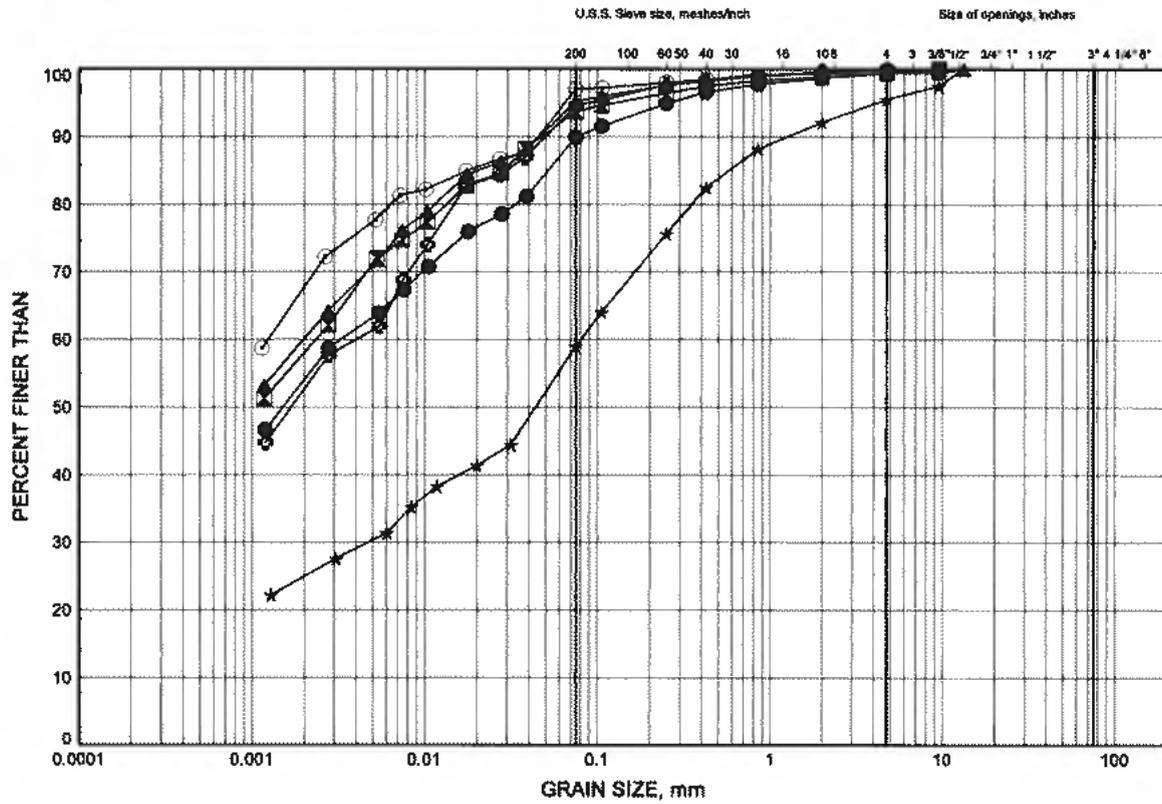


GRAIN-SIZE TEST RESULTS



BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 1



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP10-20	0.3	
■	TP16-20	0.3	
▲	TP17-20	0.3	
★	TP19-20	0.3	
⊙	TP3-20	0.3	
◇	TP4-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER, BLUMETRIC LAB TESTING.GPJ 306620

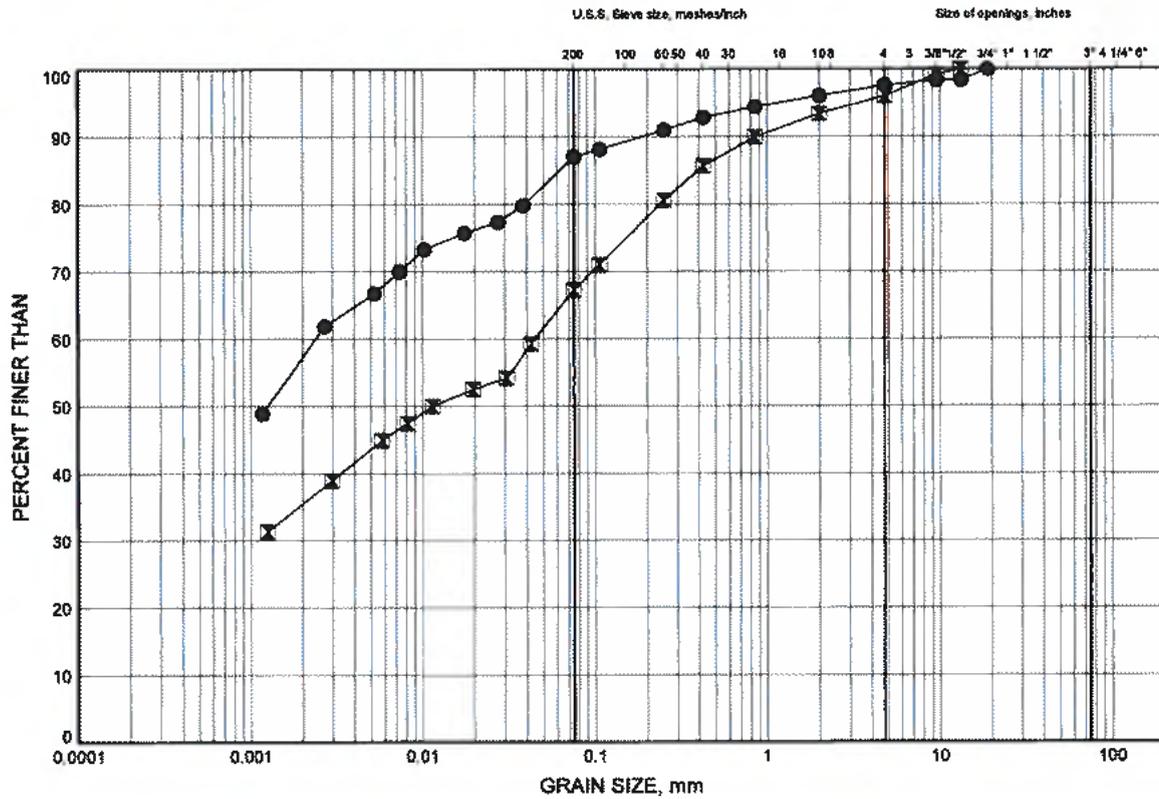
Date June 2020
29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 2



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP6-20	0.3	
x	TP9-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER BLUMETRIC LAB TESTING.GPJ 30/6/20

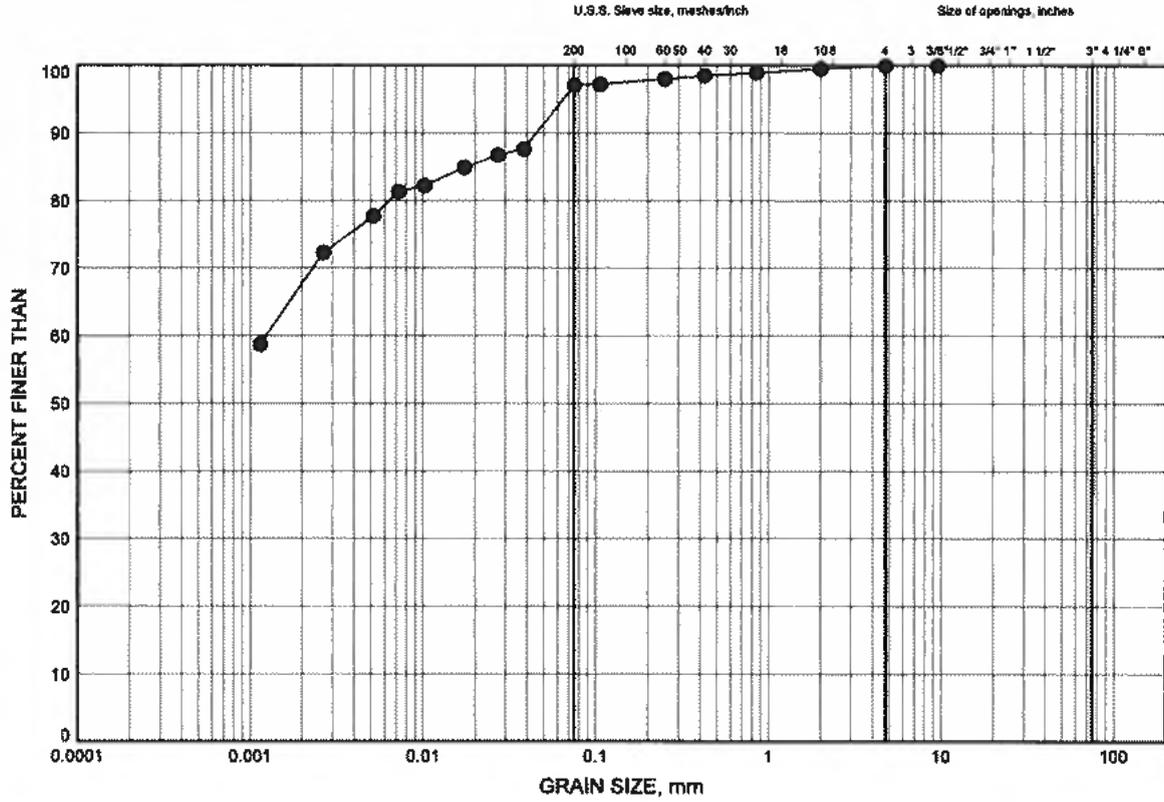
Date June 2020
29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 3



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP3-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER, BLUMETRIC LAB TESTING, GPJ, 306/20

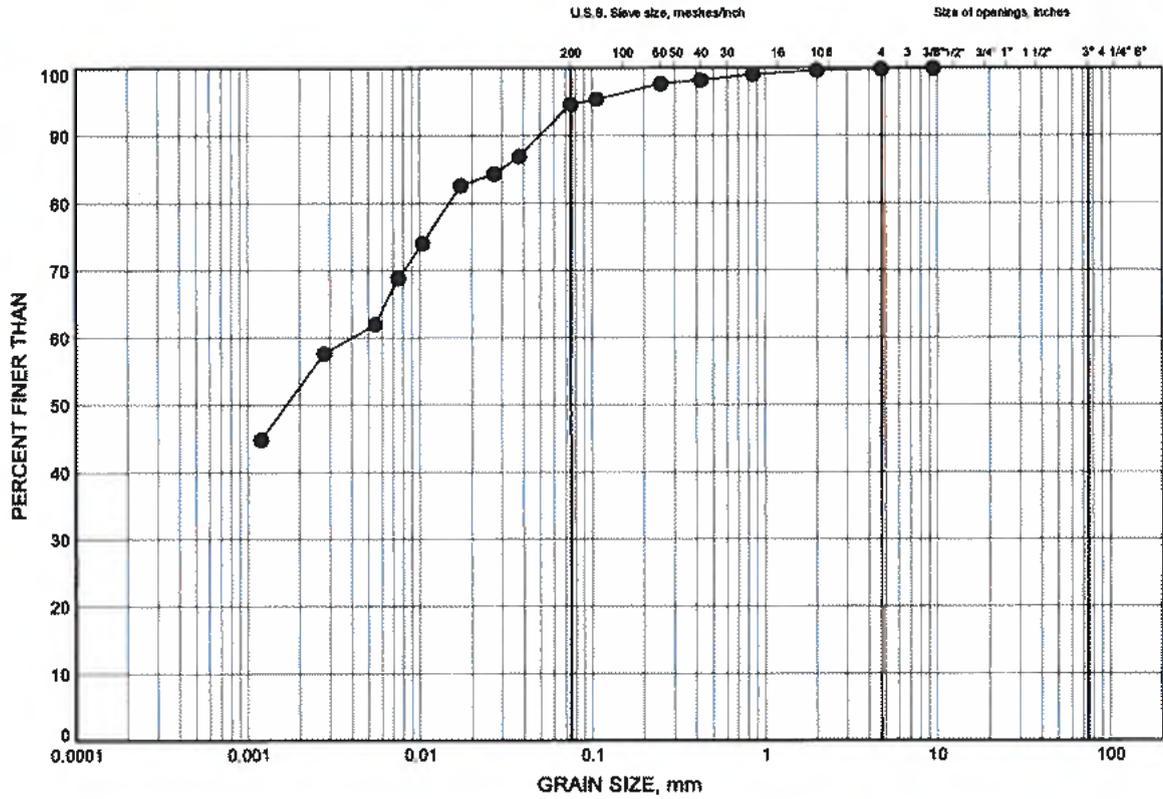
Date June 2020
29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 4



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP4-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER - BLUMETRIC LAB TESTING.GPJ 30/6/20

