



2019 Annual Report

Red Rock Waste Disposal Site (A412307)

**Township of Killaloe, Hagarty, and Richards
County of Renfrew, Ontario**

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13 Commerce Court
Bancroft, Ontario
613-332-0057
www.greenview-environmental.ca



Executive Summary

This report has been prepared to document the results of the 2019 environmental monitoring program for the Township of Killaloe, Hagarty and Richards' Red Rock Waste Disposal Site, located on Part Lot 11, Concession 7, within the geographic Township of Richards, in the amalgamated Township of Killaloe, Hagarty and Richards. The site is located approximately 24 kilometres north of the Village of Killaloe, and is accessed by Beechnut Lake Road, north from County Road 58.

The Red Rock Waste Disposal Site is approved for the operation of a municipal solid waste and Blue Box recycling transfer station under Environmental Compliance Approval A412307, and the most recent amendment dated August 2, 2016. The site consists of 1.0 hectare of approved waste disposal area, within 3.583 hectares of total property area. Following the issuance of the Amendment to the Environmental Compliance Approval dated July 21, 2014, the Red Rock site was approved for the disposal of construction and demolition, bulky, and leaf and yard waste. No mobile waste and recycling operations were conducted by the Township of Killaloe, Hagarty, and Richards at the Red Rock site in 2019 and the site was closed to all public access.

In 2019, groundwater immediately downgradient of the waste mound continued to exhibit impacts from landfill-related factors. Generally consistent with historical results, non-conformances of the Ontario Drinking Water Standards were documented for concentrations of alkalinity (low), dissolved organic carbon, iron, manganese, total dissolved solids, and low pH values (field and lab-tested) at select wells. Monitoring well BH04-5 exhibited groundwater quality interpreted to be most impacted by landfill-related factors. Groundwater at monitoring well BH04-6 was not interpreted to be significantly impacted from landfill-related factors in 2019, while increasing trends interpreted in results from BH04-4 suggest that landfilling in the vicinity of BH04-4 has impacted groundwater. Groundwater quality at the southern, downgradient contaminant attenuation zone boundary (assessed at monitoring wells MW06-7 and MW06-8) was not interpreted to be significantly impacted from landfill-related factors in 2019. Since the majority of concentrations were significantly lower than those at monitoring wells in close proximity to the active disposal area, attenuation was interpreted to be occurring downgradient of the waste mound. In many cases, concentrations in groundwater results at monitoring wells MW06-7 and MW06-8 were comparable to background groundwater at the site.

Given that high iron concentrations (and low pH values) have been documented periodically in background groundwater at the site, the Reasonable Use Concept non-conformance for iron in results from fall 2019 at MW06-7 were not interpreted to represent significant landfill-related impacts at the downgradient contaminant attenuation zone boundary. Similarly, high concentrations of dissolved organic carbon have been noted in historical results from both background monitoring wells BH04-1 and BH04-3, and therefore the Reasonable Use Concept non-conformance for dissolved organic carbon in results in fall 2019 at MW06-7 was not interpreted to represent significant landfill-related impacts at the downgradient contaminant attenuation zone boundary. Given that low quantities of groundwater were observed in monitoring well MW06-7 during the fall sampling event, low water conditions could have contributed to elevated concentrations of some constituents (i.e. dissolved organic carbon and iron). The low pH values observed in results for downgradient monitoring well MW06-8 in spring 2019 were consistent with pH values historically documented in results for both background wells, and are interpreted to be interrelated with the low alkalinity concentrations noted for both wells. Low pH values at the site are interpreted to be resultant of naturally-occurring conditions. Based on the above, the Red Rock site was interpreted to meet the intent of Guideline B-7 at the downgradient contaminant attenuation zone boundary in 2019, and no significant impacts related to the Red Rock Waste Disposal Site were interpreted to be occurring. Further sampling and analysis of groundwater at monitoring wells MW06-7 and MW06-8 is required to assess potential future impacts at the site.

Based on a review of the approved trigger mechanism, the trigger mechanism for the Red Rock Waste Disposal Site was not interpreted to have been activated in 2019.

Further to the topographic waste capacity survey completed on December 10, 2019, it was calculated that

approximately 1,733 cubic metres of compacted and processed construction, demolition, bulky, and leaf and yard waste was disposed by the municipality at the Red Rock site in spring and fall 2019.

Based on the 2019 fill rate of 1,733 cubic metres and the approved final contours at closure for the Red Rock site, the remaining site capacity as of December 10, 2019 was approximately 1,109 cubic metres. Given the average (mean) fill rate (2015 to 2019) of 1,290 cubic metres and the remaining capacity of 1,109 cubic metres, the estimated remaining site life for the Red Rock site is approximately one (1) year.

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1.0 Introduction

1.1 Site Information

The Red Rock Waste Disposal Site is approved for the operation of a municipal solid waste and Blue Box recycling transfer station under Environmental Compliance Approval (ECA) A412307, and the most recent amendment dated August 2, 2016 (Appendix A), servicing the ratepayers of the Township of Killaloe, Hagarty, and Richards. The Red Rock site was approved for the disposal of construction and demolition (C&D), bulky, and leaf and yard (L&Y) waste with the issuance of the Amendment to the ECA dated July 21, 2014 (Appendix A). The Red Rock site is located approximately three (3) kilometres (km) north of Bonnechere Provincial Park on Part Lot 11, Concession VII, in the geographic Township of Richards, in the amalgamated Township of Killaloe, Hagarty and Richards (Township), in Renfrew County. The site is accessed from Beechnut Lake Road (Figure 1). The Universal Transverse Mercator (UTM) coordinates at the site entrance gate relative to the North American Datum (NAD83) are 303959.0 metres (m) East, 5061895.0 m North, in Zone 18T (Google Earth, 2013). The Red Rock site is approved for the operation of a 1.0 hectare (ha) landfill and transfer station, within a total property area of 3.583 ha (Appendix A). The 3.583 ha of site lands were obtained by the Township on May 11, 2010 from the Crown for landfilling area, operational buffer and contaminant attenuation zone (CAZ) purposes, in order to satisfy Condition 40 of the ECA (Appendix A).

Following completion of an upgraded transfer station at the Round Lake Waste Disposal Site (A412303) in 2012, mobile waste and Blue Box recycling operations at the Red Rock site ceased. No mobile waste and recycling operations were conducted by the Township at the Red Rock site in 2019 and the site was closed to all public access. The Township is currently utilizing the remaining landfilling capacity at the Red Rock Waste Disposal Site for the disposal of processed C&D, bulky, and L&Y waste, which is processed annually at the Killaloe Waste Disposal Site (A412306), in accordance with Condition 25 of the Amendment to the ECA (Appendix A).

1.2 Background

The Red Rock Waste Disposal Site historically received municipal waste for landfilling from within the geographic Township of Richards since 1979; however, in March 2004, the Ontario Ministry of the Environment, Conservation and Parks (MECP) issued a Provincial Officer Order (P142086) indicating that landfilling practices at the time were not consistent with the ECA for the site. As a result of the Provincial Officer Order, and as instructed in correspondence from the MECP dated March 30, 2004, the Township ceased landfilling operations at the site in 2004, and established a mobile municipal solid waste and Blue Box recycling transfer station.

Further to MECP approval of the proposed property area for CAZ purposes, received in correspondence dated August 24, 2007 (Greenview, 2008), the Township continued negotiations with the Crown for the acquisition of the 3.583 ha approved CAZ (Figure 2) in order to satisfy Condition 40 of the ECA. On May 11, 2010, the Township acquired the 3.583 ha from the Crown for landfilling area, operational buffer, and CAZ purposes (Appendix A). In order to satisfy Condition 42 of the ECA, the Certificate of Requirement was registered on title on December 10, 2010, and subsequently submitted by the Township to the MECP Director and the MECP Ottawa District Office (Appendix A).

On November 8, 2013, the Township submitted an application to amend the ECA for the Red Rock site, and an associated *Design, Operations, and Development Plan* (DODP, Greenview, 2013b), to the MECP Environmental Approvals Branch (EAB) which detailed the Township's proposed waste operations to utilize the remaining 7,550 cubic metres (m³) of site capacity for the disposal of C&D, bulky, and L&Y waste. The Township's application for MECP approval to proceed with the disposal of C&D, bulky, and L&Y waste at the Red Rock Waste Disposal Site was approved with the issuance of the Amendment to the ECA dated July 21, 2014 (Appendix A). The Township's request to amend the environmental monitoring program for the Red Rock site remained under review until the MECP issued an Amendment to the ECA dated March 14, 2016 which approved the revised groundwater monitoring program for the site and a related trigger mechanism and contingency plan

(Appendix A). Based on the MECP's request for modifications to the groundwater monitoring program and trigger mechanism proposed in the DODP (Greenview, 2013b), the Township prepared a Revised DODP to match with MECP expectations for the site, which was submitted to the MECP for their file in April 2016 (Greenview, 2016b). The Revised DODP was approved with the issuance of the Amendment to the ECA dated August 2, 2016 (Appendix A).

On September 17, 2015, the MECP Ottawa District Office completed a site inspection of the Red Rock Waste Disposal Site, and the results of the inspection were provided to the Township in a *Non-Hazardous Waste Transfer Processing Inspection Report* (Inspection Report) dated September 30, 2015 (Greenview, 2016a). There were no action items required by the Inspection Report; however, the Inspection Report noted that there were Blue Box recyclables on the ground in the vicinity of the former attendant's office and Blue Box recycling totes located within the storage trailer on-site. The MECP requested that these items be collected and transferred to an approved waste disposal site for management. Based on Township records, the Blue Box recyclables and totes were collected from the Red Rock site and transported to the Killaloe Waste Disposal Site.

In 2019, and as of the date of preparation of this report, no communications were received by the Township from the MECP related to the Red Rock Waste Disposal Site.

Greenview was retained by the Township to complete the 2019 environmental monitoring and reporting program at the Red Rock Waste Disposal Site.

1.3 Purpose and Scope

The purpose of this report is to provide an overview of the annual environmental monitoring, environmental compliance, and operations at the Red Rock Waste Disposal Site, per Condition 43 of the site's ECA, including the following:

- Groundwater quality assessment and Reasonable Use Concept (RUC, MECP Guideline B-7) compliance (Section 4.1).
- Site operational overview and capacity assessment (Section 4.2).
- Conclusions and recommendations (Section 5.0).

2.0 Site Description

The following sections present a summary of the physical characteristics for the Red Rock Waste Disposal Site. Locations of features described in this report are referenced to grid north.

2.1 Topography and Drainage

The Red Rock Waste Disposal Site is located on a relatively flat, sandy plain area, surrounded by forested Crown lands, and situated approximately 1.5 km northeast of Round Lake (Figure 1). There are no surface water courses in the immediate vicinity of the waste mound, however approximately 130 metres (m) north and upgradient of the Red Rock site is a pond, which represents the only sizable surface water body in the immediate area (Figures 2 and 3). The small creek that discharges from the eastern end of the pond is understood to flow to the southeast and under County Road 58. Approximately 325 m southeast of County Road 58, the small tributary converges with another small creek originating from Jacks Lake. Following convergence, the creek flows to the southwest, eventually discharging into Round Lake. Stormwater on-site is interpreted to be effectively managed within the property boundaries at the Red Rock site.

2.2 Hydrogeological and Geological Conditions

Overburden at the Red Rock Waste Disposal Site was investigated and characterized by the installation of five (5) monitoring wells around the perimeter of the site and one (1) monitoring well directly in the waste mound in August 2004 (SGS Lakefield Research Limited [SGS], 2005, Figures 2 and 3). The monitoring wells were installed in fine-grained, brown to grey sand, to depths ranging from 6.1 to 8.2 m below ground surface (bgs). Groundwater elevations ranged from 4.49 to 7.16 m bgs during the initial groundwater sampling event in August 2004, following the monitoring well installations (SGS, 2005, Appendix B).

As part of the 2006 environmental work program at the site, two (2) additional monitoring wells (MW06-7 and MW06-8) were installed downgradient of the site and north of the County Road 58 right-of-way (Greenview, 2007, Figures 2 and 3). Overburden in this area was similar to that in the vicinity of the site with a shallow layer of dark organic soil overlaying layers of brown to grey fine to medium sand, and localized pockets of light brown, medium to coarse sand and sub-angular to sub-rounded gravels. Available borehole logs for monitoring wells are provided in Appendix B. The available borehole logs include details regarding well construction for the corresponding monitoring wells.

Historically, the groundwater within the shallow overburden unit at the Red Rock site has been interpreted to flow generally to the southeast (Greenview, 2019, Figures 2 and 3).

Consistent with the Revised DODP for the Red Rock Waste Disposal Site (Greenview, 2016b), monitoring well BH04-2 was decommissioned on October 13, 2016 to allow for further use of the approved waste disposal area (AWDA) for landfilling purposes.

Further to MECP Technical Support Section (TSS) groundwater comments dated August 24, 2007 (Greenview, 2008), one (1) seasonal residence is understood to be located within 500 m of the landfill; however, it is located northwest and upgradient of the interpreted direction of groundwater flow and was not considered to be impacted by landfill-related factors (Figures 2 and 3).

2.3 Operational Setting

Prior to May 11, 2010, the Red Rock Waste Disposal Site consisted of an AWDA of 1.0 ha within a total property area of 1.7 ha, situated on Crown land under lease from the Ontario Ministry of Natural Resources and Forestry (MNR) under Land Use Permit (LUP) 1675-1006299 (Greenview, 2011). The Township's acquisition of Crown land for landfilling area, operational buffer, and CAZ purposes on May 11, 2010 increased the Red Rock site's total property area to 3.583 ha (Appendix A, Figure 4). Subsequent to the land acquisition, all site lands were registered on title with a Certificate of Requirement on December 10, 2010, which was then submitted to the

MECP (Appendix A). A former Ontario Ministry of Transportation (MTO) Works Yard is located adjacent to the eastern boundary of the Red Rock site (Figure 4).

The Red Rock Waste Disposal Site remained closed to all public access in 2019. In late fall 2019, the Township transported processed C&D, bulky, and L&Y waste from the Killaloe Waste Disposal Site to the Red Rock Waste Disposal Site for final disposal (Figure 4). The C&D, bulky, and L&Y waste transported to the Red Rock site in late fall 2019 was processed at the Killaloe site in fall 2019.

3.0 2019 Environmental Monitoring Program

The following sections present a methodology of the environmental monitoring conducted at the Red Rock Waste Disposal Site in 2019.

3.1 Groundwater Monitoring

As part of the 2019 environmental monitoring program, groundwater monitoring and sampling activities were completed at the Red Rock site by Greenview on May 13, 2019 and October 21, 2019 from the network of existing groundwater monitoring wells (Table 1), and in accordance with the revised schedule for the annual groundwater monitoring program (Greenview, 2016b). The UTM coordinates of the groundwater monitoring wells were measured and/or confirmed by Greenview personnel during site visits in 2019 using a handheld geographic positioning system (GPS) instrument with an anticipated accuracy of within +/- 5 m (Table 2).

All monitoring wells included in the revised groundwater monitoring program for the Red Rock site, including BH04-1 (background), BH04-3 (background), BH04-4, BH04-5 (leachate), BH04-6, MW06-7, and MW06-8, were sampled as part of the 2019 groundwater monitoring program, and groundwater elevations were measured at each monitoring well using an electronic water level tape prior to sampling (Table 3). Based on the groundwater elevation, a well purge volume equivalent to approximately three (3) borehole volumes was calculated using a standard conversion factor relevant to the respective well diameter.

Groundwater samples were collected from each monitoring well using dedicated polyethylene tubing and inertial lift foot-valves. Samples were collected into appropriate sample bottles as provided by an accredited laboratory and the designated sample for metal parameters was field-filtered using a dedicated high capacity 45-micron filter to reduce the potential for turbidity-induced bias in the analytical results.

Volatile organic compounds (VOC) were sampled at leachate monitoring well BH04-5 in spring and fall 2019, in accordance with the revised groundwater monitoring program for the Red Rock site (Table 4).