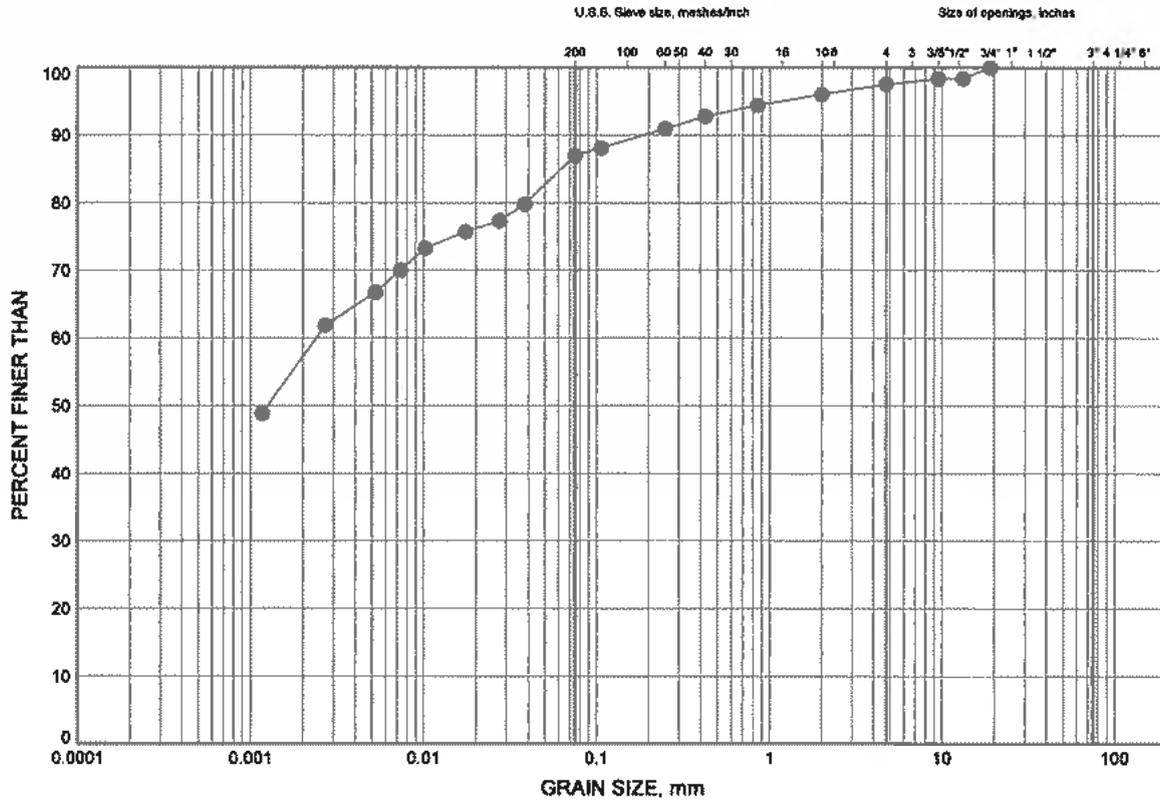
Date June 2020
 29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 5



SILT and CLAY		FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED		SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP6-20	0.3	

Date June 2020
29082

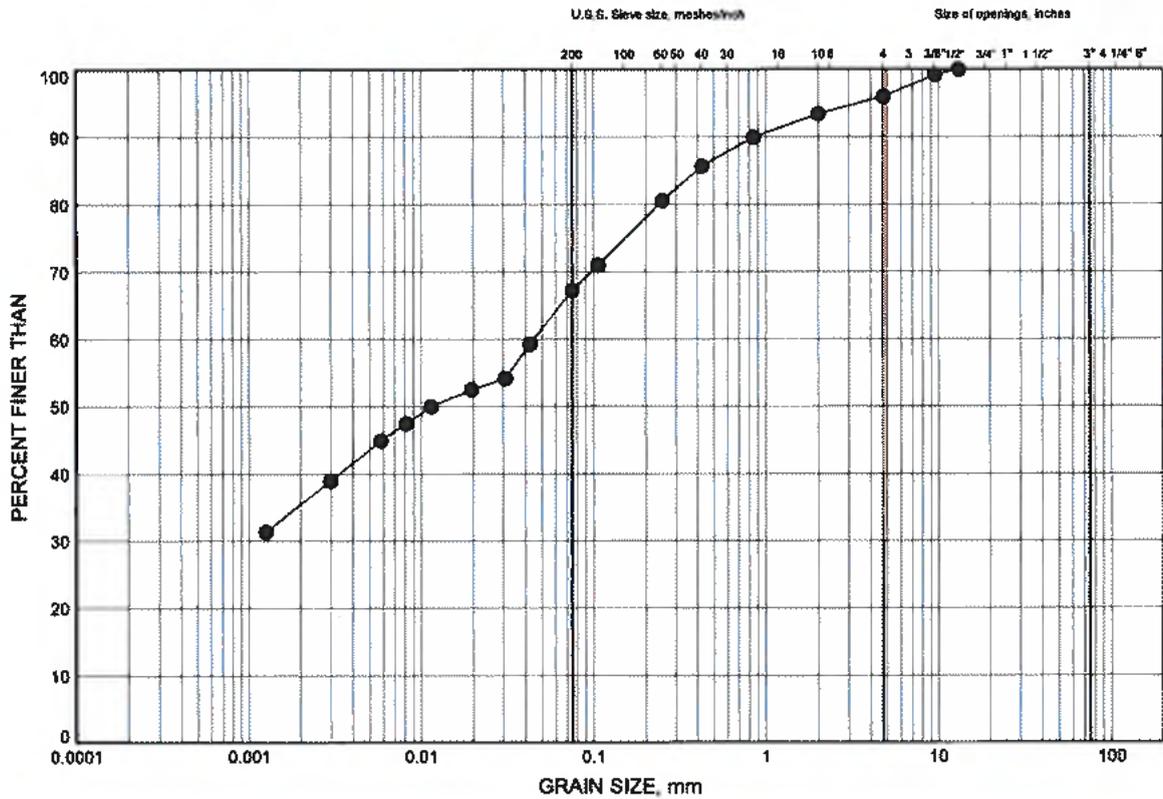


Prep'd AC
 Chkd. SD

GRAIN SIZE DISTRIBUTION - THURBER BLUMETRIC LAB TESTING.GPJ 30/6/20

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 6



SILT and CLAY		FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED		SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP9-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER - BLUMETRIC LAB TESTING GPJ 30/6/20

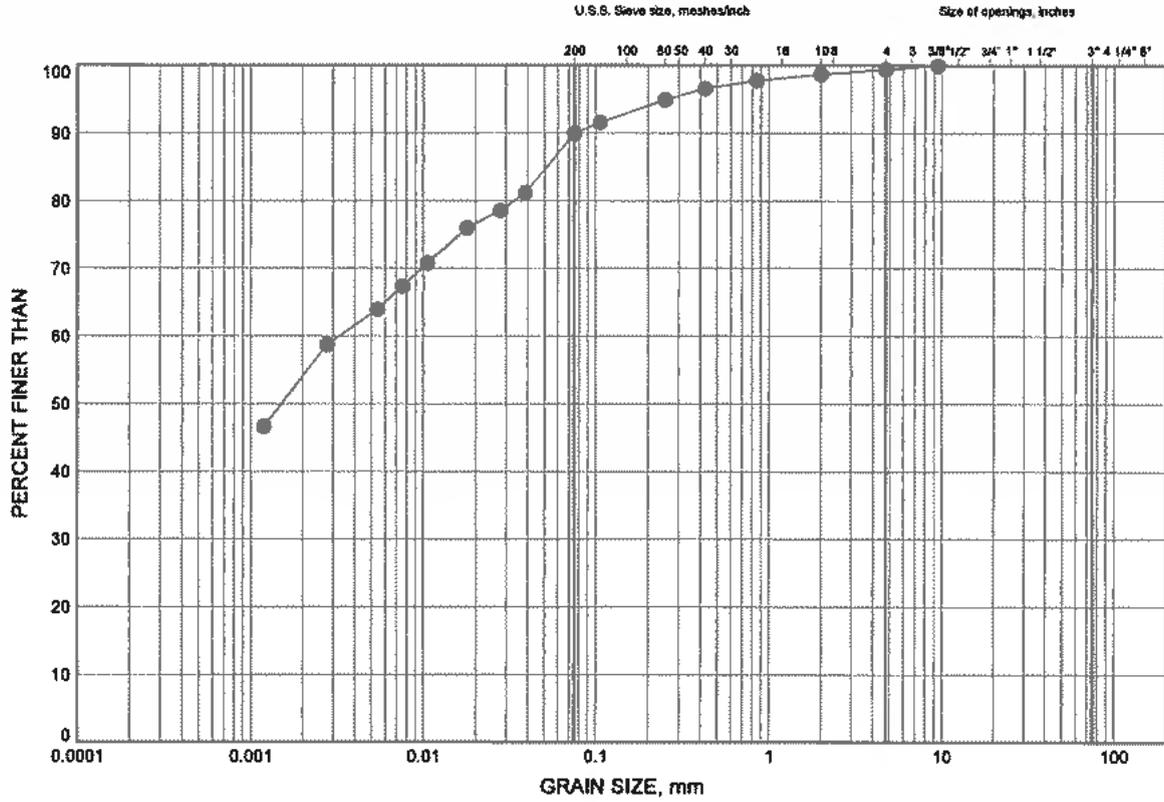
Date June 2020
 29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 7



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP10-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER - BLUMETRIC LAB TESTING.GPJ: 30620

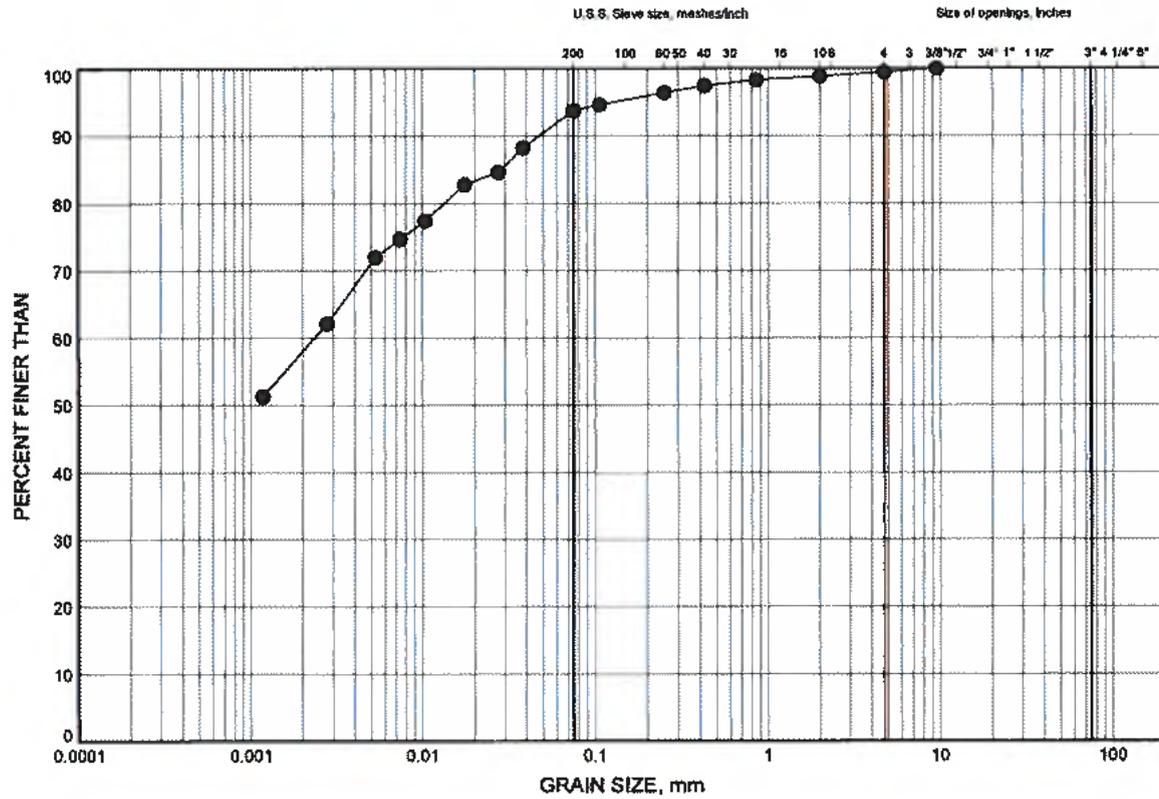
Date June 2020
 29082



Prep'd AC
 Chkd. SD

BiuMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 8



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP16-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER - BIUMETRIC LAB TESTING.GPJ 30/6/20