During the spring 2019 sampling event, monitoring well MW06-7 was observed to pump dry during sampling, and a full purge volume was not obtained (Appendix C). During the fall 2019 sampling event, monitoring wells BH04-5 and MW06-7 were observed to pump dry during sampling, and full purge volumes were not obtained (Appendix C).

Duplicate groundwater samples were collected for Quality Assurance and Quality Control (QA/QC) purposes from monitoring well BH04-1 during the spring and fall 2019 sampling events (Appendix C).

All samples were submitted to an accredited analytical laboratory to be analyzed for the parameter suite listed in Table 1.

Field measurements of pH, dissolved oxygen (DO), conductivity, and temperature were recorded at each respective groundwater well immediately following the collection of the groundwater samples. Field sampling records completed during the 2019 monitoring program are included in Appendix C. The groundwater samples were recorded on a laboratory Chain of Custody Form, and placed in coolers packed with contained ice for preservation during transport to the analytical laboratory.

The results of the 2019 groundwater monitoring program are presented in Section 4.1 of this report.

3.2 Surface Water Monitoring

As documented in the 2006 Annual Report (Greenview, 2007), and further to MECP TSS surface water review comments dated October 20, 2005, a surface water monitoring program was established at the Red Rock site as part of the 2006 environmental monitoring program (Greenview, 2007).

Based on the results of the 2006 surface water monitoring program at the site, which were presented in the 2006 Annual Report (Greenview, 2007), it was determined that the Red Rock Waste Disposal Site was not impacting

adjacent surface water systems at/near the site. As such, and in accordance with MECP TSS surface water review comments on the 2006 Annual Report (Greenview, 2007) dated November 28, 2007, in which the results of the 2006 surface water program were confirmed, the surface water monitoring program was discontinued at the site in 2007 (Greenview, 2008). The amendments to the environmental monitoring program at the site, including the discontinuation of the surface water monitoring program, were detailed in correspondence to the MECP Environmental Assessment and Approvals Branch (EAAB) dated May 8, 2007 (Greenview, 2008), and were approved in an Amendment to the ECA (A412307) dated December 5, 2007 (Appendix A).

3.3 Analytical Laboratory Accreditation

Collected groundwater samples were submitted for analysis to the Caduceon Environmental Laboratories (Caduceon), located in Kingston, Ontario. Caduceon is accredited by the Canadian Association for Laboratory Accreditation (CALA), for specific environmental testing procedures listed in the scope of accreditation and is assessed biannually by CALA to the ISO/IEC 17025 standard. ISO/IEC 17025 is an international standard for both quality management and technical aspects of operating a testing laboratory. Caduceon is licensed by the MECP to perform analysis on drinking water in Ontario in accordance with the Safe Drinking Water Act.

3.4 Landfill Gas Monitoring

Landfill gas monitoring is not part of the current environmental monitoring program for the site. The waste mound at the Red Rock site is covered with porous soil materials, allowing natural gas flux to the atmosphere. Overburden geology at and adjacent to the site is characterized by shallow, sandy materials, with localized pockets of minor gravel, which, coupled with the extended distance of the nearest residence relative to the landfill, provide a minimal risk of landfill gases impinging off-site receivers.

3.5 Operational Monitoring

Operational monitoring at the Red Rock site is minimal given that the site remained closed to all public access in 2019.

A grade stake survey at the Red Rock Waste Disposal Site was completed by the Township on July 15, 2014 to assist in C&D, bulky, and L&Y waste landfilling activities. Final approval from the MECP to utilize remaining capacity at the site for C&D, bulky, and L&Y waste was granted with the issuance of the Amendment to the ECA on July 21, 2014 (Appendix A).

In late fall 2019, the Township landfilled processed C&D, bulky, and L&Y waste at the Red Rock site (A412307) which was processed at the Killaloe Waste Disposal Site (A412306) in fall 2019, in accordance with Condition 25 of the Amendment to the ECA (Appendix A). Disposal of C&D, bulky, and L&Y waste in fall 2019 was conducted by the Township in the southern area of the AWDA (Figure 4).

A topographic survey was conducted on December 10, 2019 to determine the current capacity status at the Red Rock Waste Disposal Site.

The results of the 2019 operational monitoring are presented in Section 4.2 of this report.

4.0 Environmental Monitoring Results

The following sections present a summary of the 2019 environmental monitoring program conducted at the Red Rock Waste Disposal Site.

4.1 Groundwater Quality Assessment

The results of the 2019 groundwater monitoring program conducted at the site are presented as follows.

4.1.1 Groundwater Configuration

Historically, the groundwater configuration at the site has been interpreted to flow generally to the southeast, towards Round Lake Road (Greenview, 2019).

Groundwater elevation data obtained during the 2019 groundwater monitoring program at the site are provided in Table 3. Average horizontal gradients in the vicinity of the waste mound and to the southeast of the waste mound were calculated as follows:

Location	Horizontal Gradient (Spring 2019)	General Direction	Horizontal Gradient (Fall 2019)	General Direction
Vicinity of waste mound and to the southeast	0.013	Southeast	0.012	Southeast

4.1.2 Groundwater Quality

The results of the 2019 groundwater monitoring program are presented in Table 4 and the accredited laboratory Certificates of Analysis are attached in Appendix D. Analytical data were compared to the Ontario Drinking Water Standards (ODWS, MECP, 2003), median background water quality at the site, and MECP Guideline B-7 and the RUC (MECP, 1994a). RUC values were calculated using the median background concentration from a minimum of ten (10) previous sampling events (Table 4). Trend analysis was completed using results from the previous five (5) years and only significant trends are discussed in this report.

Blind duplicate samples collected at monitoring well BH04-1 for QA/QC purposes during the spring and fall 2019 sampling events were similar to the identified samples, indicating that the results of the 2019 groundwater monitoring program can be interpreted with confidence.

Background groundwater quality at the Red Rock site has been historically interpreted from groundwater results sampled at upgradient monitoring wells BH04-1 and BH04-3 (Figures 2 and 3). In 2019, some parameter concentrations in the samples collected from background well BH04-1 were above the median background concentrations, while few parameter concentrations were above the median background concentrations at background well BH04-3 (Table 4). Non-conformances of ODWS and significant groundwater trends at background groundwater monitoring locations BH04-1 and BH04-3 were as follows (Table 4):

Monitoring Well	ODWS Non-Conformance		Five (5) Year Trend Analysis	
	Spring 2019	Fall 2019	Increasing	Decreasing
BH04-1 (background)	<ul style="list-style-type: none"> Alkalinity (low) pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> Alkalinity (low) pH (low; lab tested) 	<ul style="list-style-type: none"> No significant trends 	<ul style="list-style-type: none"> No significant trends
BH04-3 (background)	<ul style="list-style-type: none"> Alkalinity (low) pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> Alkalinity (low) pH (low; lab tested) 	<ul style="list-style-type: none"> No significant trends 	<ul style="list-style-type: none"> Conductivity (lab tested) Total Dissolved Solids (TDS)

The groundwater quality results from the background wells in 2019 generally corresponded with historical results (Table 4), and were interpreted to be representative of background groundwater quality in the vicinity of the Red Rock site.

Monitoring well BH04-2 was previously located within the waste mound, and was historically used to determine leachate quality at the Red Rock site; however, consistent with the revised groundwater monitoring program as approved by the MECP (Appendix A, Greenview, 2016b), monitoring well BH04-2 was decommissioned by licensed well drillers on October 13, 2016. Based on documented groundwater quality, monitoring well BH04-5 is considered most representative of leachate quality at the Red Rock Waste Disposal Site.

Groundwater quality immediately downgradient of the AWDA was characterized at monitoring wells BH04-4, BH04-5, and BH04-6 (Figures 2 and 3).

Groundwater monitoring well BH04-4 is located along the eastern CAZ boundary, near the southeastern corner of the AWDA (Figures 2 and 3). In 2019, most parameter concentrations in the spring and fall samples collected from monitoring well BH04-4 were above the median background concentrations (Table 4). Non-conformances of ODWS and significant groundwater trends at groundwater monitoring location BH04-4 were as follows (Table 4):

Monitoring Well	ODWS Non-Conformance		Five (5) Year Trend Analysis	
	Spring 2019	Fall 2019	Increasing	Decreasing
BH04-4	<ul style="list-style-type: none"> Dissolved Organic Carbon (DOC) Manganese pH (low; field tested) pH (low; lab tested) TDS 	<ul style="list-style-type: none"> DOC Manganese pH (low; field tested) TDS 	<ul style="list-style-type: none"> Alkalinity Barium Boron Calcium Chloride Chemical Oxygen Demand (COD) Conductivity (lab-tested) Conductivity (field-tested) DOC Magnesium Sodium Sulphate TDS 	<ul style="list-style-type: none"> No significant trends

Groundwater quality at monitoring well BH04-4, located along the eastern CAZ boundary at the Red Rock site, was interpreted to be impacted from landfill-related factors following inclusion of 2019 results (Table 4).

Monitoring well BH04-5 is located approximately 10 m south and downgradient of the AWDA at the Red Rock site (Figures 2 and 3). In 2019, most parameter concentrations in the spring and fall samples collected from monitoring well BH04-5 were above the median background concentrations (Table 4). Non-conformances of ODWS and significant groundwater trends at groundwater monitoring location BH04-5 were as follows (Table 4):

Monitoring Well	ODWS Non-Conformance		Five (5) Year Trend Analysis	
	Spring 2019	Fall 2019	Increasing	Decreasing
BH04-5	<ul style="list-style-type: none"> • DOC • Iron • Manganese 	<ul style="list-style-type: none"> • DOC • Iron • Manganese 	<ul style="list-style-type: none"> • COD • Sulphate 	<ul style="list-style-type: none"> • Alkalinity • Ammonia (total) • Barium • Boron • Calcium • Conductivity (lab-tested) • Conductivity (field-tested) • TDS

Analysis for VOC in groundwater obtained from monitoring well BH04-5 was completed in spring and fall 2019 (Table 4). All documented concentrations were below ODWS limits in spring and fall 2019 (Table 4). In 2019, monitoring well BH04-5 continued to exhibit groundwater quality results that were interpreted to be most impacted from landfill-related factors at the site (Table 4).

Groundwater monitor BH04-6 is located south and downgradient of the AWDA, and approximately 75 m west of monitoring well BH04-5 (Figures 2 and 3). In 2019, many parameter concentrations in the spring and fall samples collected from monitoring well BH04-6 were above the median background concentrations (Table 4). Non-conformances of ODWS and significant groundwater trends at groundwater monitoring location BH04-6 were as follows (Table 4):

Monitoring Well	ODWS Non-Conformance		Five (5) Year Trend Analysis	
	Spring 2019	Fall 2019	Increasing	Decreasing
BH04-6	<ul style="list-style-type: none"> • Alkalinity (low) • pH (low; field tested) 	<ul style="list-style-type: none"> • Alkalinity (low) 	<ul style="list-style-type: none"> • No significant trends 	<ul style="list-style-type: none"> • Alkalinity • Barium • Boron • Calcium • Chloride • Conductivity (lab tested) • Conductivity (field tested) • Iron • Sulphate • TDS

Groundwater quality at monitoring well BH04-6 was not interpreted to be significantly impacted from landfill-related factors following inclusion of 2019 results (Table 4).

Monitoring wells MW06-7 and MW06-8 are located downgradient of the site at the southern CAZ boundary, and approximately 20 m north of County Road 58. Monitoring well MW06-7 is situated near the southeastern corner of the CAZ, whereas MW06-8 is located near the mid-point of the southern extent of the CAZ (Figures 2 and 3). Consistent with historical results, many parameter concentrations in groundwater at monitoring well MW06-7 were higher than in the background, while concentrations at monitoring well MW06-8 were generally lower than those at monitoring well MW06-7 (Greenview, 2019, Table 4). Parameter concentrations in groundwater results at both monitoring wells MW06-7 and MW06-8 were generally lower than those from monitoring wells closer to the AWDA, which was interpreted to indicate that attenuation was occurring downgradient of the waste mound (Table 4). In many cases, parameter concentrations at MW06-7 and MW06-8 were comparable to background groundwater quality results at the site. Non-conformances of ODWS and significant groundwater trends at

groundwater monitoring locations MW06-7 and MW06-8 were as follows (Table 4):

Monitoring Well	ODWS Non-Conformance		Five (5) Year Trend Analysis	
	Spring 2019	Fall 2019	Increasing	Decreasing
MW06-7	<ul style="list-style-type: none"> Alkalinity (low) 	<ul style="list-style-type: none"> Alkalinity (low) Iron 	<ul style="list-style-type: none"> No significant trends 	<ul style="list-style-type: none"> Conductivity (lab tested) Conductivity (field tested) TDS
MW06-8	<ul style="list-style-type: none"> Alkalinity (low) pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> Alkalinity (low) 	<ul style="list-style-type: none"> COD 	<ul style="list-style-type: none"> Conductivity (lab tested) Conductivity (field tested) Iron Nitrate TDS

Based on documented groundwater quality results at monitoring wells MW06-7 and MW08-8 in 2019, neither monitoring well was interpreted to be significantly impacted from landfill-related factors at the Red Rock Waste Disposal Site in 2019 (Table 4). Additional sampling as part of future groundwater monitoring events is required to confirm the significance of ODWS non-conformances documented in 2019.

4.1.3 Reasonable Use Concept Assessment

In an effort to assess potential landfill-related impacts migrating beyond the CAZ boundary, the RUC was used as an assessment tool to monitor downgradient impacts from the waste disposal site. Downgradient impacts are typically assessed using the RUC at monitoring wells located at, or in close proximity to, the downgradient CAZ boundary. The downgradient monitoring wells located near the CAZ boundary were compared to trigger concentrations for specific parameters as determined by groundwater quality at the site using the RUC for groundwater (MECP Procedure B-7-1, 1994a).

The MECP Procedure B-7-1: Determination of Contaminant Limits and Attenuation Zones iterates that in accordance with the appropriate criteria for particular uses, a change in groundwater quality on an adjacent property as a result of landfilling activities will only be accepted by the MECP as follows:

The quality cannot be degraded by an amount in excess of 50% of the difference between background and the Ontario Drinking Water Standards for non-health related parameters and in excess of 25% of the difference between background and the Ontario Drinking Water Standards for health-related parameters. Background is considered to be the quality of the groundwater prior to any man-made contamination.

MECP Procedure B-7-1

The RUC assessment was conducted using the concepts and procedures outlined in MECP Procedure B-7-1 (MECP, 1994a), specifically using the median value of individual parameter concentrations from background monitoring wells BH04-1 and BH04-3, to characterize natural groundwater quality at the site. Monitoring wells MW06-7 and MW06-8 were used to monitor downgradient groundwater quality south of the Red Rock site on the north side of Round Lake Road, for assessing site compliance with the RUC at the downgradient CAZ boundary (Figures 2 and 3).

All parameters tested as part of the established annual monitoring program were used as groundwater triggers, and a respective RUC criteria value was calculated for each parameter at the Red Rock Waste Disposal Site. The trigger concentrations used to assess RUC compliance for the groundwater regime at the site are based on the RUC value for each of the respective parameters.

The RUC values for individual parameters should be generated each year based on analytical results obtained from the groundwater monitoring program. If RUC non-conformances are noted, then action will be undertaken as appropriate and necessary in accordance with a defined groundwater contingency plan for the site. In cases where a groundwater contingency plan is not defined, a meeting with representatives of the MECP District Office should be held to develop an appropriate contingency plan, as necessary and appropriate for the particular site. Non-conformances of RUC in spring and fall 2019 from groundwater results at monitoring wells MW06-7 and MW06-8 are included in the table below. RUC non-conformances for background monitoring wells BH04-1 and BH04-3 were included for comparison purposes.

Monitoring Well	RUC Non-Conformance	
	Spring 2019	Fall 2019
BH04-1 (background)	<ul style="list-style-type: none"> pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> Iron pH (low; lab tested)
BH04-3 (background)	<ul style="list-style-type: none"> pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> pH (low; lab tested)
MW06-7	<ul style="list-style-type: none"> None 	<ul style="list-style-type: none"> DOC Iron
MW06-8	<ul style="list-style-type: none"> pH (low; field tested) pH (low; lab tested) 	<ul style="list-style-type: none"> None

Given that high iron concentrations (and low pH values) have been documented periodically in background groundwater at the site at monitoring wells BH04-1 and BH04-3 (Table 4), the RUC non-conformance for iron in results from fall 2019 at MW06-7 was not interpreted to represent significant landfill-related impacts at the downgradient CAZ boundary. Similarly, high concentrations of DOC have been noted in historical results from both background monitoring wells BH04-1 and BH04-3, and therefore the RUC non-conformance for DOC in results in fall 2019 at MW06-7 was not interpreted to represent significant landfill-related impacts at the downgradient CAZ boundary (Table 4).