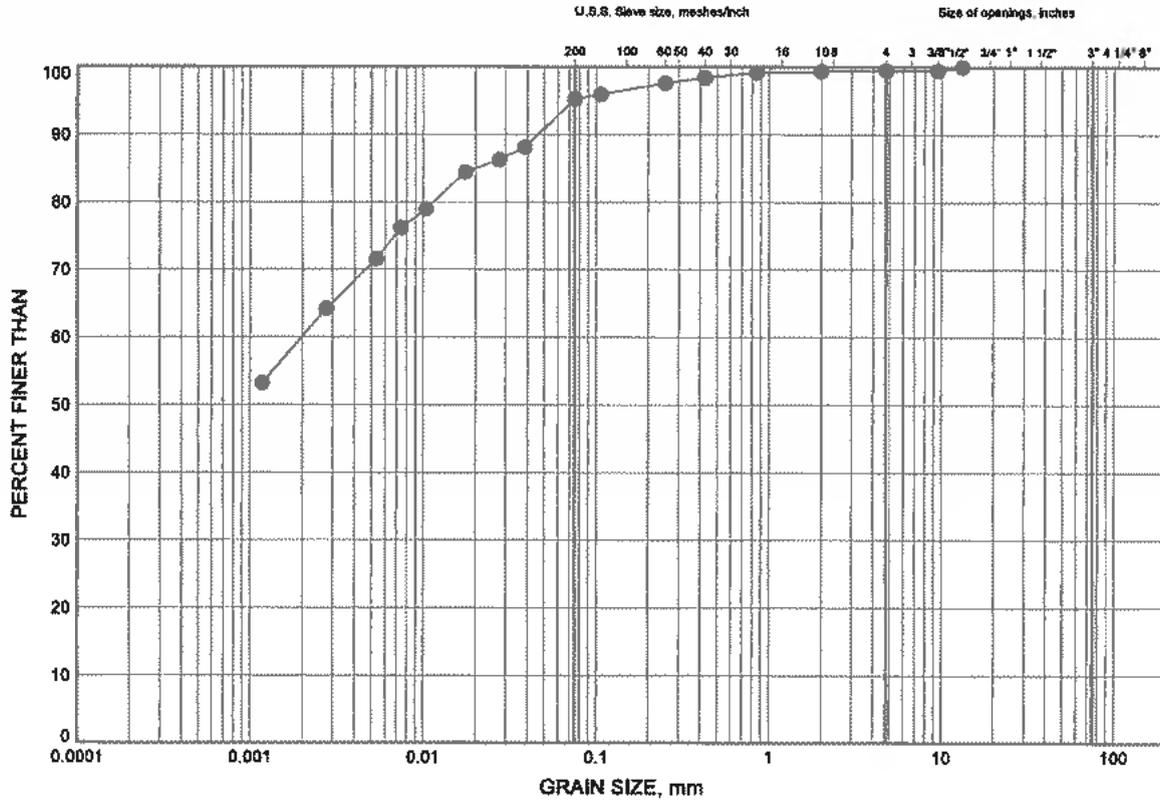
Date June 2020
 29082



Prep'd AC
 Chkd. SD

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 9



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP17-20	0.3	

Date June 2020
 29082

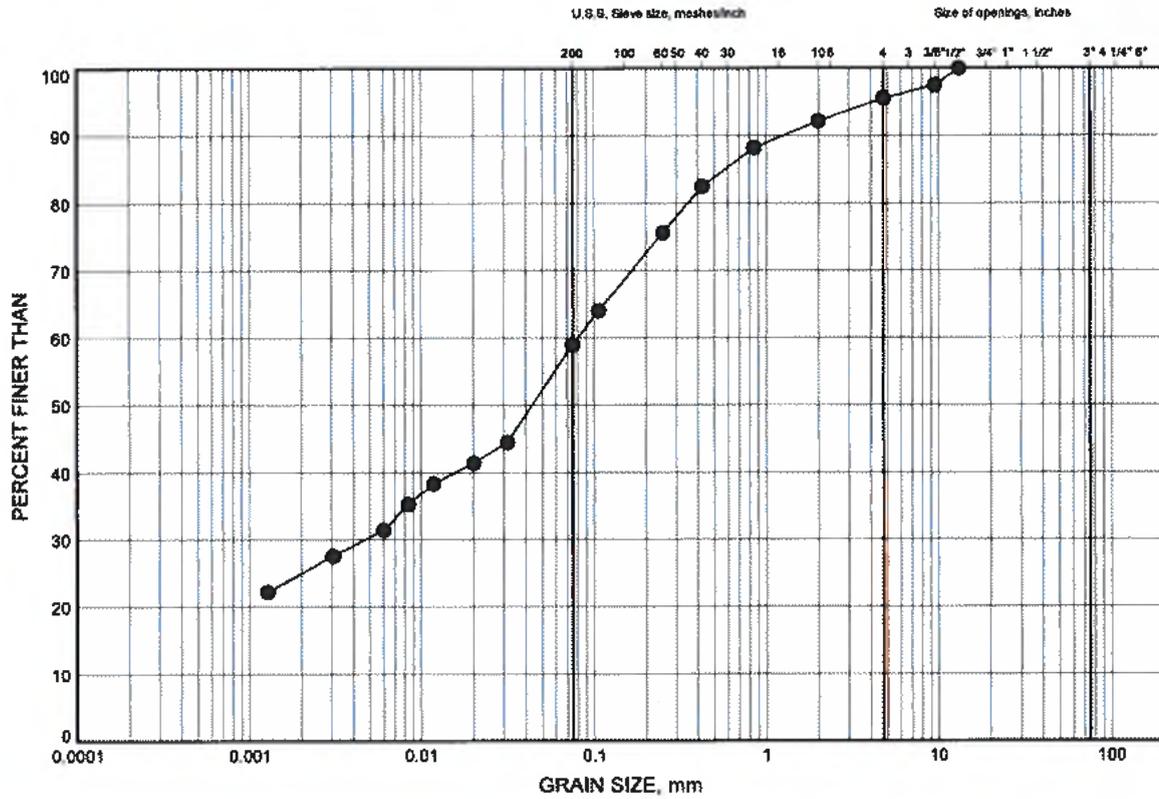


Prep'd AC
 Chkd. SD

GRAIN SIZE DISTRIBUTION - THURBER, BLUMETRIC LAB TESTING, GPJ 30620

BluMetric Lab Testing
GRAIN SIZE DISTRIBUTION

FIGURE 10



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	TP19-20	0.3	

GRAIN SIZE DISTRIBUTION - THURBER - BLUMETRIC LAB TESTING GPJ 30/6/20

Date June 2020
29062



Prep'd AC
 Chkd. SD

MOISTURE CONTENT & DENSITY TEST RESULTS





Determination of Moisture Content of Soil

LS 701 & ASTM D2216

Project Name: BluMetric - Shelby Tubes - Richmond Landfill
 Tested By: RH/MW

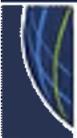
Project No: 29082-190222/08
 Date Tested: June 11, 2020

Borehole/Test Pit No	TP4-20	TP3-20	TP4-20	TP9-20	TP3-20
Sample No.					
Sample Depth	0.7-1.4	0.3-0.6	0.0-0.7	0.0-0.7	0.0-0.28
Composition					
% Gravel	5	0	5	5	0
% Sand	10	10	10	10	10
% Fines	85	90	85	85	90
Plastic (P) or Non-Plastic (N)					
Organic (Y/N)		Y			
USCS Symbol	CL-ML	CL-ML	CL-ML	CL-ML	CL-ML
Other Constituents		ROOT MAT.	ROOT MAT.		
Moisture Content and Density Determination					
Container No.	B8	B4	B3	B5	B2
Sample Volume (cm ³)	78.7381	78.7381	78.7381	78.7381	78.7381
Weight of Tin (g)	108.89	103.48	95.85	93.75	98.37
Weight Sample (Wet + Tin) (g)	275.95	251.61	250.21	255.25	246.83
Weight Wet Sample (g)	167.06	148.13	154.36	161.50	148.46
Weight Sample (Dry + Tin) (g)	238.71	215.66	217.93	222.74	214.69
Weight of Water (g)	37.24	35.95	32.28	32.51	32.14
Weight Dry Sample (g)	129.82	112.18	122.08	128.99	116.32
Moisture Content (%)	28.7	32.0	26.4	25.2	27.6
Wet Density (kg/m ³)	2122	1881	1960	2051	1885
Dry Density (kg/m ³)	1649	1425	1550	1638	1477
Borehole/Test Pit No	TP15-20	TP21-20	TP13-20	TP9-20	TP1-20
Sample No.					
Sample Depth	0.0-0.7	0.0-0.6	0.0-0.7	0.7-1.4	0.0-0.7
Composition					
% Gravel	0	5	15	5	5
% Sand	10	15	15	10	10
% Fines	90	80	70	85	85
Plastic (P) or Non-Plastic (N)					
Organic (Y/N)	Y	Y			
USCS Symbol	CL-ML	CL-ML	CL-ML	CL-ML	CL-ML
Other Constituents	ROOT MAT.	ROOT MAT.			
Moisture Content and Density Determination					
Container No.	D50	D2	B56	C44	B50
Sample Volume (cm ³)	78.7381	78.7381	78.7381	78.7381	78.7381
Weight of Tin (g)	116.58	116.44	106.62	129.05	104.87
Weight Sample (Wet + Tin) (g)	273.82	263.86	286.21	280.06	255.84
Weight Wet Sample (g)	157.24	147.42	179.59	151.01	150.97
Weight Sample (Dry + Tin) (g)	244.19	239.51	267.81	245.47	222.60
Weight of Water (g)	29.63	24.35	18.40	34.59	33.24
Weight Dry Sample (g)	127.61	123.07	161.19	116.42	117.73
Moisture Content (%)	23.2	19.8	11.4	29.7	28.2
Wet Density (kg/m ³)	1997	1872	2281	1918	1917
Dry Density (kg/m ³)	1621	1563	2047	1479	1495

Reviewed By: Stephen Dunlop, P.Eng.

Date: 22-Jun-20

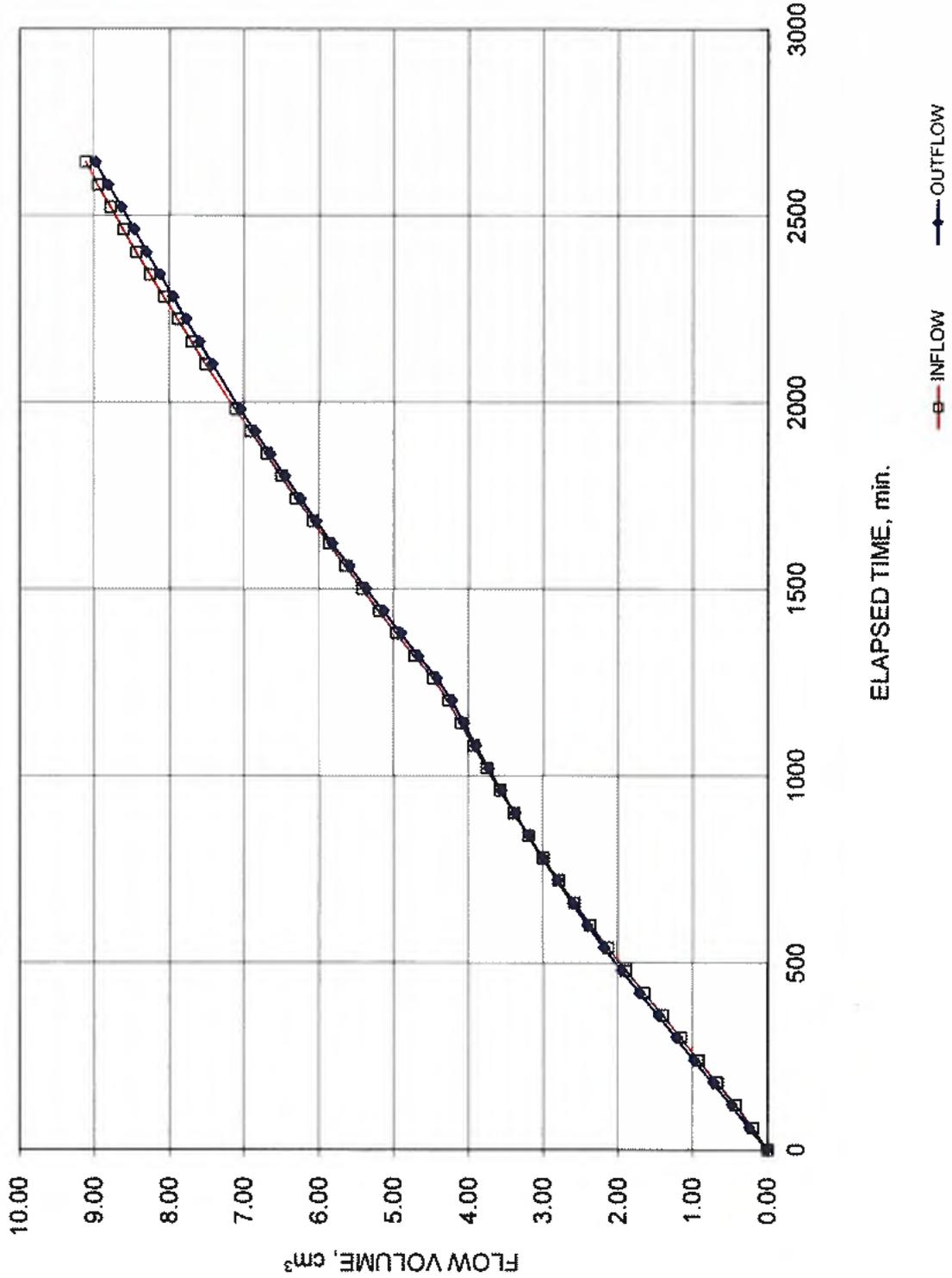
PERMEABILITY TEST RESULTS



HYDRAULIC CONDUCTIVITY TEST

Project title: Thurber/Lab Testing/Miss
Borehole number: TP13-20
Sample depth: 0.7-1.4

Flow volume vs. Time
BOREHOLE NUMBER - TP13-20
SAMPLE - ST2



Project number : 20146139 (2000)
Prepared by : AH

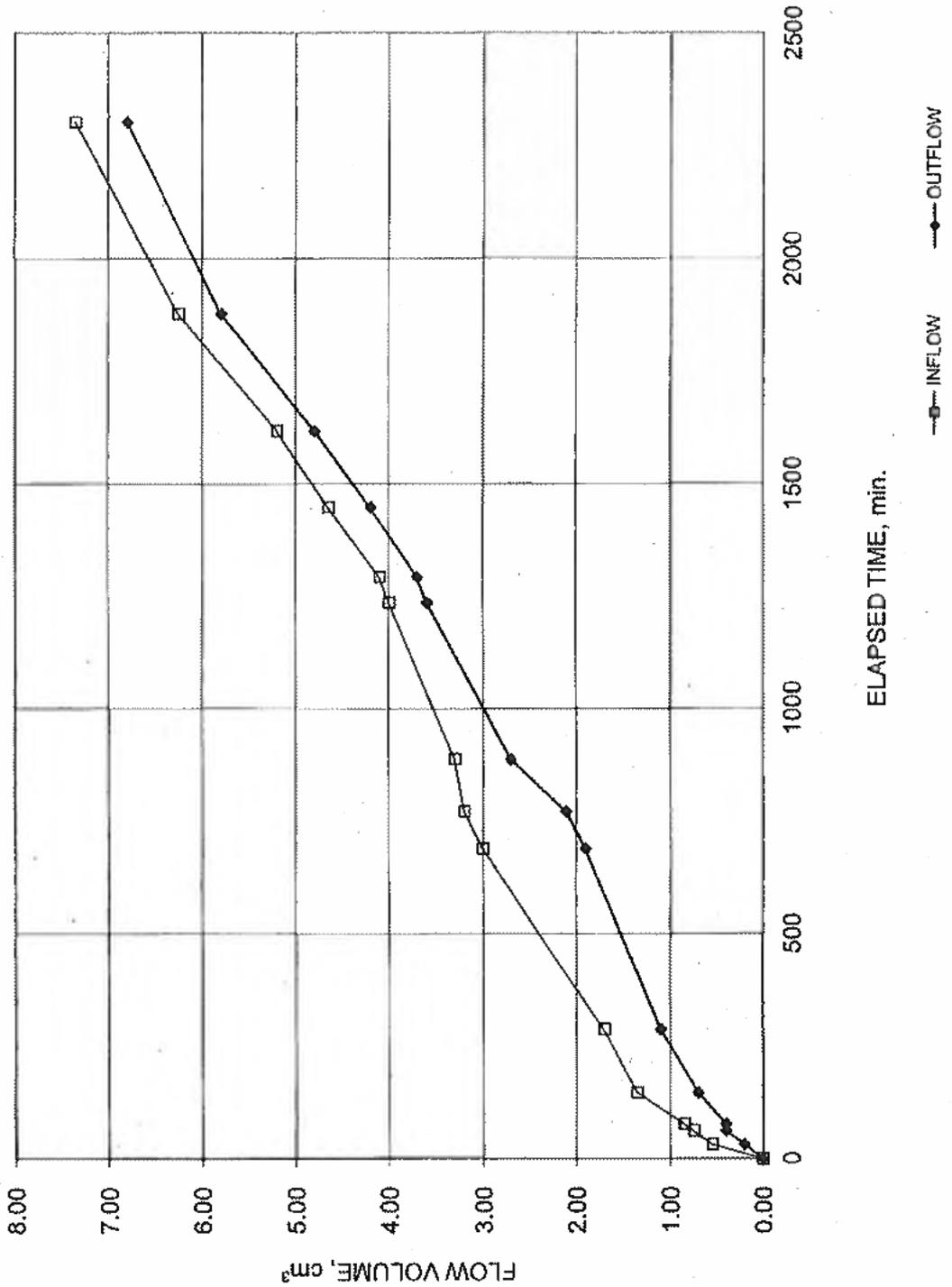
Golder

Checked by : MM

HYDRAULIC CONDUCTIVITY TEST

Project title: Thurber/Lab Testing/Miss
Borehole number: TP14-20
Sample depth: 0.0-0.7