Given that low quantities of groundwater were observed in monitoring well MW06-7 during the fall sampling event (Appendix C), low water conditions could have contributed to elevated concentrations of some constituents (i.e. DOC and iron, Table 4).

The low pH values observed in results for downgradient monitoring well MW06-8 in spring 2019 were consistent with pH values historically documented in results for both background wells BH04-1 and BH04-3, and are interpreted to be interrelated with the low alkalinity concentrations noted for both wells. Low pH values at the site are interpreted to be resultant of naturally-occurring conditions.

In general, the Red Rock site was interpreted to meet the intent of MECP Guideline B-7 at the downgradient CAZ boundary in 2019, and no significant impacts related to the Red Rock Waste Disposal Site were interpreted to be occurring.

4.1.4 Trigger Mechanism and Contingency Plan Review

In accordance with the approved trigger mechanism and contingency plan for the Red Rock site, as described in the Revised DODP (Greenview, 2016b), groundwater quality results and trends were reviewed following inclusion of 2019 data (Table 4). The trigger mechanism is required to be reviewed annually, as part of each Annual Report for the Red Rock site.

All parameters monitored as part of annual groundwater sampling events are to be considered Key Trigger Parameters, per the MECP. It is important to note that many parameters have alternate sources, and evaluation of landfill impact must be completed in consideration of multiple parameters and multiple lines of evidence (e.g. groundwater quality and groundwater quantity evaluation, etc.).

Key Trigger Monitoring Locations are those locations that represent natural background conditions (BH04-1 and BH04-3), source leachate conditions (BH04-5), pathway conditions along the groundwater migration route (BH04-4 and BH04-6), and groundwater receptors (MW06-7 and MW06-8). The Groundwater (receptor) Key Trigger Locations are MW06-7 and MW06-8, located at the downgradient CAZ boundary (Figures 2 and 3).

If significant increasing trends for any of the Key Trigger Parameters are noted at all Key Trigger Monitoring Locations along the source-pathway-receptor model, with the exception of background locations (BH04-1 and BH04-3), then the trigger mechanism is interpreted to be activated.

If similar significant increasing trends for any of the Key Trigger Parameters are observed at all Key Trigger Monitoring Locations along the source-pathway-receptor model, including the background locations (BH04-1 and BH04-3) over the same five (5) year period, the trigger mechanism is not interpreted to be activated, and would be interpreted to be naturally-occurring. In this instance, a review of the Key Trigger Parameters used as part of the trigger mechanism would be required.

Additionally, if three (3) consecutive RUC exceedances are noted for any of the Key Trigger Parameters that are interpreted to be resultant of landfill-related activities at both groundwater receptor Key Trigger Locations, MW06-7 and MW06-8, then the Trigger Mechanism is interpreted to be activated.

Following the activation of the Trigger Mechanism based on Routine Monitoring, Tier I – Confirmation Monitoring is required, per the Revised DODP (Greenview, 2016b).

The following table is a summary of any interpreted significant trends following inclusion of 2019 results:

Key Trigger Monitoring Locations	Significant Increasing Trends
Natural Background Conditions	
BH04-1	No significant increasing trends
BH04-3	No significant increasing trends
Source Leachate Conditions	
BH04-5	COD, Sulphate
Pathway Conditions Along Migration Route	
BH04-4	Alkalinity, Barium, Boron, Calcium, Chloride, COD, Conductivity (lab-tested), Conductivity (field-tested), DOC, Magnesium, Sodium, Sulphate, TDS
BH04-6	No significant increasing trends
Groundwater Receptors	
MW06-7	No significant increasing trends
MW06-8	COD

Many significant decreasing trends were interpreted in groundwater results monitoring well BH04-5 (source leachate conditions), BH04-6 (pathway conditions along migration route), and MW06-7 and MW06-8 (groundwater receptors). Further details on trend analysis of groundwater results is included in Section 4.1.2.

Given that no significant increasing trends for specific parameters were interpreted at all sampling locations, inclusive of BH04-4, BH04-5, BH04-6, MW06-7, and MW06-8 (exclusive of background monitoring wells), at the site in 2019 following inclusion of spring and fall results, the trigger mechanism was not interpreted to be activated.

Additionally, as there were no instances of three (3) consecutive RUC exceedances for any parameter concentrations attributed to landfill-related impacts at groundwater receptor Key Trigger Locations MW06-7 and MW06-8, the trigger mechanism was not interpreted to be activated in 2019.

4.2 Operations Summary

A summary of 2019 waste management operations at the Red Rock Waste Disposal Site is presented below.

4.2.1 Site Operations

Following completion of the new transfer station at the Round Lake Waste Disposal Site (A412303) in 2012, mobile waste and recycling operations ceased at the Red Rock Waste Disposal Site. In 2019, the site remained closed to all public access.

Based on the MECP approval of the design and operational concepts presented in the DODP (Greenview, 2013b) and the resultant amendment to the ECA dated July 21, 2014 (Appendix A), the disposal of C&D, bulky, and L&Y waste generated within the Township was approved for the Red Rock site. A grade stake survey at the Red Rock Waste Disposal Site was completed by the Township in July 2014 to assist in operational activities, upon approval from the MECP to utilize remaining capacity at the site for C&D, bulky, and L&Y waste (Appendix A). Initiation of the disposal of C&D, bulky, and L&Y waste at the Red Rock site commenced in spring 2015.

The majority of the Red Rock Waste Disposal Site is well screened with surrounding trees and thick vegetation. A lockable gate is present at the site entrance, controlling access to the waste mound and facilities onsite, while a page wire fence exists around the perimeter of the site (Figure 4).

The access roads at the site entrance and within the Red Rock site have sufficient width to allow for unimpeded winter travel and access for emergency and snow removal equipment. The site access road was observed to be in good condition during the routine site inspections conducted by Greenview during various site visits throughout 2019.

4.2.2 Waste Disposal / Transfer Summary

In late fall 2019, the Township transported processed C&D, bulky, and L&Y waste from the Killaloe Waste Disposal Site to the Red Rock Waste Disposal Site for final disposal (Figure 4), in accordance with Condition 25 of the Amendment to the ECA (Appendix A). The C&D, bulky, and L&Y waste was processed at the Killaloe site in fall 2019.

Based on a topographic waste capacity survey completed on December 10, 2019, approximately 1,733 cubic metres (m³) of compacted and processed C&D, bulky, and L&Y waste was disposed by the municipality at the Red Rock site in 2019.

Based on the fill rate of 1,733 m³ (processed C&D, bulky, and L&Y waste) and the approved final contours at closure for the Red Rock site, the remaining site capacity as of December 10, 2019 was approximately 1,109 m³. Given the average (mean) fill rate from (2015 to 2019) of 1,290 m³ and the remaining capacity of 1,109 m³, the estimated remaining site life for the Red Rock site is approximately one (1) year.

4.2.3 Site Inspections and Maintenance

Inspections of the Red Rock site were conducted by Greenview on May 13, 2019 and October 21, 2019 during the spring and fall 2019 sampling events. An additional site inspection was completed on December 10, 2019 during the 2019 waste capacity survey at the Red Rock site. The Township also conducted periodic investigations to verify the compliance status of the site.

The site inspections included a cursory investigation of housekeeping/litter control aspects, monitoring well maintenance requirements in accordance with O. Reg. 903 (Wells), as amended, and a general site overview for MECP regulatory compliance issues.

4.2.4 Complaints

Based on Township records, there were no complaints received by the Township with respect to waste

management operations at the Red Rock site in 2019.

4.2.5 Monitoring and Screening Checklist

In accordance with the MECP TGD (MECP, 2010), the Monitoring and Screening Checklist for the Red Rock Waste Disposal Site is included as Appendix E of this report.

5.0 Conclusions and Recommendations

Based on the results of the 2019 environmental monitoring program completed for the Red Rock Waste Disposal Site, the following conclusions are provided:

- The groundwater configuration at the site is interpreted to be similar to historical interpretations, with the predominant direction of groundwater flow in the shallow overburden unit being to the southeast. Horizontal gradients of 0.013 in spring and 0.012 in fall were calculated for sampling events in 2019.
- In 2019, groundwater immediately downgradient of the waste mound continued to exhibit impacts from landfill-related factors. Generally consistent with historical results, non-conformances of the ODWS were documented for concentrations of alkalinity (low), DOC, iron, manganese, TDS, and low pH values (field and lab-tested) at select wells. Monitoring well BH04-5 exhibited groundwater quality interpreted to be most impacted by landfill-related factors. Groundwater at monitoring well BH04-6 was not interpreted to be significantly impacted from landfill-related factors in 2019, while increasing trends interpreted in results from BH04-4 suggest that landfilling in the vicinity of BH04-4 has impacted groundwater. Groundwater quality at the southern, downgradient CAZ boundary (assessed at monitoring wells MW06-7 and MW06-8) was not interpreted to be significantly impacted from landfill-related factors in 2019. Since the majority of concentrations were significantly lower than those at monitoring wells in close proximity to the active disposal area, attenuation was interpreted to be occurring downgradient of the waste mound. In many cases, concentrations in groundwater results at monitoring wells MW06-7 and MW06-8 were comparable to background groundwater at the site.
- Given that high iron concentrations (and low pH values) have been documented periodically in background groundwater at the site at monitoring wells BH04-1 and BH04-3, the RUC non-conformance for iron in results from fall 2019 at MW06-7 was not interpreted to represent significant landfill-related impacts at the downgradient CAZ boundary. Similarly, high concentrations of DOC have been noted in historical results from both background monitoring wells BH04-1 and BH04-3, and therefore the RUC non-conformance for DOC in results in fall 2019 at MW06-7 was not interpreted to represent significant landfill-related impacts at the downgradient CAZ boundary. Given that low quantities of groundwater were observed in monitoring well MW06-7 during the fall sampling event, low water conditions could have contributed to elevated concentrations of some constituents (i.e. DOC and iron). The low pH values observed in results for downgradient monitoring well MW06-8 in spring 2019 were consistent with pH values historically documented in results for both background wells BH04-1 and BH04-3, and are interpreted to be interrelated with the low alkalinity concentrations noted for both wells. Low pH values at the site are interpreted to be resultant of naturally-occurring conditions. Based on the above, the Red Rock site was interpreted to meet the intent of MECP Guideline B-7 at the downgradient CAZ boundary in 2019, and no significant impacts related to the Red Rock Waste Disposal Site were interpreted to be occurring. Further sampling and analysis of groundwater at monitoring wells MW06-7 and MW06-8 is required to assess potential future impacts of the site.
- Based on a review of the approved trigger mechanism, the trigger mechanism for the Red Rock Waste Disposal Site was not interpreted to have been activated in 2019.
- Based on a topographic waste capacity survey completed on December 10, 2019, approximately 1,733 m³ of compacted and processed C&D, bulky, and L&Y waste was disposed by the municipality at the Red Rock site in 2019.
- Based on the fill rate of 1,733 m³ (processed C&D, bulky, and L&Y waste) and the approved final contours at closure for the Red Rock site, the remaining site capacity as of December 10, 2019 was approximately 1,109 m³. Given the average (mean) fill rate from (2015 to 2019) of 1,290 m³ and the remaining capacity of 1,109 m³, the estimated remaining site life for the Red Rock site is approximately one (1) year.

The following recommendations are provided to the Township for consideration as part of the 2020 environmental work program for the Red Rock Waste Disposal Site:

- The 2020 groundwater monitoring program for the site should continue to include sampling events in the spring and fall of all monitoring wells using the parameter suite provided in Table 1, to continue to monitor the groundwater regime at the site.
- If active landfilling operations occur at the Red Rock Waste Disposal Site in 2020, the Township should complete a topographic waste capacity survey at the Red Rock site in late fall 2020 in order to determine the 2020 fill rate and remaining capacity for the 2020 Annual Report.
- Given the remaining site life of approximately one (1) year, the Township should consider the export of all C&D and bulky waste to an approved landfilling facility outside of the municipality in 2020, and retain the remaining capacity at the Red Rock Waste Disposal Site for contingency purposes. The Township should also consider proceeding with an application for a landfill expansion at the Red Rock site as part of their 2020 environmental work program.

6.0 Closing

Greenview has prepared this 2019 Annual Report in accordance with Condition 43 of the ECA A412307 and MECP guidelines to document the results of the 2019 environmental monitoring program for the Red Rock Waste Disposal Site.

This report is governed by the attached statement of service conditions and limitations (Appendix F).

All respectfully submitted by,

Greenview Environmental Management Limited



Dan Hagan, P.Geo.
Senior Project Manager / Geologist



Tyler H. Peters, P.Eng.
Project Director

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Tables





Table 1
2019 Groundwater Monitoring Program
Red Rock Waste Disposal Site

Location		Frequency	Parameters		
Groundwater					
BH04-1	BH04-3	Twice (2x)	Alkalinity	Ammonia (total)	Arsenic
BH04-4	BH04-5		Barium	Boron	Calcium
BH04-6	MW06-7		Chloride	Chromium	COD
MW06-8			Conductivity	Copper	DOC
			Iron	Magnesium	Manganese
1x QA/QC		(Spring & Fall)	Nitrate	pH	Sodium
			Sulphate	TDS	
			Field Measurements		
			Conductivity	Dissolved Oxygen	pH
COUNT =	8		Temperature	Unionized Ammonia (calculation)	
Groundwater (Leachate Only)					
BH04-5		Twice (2x)	BOD	TSS	EPA 624 VOC
		(Spring & Fall)			
COUNT =	1				



Table 2
Groundwater Monitoring Well Sampling Locations
Red Rock Waste Transfer Site

Groundwater			
Monitor	Zone	Northing	Easting
BH04-1	18T	5061904	303966
BH04-2	18T	5061913	304020
BH04-3	18T	5061988	304017
BH04-4	18T	5061947	304096
BH04-5	18T	5061907	304079
BH04-6	18T	5061859	304039
MW06-7	18T	5061848	304147
MW06-8	18T	5061806	304090

Notes:

Global Positioning System (GPS) point locations acquired by Greenview using a Garmin eTrex Venture HC.



Table 3
Groundwater Elevations
Red Rock Waste Disposal Site

Monitor	Top of Pipe Elevation (m) ¹	Original Stick-up (m)	Original Ground Elevation (m) ¹	Measured Depth of Well (m) ⁴	Groundwater Elevation (m)												
					20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	3-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19
BH04-1 ⁵	184.39	0.59	183.80	7.09	179.75	179.69	179.97	179.31	179.30	179.53	179.99	180.36	180.04	179.68	179.64	180.22	179.43
BH04-2	186.36	0.83	185.45	8.33	179.54	179.46	179.37	179.12	179.13	179.70	-	-	-	-	-	-	-
BH04-3	184.69	0.65	183.88	6.24	179.73	179.73	179.69	179.49	179.43	179.93	179.54	180.31	179.88	179.65	179.64	180.13	179.33
BH04-4	185.11 ²	0.68	184.43	7.69	178.68	178.53	178.46	178.21	178.25	178.85	178.38	179.21	178.84	179.53	178.47	179.07	178.35
BH04-5	184.41	0.74	183.55	6.21	178.94	178.67	178.61	178.37	178.38	178.98	178.54	179.33	179.01	178.73	178.63	179.20	178.53
BH04-6	184.33	0.50	183.68	7.16	179.06	178.93	178.83	178.55	178.56	179.21	178.75	179.59	179.33	178.95	178.91	179.49	178.80
MW06-7 ³	183.78	0.87	182.91	7.04	177.77	177.53	177.49	177.21	177.24	177.85	177.48	178.12	177.95	177.54	177.50	178.01	177.49
MW06-8 ³	183.57	0.83	182.74	6.43	178.29	178.39	178.04	177.74	177.76	178.36	177.96	178.63	178.53	178.11	178.09	178.56	178.05

Notes:

1. Surveyed by SGS on September 13, 2004.
2. Measuring point not surveyed, calculated using original ground elevation and original stick up.
3. Original ground and top of pipe elevations surveyed by Transenco Limited on May 2, 2006.
4. Depth of well below ground surface (m).
5. Updated top of pipe elevation surveyed by Greenview in 2014.