Flow volume vs. Time
BOREHOLE NUMBER - TP14-20
SAMPLE - ST1



Project number : 20146139 (2000)
Prepared by : SJ

Golder Associates

Checked by : AH

HYDRAULIC CONDUCTIVITY TEST

ASTM D 5084 - Testing methodology modified

SAMPLE IDENTIFICATION			
PROJECT NUMBER	20146139 (2000)	SAMPLE	ST1
PROJECT TITLE	Thurber/Lab Testing/Miss	SAMPLE DEPTH, m	0.0-0.7
BOREHOLE NUMBER	TP14-20	DATE	7/06/2020

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)			
SAMPLE HEIGHT, cm	14.11	UNIT WEIGHT, kN/m ³	19.54
SAMPLE DIAMETER, cm	6.93	DRY UNIT WEIGHT, kN/m ³	15.64
SAMPLE AREA, cm ²	37.74	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	532.33	VOLUME OF SOLIDS, cm ³	314.35
TOTAL MASS, g	1060.92	VOLUME OF VOIDS, cm ³	217.98
DRY MASS, g	848.74	VOID RATIO	0.69
WATER CONTENT, %	25.0		

SATURATION STAGE			
CELL PRESSURE, kPa	N/A	EFFECTIVE CONSOLIDATION STRESS, kPa	N/A
HEAD PRESSURE, kPa	N/A	DURATION, min	N/A
BACK PRESSURE, kPa	N/A	B COEFFICIENT	N/A

CONSOLIDATION STAGE			
CELL PRESSURE, kPa	N/A	EFFECTIVE CONSOLIDATION STRESS, kPa	N/A
HEAD PRESSURE, kPa	N/A	DURATION, min	N/A
BACK PRESSURE, kPa	N/A	VOLUME CHANGE, cm ³	0.00
		DRAINAGE	N/A

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)			
SAMPLE HEIGHT, cm	14.11	SAMPLE AREA, cm ²	37.74
SAMPLE DIAMETER, cm	6.93	SAMPLE VOLUME, cm ³	532.33

HYDRAULIC CONDUCTIVITY STAGE			
CELL PRESSURE, kPa	40	EFFECTIVE CONSOLIDATION STRESS, kPa	5
HEAD PRESSURE, kPa	35	DURATION, min	2302
BACK PRESSURE, kPa	20	HYDRAULIC GRADIENT, $\frac{h}{L}$	11

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)			
SAMPLE HEIGHT, cm	14.11	UNIT WEIGHT, kN/m ³	19.81
SAMPLE DIAMETER, cm	6.93	DRY UNIT WEIGHT, kN/m ³	15.64
SAMPLE AREA, cm ²	37.74	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	532.33	VOLUME OF SOLIDS, cm ³	314.35
TOTAL MASS, g	1075.21	VOLUME OF VOIDS, cm ³	217.98
DRY MASS, g	848.74	VOID RATIO	0.69
WATER CONTENT, %	26.7		

TEST RESULTS	
ELAPSED TIME TO STEADY STATE FLOW (min)	0.0
DURATION OF STEADY STATE FLOW (min)	2302
INFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)	7.4
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)	6.8
INFLOW TO OUTFLOW RATIO	1.08
HYDRAULIC CONDUCTIVITY (INFLOW) (m/s)	1.30E-09
HYDRAULIC CONDUCTIVITY (OUTFLOW) (m/s)	1.20E-09
HYDRAULIC CONDUCTIVITY, K, m/s	1.25E-09
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K ₂₀ , m/s	1.17E-09

NOTES:
 Effective consolidation stress assigned, by client.
 Saturation and consolidation of the specimen was omitted per clients instruction.
 PERMEANT FLUID Deaired tap water
 AVERAGE TEST TEMPERATURE 23.0 °C

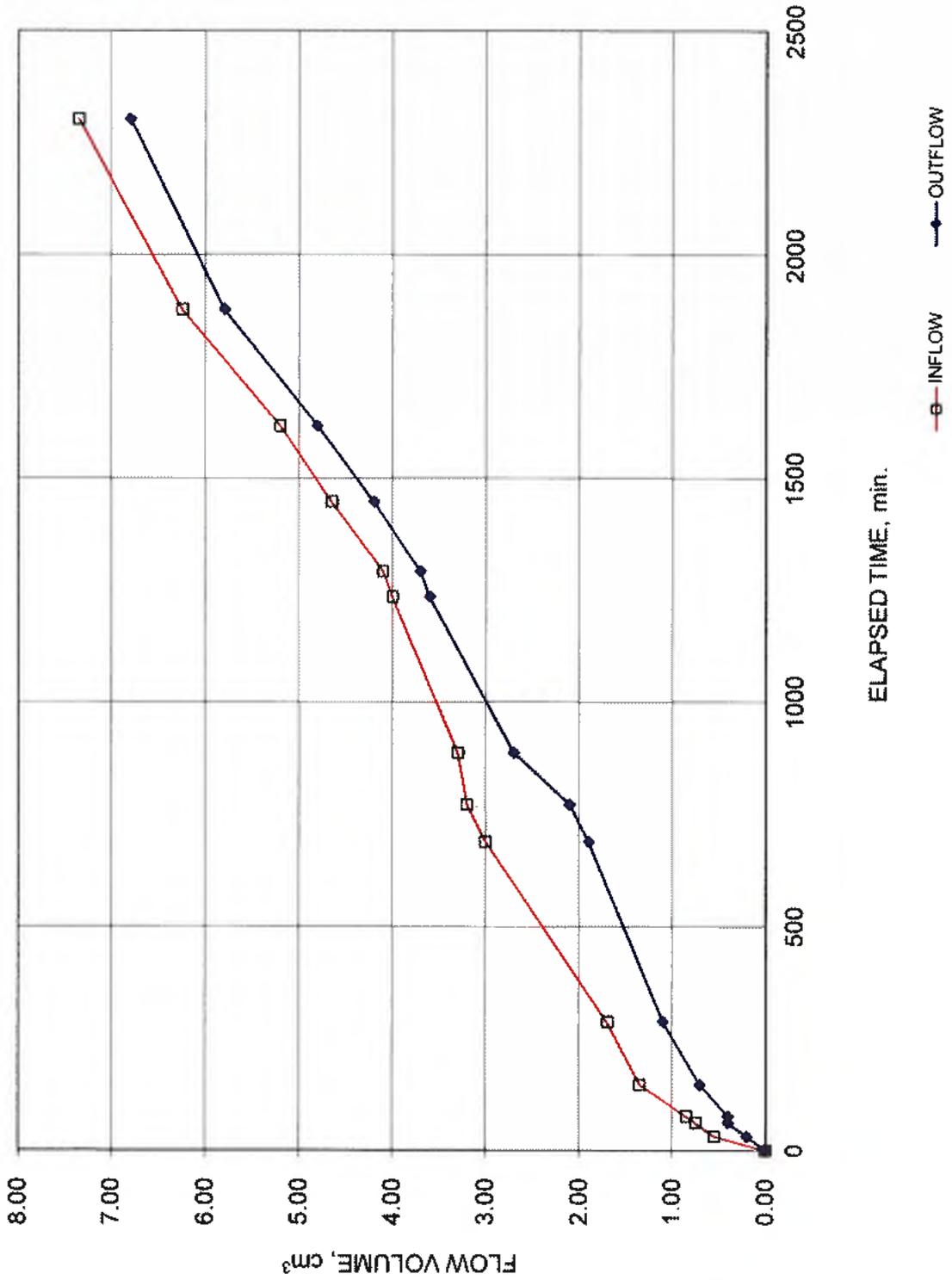
HYDRAULIC CONDUCTIVITY TEST

Project title: Thurber/Lab Testing/Miss
Borehole number: TP14-20
Sample depth: 0.0-0.7

Flow volume vs. Time

BOREHOLE NUMBER - TP14-20

SAMPLE - ST1



Project number : 20146139 (2000)
Prepared by : SJ

Golder Associates

Checked by : AH

HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084 (CONSTANT HEAD - Method A)

SAMPLE IDENTIFICATION

PROJECT NUMBER	20146139 (2000)	SAMPLE	ST 2
PROJECT TITLE	Thurber/Lab Testing/Miss	SAMPLE DEPTH, m	0.7-1.4
BOREHOLE NUMBER	TP 14-20	DATE	6/24/20

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)

SAMPLE HEIGHT, cm	6.86	UNIT WEIGHT, kN/m ³	18.99
SAMPLE DIAMETER, cm	6.93	DRY UNIT WEIGHT, kN/m ³	14.48
SAMPLE AREA, cm ²	37.74	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	258.75	VOLUME OF SOLIDS, cm ³	141.46
TOTAL MASS, g	501.12	VOLUME OF VOIDS, cm ³	117.29
DRY MASS, g	381.95	VOID RATIO	0.83
WATER CONTENT, %	31.2		

SATURATION STAGE

CELL PRESSURE, kPa	280.00	EFFECTIVE CONSOLIDATION STRESS, kPa	10
HEAD PRESSURE, kPa	270.00	DURATION, min	3,006
BACK PRESSURE, kPa	270.00	B COEFFICIENT	0.96

CONSOLIDATION STAGE

CELL PRESSURE, kPa	305.00	EFFECTIVE CONSOLIDATION STRESS, kPa	35
HEAD PRESSURE, kPa	270.00	DURATION, min	1,459
BACK PRESSURE, kPa	270.00	VOLUME CHANGE, cm ³	1.10

DRAINAGE

Top and Bottom

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)

SAMPLE HEIGHT, cm	6.85	SAMPLE AREA, cm ²	37.63
SAMPLE DIAMETER, cm	6.92	SAMPLE VOLUME, cm ³	257.65

HYDRAULIC CONDUCTIVITY STAGE

CELL PRESSURE, kPa	318	EFFECTIVE CONSOLIDATION STRESS, kPa	35
HEAD PRESSURE, kPa	283	DURATION, min	4310
BACK PRESSURE, kPa	270	HYDRAULIC GRADIENT, $\frac{h}{L}$	19

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)

SAMPLE HEIGHT, cm	6.85	UNIT WEIGHT, kN/m ³	19.49
SAMPLE DIAMETER, cm	6.92	DRY UNIT WEIGHT, kN/m ³	14.54
SAMPLE AREA, cm ²	37.63	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	257.65	VOLUME OF SOLIDS, cm ³	141.46
TOTAL MASS, g	512.10	VOLUME OF VOIDS, cm ³	116.19
DRY MASS, g	381.95	VOID RATIO	0.82
WATER CONTENT, %	34.1		

TEST RESULTS

ELAPSED TIME TO STEADY STATE FLOW (min)		0.0
DURATION OF STEADY STATE FLOW (min)		4310
INFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)		1.4
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)		1.4
INFLOW TO OUTFLOW RATIO		1.1
HYDRAULIC CONDUCTIVITY (INFLOW) (m/s)		7.59E-11
HYDRAULIC CONDUCTIVITY (OUTFLOW) (m/s)		7.16E-11
HYDRAULIC CONDUCTIVITY, K, m/s		7.38E-11
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K ₂₀ , m/s		8.87E-11

NOTES:

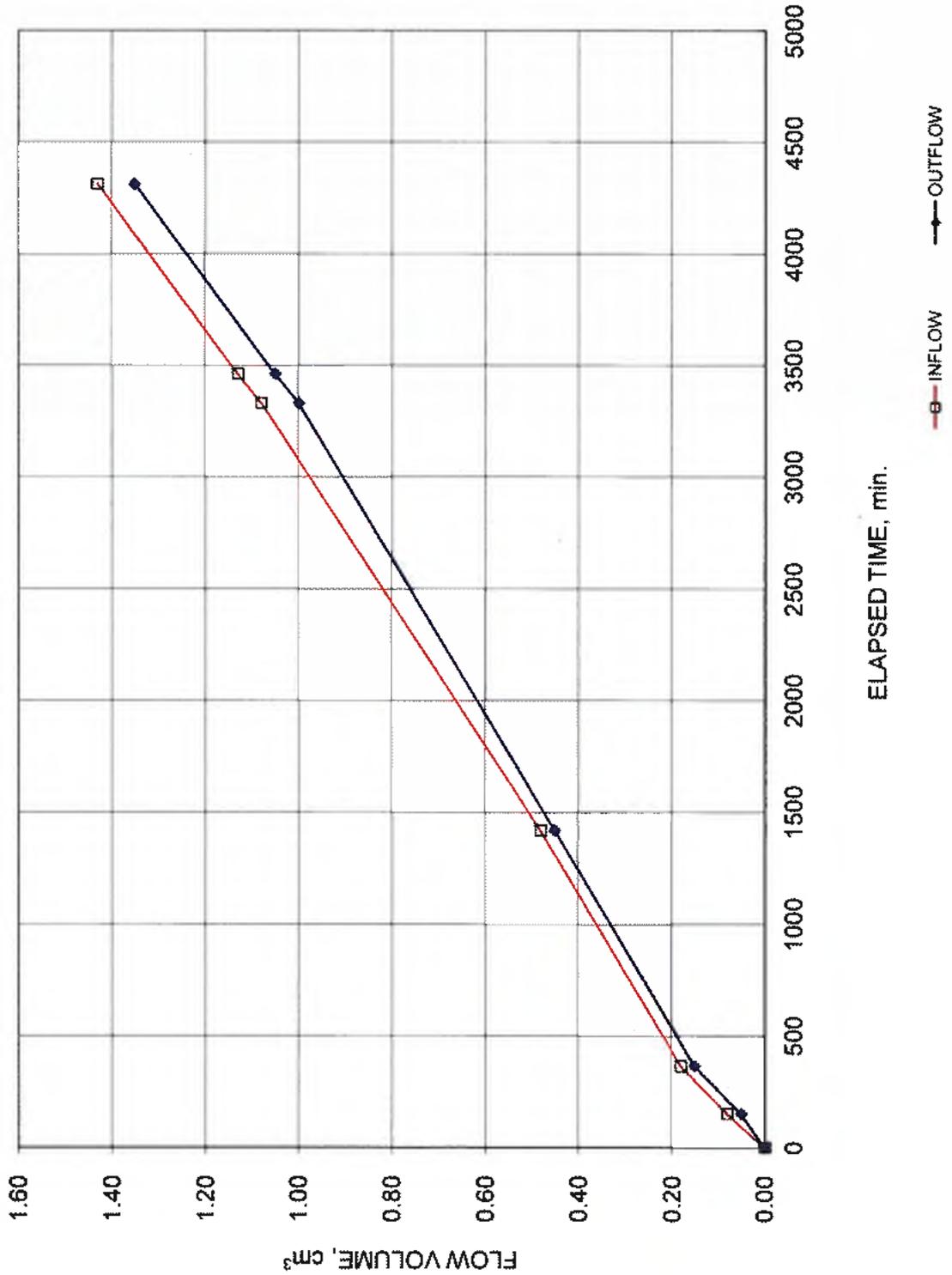
Effective consolidation stress assigned, by client.

PERMEANT FLUID	Deaired tap water
AVERAGE TEST TEMPERATURE	23.0 °C

HYDRAULIC CONDUCTIVITY TEST

Project title: Thurber/Lab Testing/Miss
Borehole number: TP 14-20
Sample depth: 0.7-1.4

Flow volume vs. Time
BOREHOLE NUMBER - TP 14-20
SAMPLE - ST 2



Project number : 20146139 (2000)
Prepared by : AH

Golder

Checked by : MM

HYDRAULIC CONDUCTIVITY TEST
ASTM D 5084 (CONSTANT HEAD - Method A)

SAMPLE IDENTIFICATION

PROJECT NUMBER	20146139 (2000)	SAMPLE	ST1
PROJECT TITLE	Thurber/Lab Testing/Miss	SAMPLE DEPTH, m	0.0-0.7
BOREHOLE NUMBER	TP 22-20	DATE	6/24/20

SPECIMEN PROPERTIES AND DIMENSIONS (INITIAL)

SAMPLE HEIGHT, cm	6.53	UNIT WEIGHT, kN/m ³	21.52
SAMPLE DIAMETER, cm	6.94	DRY UNIT WEIGHT, kN/m ³	19.25
SAMPLE AREA, cm ²	37.83	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	247.01	VOLUME OF SOLIDS, cm ³	179.56
TOTAL MASS, g	541.98	VOLUME OF VOIDS, cm ³	67.47
DRY MASS, g	484.78	VOID RATIO	0.38
WATER CONTENT, %	11.8		

SATURATION STAGE

CELL PRESSURE, kPa	350.00	EFFECTIVE CONSOLIDATION STRESS, kPa	10
HEAD PRESSURE, kPa	340.00	DURATION, min	4,523
BACK PRESSURE, kPa	340.00	B COEFFICIENT	0.96

CONSOLIDATION STAGE

CELL PRESSURE, kPa	375.00	EFFECTIVE CONSOLIDATION STRESS, kPa	35
HEAD PRESSURE, kPa	340.00	DURATION, min	1,576
BACK PRESSURE, kPa	340.00	VOLUME CHANGE, cm ³	1.60

DRAINAGE Top and Bottom

SPECIMEN PROPERTIES AND DIMENSIONS (AFTER CONSOLIDATION)

SAMPLE HEIGHT, cm	6.52	SAMPLE AREA, cm ²	37.66
SAMPLE DIAMETER, cm	6.92	SAMPLE VOLUME, cm ³	245.42

HYDRAULIC CONDUCTIVITY STAGE

CELL PRESSURE, kPa	388	EFFECTIVE CONSOLIDATION STRESS, kPa	35
HEAD PRESSURE, kPa	353	DURATION, min	3738
BACK PRESSURE, kPa	340	HYDRAULIC GRADIENT, $\frac{h}{L}$	20

SPECIMEN PROPERTIES AND DIMENSIONS (FINAL)

SAMPLE HEIGHT, cm	6.52	UNIT WEIGHT, kN/m ³	22.28
SAMPLE DIAMETER, cm	6.92	DRY UNIT WEIGHT, kN/m ³	19.37
SAMPLE AREA, cm ²	37.66	SPECIFIC GRAVITY, assumed	2.70
SAMPLE VOLUME, cm ³	245.42	VOLUME OF SOLIDS, cm ³	179.55
TOTAL MASS, g	557.49	VOLUME OF VOIDS, cm ³	65.87
DRY MASS, g	484.78	VOID RATIO	0.37
WATER CONTENT, %	15.0		

TEST RESULTS

ELAPSED TIME TO STEADY STATE FLOW (min)		0.0
DURATION OF STEADY STATE FLOW (min)		3738
INFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)		1.3
OUTFLOW VOLUME UNDER STEADY STATE FLOW (cm ³)		1.3
INFLOW TO OUTFLOW RATIO		1.0
HYDRAULIC CONDUCTIVITY (INFLOW) (m/s)		7.56E-11
HYDRAULIC CONDUCTIVITY (OUTFLOW) (m/s)		7.56E-11
HYDRAULIC CONDUCTIVITY, K, m/s		7.56E-11
HYDRAULIC CONDUCTIVITY AT STANDARD TEMPERATURE, K ₂₀ , m/s		7.04E-11

NOTES:

Effective consolidation stress assigned, by client.

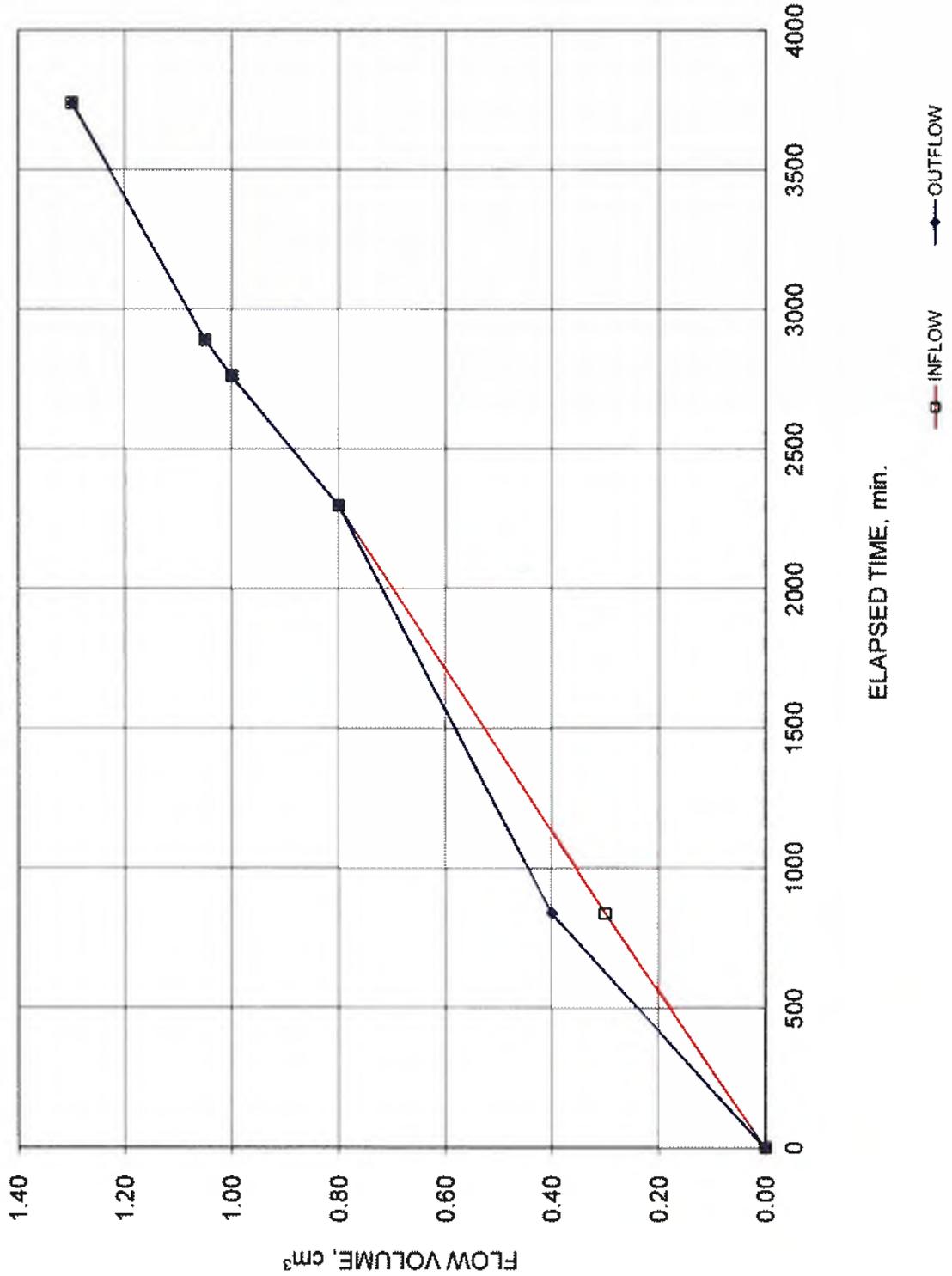
PERMEANT FLUID Deaired tap water

AVERAGE TEST TEMPERATURE 23.0 °C

HYDRAULIC CONDUCTIVITY TEST

Project title: Thurber/Lab Testing/Miss
Borehole number: TP 22-20
Sample depth: 0.0-0.7

Flow volume vs. Time
BOREHOLE NUMBER - TP 22-20
SAMPLE - ST1

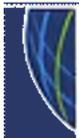


Project number : 20146139 (2000)
Prepared by : AH

Golder

Checked by : MM

APPENDIX F
Percolation Assessment Report



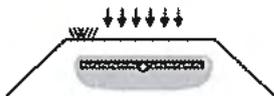
24 September 2020

BluMetric Environmental
Attn: Andy Benson
3108 Carp Road
PO Box 430
Ottawa, Ontario
Canada

RE: Richmond Landfill, Earthen Cover Percolation Assessment

Dear Andy:

This letter report summarizes the results of percolation modeling carried out for the Richmond Landfill located in Napanee, Ontario. The model simulated the existing earthen final cover. The final cover was installed progressively over several years prior to 2010. The last area of the cover was completed in 2011. In addition to percolation modeling, time-dependent settlement of the landfill was also estimated for the period 2011 to 2019. The settlement analysis results are also presented in this letter report.



M.V.Khire, PhD, P.E., BCEE
Geotechnical and
Geoenvironmental
Engineering

Mobile: 517/402-4112
E-mail: mvkhire@gmail.com

1. PERCOLATION MODELING

Unsaturated flow modeling was carried out using the numerical model HYDRUS-2D. HYDRUS-2D is a saturated and unsaturated flow model that simulates water balance of earthen systems. The model requires input of precipitation, potential evapotranspiration (PET) rates, transpiration rates, and saturated and unsaturated hydraulic properties for the soil components. The model solves Richards' equation for saturated and unsaturated flow to calculate the soil water storage, deep drainage or percolation, surface runoff and evapotranspiration (ET). A total of 12 model runs were carried out which included the following key parameters:

- a) Total thickness of the earthen cover (80 cm, 98 cm and 130 cm);
- b) Precipitation data for 2011 and 2017 (94 cm/yr and 111 cm/yr); and
- c) Hydraulic conductivity of the barrier layer (10^{-7} cm/s and 10^{-6} cm/s).

The model input and results are as follows.

1.1 Model Input

The model input consisted of: (1) cover thickness and boundary conditions; (2) daily precipitation and PET rates; and (3) saturated and unsaturated hydraulic properties of the soil layers that constitute the cover.

Cover Thickness

Three cover thickness profiles were modeled based on the data provided by BluMetric Environmental (BluMetric). The three cover thickness profiles represented three zones of the earthen cover. Each of the three cover thickness profiles consisted of three soil layers from top down: topsoil layer, compacted barrier layer, and fill layer. The thicknesses of these soil layers for the three cover profiles in the same order input to the model are as follows.

- a) Zone 1: 23 cm, 84 cm, 23 cm, Total thickness = 130 cm;
- b) Zone 2: 21 cm, 45 cm, 32 cm, Total thickness = 98 cm; and
- c) Zone 3: 16 cm, 18 cm, 46 cm, Total thickness = 80 cm.