All elevations are relative to a site specific benchmark elevation of 184.10 m.

"-" denotes water level not available.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	BH04-1 (Background)														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	19	9	12	11	10	8	11	12	10	10	9	7	10	9	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.02	< 0.01	< 0.01	0.02	< 0.01	0.03	0.08	< 0.01	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Barium	0.009	0.26	1.0	0.01060	0.00919	0.00491	0.00620	0.00912	0.00694	0.011	0.011	0.009	0.011	0.007	0.005	0.005	0.012	
Boron	0.005	1.3	5.0	0.0040	0.0065	0.0097	0.0047	0.0140	0.0074	< 0.005	< 0.005	< 0.005	0.010	0.005	< 0.005	< 0.005	< 0.005	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	2.74	2.75	4.09	2.77	2.74	2.94	3.83	3.27	3.02	4.07	2.47	2.33	2.64	2.34	
Chloride	1.0	126	250	1.3	1.6	1.7	1.6	1	1	< 0.5	0.6	0.6	4.9	1.4	2.4	2.0	3.0	
Chemical Oxygen Demand	8	N/L	N/L	< 8	< 8	< 8	18	< 8	< 8	7	< 5	25	42	7	< 5	< 5	14	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	51	47	52	51	46	44	48	43	47	62	42	44	46	48	
Conductivity (µS/cm) ³	29	N/L	N/L	28	32	58	65	27	152	33	29	30	45	27	26	25	32	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.002	
Dissolved Organic Carbon	1.0	3.0	5	1.3	2.6	< 1	< 1	< 1	1.1	< 0.2	0.9	< 0.2	3.6	1.1	1.0	1.8	0.9	
Iron	0.012	0.16	0.3	0.488	0.129	0.427	< 0.007	< 0.007	0.046	< 0.005	< 0.005	0.010	< 0.005	0.038	< 0.005	< 0.005	0.199	
Magnesium	0.86	N/L	N/L	0.802	0.794	0.894	0.830	0.777	0.855	1.05	1.08	0.97	1.21	0.79	0.71	0.85	0.78	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	< 0.001	0.002	0.003	0.003	0.002	0.001	0.001	0.008	
Nitrate	0.075	2.6	10	0.07	0.08	0.11	0.13	0.08	0.07	0.1	< 0.1	< 0.05	0.42	0.14	0.09	0.28	0.08	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	7.25	6.88	7.58	6.61	6.86	6.60	6.53	6.42	6.54	6.64	6.86	6.63	6.38	6.49	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	7.27	5.57	6.70	6.86	5.70	6.79	7.88	6.80	6.44	6.65	7.77	6.18	6.04	7.33	
Sodium	2.8	102	200	3.64	4.10	4.36	4.58	4.47	3.41	3.6	4.4	3.3	4.1	4.1	4.1	4.2	4.5	
Sulphate	7	254	500	8.1	7.5	7.8	7.7	8	8	9	8	8	7	7	8	6	6	
Total Dissolved Solids	28	265	500	160	46	94	34	83	< 30	26	24	26	34	21	22	23	24	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	BH04-3 (Background)														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	23	6	8	6	9	6	9	10	7	5	9	8	8	7	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	0.05	< 0.01	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Barium	0.009	0.26	1.0	0.00897	0.00899	0.0115	0.00919	0.0106	0.0112	0.010	0.014	0.009	0.008	0.011	0.009	0.007	0.007	
Boron	0.005	1.3	5.0	0.0052	0.0055	0.0059	0.0037	0.0093	0.0062	< 0.005	< 0.005	< 0.005	0.005	< 0.005	< 0.005	< 0.005	< 0.005	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	2.77	3.00	3.27	2.74	3.21	3.57	3.44	3.57	2.79	2.43	3.13	2.50	2.52	2.10	
Chloride	1.0	126	250	0.9	0.9	0.8	1.0	1.0	1	< 0.5	0.7	< 0.5	0.9	< 0.5	0.9	0.7	1.1	
Chemical Oxygen Demand	8	N/L	N/L	< 8	< 8	< 8	28	< 8	< 8	7	6	18	30	13	< 5	5	6	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	50	34	41	34	40	44	42	38	36	31	36	31	29	26	
Conductivity (µS/cm) ³	29	N/L	N/L	21	22	120	22	26	331	30	26	23	30	24	20	18	32	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	< 0.002	< 0.002	0.003	0.003	< 0.002	< 0.002	
Dissolved Organic Carbon	1.0	3.0	5	< 1	1.9	1.3	< 1	< 1	1.2	0.8	0.9	0.5	1.8	1.3	1.0	2.0	0.6	
Iron	0.012	0.16	0.3	0.046	0.020	0.011	0.149	0.013	0.154	< 0.005	0.021	0.005	< 0.005	0.015	< 0.005	< 0.005	< 0.005	
Magnesium	0.86	N/L	N/L	0.838	0.859	1.02	0.868	0.904	1.12	0.90	1.13	0.89	0.73	0.96	0.74	0.77	0.65	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	0.014	0.017	0.012	0.009	0.011	0.010	0.010	0.006	
Nitrate	0.075	2.6	10	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	< 0.06	0.1	< 0.1	< 0.05	< 0.05	< 0.05	< 0.05	0.19	0.06	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	7.70	6.58	7.29	6.38	6.86	6.57	6.53	6.23	6.31	6.47	6.54	6.38	6.09	6.39	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.38	7.31	6.43	6.65	7.06	6.72	6.01	6.62	6.65	6.15	7.86	7.71	6.03	6.88	
Sodium	2.8	102	200	1.39	1.45	1.76	1.81	2.12	1.83	1.8	2.3	1.6	1.6	2.0	1.7	1.5	1.3	
Sulphate	7	254	500	7.6	6.7	8.4	6.0	7	10	9	7	6	5	5	4	4	3	
Total Dissolved Solids	28	265	500	54	< 30	66	34	46	< 30	23	21	20	17	18	16	15	13	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	BH04-4														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	3-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	60	41	54	53	48	35	35	39	29	92	87	113	52	76	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.02	< 0.01	< 0.01	0.01	0.02	0.03	0.07	0.02	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	< 0.0001	0.0002	< 0.0001	0.0002	0.0001	0.0011	0.0013	0.0009	
Barium	0.009	0.26	1.0	0.0149	0.0121	0.0191	0.0123	0.0119	0.00822	0.009	0.012	0.007	0.030	0.108	0.144	0.122	0.042	
Boron	0.005	1.3	5.0	0.0482	0.0418	0.0417	0.0364	0.0346	0.0317	0.030	0.023	0.014	0.141	2.75	1.16	2.93	1.86	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	20.6	15.1	22.7	17.9	18.8	11.2	16.4	20.8	12.7	54.8	159	116	121	73.9	
Chloride	1.0	126	250	1.1	1.1	0.7	1.2	1.0	1	< 0.5	0.6	4.2	27.6	74.2	47.4	21.3	18.4	
Chemical Oxygen Demand	8	N/L	N/L	< 8	< 8	< 8	27	< 8	< 8	10	< 5	24	57	65	29	107	29	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	177	131	182	169	153	110	114	123	111	429	1010	1030	943	732	
Conductivity (µS/cm) ³	29	N/L	N/L	115	85	138	95	90	74	68	75	71	298	653	658	637	530	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	< 0.002	0.003	< 0.002	0.002	< 0.002	< 0.002	
Dissolved Organic Carbon	1.0	3.0	5	< 1	1.6	3.8	< 1	1.3	< 1	1.1	1.0	0.9	5.4	11.1	11.9	12.4	9.1	
Iron	0.012	0.16	0.3	0.057	0.107	0.122	0.012	< 0.007	0.041	< 0.005	0.015	< 0.005	< 0.005	0.018	0.008	0.008	< 0.005	
Magnesium	0.86	N/L	N/L	5.25	2.95	4.37	3.33	4.32	2.96	2.83	3.60	2.53	12.9	30.5	19.9	25.5	17.8	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	0.002	0.003	0.001	0.006	0.040	0.128	2.82	0.543	
Nitrate	0.075	2.6	10	1.48	0.53	0.91	1.63	1.53	1.04	0.2	0.3	0.37	1.67	2.43	0.08	0.34	0.62	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	7.90	7.46	7.87	6.97	7.19	7.05	6.81	6.76	6.79	6.85	6.74	6.62	5.99	6.75	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.16	5.58	6.52	6.49	6.74	7.61	7.81	6.21	6.02	5.94	7.07	6.95	5.80	6.19	
Sodium	2.8	102	200	4.38	3.11	3.01	2.71	3.46	2.40	2.6	3.3	2.4	5.4	21.7	60.3	51.7	46.0	
Sulphate	7	254	500	21	17	30	16	21	14	17	19	11	46	352	336	383	239	
Total Dissolved Solids	28	265	500	131	106	60	80	106	86	62	68	61	236	539	551	501	382	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	BH04-5														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	470	449	375	415	399	409	407	367	382	402	295	225	264	225	
Ammonia, Total (N)	0.07	N/L	N/L	18.5	23.3	13.8	15.1	15.1	15.5	14.7	17.2	14.4	16.3	15.0	9.04	9.60	9.47	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	0.0006	0.0009	0.0010	0.0007	0.0002	0.0004	0.0004	0.0004	
Barium	0.009	0.26	1.0	0.415	0.334	0.286	0.348	0.332	0.287	0.352	0.351	0.312	0.332	0.175	0.178	0.230	0.173	
Boron	0.005	1.3	5.0	0.484	0.445	0.373	0.316	0.369	0.333	0.404	0.400	0.382	0.376	0.227	0.227	0.305	0.299	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	7	3	5	< 2	7	7	4	4	
Calcium	2.78	N/L	N/L	120.0	106.0	85.0	89.6	98.0	81.4	109	105	98.2	103	55.1	55.1	75.9	56.0	
Chloride	1.0	126	250	15.0	9.4	12	9.4	19	15	10.8	7.3	6.9	5.9	8.0	8.5	6.6	4.9	
Chemical Oxygen Demand	8	N/L	N/L	43	38	28	43	34	34	278	104	84	99	101	135	124	175	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.002	0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	983	907	762	772	795	807	824	764	797	825	649	518	603	522	
Conductivity (µS/cm) ³	29	N/L	N/L	714	692	697	634	560	620	644	578	611	630	241	379	412	387	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	
Dissolved Organic Carbon	1.0	3.0	5	8.0	11.0	10.8	8.5	10.7	8.9	8.6	9.0	5.8	13.5	5.8	7.0	8.9	7.5	
Iron	0.012	0.16	0.3	33.6	39.4	33.9	36.2	37.9	27.8	50.0	47.9	44.7	40.8	18.1	31.1	40.9	30.8	
Magnesium	0.86	N/L	N/L	20.3	18.5	16.0	17.5	16.0	16.2	19.1	18.6	16.3	15.7	7.10	8.89	12.9	11.4	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	7.88	7.42	5.62	5.49	1.93	3.31	4.66	3.71	
Nitrate	0.075	2.6	10	1.21	< 0.06	< 0.06	< 0.06	0.07	0.07	0.1	< 0.1	< 0.05	< 0.05	0.05	< 0.05	0.18	0.17	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	8.11	7.82	8.06	7.13	7.82	7.38	6.92	6.91	7.37	7.08	7.28	7.03	6.72	7.22	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.7	6.39	6.17	6.47	6.42	8.03	6.55	6.71	6.06	8.38	6.24	7.46	6.59	6.65	
Sodium	2.8	102	200	19.0	18.0	16.4	15.5	15.7	12.5	17.9	13.7	14.6	10.7	8.1	12.1	13.7	13.8	
Sulphate	7	254	500	5.7	8.0	12	14	11	10	10	15	17	11	17	16	21	26	
Total Dissolved Solids	28	265	500	611	469	409	450	471	437	453	420	438	454	337	268	313	270	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	65500	18600	136000	60000	46000	24400	295000	24400	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	BH04-6														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	40	44	34	25	29	41	43	37	37	29	24	18	18	16	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.09	< 0.01	< 0.01	0.05	0.06	0.05	0.09	0.04	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Barium	0.009	0.26	1.0	0.0254	0.0264	0.0216	0.0217	0.0211	0.0294	0.023	0.022	0.020	0.008	0.006	0.005	0.008	0.007	
Boron	0.005	1.3	5.0	0.053	0.126	0.113	0.0457	0.107	0.0569	0.036	0.132	0.033	0.009	0.009	< 0.005	0.019	0.006	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	14.6	22.6	12.7	13.5	14.6	19.8	17.4	18.7	16.2	6.47	4.83	3.74	5.69	4.72	
Chloride	1.0	126	250	13.0	19.0	13	21	11	5	3.6	2.7	1.3	1.5	1.1	1.3	4.4	5.9	
Chemical Oxygen Demand	8	N/L	N/L	< 8	< 8	< 8	21	< 8	< 8	57	44	30	66	27	< 5	48	25	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.003	0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	170	236	173	151	159	191	152	140	122	80	68	65	83	76	
Conductivity (µS/cm) ³	29	N/L	N/L	115	171	118	160	88	121	108	97	94	51	39	40	50	52	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	0.003	< 0.002	< 0.002	0.002	< 0.002	< 0.002	
Dissolved Organic Carbon	1.0	3.0	5	< 1	3.3	< 1	< 1	< 1	2.0	1.6	1.4	1.1	5.0	1.1	1.1	2.1	0.6	
Iron	0.012	0.16	0.3	0.078	0.299	0.200	0.295	< 0.007	0.302	0.011	0.013	< 0.005	0.015	0.022	0.027	0.036	0.017	
Magnesium	0.86	N/L	N/L	2.87	3.90	2.95	2.66	2.71	4.42	2.95	3.75	3.10	1.59	1.18	1.12	1.55	1.40	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	0.001	< 0.001	0.001	0.001	< 0.001	0.001	0.001	0.001	
Nitrate	0.075	2.6	10	0.85	1.37	0.69	0.46	0.53	0.74	0.8	0.9	1.01	0.05	0.07	< 0.05	0.52	0.27	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	7.72	7.48	7.70	6.74	7.09	7.07	6.83	6.73	6.73	7.15	7.08	6.71	6.56	6.82	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.46	5.90	6.82	7.20	6.58	6.89	7.38	7.57	6.54	8.42	6.76	6.26	6.33	6.95	
Sodium	2.8	102	200	10.60	7.83	9.35	11.3	9.91	8.45	11.8	10.5	10.3	6.4	6.4	6.1	8.2	7.4	
Sulphate	7	254	500	22	33	24	15	24	42	21	24	17	7	8	9	9	7	
Total Dissolved Solids	28	265	500	137	155	126	97	123	114	84	77	67	44	34	33	42	38	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	MW06-7												5-year Trends (sparkline)
				20-Aug-13	13-May-14	9-Sep-14	20-May-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	57	43	47	44	22	28	14	30	25	35	17	18	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	0.04	0.03	0.01	0.03	0.04	0.04	0.06	0.03	
Arsenic	0.0001	0.003	0.01	-	-	-	-	< 0.0001	0.0002	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001	
Barium	0.009	0.26	1.0	0.0239	0.0197	0.0334	0.0163	0.012	0.013	0.010	0.024	0.008	0.010	0.009	0.014	
Boron	0.005	1.3	5.0	0.0458	0.0132	0.0133	0.0234	0.010	0.012	0.005	0.019	0.009	< 0.005	0.008	0.009	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	20.10	13.0	14.1	19.4	9.81	7.49	7.68	9.19	6.97	8.06	8.05	6.76	
Chloride	1.0	126	250	2.7	0.7	0.9	1	3.4	2.3	2.0	1.4	< 0.5	< 0.5	1.1	1.1	
Chemical Oxygen Demand	8	N/L	N/L	11	9	20	8	74	133	30	69	75	13	35	40	
Chromium	0.001	0.013	0.05	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	175	107	123	117	82	78	73	95	67	104	73	65	
Conductivity (µS/cm) ³	29	N/L	N/L	86	65	113	128	53	39	47	60	39	66	40	46	
Copper	0.002	0.5	1.0	-	-	-	-	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	0.003	< 0.002	< 0.002	
Dissolved Organic Carbon	1.0	3.0	5	3.8	4.8	3.1	2.4	2.5	2.6	2.2	1.5	1.6	2.3	2.4	3.6	
Iron	0.012	0.16	0.3	0.747	0.170	1.19	0.028	0.016	1.18	0.180	2.81	0.079	0.869	0.011	1.68	
Magnesium	0.86	N/L	N/L	6.24	3.05	3.82	3.87	2.33	2.06	1.62	2.65	1.93	2.15	1.84	1.67	
Manganese	0.007	0.03	0.05	-	-	-	-	0.005	0.068	0.010	0.066	0.009	0.010	0.005	0.013	
Nitrate	0.075	2.6	10	0.27	0.09	< 0.06	0.08	0.1	0.1	< 0.05	< 0.05	< 0.05	< 0.05	0.18	0.14	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	7.34	7.85	6.95	7.45	6.94	6.97	6.73	6.94	6.98	6.90	6.59	6.76	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.34	6.35	7.39	7.22	7.76	6.28	6.59	7.86	7.56	7.81	6.97	6.95	
Sodium	2.8	102	200	3.81	2.68	3.36	2.96	2.6	3.0	1.9	3.2	2.4	2.7	2.1	1.9	
Sulphate	7	254	500	78.0	9.7	15	12	12	8	12	12	9	13	12	9	
Total Dissolved Solids	28	265	500	103	80	77	103	45	43	40	52	34	53	37	33	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	

Notes:

1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.

Bold and shaded values exceed ODWS.

Bold and italic values exceed RUC limits.

N/L indicates No Limit.

"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Waste Disposal Site

Parameter	Background (median)	RUC ¹	ODWS ²	MW06-8														5-year Trends (sparkline)
				24-Apr-13	20-Aug-13	13-May-14	9-Sep-14	20-May-15	20-Aug-15	30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19	
Alkalinity (as CaCO ₃)	9	255	30 - 500	10	5	7	5	6	6	8	10	8	9	8	8	8	8	
Ammonia, Total (N)	0.07	N/L	N/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0.02	< 0.01	< 0.01	0.02	0.02	0.03	0.05	0.02	
Arsenic	0.0001	0.003	0.01	-	-	-	-	-	-	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Barium	0.009	0.26	1.0	0.00445	0.00788	0.00671	0.00668	0.00608	0.00694	0.005	0.005	0.004	0.012	0.003	0.003	0.002	0.004	
Boron	0.005	1.3	5.0	0.0067	0.007	0.0070	0.0061	0.0114	0.0082	< 0.005	< 0.005	< 0.005	0.006	0.006	< 0.005	0.005	< 0.005	
Biological Oxygen Demand	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Calcium	2.78	N/L	N/L	5.07	4.38	4.57	4.65	5.42	5.12	5.28	4.86	4.76	3.73	3.64	3.03	2.71	2.07	
Chloride	1.0	126	250	11	9.8	12	13	18	20	7.3	5.8	7.2	4.4	4.9	3.5	2.4	1.3	
Chemical Oxygen Demand	8	N/L	N/L	< 8	< 8	< 8	26	< 8	< 8	43	46	56	84	42	9	89	58	
Chromium	0.001	0.013	0.05	-	-	-	-	-	-	< 0.002	< 0.002	< 0.001	< 0.001	< 0.001	< 0.001	0.001	< 0.001	
Conductivity (µS/cm) ⁴	44	N/L	N/L	75	76	77	81	89	98	71	68	72	61	56	53	49	43	
Conductivity (µS/cm) ³	29	N/L	N/L	57	49	293	96	51	62	50	37	49	40	36	33	27	31	
Copper	0.002	0.5	1.0	-	-	-	-	-	-	< 0.002	< 0.002	0.002	< 0.002	< 0.002	0.003	< 0.002	0.002	
Dissolved Organic Carbon	1.0	3.0	5	1.8	3.2	< 1	< 1	1.8	< 1	0.8	0.9	0.9	3.7	1.2	1.4	2.8	1.3	
Iron	0.012	0.16	0.3	0.063	0.192	0.067	0.073	< 0.007	0.069	0.007	0.007	< 0.005	0.005	0.006	0.008	0.006	0.011	
Magnesium	0.86	N/L	N/L	1.91	1.49	1.58	1.7	1.83	1.92	1.64	1.76	1.73	1.35	1.32	1.10	1.01	0.80	
Manganese	0.007	0.03	0.05	-	-	-	-	-	-	0.002	0.003	0.002	0.001	0.001	0.001	0.001	0.001	
Nitrate	0.075	2.6	10	< 0.06	0.27	0.22	0.18	0.09	0.15	0.5	0.3	0.43	0.40	0.12	< 0.05	0.19	0.08	
pH (units) ⁴	6.58	6.5 - 8.5	6.5 - 8.5	6.85	6.68	7.30	6.42	6.68	6.54	6.53	6.40	6.47	6.73	6.65	6.59	6.39	6.61	
pH (units) ³	6.65	6.5 - 8.5	6.5 - 8.5	6.67	6.23	6.22	6.96	7.08	6.55	7.72	7.79	5.99	6.66	6.82	6.83	6.25	7.10	
Sodium	2.8	102	200	4.31	5.35	5.83	7.72	7.63	8.10	6.0	5.2	4.8	4.7	5.0	4.3	4.9	4.5	
Sulphate	7	254	500	9.6	8.5	7.9	7.9	7	6	10	9	7	8	9	9	9	9	
Total Dissolved Solids	28	265	500	106	83	31	57	94	60	39	37	40	33	28	27	25	22	
Total Suspended Solids	-	N/L	N/L	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

- Notes:
1. Reasonable Use Concept (RUC) criteria.
2. Ontario Drinking Water Standards (ODWS).
3. Result from field analysis.
4. Results from laboratory analysis.

Results expressed in mg/L unless otherwise noted.
Bold and shaded values exceed ODWS.
Bold and italic values exceed RUC limits.
N/L indicates No Limit.
"-" parameter not analyzed.



Table 4
Groundwater Quality
Red Rock Disposal Site

Parameter	ODWS ¹	BH04-5							
		30-May-16	31-Oct-16	03-May-17	24-Oct-17	1-May-18	18-Oct-18	13-May-19	21-Oct-19
Acetone	N/L	< 0.002	< 0.002	0.006	0.004	< 0.002	0.003	< 0.03	< 0.030
Benzene	0.001	0.0008	0.0006	< 0.0005	0.0008	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Bromobenzene	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0004	< 0.0004
Bromodichloromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.002	< 0.002
Bromoform	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.005	< 0.005
Bromomethane	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0005	< 0.0005
Carbon Tetrachloride	0.002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Monochlorobenzene	0.08	0.0014	0.0008	0.0005	0.0011	0.0003	0.0003	< 0.0005	< 0.0005
Chloroethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.003	< 0.003
Chloroform	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.001	< 0.001
Chloromethane	N/L	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.0003	< 0.002	< 0.002
Chlorotoluene,2-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chlorotoluene,4-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dibromo-3-Chloropropane, 1,2-	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0006	< 0.0006
Dibromochloromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.002	< 0.002
Dibromoethane (Ethylene dibromide) 1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0002	< 0.0002
Dibromomethane	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0001	< 0.0001
Dichlorobenzene 1,2-	0.2	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichlorobenzene 1,3-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichlorobenzene 1,4-	0.005	< 0.0032	0.0025	0.003	0.0053	< 0.0002	0.0008	0.0012	< 0.0005
Dichlorodifluoromethane	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002
Dichloroethane 1,1-	N/L	0.0002	0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloroethane 1,2-	0.005	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	0.0002	< 0.0005	< 0.0005
Dichloroethylene (vinylidene chloride) 1,1-	0.014	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloroethene cis-1,2	N/L	0.0025	0.0021	0.0021	0.0027	0.001	0.0014	0.0021	< 0.0005
Dichloroethene trans-1,2	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloromethane (Methylene Chloride)	N/L	< 0.0003	< 0.0003	< 0.0003	0.0003	< 0.0003	< 0.0003	< 0.005	< 0.005
Dichloropropane 1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloropropane,1,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Dichloropropane,2,2-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	-	-
Dichloropropene cis-1,3	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloropropene trans-1,3	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Dichloropropene,1,1-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Ethylbenzene	0.0024	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Hexachlorobutadiene	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0006	< 0.0006
Hexane	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.005	< 0.005
Isopropylbenzene	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Isopropyltoluene,4-	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0002	< 0.0002
Methyl Butyl Ketone	N/L	< 0.01	< 0.010	< 0.010	< 0.010	< 0.010	< 0.010	< 0.005	< 0.005
Methyl Ethyl Ketone	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02
Methyl Isobutyl Ketone	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.02	< 0.02
Methyl-t-butyl Ether	N/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.002	< 0.002
Naphthalene	N/L	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0004	< 0.0004
n-Butylbenzene	N/L	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0007	< 0.0004	< 0.0004
n-Propylbenzene	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0001	< 0.0001
sec-Butylbenzene	N/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0001	< 0.0001
Styrene	N/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
tert-Butylbenzene	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Tetrachloroethane,1,1,1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Tetrachloroethane 1,1,2,2-	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0005	< 0.0005
Tetrachloroethylene (Perchloroethylene)	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005
Toluene	0.024	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Trichlorobenzene,1,2,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005
Trichlorobenzene,1,2,4-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005
Trichloroethane 1,1,1-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Trichloroethane 1,1,2-	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Trichloroethene (Trichloroethylene)	0.005	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005
Trichlorofluoromethane	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.005	< 0.005
Trichloropropane,1,2,3-	N/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0005	< 0.0005
Trimethylbenzene,1,2,4-	N/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.001	< 0.001
Trimethylbenzene,1,3,5-	N/L	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0006	< 0.0001	< 0.0001
Vinyl Chloride	0.001	0.0003	0.0003	0.0004	0.0003	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Xylene	0.3	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0004	< 0.0004	< 0.0015	< 0.0015
m-Xylene & p-Xylene	N/L	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.0004	< 0.001	< 0.001
o-Xylene	N/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0005	< 0.0005

Notes:

1. Ontario Drinking Water Standards (ODWS).

All results are expressed in mg/L unless otherwise stated.

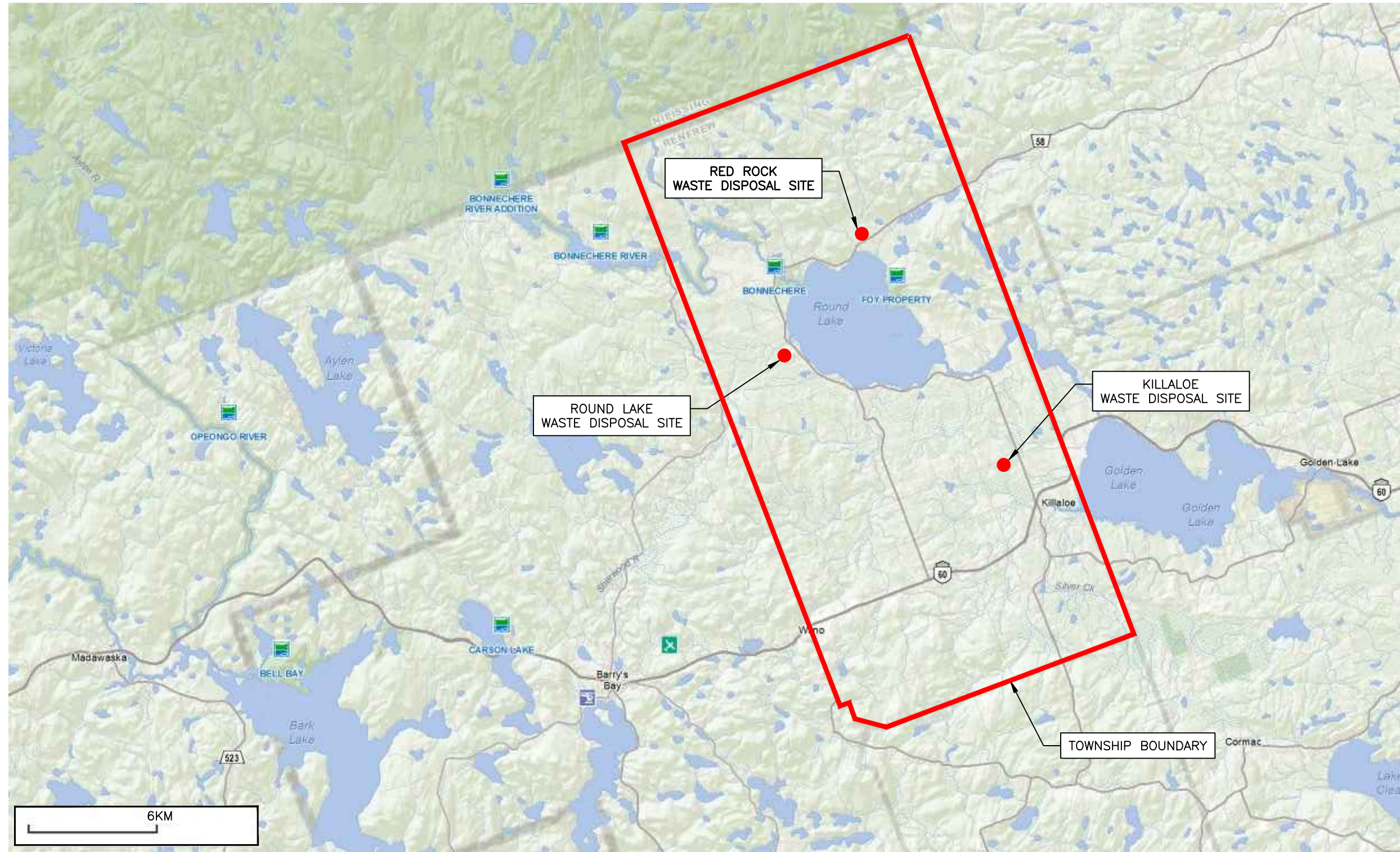
Shaded areas indicate values that exceed ODWS maximum acceptable concentrations.

N/L indicates No Limit specified.

“-” means parameter not analyzed.

Figures





SOURCE: ONTARIO MINISTRY OF NATURAL RESOURCES AND FORESTRY, LAND INFORMATION ONTARIO, 2016.