For each of the cover profiles, the boundary conditions input to the model were atmospheric boundary for the upper boundary and free drainage boundary for the lower boundary. The atmospheric boundary condition allows the model to simulate infiltration, ET and runoff. The free drainage boundary assumes a unit hydraulic gradient at the bottom boundary and the flux that seeps out of the lower boundary is percolation. Simulated percolation for all model simulations is presented in the results section.

Precipitation and PET Rates

Weather data consisting of daily precipitation and air temperatures for Belleville, Ontario was provided by BluMetric for the duration 2008 to 2019. Belleville which is located about 30 km west of the landfill is the nearest location where continuous weather data is collected by Environment Canada. Based on this data and weather data published on weather sites, average annual precipitation for Belleville is about 89 cm (~50 percentile). Based on the weather data, the following two years were selected for simulation.

- a) 2011, total precipitation = 94 cm (73 Percentile); and
- b) 2017, total precipitation = 111 cm (99 Percentile).

The key reason for selecting 2011 as one of the simulation years was because it was wetter than an average year to simulate the cover conservatively. Year 2017 was selected to evaluate how the cover will perform during an extremely wet year.

The daily precipitation values for each of these two years were assigned to the top boundary of the cover profiles.

Daily PET values are either measured from pan evaporation data or estimated from meteorological data that usually consists of daily values of air temperatures, solar radiation, relative humidity (or dew point), and wind speed. Such data was not available for Belleville. Hence, daily PET values estimated by Mijares (2011) and Mijares and Khire (2012) for a landfill cover located near Detroit, Michigan during the period 2009 to 2010 were used. While this site is located several hundred

kilometers from Richmond Landfill, both locations have about the same latitude and similar annual average precipitations and temperatures. Total annual PET estimated for the Detroit site was 86 cm. The daily PET rates were estimated using a modified Penman equation using the water balance model UNSAT-H. Daily values of PET were input to the model and assigned to the top boundary. The PET/P ratios for 2011 and 2017 are:0.91 and 0.77, respectively.

Saturated and Unsaturated Hydraulic Properties

The model input consists of saturated hydraulic conductivities and fitting parameters for soil water characteristic curves and unsaturated hydraulic conductivity functions. BluMetric collected Shelby tube samples of the cover during the field investigation in June 2020. These Shelby tube samples primarily represented the compacted barrier layer and fractions of the topsoil and fill layers. Four saturated hydraulic conductivity tests were carried out by Golder. The hydraulic conductivities measured from these tests ranged from 10^{-8} cm/s to 10^{-7} cm/s. However, the tests that yielded closer to 10^{-8} cm/s values, might have been influenced by relatively high confining pressures/gradients used in the test. Usually, Shelby tube samples being relatively small, they underestimate the field hydraulic conductivities (Saravanathiiban 2014). In addition, based on Saravanathiiban and Khire (2014), because final covers are subjected to repeated wetting and drying cycles, they undergo pedogenesis and that usually results in in-service hydraulic conductivities that are greater than 10^{-7} cm/s. Hence, for half of the simulations, the saturated hydraulic conductivity of the barrier layer was assumed equal to 10^{-6} cm/s.

The saturated and unsaturated hydraulic properties input for topsoil, barrier and fill layers are presented in Table 1.

1.2 Model Results

Percolations simulated by the model for the 12 simulations carried out are summarized in Table 2 for 2011 precipitation data and in Table 3 for 2017 precipitation data. Each of the presented percolations is the annual average obtained from a 3-year simulation where the precipitation and PET values were repeated for the three consecutive years.

Effect of Barrier Layer Hydraulic Conductivity

The simulation results show that percolation was relatively small when barrier layer was assigned hydraulic conductivity equal to 10^{-7} cm/s. The simulated annual average percolation for Zone 1 and Zone 2 cover profiles was less than 0.5 cm and it was a little less than 1 cm for the Zone 3 cover profile. The model also simulated relatively large runoff and ET almost equal to runoff. While there is no field data collected to validate the model results, such relatively large runoff and low ET are unlikely. Hence, most likely the field-scale hydraulic conductivity of the barrier layer is greater than 10^{-7} cm/s.

The simulation results for barrier layer hydraulic conductivity equal to 10^{-6} cm/s are discussed as follows

Effect of Cover Thickness

For barrier layer hydraulic conductivity equal to 10^{-6} cm/s, the average annual percolation for the thinnest to thickest cover profiles (Zone 3, Zone 2 and Zone 1) ranged from 3.1 cm/yr to 5.6 cm/yr for the 2011 precipitation year (73 percentile wet year). Percolation ranged from 3.4 cm/yr to 5.9 cm/yr for the 2017 precipitation year (99 percentile wet year). The thickness of the cover had greater influence on the simulated percolation than the annual precipitation. Simulated runoff was relatively small (less than 5 cm/yr). Simulated ET represents most of the water balance. Figure 1 shows simulated percolation and the annual leachate flow normalized to depth of water for comparison. Figure 1 shows that percolation represents a fraction of the leachate flow from the landfill.

2. TIME-DEPENDENT SETTLEMENT EVALUATION

Figure 1 shows that the simulated percolation from the final cover is approximately 4% to 50% of the leachate flow collected at the site. Hence, the settlement analysis was carried out to estimate the effect of time-dependent settlement on leachate generated from the landfill during the post-closure period from 2011 to 2019.

In order to estimate landfill settlement, the settlement equation developed by Gourc et al. (2010) was used. Figure 2 shows a typical conceptual total settlement curve for MSW in landfills (Bareither and Kwak 2012). In this analysis, the Phase I or immediate settlement/compression was ignored. The Gourc et al. (2010) equation used to estimate the time-dependent settlement is as follows.

$$S_{TD}(t) = H_{EOI} \left[C'_{aM} \cdot \log \left(\frac{t}{t_M} \right) + \epsilon_{BIO} (1 - e^{-k(t-t_B)}) \right]$$

where S_{TD} – total time dependent settlement; H_{EOI} is the height of MSW after the end of immediate compression; C'_{aM} is the mechanical creep ratio; t = current time for the total settlement, t_M is the time at which the MSW transitions from immediate compression to mechanical creep; ϵ_{BIO} is the total strain due to biodegradation; k is first-order rate coefficient; and t_B is the time at which MSW transitions from mechanical creep to biocompression. Bareither and Kwak (2015) applied Gourc et al. (2010) model for Yolo County Landfill where they collected settlement data for MSW over a decade for a conventional and bioreactor cells. The calibrated parameters for the conventional cell that Bareither and Kwak (2015) estimated were used in this analysis for Richmond Landfill. These parameters are presented in Table 4.

Based on the topographic profiles measured in 2011 and 2019, the following interpretations and assumptions were made for estimating the settlement.

- a) Waste was placed in the landfill from 1988 to 2011 with an average thickness of approximately 30 m in 2011; and
- b) Average thickness was estimated by dividing the approximate volume of the waste by the area or footprint of the waste.

Based on the above presented assumptions, the total estimated settlement of the landfill from 2011 to 2019 is about 2.7 m (34 cm/yr).

According to Bareither and Kwak (2015), while Gourc et al. (2010) model is recommended for practice due to relatively high accuracy and relatively few input parameters, it was pointed out that the model does not have a settlement constraint. Hence, the model tends to over-predict long-term settlement. Based on the 2019 and 2011 topographic profiles provided by BluMetric, the peak settlement of the waste in the 8-yr period is about 2.7 m while the average settlement is about 1.5 m (19 cm/yr). However, the accuracy of the topographic survey carried out in 2011 is relatively low. Hence, the settlement of the waste maybe somewhere between 19 cm/yr to 34 cm/yr.

The settlement of the waste (19 cm/yr to 34 cm/yr) will result in leachate that will be expelled out of the waste as the waste undergoes settlement. Saturated inorganic solids such as clayey soils which contain incompressible solids when consolidate result in column of water that is expelled that is same in magnitude as the settlement. However, because MSW in landfills is unlikely to be saturated and it contains compressible organic solids, only a fraction of the settlement is expected to generate leachate. Based on Figure 1, it is a reasonable interpretation that the leachate flow contains a fraction (< 50%) that is percolation from the final cover and remainder is leachate expelled due to time-dependent settlement of the waste. Additional field and laboratory tests are required if it is critical to validate the percolation and settlement modeling results.

3. CLOSURE

I trust that this report meets the scope of work that was agreed. If you have any questions, please feel free to contact me via email at mvkhire@gmail.com or via phone at (517) 402-4112.

Sincerely,



M.V. Khire, PhD., PE., BCEE
(Registered in the states of MI and TX)

REFERENCES

- Bareither, C and Kwak, S. (2015), "Assessment of municipal solid waste settlement models based on field-scale data analysis," *Waste Management*, 42, 101-117.
- Gourc, J-P, Staub, M, and Conte, M (2010), "Assessment of municipal solid waste settlement models based on field-scale data analysis," *Waste Management*, 30, 1556--1568.
- Mijares, R. (2011), "Hydraulic Evaluation of Lysimeters vs. Actual Evapotranspirative Caps," PhD Dissertation, Michigan State University.
- Mijares, R. and Khire, M. (2012), "Field Data and Numerical Modeling of Water Balance of Lysimeter versus Actual Earthen Cap," *Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 138, No. 8, 889-897.
- Saravanathiiban, D. (2014), "Preferential Flow through earthen landfill covers: Field evaluation of Root Zone Water Quality Model (RZWQM) and laboratory validation of Lattice Boltzmann Method (LBM)," PhD Dissertation, Michigan State University.
- Saravanathiiban, D. and Khire, M. (2014), "Controlled irrigation to estimate field-scale hydraulic conductivity of a landfill cover," Geo Congress 2014, ASCE Geo Institute, Atlanta, Feb 23-26.

Table 1. Summary of saturated and unsaturated hydraulic properties input to the model

Cover Layer	Saturated water content (θ_s)	Residual water content (θ_r)	van Genuchten SWCC Fitting Parameter α (1/m)	van Genuchten SWCC Fitting Parameter (n)	Saturated Hydraulic Conductivity K_s (cm/s)	van Genuchten - Mualem unsaturated conductivity function Fitting Parameter, l
Topsoil	0.01	0.53	5	1.22	4.5×10^{-3}	0.5
Compacted Barrier Layer	0.05	0.50	0.95	1.08	10^{-7} and 10^{-6}	0.5
Fill Layer	0.05	0.50	0.7	1.34	4.5×10^{-5}	0.5

Notes – 1) van Genuchten function was used for representing soil water characteristic curve (SWCCs) for all soil layers; and 2) van Genuchten – Mualem function was used to simulate unsaturated hydraulic conductivity functions.

Table 2. Summary of simulated percolation for various cover profiles using 2011 Precipitation data.

Zone	Thickness of Soil Layers of Cover (cm)				Percolation (cm/yr)	
					K_{Barrier} (cm/s)	
	Top Soil	Barrier	Fill	TOTAL	1×10^{-7}	1×10^{-6}
1	23	84	23	130	< 0.5	3.1
2	21	45	32	98	< 0.5	3.8
3	16	18	46	80	< 1.0	5.6

Note - Percolation values represent a 3-yr simulation average

Table 3. Summary of simulated percolation for various cover profiles using 2017 Precipitation data.

Zone	Thickness of Soil Layers of Cover (cm)				Percolation (cm/yr)	
					K_{Barrier} (cm/s)	
	Top Soil	Barrier	Fill	TOTAL	1×10^{-7}	1×10^{-6}
1	23	84	23	130	< 0.5	3.4
2	21	45	32	98	< 0.5	4.0
3	16	18	46	80	< 1.0	5.9

Note - Percolation values represent a 3-yr simulation average

Table 4. Summary of input parameters used in Gourc et al. (2010) settlement model.

H_{EOI} (m)	C'_{aM}	t_M (yr)	ϵ_{BIO}	k (1/yr)	t_B (yr)
Waste Placed from 1988 to 2011					
30	0.058	0.1	0.132	0.045	2

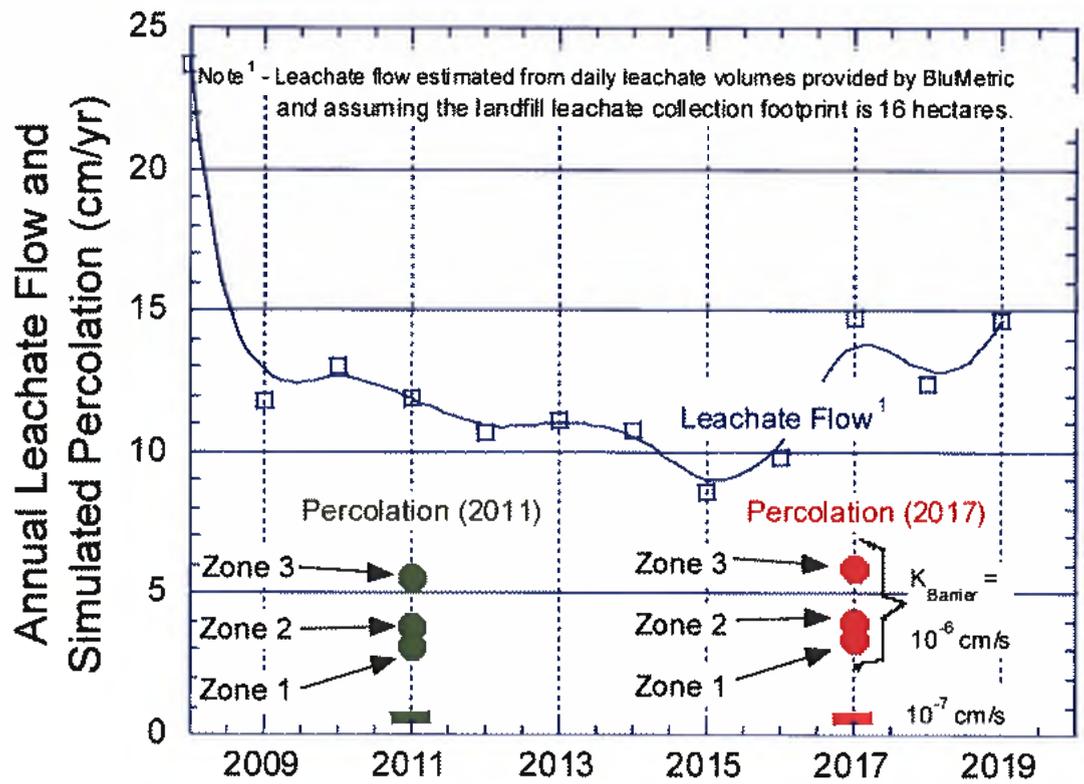


Figure 1. Measured leachate flow and simulated percolation for three cover profiles