Greenview
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Bancroft, Ontario
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No.	DATE	BY	REMARKS
1	MAR16-20	SDK	ISSUED FOR MECP REVIEW
0	JAN08-20	SDK	ISSUED FOR CLIENT REVIEW

DRAWN BY: SDK	CHECKED BY: DMH
DESIGNED BY: SDK	APPROVED BY: DMH
SCALE: AS NOTED	DATE: MAR 2020



PROJECT:

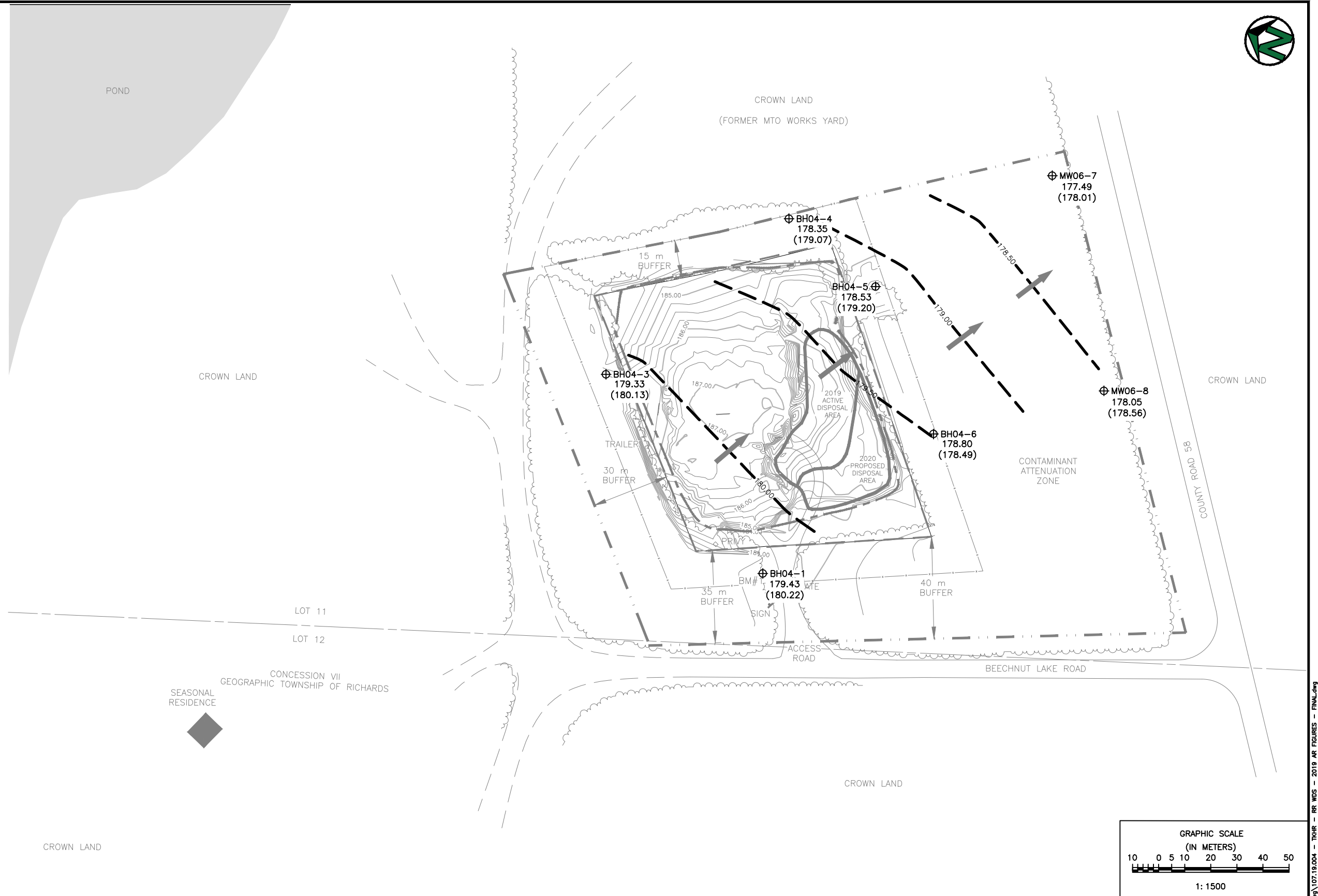
REGIONAL LOCATION PLAN
2019 ANNUAL REPORT
RED ROCK WASTE DISPOSAL SITE
TOWNSHIP OF KILLALOE, HAGARTY AND RICHARDS

PROJECT No: 107.19.004
FIGURE: 1
1 OF 4

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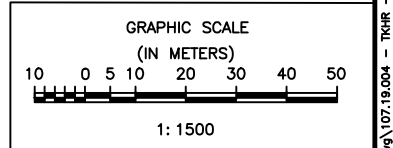
LEGEND

- FENCE
- APPROVED WASTE DISPOSAL AREA (1.0 ha)
- EXISTING LIMIT OF WASTE
- CONTAMINANT ATTENUATION ZONE (3.6 ha)
- 185.00 TOPOGRAPHIC CONTOUR LINE
- ON-SITE ROAD
- APPROXIMATE ROAD LOCATION
- LOT LINE
- APPROXIMATE TREE LINE
- ⊕ BH04-1 GROUNDWATER MONITORING WELL
- 180.00 EQUIPOTENTIAL CONTOURS (MAY 13, 2019)
- 180.04 GROUNDWATER ELEVATIONS (180.36) OCTOBER 21, 2019 (MAY 13, 2019)
- GROUNDWATER FLOW DIRECTION
- △ BM#1 BENCHMARK



NOTES

1. BENCHMARKS
 BM#1
 NAIL AND WASHERS ON EAST FACE OF NORTH GATE POST AT ENTRANCE OF SITE.
 ELEVATION = 184.10 m
 SITE BENCHMARKS BASED ON AN ASSUMED ELEVATION TO CONVERT TO GEODETIC BENCHMARK, ADD 255.793.
2. POND LOCATION APPROXIMATE ONLY.
3. BASE SURVEY DATA PROVIDED BY SGS LAKEFIELD RESEARCH LIMITED AND Jp2g CONSULTANTS INC.
4. LOT LINE AND LIMITS OF CONTAMINANT ATTENUATION ZONE BASED ON CROWN LAND REFERENCE PLAN, W. SIMPSON, OLS, 2008.
5. UPDATED TOPOGRAPHIC SURVEY COMPLETED BY GREENVIEW ON DECEMBER 10, 2019.

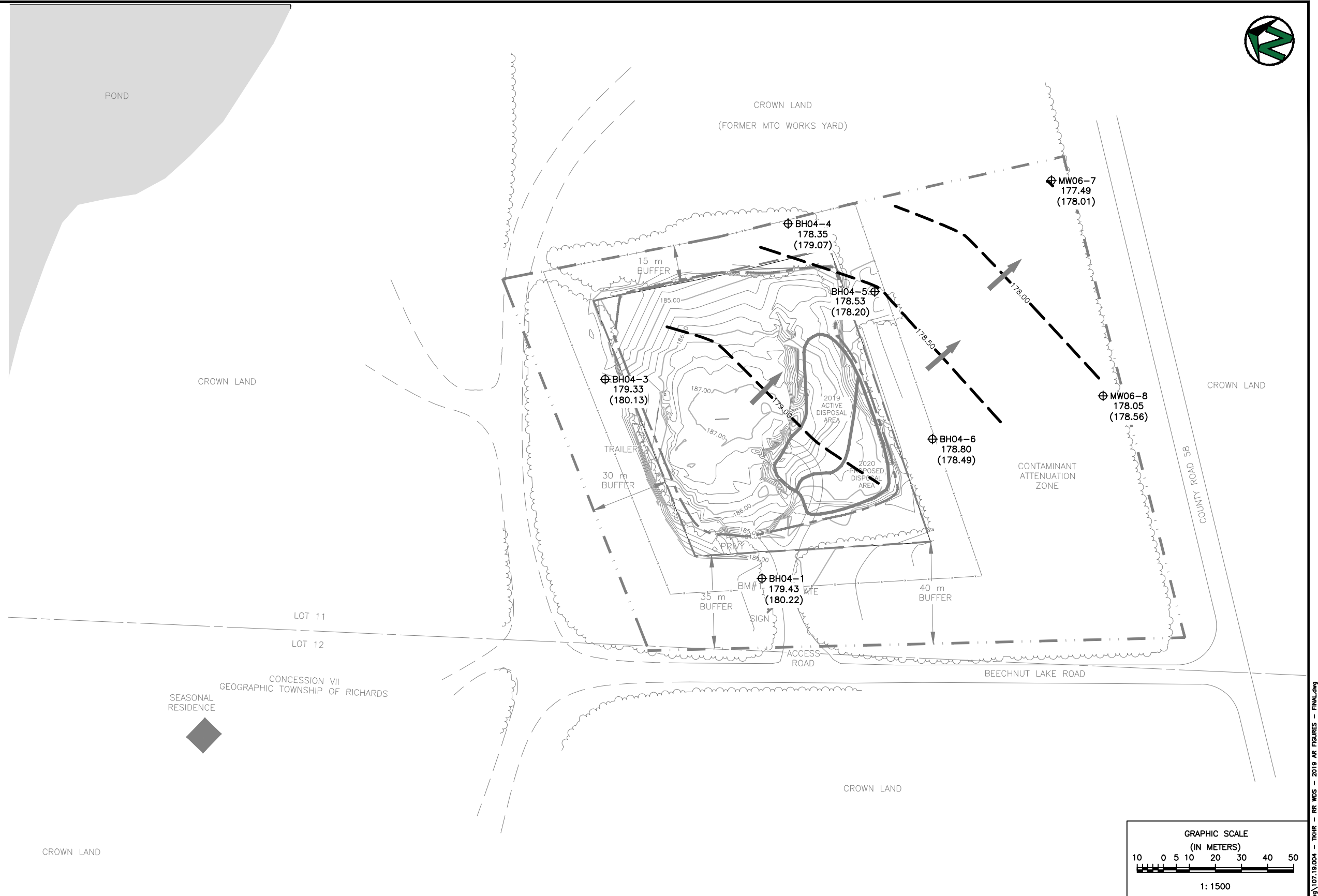


 13 Commerce Court Bancroft, Ontario 613.332.9057 greenview-environmental.ca					DRAWN BY: SDK	CHECKED BY: DMH	CLIENT:	PROJECT:	PROJECT No: 107.19.004
					DESIGNED BY: SDK	APPROVED BY: DMH		ENVIRONMENTAL MONITORING LOCATION PLAN – SPRING 2019 ANNUAL REPORT RED ROCK WASTE DISPOSAL SITE TOWNSHIP OF KILLALOE, HAGARTY, AND RICHARDS	FIGURE: 2
	1	MAR16-20	SDK	ISSUED FOR MECP REVIEW	SCALE: 1:1500	DATE: MAR 2020			
	No.	DATE	BY	REMARKS					2 OF 4

G:\ViroCAD\107 KH\004 Red Rock\Fig\107.19.004 - TCR - RR WDS - 2019 AF FIGURES - FINAL.dwg

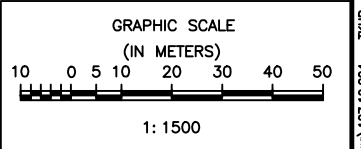
LEGEND

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- APPROVED WASTE DISPOSAL AREA (1.0 ha)
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DRAWN BY: SDK	CHECKED BY: DMH
DESIGNED BY: SDK	APPROVED BY: DMH
SCALE: 1:1500	DATE: MAR 2020

CLIENT:

PROJECT:

ENVIRONMENTAL MONITORING LOCATION PLAN – FALL 2019 ANNUAL REPORT
 RED ROCK WASTE DISPOSAL SITE
 TOWNSHIP OF KILLALOE, HAGARTY, AND RICHARDS

PROJECT No:
107.19.004

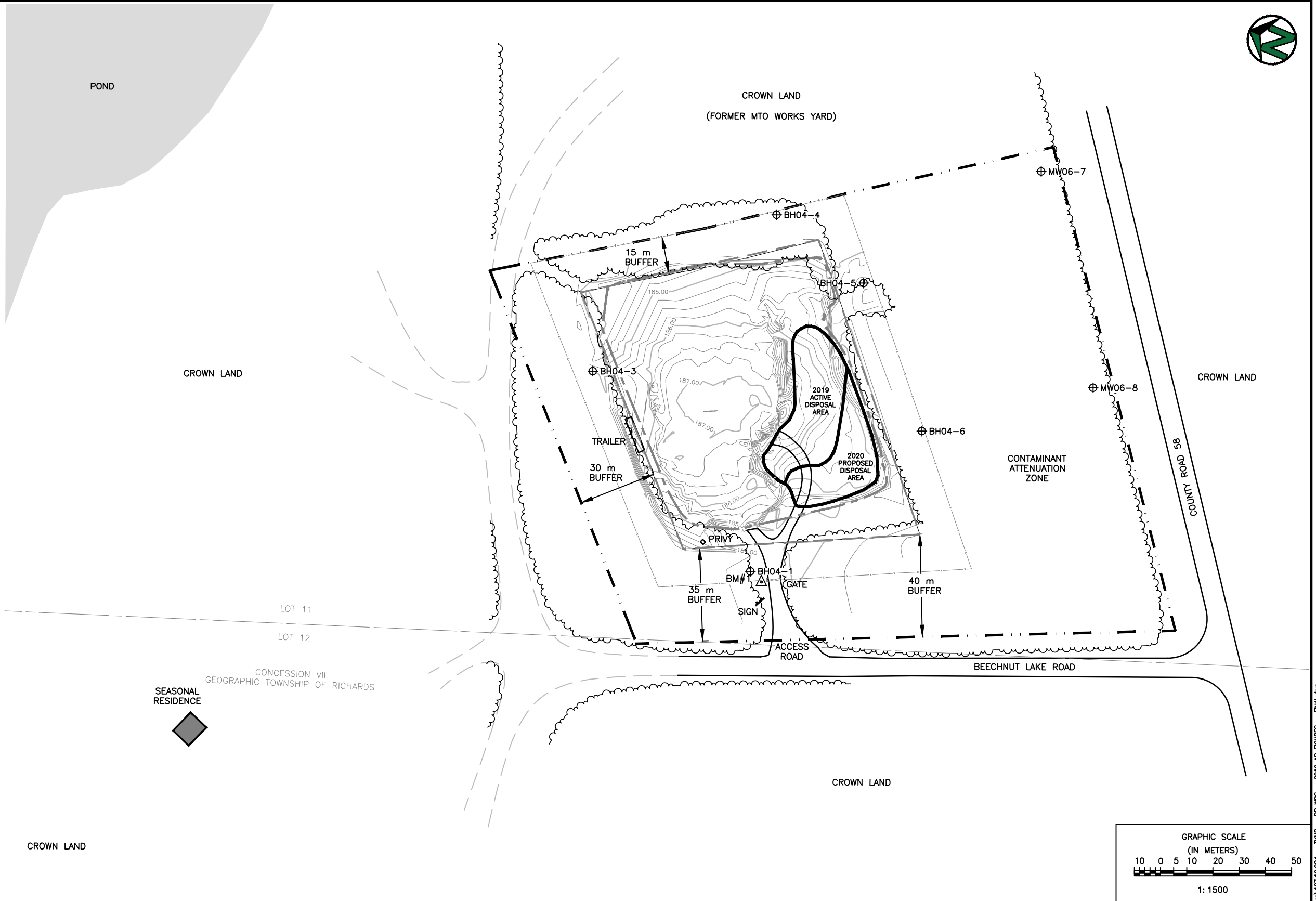
FIGURE:
3

3 OF 4

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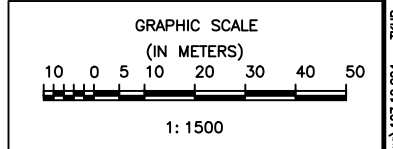
LEGEND

- FENCE
- APPROVED WASTE DISPOSAL AREA (1.0 ha)
- - - EXISTING LIMIT OF WASTE
- CONTAMINANT ATTENUATION ZONE (3.6 ha)
- MAJOR TOPOGRAPHIC CONTOUR LINE (2m)
- MINOR TOPOGRAPHIC CONTOUR LINE (0.5m)
- ===== ON-SITE ROAD
- - - APPROXIMATE ROAD LOCATION
- LOT LINE
- APPROXIMATE TREE LINE
- ⊕ BH04-1 GROUNDWATER MONITORING WELL
- △ BM#1 BENCHMARK



NOTES

1. BENCHMARKS
 BM#1
 NAIL AND WASHERS ON EAST FACE OF NORTH GATE POST AT ENTRANCE OF SITE.
 ELEVATION = 184.10 m
 SITE BENCHMARKS BASED ON AN ASSUMED ELEVATION TO CONVERT TO GEODETIC BENCHMARK, ADD 255.793.
2. POND LOCATION APPROXIMATE ONLY.
3. BASE SURVEY DATA PROVIDED BY SGS LAKEFIELD RESEARCH LIMITED AND Jp2g CONSULTANTS INC.
4. LOT LINE AND LIMITS OF CONTAMINANT ATTENUATION ZONE BASED ON CROWN LAND REFERENCE PLAN, W. SIMPSON, OLS, 2008.
5. UPDATED TOPOGRAPHIC SURVEY COMPLETED BY GREENVIEW ON DECEMBER 10, 2019.



Greenview
 ENVIRONMENTAL MANAGEMENT

13 Commerce Court
 Bancroft, Ontario
 613.332.0057
 greenview-environmental.ca

No.	DATE	BY	REMARKS
1	MAR16-20	SDK	ISSUED FOR MECP REVIEW
0	JAN08-20	SDK	ISSUED FOR CLIENT REVIEW

DRAWN BY: SDK	CHECKED BY: DMH
DESIGNED BY: SDK	APPROVED BY: DMH
SCALE: 1:1500	DATE: MAR 2020

CLIENT:

PROJECT:

EXISTING SITE CONDITIONS PLAN
 2019 ANNUAL REPORT
 RED ROCK WASTE DISPOSAL SITE
 TOWNSHIP OF KILLALOE, HAGARTY, AND RICHARDS

PROJECT No:
107.19.004

FIGURE:
4

4 OF 4

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Appendix A





Ministry of the Environment and
Climate Change
Ministère de l'Environnement et
de l'Action en matière de
changement climatique

**AMENDMENT TO ENVIRONMENTAL COMPLIANCE
APPROVAL**

NUMBER A412307

Notice No. 4

Issue Date: August 2, 2016

The Corporation of the Township of Killaloe, Hagarty,
and Richards
1 John St
Killaloe, Ontario
K0J 2A0

iteRed Rock Waste Disposal Site
Location: Lot 11, Concession 7
Killaloe, Hagarty and Richards Township, County of
Renfrew

You are hereby notified that I have amended Approval No. A412307 issued on October 22, 2004 and amended on December 5, 2007 and July 21, 2014 for a 1.0 hectare Landfill as well as a Transfer Station, within a 3.583 hectare Site, as follows:

Schedule "A" Items 7 and 8 are hereby revoked and replaced with Item 7 as follows:

Schedule "A"

7. Report entitled "Design, Operations and Development Plan - Red Rock Waste Disposal Site" prepared for the Township of Killaloe, Hagarty and Richards by Greenview Environmental Management Limited dated April 2016.

The reason for this amendment to the Approval is to replace items 7 and 8 of the Schedule "A" with a current Design and Operations Report.

This Notice shall constitute part of the approval issued under Approval No. A412307 dated October 22, 2004 as amended.

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 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**

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

DATED AT TORONTO this 2nd day of August, 2016

Dale Gable, P.Eng.

Director

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

RM/

c: District Manager, MOECC Ottawa

Dan Hagan, Greenview Environmental Management

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

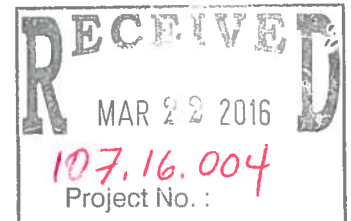
NUMBER A412307

Notice No. 3

Issue Date: March 14, 2016

The Corporation of the Township of Killaloe, Hagarty and Richards
Post Office Box, No. 39
Killaloe, Ontario
K0J 1B0

Site Location: Red Rock Waste Disposal Site
Lot 11, Concession 7
Killaloe, Hagarty and Richards Township, County of Renfrew



You are hereby notified that I have amended Approval No. A412307 issued on October 22, 2004 and amended on December 5, 2007 and July 21, 2014 for a 1.0 hectare Landfill as well as a Transfer Station, within a 3.583 hectare Site, as follows:

Definition of Certificate is hereby revoked and replaced with the following:

"Approval" or "Certificate" means this Environmental Compliance Approval and any Schedules to it, including the application and supporting documentation listed in Schedule "A";

Conditions 25 (2), 28 and 33 are hereby revoked and replaced with the following:

25. (2) The *Owner* shall design and operate the *Site* in accordance with documents in Schedule "A".
28. The *Owner* shall monitor groundwater in accordance with documents in Schedule "A".
33. Trigger mechanisms and contingency plans for groundwater quality monitoring for the purpose of initiating investigative activities into the potential cause of increased contaminant concentrations at the property boundary shall be in accordance with documents in Schedule "A".

Condition 25(3) is added to this *Approval*.

25. (3) Only Construction, Demolition and Bulky waste shall be accepted for **disposal** at the *Site*. Leaf and Yard Waste may be disposed of at the *Site* and/or used as alternative periodic cover material but not for final cover.

Schedule "A"

Item 3 of Schedule "A" of Notice No. 2 dated July 21, 2014 is hereby renumbered as Item 7:

7. Report entitled "Design, Operations and Development Plan - Red Rock Waste Disposal Site" prepared for the Township of Killaloe, Hagarty and Richards by Greenview Environmental Management Limited dated October 4, 2013.

Item 8 is added to the Schedule "A":

8. Electronic mail dated February 29, 2016 (1:44 p.m.) from Dan Hagan (Greenview) to Ranjani Munasinghe (MOECC) agreeing to the comments from Technical Support Section, Ministry of the Environment and Climate Change.

The reasons for this amendment to the *Approval* are as follows:

- The reason for revising the Conditions 25 (2) and 33 are due to correction of the item number 3 as item 7 in Schedule "A".
- The reason for amending the condition 28 is to approve the monitoring plan proposed in the Design, Operations and Development Plan (item 7 in Schedule "A").
- The reason for 25 (3) is to clarify the type of waste approved for disposal at the *Site*.

This Notice shall constitute part of the approval issued under Approval No. A412307 dated October 22, 2004 as amended.

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

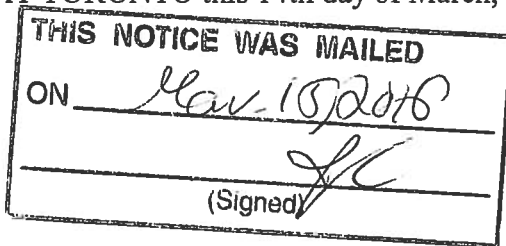
AND

The Director appointed for the purposes of Part II.1 of
 the Environmental Protection Act
 Ministry of the Environment 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

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 March, 2016

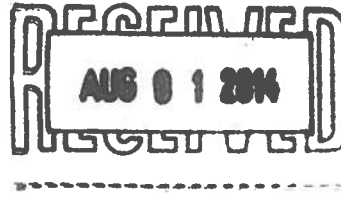


Dale D. Gable

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

RM/

c: District Manager, MOECC Ottawa
 n/a, The Corporation of the Township of Killaloe, Hagarty and Richards



Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO ENVIRONMENTAL COMPLIANCE APPROVAL

NUMBER A412307

Notice No. 2

Issue Date: July 21, 2014

The Corporation of the Township of Killaloe, Hagarty and Richards
1 John St
Post Office Box, No. 39
Killaloe, Ontario
K0J 2A0

Site Location: Red Rock Waste Disposal Site
36 Beechnut Lake Road
Lot 11, Concession 7
Killaloe, Hagarty and Richards Township, County of Renfrew

You are hereby notified that I have amended Approval No. A412307 issued on October 22, 2004 and amended December 5, 2007 for the use and operation of Waste Disposal Site consisting of a 1.0 hectare Landfill as well as a Transfer Station, within a 3.583 hectare Site, as follows:

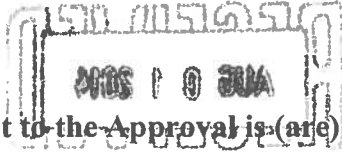
The following Conditions are hereby amended as follows:

Site Operations - Landfill

25. (1) The *Owner* is hereby approved to utilize the remaining capacity for the as identified in Condition No. 26.
- (2) The *Owner* shall design and operate the *Site* in accordance with Item 2 and 3 (Sections 1 to 4) of Schedule "A".
26. The *Site* capacity is **35,000 cubic meters** including waste, but not including final cover. The remaining capacity of the site is **7550 cubic meters**.

The following Items are hereby added to Schedule "A":

3. Report entitled "Design, Operations and Development Plan - Red Rock Waste Disposal Site" prepared for the Township of Killaloe, Hagarty and Richards by Greenview Environmental Management Limited dated October 4, 2014.



The reason(s) for this amendment to the Approval is (are) as follows:

1. *The reasons for the amendments to Conditions 25 and 26 are to approve the utilization of the remaining waste capacity for the Site. This is to ensure the work is completed in a manner that is protective of the environment and human health.*

This Notice shall constitute part of the approval issued under Approval No. A412307 dated October 22, 2004

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) 314-3717 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 21st day of July, 2014

THIS NOTICE WAS MAILED
ON July 29, 2014
H.A.
(Signed)



Tesfaye Gebrezghi, P.Eng.

Director

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

DG/

c: District Manager, MOE Ottawa

Dan Hagan, Greenview Environmental Management Limited ✓



Ministry of the Environment
Ministère de l'Environnement

AMENDMENT TO PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A412307
Notice No. 1
Issue Date: December 5, 2007

The Corporation of the Township of Killaloe, Hagarty and Richards
PO Box 39
Killaloe, Ontario
K0J 2A0

Site Location: Red Rock Waste Disposal Site
Lot 11, Concession 7, Richards
Killaloe, Hagarty and Richards Township, County of Renfrew

You are hereby notified that I have amended Provisional Certificate of Approval No. A412307 issued on October 22, 2004 for a 1.0 hectare Landfill as well as a Transfer Station, within a 1.7 hectare Site, as follows:

Condition 26 is revoked.

The following conditions and Schedule "B" are added to the Certificate:

Site Operations - Landfill

26. The *Site* capacity is **35,000 cubic meters** including waste, daily cover and intermediate cover materials. The remaining capacity of the site is **7550 cubic meters**.

Compliance Limits

27. The *Site* shall be operated in such a way as to ensure compliance with the Reasonable Use Guideline B-7 for the protection of the groundwater at the *Site*.

Groundwater Monitoring

28. The *Owner* shall monitor ground water in accordance with Items 3 and 4 in Schedule "A".
29. A licensed Professional Geoscientist or Engineer possessing appropriate hydrogeological training and experience shall execute or directly supervise the groundwater monitoring and reporting program.

Groundwater Wells and Monitors

30. The *Owner* shall ensure that all groundwater monitoring wells which form part of the monitoring program are properly capped, locked and protected from damage.
31. Where landfilling is to proceed around monitoring wells, suitable extensions shall be added to the wells and the wells shall be properly re-secured.
32. Any groundwater monitoring wells included in the on-going monitoring program that are damaged shall be assessed, repaired, replaced or decommissioned by the *Owner*, as required.
 - (a) The *Owner* shall repair or replace any monitoring well which is destroyed or in any way made to be inoperable for sampling such that no more than one regular sampling event is missed.
 - (b) All monitoring wells which are no longer required as part of the groundwater monitoring program, and have been approved by the *District Manager* for abandonment, shall be decommissioned by the *Owner*, as required, in accordance with *O.Reg. 903*, that will prevent contamination through the abandoned well. A report on the decommissioning of the well shall be included in the Annual Report for the period during which the well was decommissioned.

Trigger Mechanisms and Contingency Plans

33. Trigger mechanisms and contingency plans for groundwater quality monitoring for the purpose of initiating investigative activities into the potential cause of increased contaminant concentrations at the property boundary shall be as in Items 3 and 4 of Schedule "A".
34. In the event of three (3) confirmed exceedence of a site-specific trigger level relating to leachate mounding or groundwater impacts due to leachate at the site's *property limit*, the *Owner* shall immediately notify the *District Manager*, and an investigation into the cause and the need for implementation of remedial or contingency actions shall be carried out by the *Owner* in accordance with the approved trigger mechanisms and associated contingency plans.
35. If monitoring results, investigative activities and/or trigger mechanisms indicate the need to implement contingency measures, the *Owner* shall ensure that the following steps are taken:
 - (a) The *Owner* shall notify the *District Manager*, in writing of the need to implement contingency measures, no later than 30 days after confirmation of the exceedences;
 - (b) Detailed plans, specifications and descriptions for the design, operation and maintenance of the contingency measures shall be prepared and submitted by the *Owner* to the *District Manager* for approval; and
 - (c) The contingency measures shall be implemented by the *Owner* upon approval by the *District Manager*.
36. The *Owner* shall ensure that any proposed changes to the site-specific trigger levels for leachate impact to the groundwater, shall be approved in advance by the *Director* via an amendment to this *Certificate*.

Changes to Monitoring Plan

37. The Owner may make request to changes to the monitoring program to the District Manager in accordance with the recommendations of the Annual Report as described in Condition 43.
38. Within fourteen (14) days of receiving the written correspondence from the District Office confirming that the District Office is in agreement with the proposed changes to the environmental monitoring program identified in the Annual Report, the Owner shall forward a letter identifying the proposed changes and a copy of the correspondences from the District Manager and all other correspondences and responses related to the Annual Report, to the Director requesting the Certificate be amended to approve the proposed changes to the environmental monitoring plan.
39. In the event any other changes to the environmental monitoring program are proposed outside of the recommendation of the annual report, the Owner shall follow current ministry procedures for seeking approval for amending the Certificate of Approval.

Contaminant Attenuation Zone/Buffer

40. Within two (2) years from the date of this Certificate, the Owner shall complete acquiring the ground water easement to the proposed contaminant attenuation zone and buffer lands.

Certificate of Requirement/Registration on Title

41. Pursuant to Section 197 of the EPA, neither the Owner nor any 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.

Additional Buffer/Contaminant Attenuation Zone

42. The Municipality shall:
 - (a) within sixty (60) calendar days of the date of the purchase or the easement agreement being signed with the property owner(s) of the land required for the Additional Buffer and the Contaminant Attenuation Zone, submit to the Director for the Director's signature two (2) copies of a completed Certificate of Requirement containing a registerable description of the land required for the Additional Buffer and the Contaminant Attenuation Zone, in accordance with the form included in Schedule "B";
 - (b) within ten (10) calendar days of receiving the Certificate of Requirement signed by the Director, the Certificate of Requirement is registered in the appropriate Land Registry Office on title to the property containing the Additional Buffer and the Contaminant

Attenuation Zone and submit to the Director immediately following registration the duplicate registered copy;

- (c) within ten (10) calendar days of receiving the Certificate of Requirement signed by the Director, submit a copy of the Certificate of Requirement to the District Manager.

Annual Report

43. A written report on the development, operation and monitoring of the *Site*, shall be completed annually (the "Annual Report"). The Annual Report shall be submitted to the *District Manager*, by April 30th of the year following the period being reported upon.

Closure Plan

44. At least 2 years prior to the anticipated date of closure of this *Site*, the *Owner* shall submit to the *Director* for approval, with copies to the *District Manager*, a detailed *Site* closure plan pertaining to the termination of landfilling operations at this *Site*, post-closure inspection, maintenance and monitoring, and end use.
45. The *Site* shall be closed in accordance with the closure plan as approved by the *Director*.

Following items are added to Schedule "A":

3. Investigative Report, Red Rock Disposal Site, prepared for the Corporation of the Township of Killaloe-Hagarty-Richards, prepared by SGS Lakefield Research Limited, dated January 21, 2005.
4. Letter from Mrs. Lorna Hudder, CAO/Clerk Treasurer to Ranjani Munasinghe, Ministry of the Environment, dated June 21, 2006 accompanying the report entitled "Response to MOE Groundwater and Surface Water Comments" prepared by Greenview Environmental Management dated June 29, 2006.
5. Report entitled "2006 Annual Report, Red Rock Waste Disposal Site" dated March 2007, prepared by Greenview Environmental Management.
6. Letter dated May 8, 2007, From Tyler H. Peters, Greenview Environmental Management Limited to Ranjani Munasinghe, Ministry of the Environment.

Schedule "B"

CERTIFICATE OF REQUIREMENT

s. 197(2)

Environmental Protection Act

This is to certify that pursuant to a(n) [INSERT ORDER OR DECISION TYPE] [INSERT ORDER OR DECISION NUMBER OR IDENTIFIER] issued by [INSERT NAME OF ISSUING PERSON, POSITION] dated [INSERT DATE] with respect to [INSERT DESCRIPTION, SUCH AS CONTAMINATION, WASTE DISPOSAL SITE, ETC.] on the [INSERT REGISTRABLE DESCRIPTION OF THE PROPERTY]. The following person(s):

[INSERT PERSON(S) NAMED IN INSTRUMENT]

and any other persons having an interest in the [INSERT REGISTRABLE DESCRIPTION OF THE PROPERTY] are required, before dealing with the property in any way, to give a copy of the [INSERT ORDER OR DECISION TYPE] including any amendments that may be made thereto, to every person who will acquire an interest in the property as a result of the dealing.