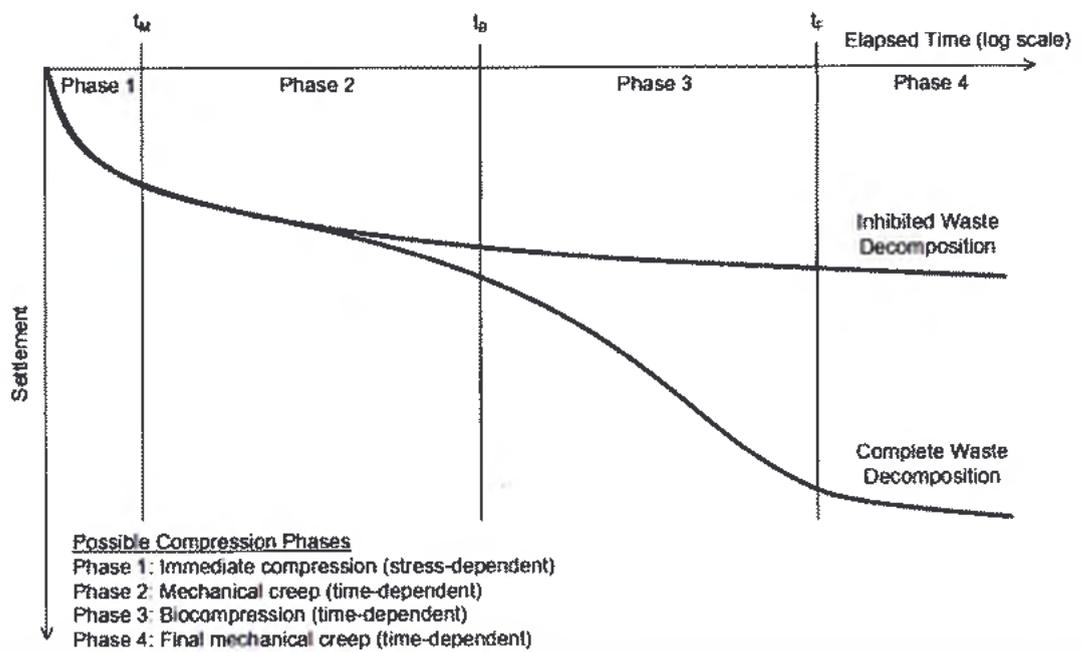


Figure 2. Conceptual settlement phases for MSW (Source: Bareither and Kwak, 2015)

APPENDIX

M

2020 PHYTOREMEDIATION
SYSTEM MONITORING
RESULTS, PREPARED BY
BLUMETRIC
ENVIRONMENTAL INC.



MEMORANDUM

Date: 16 March 2021
To: Bill McDonough, Waste Management (WMCC)
Cc: Chris Prucha and Jim Forney (WMCC) and Beverly Leno, WSP Canada Inc.
From: François Richard and Madeleine Corriveau, BluMetric Environmental Inc.
Project No: 210166-03
Re: 2020 Monitoring Results, Phytoremediation System
WMCC Richmond Landfill, Town of Greater Napanee, ON

Condition 5.11 of Amended Environmental Compliance Approval (ECA) No. A371203, dated July 14, 2017, for the Waste Management of Canada Corporation (WMCC) Richmond Landfill requires that the Annual Report includes an assessment of the results from the phytoremediation system as related to the stated objectives for the existing and proposed phytoremediation system, as well as an assessment of the need to change the monitoring program for the phytoremediation system and a recommendation of the required changes.

BluMetric Environmental Inc. is contracted by WMCC to complete the environmental monitoring program at the landfill, and to prepare the Semi-Annual Monitoring Reports as required by Condition 14.1 of the ECA. The purpose of this memorandum is to provide the monitoring results for the phytoremediation system and related assessments required by Condition 5.11 of the ECA.

During the 2020 calendar year, the results from the environmental monitoring program, conducted in accordance with the latest Environmental Monitoring Plan (Interim EMP (rev. 05) dated April 2016), were also used to monitor groundwater levels and quality around the phytoremediation system in the northwest corner of the Site.

To address ECA Condition 5.11 (i), groundwater levels were recorded from monitoring wells specified in Condition 5.10 (1) which includes monitors installed in the Shallow Groundwater Flow Zone (M27, M29, M30, M31, M38, M66-2, M67-2, M100, M101, M102 and M103) as well as the Intermediate Bedrock Groundwater Flow Zone (M3A-3, M5-3, M6-3, M74 and M75). Similarly, Condition 5.10 (2) lists wells for quality monitoring and includes locations from the Shallow Flow Zone (M66-2, M67-2, M101, M102 and M103) and Intermediate Bedrock Flow Zone (M5-3, M6-3, M74 and M75). Groundwater elevation and quality results are presented in **Tables 1** and **2**, respectively.



Tel. 613-531-2725
Fax. 613-531-1852

BluMetric Environmental Inc.

The Tower, The Woolen Mill, 4 Cataraqui Street, Kingston, Ontario, Canada K7K 1Z7

www.blumetric.ca

It should be noted that some of the wells listed in ECA Conditions 5.10 (1) and 5.10 (2) have been removed from the EMP since the fall 2015 monitoring event (groundwater flow directions and quality can be adequately characterized in this area of the site using other nearby monitoring wells). As a result, water levels at groundwater monitoring locations M5-3, M6-3, M29, M30, M31, M38 or M75, as well as groundwater samples at M102, were not collected in 2020. Also, monitoring well M67-2 was dry in fall 2020 so no sample was collected at this location. Additional details related to the 2020 monitoring results are available in the Spring and Fall 2020 Semi-Annual Monitoring Reports.

The phytoremediation system was initially planted in May 2011, and following some start-up issues was completely removed in 2012. The ground was reworked and 6,700 dogwoods and willows were planted in May 2013. Since the plantation has yet to become fully established, no trends are apparent from the monitoring results in relation to the operation of the phytoremediation system. No information is available to address Conditions 5.11 (ii and iii), as the system continues to establish itself. These conditions will be addressed in future monitoring reports.

We trust you will find this statement of compliance with the environmental monitoring and reporting requirements of ECA No. A371203 to be satisfactory. If you have any questions regarding the above information, please contact the undersigned anytime.

Respectfully submitted,
BluMetric Environmental Inc.



François A. Richard, P.Geo., Ph.D.
Senior Hydrogeologist



Madeleine Corriveau, M.Sc., P.Geo.
Senior Geoscientist

Encl.

TABLES



Table 1: 2020 Phytoremediation System Monitoring Results (Water Levels)

Monitoring Well	Water Level masl	Monitoring Well	Water Level masl	Monitoring Well	Water Level masl
06-Apr-20		15-Jul-20		26-Oct-20	
Shallow Groundwater Flow Zone					
M27	126.33	M27	124.83	M27	126.32
M29	NM	M29	NM	M29	NM
M30	NM	M30	NM	M30	NM
M31	NM	M31	NM	M31	NM
M38	NM	M38	NM	M38	NM
M66-2	123.21	M66-2	122.12	M66-2	122.08
M67-2	122.68	M67-2	122.29	M67-2	121.92
M100	125.46	M100	124.06	M100	123.84
M101	124.06	M101	122.81	M101	122.68
M102	124.15	M102	122.89	M102	124.10
M103	123.90	M103	122.52	M103	122.94
Intermediate Bedrock Groundwater Flow Zone					
M3A-3	125.11	M3A-3	124.49	M3A-3	124.47
M5-3	123.03	M5-3	NM	M5-3	123.27
M6-3	123.54	M6-3	NM	M6-3	123.99
M74	123.83	M74	123.09	M74	123.16
M75	123.06	M75	NM	M75	123.29

NM: Not measured

Table 2a: 2020 Phytoremediation System Monitoring Results (Spring Groundwater Quality)

Name	Date	Alkalinity mg/L	Ammonia mg/L	Boron mg/L	Calcium mg/L	Chloride mg/L	Conductivity mS/cm	Dissolved Organic Carbon mg/L	Iron mg/L	Magnesium mg/L	Manganese mg/L	Nitrate mg/L	Nitrite mg/L	Potassium mg/L	Sodium mg/L	Sulphate mg/L	Total Dissolved Solids mg/L
Shallow Groundwater Flow Zone																	
M66-2	2020-04-14	220	< 0.15	0.43	110	100	1200	1.4	< 0.1	35	< 0.002	0.17	< 0.01	4.3	110	270	750
M67-2	2020-04-14	370	0.37	0.69	55	5.3	680	1.8	0.63	29	0.063	< 0.1	< 0.01	7.7	49	6.3	380
M101	2020-04-14	450	< 0.15	0.059	150	46	1100	2	< 0.1	46	0.002	< 0.1	< 0.01	3.3	16	57	660
M103	2020-04-14	650	< 0.15	0.2	140	180	1800	3.6	< 0.1	87	< 0.002	0.34	< 0.01	5.5	130	53	1010
Intermediate Bedrock Groundwater Flow Zone																	
M5-3	2020-04-14	460	1.34	1.1	36	45	980	1	< 0.1	27	< 0.002	< 0.1	< 0.01	13	140	< 1	525
M6-3	2020-04-14	1700	5.03	0.069	1100	1500	11000	34	< 0.1	0.13	< 0.002	< 0.1	0.012	47	660	< 1	4310
M74	2020-04-16	310	1.28	0.8	30	25	660	2.4	< 0.1	18	0.03	< 0.1	< 0.01	12	77	5.9	385
M75	2020-04-14	410	1.46	1.1	34	48	1000	1.4	< 0.1	24	0.008	< 0.1	< 0.01	14	150	46	590

Name	Date	1,1,1,2-Tetrachloroethane mg/L	1,1,1-Trichloroethane mg/L	1,1,2,2-Tetrachloroethane mg/L	1,1,2-Trichloroethane mg/L	1,1-Dichloroethane mg/L	1,1-Dichloroethylene mg/L	1,2-Dichlorobenzene (o) mg/L	1,2-Dichloroethane mg/L	1,3,5-Trimethylbenzene mg/L	1,3-Dichlorobenzene (m) mg/L	1,4-Dichlorobenzene (p) mg/L	1,4-Dioxane mg/L	Benzene mg/L	Chlorobenzene mg/L	Chloroethane mg/L	Chloromethane mg/L	Cis-1,2-Dichloroethylene mg/L	Dichloromethane mg/L	Ethylbenzene mg/L	m+p-Xylene mg/L	o-Xylene mg/L	Styrene mg/L	Tetrachloroethylene mg/L	Toluene mg/L	Total Xylenes mg/L	Trans-1,2-dichloroethylene mg/L	Trichloroethylene mg/L	Vinyl Chloride mg/L		
Shallow Groundwater Flow Zone																															
M66-2	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
M67-2	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
M101	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00032	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.005	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
M103	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.014	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
Intermediate Bedrock Groundwater Flow Zone																															
M5-3	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.00011	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
M6-3	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00019	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.3	0.0011	< 0.0001	< 0.002	< 0.0005	< 0.0001	< 0.0005	0.00012	0.00092	0.00034	< 0.0002	< 0.0001	0.0036	0.0013	< 0.0001	< 0.0001	< 0.0001	< 0.0002	
M74	2020-04-16	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	
M75	2020-04-14	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0002	

Table 2b: 2020 Phytoremediation System Monitoring Results (Fall Groundwater Quality)

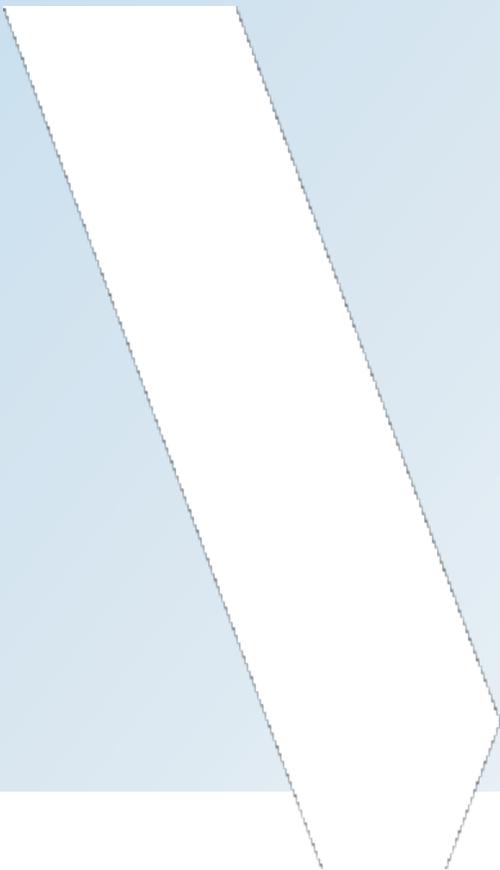
Name	Date	Alkalinity mg/L	Ammonia mg/L	Boron mg/L	Calcium mg/L	Chloride mg/L	Conductivity μ S/cm	Dissolved Organic Carbon mg/L	Iron mg/L	Magnesium mg/L	Manganese mg/L	Nitrate mg/L	Nitrite mg/L	Potassium mg/L	Sodium mg/L	Sulphate mg/L	Total Dissolved Solids mg/L
Shallow Groundwater Flow Zone																	
M66-2	2020-10-27	390	0.33	1.4	65	130	1500	1.7	0.23	27	0.018	< 0.1	< 0.01	8.4	220	210	905
M67-2	DRY																
M101	2020-10-27	470	< 0.15	0.077	150	49	1100	2.3	< 0.1	47	0.014	< 0.1	< 0.01	4.6	17	54	705
M103	2020-10-27	650	< 0.15	0.27	140	160	1700	3.6	< 0.1	85	0.003	0.19	< 0.01	6.5	130	49	915
Intermediate Bedrock Groundwater Flow Zone																	
M5-3	2020-10-27	460	1.34	1.1	34	46	980	1.4	< 0.1	27	< 0.002	< 0.1	< 0.01	13	140	< 1	645
M6-3	2020-10-27	1200	4.46	0.37	740	1400	9000	43	< 0.1	0.24	< 0.002	< 0.1	< 0.01	41	650	37	4120
M74	2020-10-27	310	1.24	0.88	34	15	640	1.6	< 0.1	22	0.028	< 0.1	< 0.01	12	68	17	455
M75	2020-10-27	310	1.16	0.93	38	45	950	1.8	< 0.1	24	0.026	< 0.1	< 0.01	13	130	110	590

Name	Date	1,1,1,2-Tetrachloroethane mg/L	1,1,1-Trichloroethane mg/L	1,1,2,2-Tetrachloroethane mg/L	1,1,2-Trichloroethane mg/L	1,1-Dichloroethane mg/L	1,1-Dichloroethylene mg/L	1,2-Dichlorobenzene (o) mg/L	1,2-Dichloroethane mg/L	1,3,5-Trimethylbenzene mg/L	1,3-Dichlorobenzene (m) mg/L	1,4-Dichlorobenzene (p) mg/L	1,4-Dioxane mg/L	Benzene mg/L	Chlorobenzene mg/L	Chloroethane mg/L	Chloromethane mg/L	Cis-1,2-Dichloroethylene mg/L	Dichloromethane mg/L	Ethylbenzene mg/L	m+p-Xylene mg/L	o-Xylene mg/L	Styrene mg/L	Tetrachloroethylene mg/L	Toluene mg/L	Total Xylenes mg/L	Trans-1,2-dichloroethylene mg/L	Trichloroethylene mg/L	Vinyl Chloride mg/L		
Shallow Groundwater Flow Zone																															
M66-2	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0002		
M67-2	DRY																														
M101	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	0.00041	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.006	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0002		
M103	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	0.013	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0002		
Intermediate Bedrock Groundwater Flow Zone																															
M5-3	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	0.00016	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	0.00016	< 0.0002	< 0.0001	< 0.0002	0.00016	< 0.0001	< 0.0001	< 0.0002		
M6-3	2020-10-27	< 0.0005	< 0.00025	< 0.0005	< 0.0005	< 0.00025	< 0.00025	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.33	0.00089	< 0.00025	< 0.0005	< 0.0013	< 0.00025	< 0.0013	< 0.00025	0.0016	0.00045	< 0.0005	< 0.00025	0.0045	0.0021	< 0.00025	< 0.00025	< 0.0005		
M74	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0002		
M75	2020-10-27	< 0.0002	< 0.0001	< 0.0002	< 0.0002	< 0.0001	< 0.0001	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.001	< 0.0001	< 0.0001	< 0.0002	< 0.0005	< 0.0001	< 0.0005	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0001	< 0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0002		

APPENDIX

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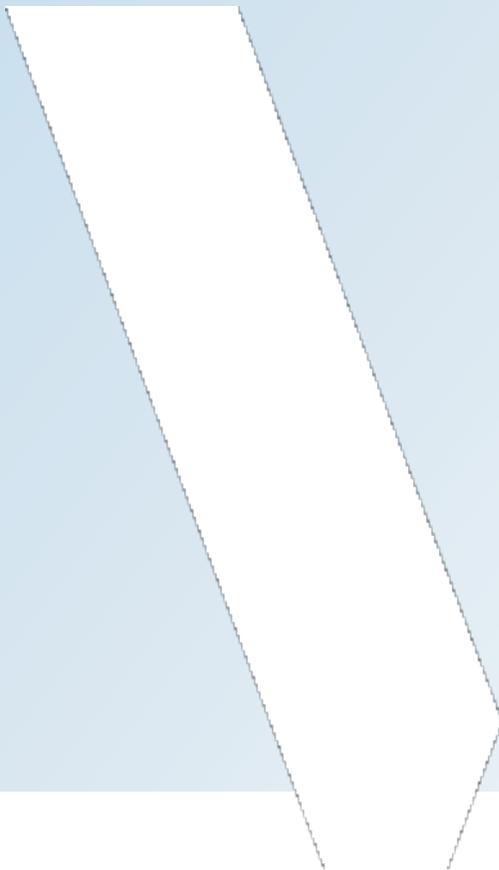
SITE LOCATION PLAN –
PHYTOREMEDIATION
SYSTEM



APPENDIX

O

LETTERS OF APPROVAL
FOR ALTERNATE LEACHATE
TREATMENT SITES



From: McDonough, William <wmcdonou@wm.com>
Sent: February 10, 2020 3:44 PM
To: Leno, Bev
Subject: FW: Landfill Leachate Disposal from Waste Management Richmond Landfill
Attachments: Septage Facility Usage Agreement.pdf

Bev,
This is the leachate disposal approval from Kingston.

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

Waste Management
8039 Zion Line
Watford ON N0M 2S0
Cell: 226 280-1795

From: Dickerson, Troy <tdickerson@utilitieskingston.com>
Sent: Tuesday, August 13, 2019 1:52 PM
To: McDonough, William <wmcdonou@wm.com>
Cc: Runions, Julie <jrunions@utilitieskingston.com>; Patenaude, James <jpatenaude@utilitieskingston.com>
Subject: [EXTERNAL] RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Hello Bill,
I have had a look at the test results and nothing is in there for us to disallow it from being brought to Ravensview septage facility to dispose of.
We will allow the leachate to be discharged at Ravensview Sewage Treatment Plant septage facility.
However, If there is a problem with the facility or we find that the leachate is affecting the treatment process, we will stop future discharge.
Attached is the form to be filled out and brought to 85 Lappan's Ln. At Lappen's Lane you can pick up a FOB.
We charge \$16.71 per cubic meter (leachate is considered industrial waste), charged at 90% capacity. Loads are pre-paid and loaded on to the key fob that they swipe at Ravensview. Transponder and fob key is \$60 +HST for new truck.

Any questions, please feel free to contact me.

Kind Regards,



Troy Dickerson

Quality Assurance Operator Water/wastewater Operations
P.O. Box 790, Kingston, ON K7L 4X7
P: 613-546-1181 x.2190 C: 613-532-3048
tdickerson@utilitieskingston.com

From: McDonough, William [<mailto:wmcdonou@wm.com>]
Sent: 08-6-2019 2:59 PM
To: Dickerson, Troy
Subject: RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Troy,

At this point its vac truck loads hauled by Sutcliffe. They haul our leachate using the same trucks they haul septage. I think they haul about 15 m3 loads.

Next year we are constructing an onsite storage tank that would allow us to haul larger loads but until the tank is built we have not looked into how much larger the loads might be.

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

Waste Management
8039 Zion Line
Watford ON N0M 2S0
Cell: 226 280-1795

From: Dickerson, Troy <tdickerson@utilitieskingston.com>
Sent: Tuesday, August 6, 2019 1:23 PM
To: McDonough, William <wmcdonou@wm.com>
Subject: [EXTERNAL] RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Would the 100m3 come in a couple of tankers or a bunch of vac truck loads?
We have a dumping facility for septage and if we allow you to discharge here it is first come first serve to dumping.
Do you have your own tanker truck or is it another company that hauls the leachate?



Troy Dickerson

Quality Assurance Operator Water/wastewater Operations
P.O. Box 790, Kingston, ON K7L 4X7
P: 613-546-1181 x.2190 C: 613-532-3048
tdickerson@utilitieskingston.com

From: McDonough, William [<mailto:wmcdonou@wm.com>]
Sent: 08-6-2019 10:03 AM
To: Dickerson, Troy
Subject: RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Troy,
On average we dispose of about 100 cubic meters per day into the Napanee sewer system. As we get into August and September that can crop to half that amount. Our problem is right after rain events when our volume increases significantly and at the same time Napanee is experiencing high flows due to infiltration and shuts us off. We are wondering if Kingston can handle 100 cubic meters per day when we get shut off from Napanee. Any amount would help us. Thanks for giving this consideration.

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

Waste Management
8039 Zion Line
Watford ON N0M 2S0
Cell: 226 280-1795

From: Dickerson, Troy <tdickerson@utilitieskingston.com>
Sent: Tuesday, August 6, 2019 8:40 AM
To: McDonough, William <wmcdonou@wm.com>
Subject: [EXTERNAL] RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Thank you Bill,
What is the time frame on when you would like to bring to dispose of?
What are the volumes? Is it a truck per day? Per week?

Cheers,



Troy Dickerson

Quality Assurance Operator Water/wastewater Operations
P.O. Box 790, Kingston, ON K7L 4X7
P: 613-546-1181 x.2190 C: 613-532-3048
tdickerson@utilitieskingston.com

From: McDonough, William [<mailto:wmcdonou@wm.com>]
Sent: 08-6-2019 7:21 AM
To: Dickerson,Troy
Subject: RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Troy,
Attached are the results of the monthly leachate testing that we do for Napanee. Please let me know if you need anything else. Thanks for your help.

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

Waste Management
8039 Zion Line
Watford ON N0M 2S0
Cell: 226 280-1795

From: Dickerson,Troy <tdickerson@utilitieskingston.com>
Sent: Friday, August 2, 2019 1:59 PM
To: McDonough, William <wmcdonou@wm.com>
Cc: Runions,Julie <jrunions@utilitieskingston.com>
Subject: [EXTERNAL] RE: Landfill Leachate Disposal from Waste Management Richmond Landfill

Good after noon Bill,
I was sent this email to touch base with you about possibly allowing leachate from Richmond's Landfill in Napanee.
The first thing I would need is to get the latest test result of the leachate.
Once I have the results and review them I will contact you to discuss.

Cheers,



Troy Dickerson

Quality Assurance Operator Water/wastewater Operations
P.O. Box 790, Kingston, ON K7L 4X7
P: 613-546-1181 x.2190 C: 613-532-3048
tdickerson@utilitieskingston.com

From: Runions,Julie
Sent: 07-12-2019 1:12 PM
To: Dickerson,Troy
Cc: Emon,Philip; Hannah,Kevin; Patenaude,James
Subject: FW: Landfill Leachate Disposal from Waste Management Richmond Landfill

Hi Troy,
See the email below.
Can you please review and reply to Bill McDonough?
If you think a meeting is appropriate, I can attend.

Thank you,
Julie



Julie Runions, P.Eng.

Manager, Water and Wastewater Treatment Operations
P.O. Box 790, Kingston, ON K7L 4X7
P: 613-546-1181 x.2172
jrunions@utilitieskingston.com

From: McDonough, William [<mailto:wmcdonou@wm.com>]
Sent: 07-11-2019 12:08 PM
To: Runions,Julie
Subject: Landfill Leachate Disposal from Waste Management Richmond Landfill

Ms. Runions,
I manage Waste Management's closed Richmond landfill near Napanee. We manage most of our landfill leachate by trucking it into Napanee. Like many communities, Napanee has infiltration/inflow problems after rainstorms and occasionally after storms cannot accept our leachate. We are looking for additional waste water treatment plants that could handle some our leachate. MECP staff has given me your name and suggested Kingston might be able help us.

Would you be willing to meet with me to discuss whether Kingston can help us?

Bill McDonough
Senior Project Manager
wmcdonou@wm.com

Waste Management
8039 Zion Line
Watford ON N0M 2S0
Cell: 226 280-1795

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Septage Facility Usage Agreement

Utilities Kingston – Receptionist 613-546-1181 ext.2337
85 Lappan's Lane
P.O. Box 790
Kingston, ON, K7L 4X7

Transceiver No. original application: _____

Proximity Key No. original application: _____

Fill out Part 1 and 2, and submit this form, in person, to register and obtain a *Transceiver and Proximity Key* for each truck.

PART 1 – CUSTOMER INFORMATION

Company: _____

Primary Contact: _____

Email Address: _____

Phone#: _____

Cell #: _____

Address: _____

City: _____

Postal Code: _____

Truck Make: _____ Cab Colour: _____

Type/Model: _____

No. Of Axles: _____ Tank Volume: _____ liters or gallons – (circle one)

MOE Approval #: _____ Your Truck ID/Name: _____

PART 2 – TERMS OF AGREEMENT / INFORMATION

Each customer (company) will fully complete an agreement for each truck requiring access to septage receiving, and for which a Transceiver and Proximity Key will be required. These will enable site access and use of the Cataraqui Bay Wastewater Treatment Plant Septage Receiving Station, subject to the activation of the *Transceiver and Proximity Key*.

Access may be restricted for any of the following reasons;

- Failure to keep accounts current
- Failure to provide proper manifest information, providing false manifest information. Transponders and Keys may only be used for the truck they were originally assigned to.
- Failure to abide by the terms of the sewer use bylaw. Random samples of dumped waste may be collected and analyzed to ensure the material dumped is within acceptable limits.

This agreement is a one-time application and provides the customer **one Transceiver** and **one Proximity Key** for each truck for a fee of \$60.00 + HST per truck.

Transceiver/Proximity Key:

- The Transceiver and Key are assigned to a specific truck, and are obtained from the Receptionist at Utilities Kingston, 85 Lappan's Lane, Kingston, ON.
- The customer will prepay for loads which the clerk will credit to the Proximity Key. Payments may be made by cheque, debit or credit card. The proximity key does not have to accompany payment when loads are purchased and credited to the key. (You do need to know which truck the purchased loads are to be applied to.)
- The Transceiver permits access to the site during permitted hours, when the terms of use are met.
- The Key activates the dumping system when one or more prepaid loads remain, and when the terms of use are met.