Under subsection 197(3) of the Environmental Protection Act, this requirement applies to each person who, subsequent to the registration of this certificate, acquires an interest in the real property.

The reasons for this amendment to the Certificate of Approval are as follows:

1. The reason for this amendment is to approve the ground water monitoring plans, trigger mechanisms and contingency plans proposed by the Owner.
2. The reason for Condition 26 is to specify the approved amount of waste that may be accepted for disposal at the *Site*, based on the *Owner*'s application and supporting documentation.
3. Condition 27 is included to provide the groundwater limits to prevent water pollution at the *Site*.
4. Conditions 28 and 29 are included to require the Owner to demonstrate that the *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.
5. Conditions 30, 31 and 32 are included to ensure the integrity of the groundwater monitoring network so that accurate monitoring results are achieved and the natural environment is protected.
6. Condition 33, 34, 35 and 36 are added to ensure the *Owner* has a plan with an organized set of procedures for identifying and responding to potential issues relating to groundwater contamination near or at the *Site's* compliance point.

7. The reason for the Conditions 37, 38 and 39 is to streamline the approval of changes to the monitoring plans.
8. Condition 40 is included to require the Owner to obtain property rights to a land that is required for a buffer that would extend 30 metres in all directions from the actual waste location and for a Contaminant Attenuation Zone that is necessary for attenuation of contamination resulting from the operation of the Site.
9. Conditions 41 and 42 are included, pursuant to subsection 197(1) of the *EPA*, to provide that any persons having an interest in the Site or lands required for the Buffer and the Contaminant Attenuation Zone, are aware that the land has been approved and used for the purposes of waste disposal or attenuation of contamination resulting from the operation of a waste disposal site.
10. The reasons for Condition 43 are 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.
11. The reasons for Conditions 44 and 45 are to ensure that final closure of the *Site* is completed in an aesthetically pleasing manner, in accordance with Ministry standards, and to ensure the long-term protection of the health and safety of the public and the environment.

This Notice shall constitute part of the approval issued under Provisional Certificate of Approval No. A412307 dated October 22, 2004

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, 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 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.

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 Review Tribunal

The Director
Section 39, *Environmental Protection Act*

2300 Yonge St., Suite 1700
P.O. Box 2382
Toronto, Ontario
M4P 1E4

AND

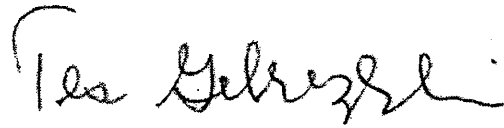
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

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

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 5th day of December, 2007

THIS NOTICE WAS MAILED
ON <u>Dec 07 2007</u>
<u>D.S.</u>
(Signed)



Tesfaye Gebrezghi, P.Eng.
Director
Section 39, *Environmental Protection Act*

RM/

c: District Manager, MOE Ottawa
Tyler H. Peters, B.Sc., Greenview Environmental Management ✓



Ontario

Ministry of the Environment
Ministère de l'Environnement

AMENDED PROVISIONAL CERTIFICATE OF APPROVAL
WASTE DISPOSAL SITE
NUMBER A412307

The Corporation of the Township of Killaloe, Hagarty and Richards
PO Box 39
Killaloe, Ontario
K0J 2A0

Site Location: Red Rock Waste Disposal Site
Part Lot 11, Concession 7
in the geographic Township of Richards
within the Township of Killaloe, Hagarty and Richards, Renfrew County

You have applied in accordance with Section 27 of the Environmental Protection Act for approval of:

the use and operation of Waste Disposal Site consisting of a 1.0 hectare Landfill as well as a Transfer Station, within a 1.7 hectare Site.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

- (a) "Act" means the *Environmental Protection Act*, R.S.O. 1990, C.E-19, as amended;
- (b) "Certificate" means this Provisional Certificate of Approval;
- (c) "Competent" means knowledgeable and able to carry out any necessary duties, in the following through instruction and practice;
 - i. relevant waste management legislation, regulations and guidelines;
 - ii. major environmental concerns pertaining to the waste to be handled;
 - iii. emergency response procedures for the waste to be handled;
 - iv. use and operation of any equipment to be used;
 - v. emergency response procedures and alerting;
 - vi. Owner specific written procedures for the control of conditions that may cause an adverse effect; and
 - vii. requirements of this Certificate;
- (d) "Director" means Director, Environmental Assessment and Approvals Branch, Ontario Ministry of the Environment;
- (e) "District Manager" means District Manager, Ottawa District Office, Ontario Ministry of the Environment;

- (f) **"Limit of Fill"** means the area in which waste is approved for final disposal according to this Certificate;
- (g) **"Ministry"** and **"MOE"** means the Ontario Ministry of the Environment;
- (h) **"OWRA"** means the *Ontario Water Resources Act*, R.S.O. 1990, c. O.40, as amended;
- (i) **"Ontario Regulation 347"** means Ontario Regulation 347 - R.R.O. 1990, General - Waste Management, as amended from time to time, made under the Act;
- (j) **"Owner"** means the Township of Killaloe-Hagarty-Richards and any person(s) contracted by the Township of Killaloe-Hagarty-Richards to manage operations on the Site on behalf of the Owner;
- (h) **"PWQO"** means the Provincial Water Quality Objectives included in the July 1994 publication entitled *Water Management Policies, Guidelines, Provincial Water Quality Objectives*, as amended from time to time;
- (k) **"RUP"** means the Reasonable Use Policy (Guideline B-7) of the Ministry of the Environment;
- (l) **"Site"** means the property located at Part Lot 11, Concession 7, geographic Township of Richards, within the Township of Killaloe-Hagarty-Richards, Renfrew County leased from the Ministry of Natural Resources under Land Use Permit LUP1675-1006161.

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

TERMS AND CONDITIONS

General

1. This Provisional Certificate of Approval supersedes and replaces Provisional Certificate Number A412307 issued April 2, 1981.
2. Except as otherwise provided by these Conditions, the Site shall be designed, developed, used, maintained and operated, and all facilities, equipment and fixtures shall be built and or installed in accordance with the Application for a Certificate of Approval for a Waste Disposal Site dated June 24, 2004, and supporting documentation, and plans and specifications listed in Schedule "A".
3. The requirements specified in this Certificate are requirements under the Act. Issuance of this Certificate in no way abrogates the Owner's legal obligations to take all reasonable steps to avoid violating other applicable provisions of this legislation and other legislation and regulations.

4. **The requirements of this Certificate are severable. If any requirements 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 in any way.**
 5. **The Owner must ensure compliance with all terms and conditions of this Certificate. Any non-compliance constitutes a violation of the Act and is grounds for enforcement.**
 6.
 - (a) **The Owner shall, forthwith upon request of the Director, District Manager, or Provincial Officer (as defined in the Act), furnish any information requested by such persons with respect to compliance with this Certificate, including but not limited to, any records required to be kept under this Certificate; and**
 - (b) **In the event the Owner provides the Ministry with information, records, documentation or notification in accordance with this Certificate (for the purposes of this condition referred to as "Information"),**
 - (i) **the receipt of Information by the Ministry;**
 - (ii) **the acceptance by the Ministry of the Information's completeness or accuracy;**
or
 - (iii) **the failure of the Ministry to prosecute the Owner, or to require the Owner to take any action, under this Certificate or any statute or regulation in relation to the Information;****shall not be construed as an approval, excuse or justification by the Ministry of any act or omission of the Owner relating to the Information, amounting to non-compliance with this Certificate or any statute or regulation.**
7. **The Owner shall allow Ministry personnel, or a Ministry authorized representative(s), upon presentation of credentials, to;**
 - (a) **carry out any and all inspections authorized by Section 156, 157 or 158 of the Act, Section 15, 16 or 17 of the OWRA, or Section 19 or 20 of the Pesticides Act, R.S.O. 1990, as amended from time to time, of any place to which this Certificate relates; and,**
 - (b) **without restricting the generality of the foregoing, to:**
 - (i) **enter upon the premises where records required by the conditions of this Certificate are kept;**
 - (ii) **have access to and copy, at reasonable times, any records required by the conditions of this Certificate;**
 - (iii) **inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations required by the conditions of this Certificate; and**
 - (iv) **sample and monitor at reasonable times for the purposes of assuring compliance with the conditions of this Certificate.**

8. Where there is a conflict between a provision of any document referred to in Schedule "A", and the conditions of this Certificate, the conditions in this Certificate shall take precedence. Where there is a conflict between the documents listed in Schedule "A", the document bearing the most recent date shall prevail.
9. Any information 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*, R.S.O. 1990, C. F-31.
10. All records and monitoring data required by the conditions of this Certificate must be kept on the Owner's premises for a minimum period of five (5) years from the date of their creation.

Notification

11. The Owner shall ensure that all communications/correspondence made pursuant to this Provisional Certificate of Approval reference Certificate No. A412307.
12. The Owner shall notify the Director in writing of any of the following changes, within thirty (30) days of the change occurring:
 - (a) change of Owner's name or address;
 - (b) change of ownership of the Site;
 - (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*, 1991 shall be included in the notification to the Director; and
 - (d) any change of name of the corporation where the Owner is or at any time becomes a corporation, and a copy of the most current "Initial Notice or Notice of Change" (form 1 or 2 of O. Regulation 182, Chapter C-39, R.R.O. 1990, as amended from time to time), filed under the *Corporations Information Act* shall be included in the notification to the Director.
13. In the event of any change in ownership of the Site, the Owner shall notify in writing the succeeding owner of the existence of this Provisional Certificate of Approval, and a copy of such notice shall be forwarded to the Director.

Site Operations - Transfer Station

14. The Transfer Station shall be designed and operated in accordance with Item 2 of Schedule "A", or as amended in writing by the District Manager.
15. The Transfer Station shall only be used for the receiving and transferring of solid, non-hazardous, waste generated within the geographic boundaries of the Township of Killaloe-Hagarty-Richards. The Site is prohibited from accepting the following:
 - (a) liquid, non-hazardous waste;
 - (b) liquid, hazardous waste;
 - (c) biomedical waste;

- (d) PCB wastes;
 - (e) explosive waste;
 - (f) scrap metal;
 - (g) white goods;
 - (h) tires;
 - (i) brush, yard waste and wood waste.
16. (a) The Owner shall set operational hours which provides an adequate level of service. The hours of operation shall be any day of the week, during daylight hours.
- (b) Hours of operation may be changed by the Owner at any time, provided that the hours are correctly posted at the Site gate and that suitable public notice is given of any change.
17. The Owner shall erect a sign at the entrance to this Site stating the name of the Owner of the Site, the hours of operation of the Transfer Station, waste acceptance procedure and a phone number to contact in the event of an emergency or complaint. The sign shall state which wastes are not accepted at the Site and shall direct persons with these wastes to the nearest appropriate facility.
18. (a) The Owner shall ensure that a Competent attendant(s) is/are on duty at all times when the Site is open to ensure proper supervision of all activities; and
- (b) The entrance gate to the Site shall be locked during non-operating hours to prevent unauthorized entry.
19. The Owner shall ensure that waste is handled in the following manner:
- (a) solid, non-hazardous mixed waste shall be collected in a mobilr compactor vehicle to a maximum of 16 m³;
 - (b) recyclable waste shall be segregated into a maximum of eighteen (18) 360 L clearly labelled bins. The lids of the bins shall be kept closed, except when waste is being deposited, to prevent the occurrence of litter;
 - (c) all litter in the waste transfer area shall be picked up as necessary to maintain a clean and orderly Site; and
 - (d) all waste and recyclable material shall be transferred from the Site at the end of each operating day.
20. The Owner shall ensure that each day on which the Site is open to accept waste for transfer, the Site is inspected. Any deficiencies noted during the inspection shall be promptly remediated.
21. The Owner shall maintain records on transfer activities including:
- (a) date of record;
 - (b) quantities of waste transferred from the Site; and
 - (c) any accidents, injuries, spills, leaks, other upsets or complaints received.
22. Burning of any wastes or materials is prohibited.

23. In the event the waste cannot be transferred from the Site, the Owner shall cease accepting waste and shall ensure the total amount of waste on Site does not exceed the maximum quantities approved under Condition 19.
24. (a) If any incoming waste load is known to, or is discovered to, contain unacceptable waste, that load shall not be accepted at the Site; and
(b) If any unacceptable waste is discovered on-site, that waste shall be removed from the Site at the end of the operating day. Any unacceptable waste removed from the Site shall be disposed in accordance with the Act and Ontario Regulation 347.

Site Operations - Landfill

25. The Owner shall refrain from further landfilling of waste on the Site, and shall apply intermediate interim cover to all cells where waste has been deposited. No further landfilling shall take place at this Site without the Director's approval.
26. By January 31, 2005, the Owner shall submit to the Director, for the Director's approval, an assessment of the surface and groundwater quality of the Site and a plan for the long-term monitoring of the Site to ensure compliance with PWQO and RUP.

SCHEDULE "A"

This Schedule "A" forms part of Certificate of Approval No. A412307.

1. Application for a Provisional Certificate of Approval for a Waste Disposal Site signed by Mrs. Lorna Hudder, CAO/Clerk Treasurer, dated June 24, 2004.
2. Design and Operations Plan, Municipal Solid Waste Transfer Station, Red Rock Disposal Site, prepared for the Corporation of the Township of Killaloe-Hagarty-Richards, prepared by SGS Lakefield Research Limited, dated June 23, 2004.

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

The reason for Condition 1 is to clarify that the previously issued Certificate of Approval No. A412307 issued on April 2, 1981 is no longer in effect and has been replaced and superseded by the Terms and Conditions stated in this Certificate.

The reason for Conditions 2, 14 and 21 is to ensure that this Site is operated in accordance with the application submitted by the Owner, and not in a manner which the Director has not been asked to consider.

The reason for Conditions 3, 4, 5, 8, 9, 10, 11, 12 and 13 is to clarify the legal responsibilities and obligations imposed by this Certificate.

The reason for Conditions 6 and 7 is to ensure that appropriate Ministry staff have ready access to the Site in order to confirm that the Site is being operated according to this Certificate. The condition is supplementary to the powers afforded a Provincial Officer pursuant to the Act, the OWRA, and the Pesticides Act, as amended.

The reason for Conditions 15 and 17 is to ensure that the types and quantities of waste received at the Site are in accordance with that approved under this Certificate.

The reason for Conditions 16, 22 and 23 is to ensure that the site is operated in a manner which does not result in a nuisance or a hazard to the health and safety of the environment or people.

The reason for Condition 18 is to ensure the Site is only operated in the presence of trained personnel and to minimize the risk of unauthorized entry.

The reason for Condition 19 is to ensure that waste storage is done in a manner and duration which does not result in a nuisance or a hazard to the health and safety of the environment or people.

The reason for Condition 20 is to ensure that deficiencies in fencing, road access etc are promptly identified and remediated.

The reason for Condition 24(a) is to ensure that only waste approved under this Certificate are received at the Site.

The reason for Condition 24(b) is to promptly remove unapproved waste from the Site to an alternate location that is approved to store such waste, until such time as the waste can be disposed in accordance with the Act and Ontario Regulation 347.

This Provisional Certificate of Approval revokes and replaces Certificate(s) of Approval No. A412307 issued on April 2, 1981

In accordance with Section 139 of the Environmental Protection Act, R.S.O. 1990, Chapter E-19, as amended, 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 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.

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 Review Tribunal
2300 Yonge St., 12th Floor
P.O. Box 2382
Toronto, Ontario
M4P 1E4

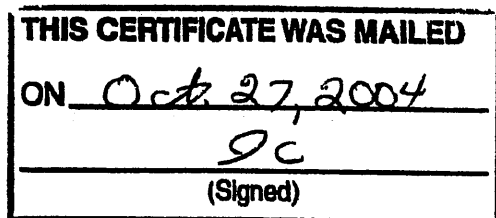
AND

The Director
Section 39, *Environmental Protection Act*
Ministry of Environment and Energy
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) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca

The above noted waste disposal site is approved under Section 39 of the Environmental Protection Act.

DATED AT TORONTO this 22nd day of October, 2004



Ian Parrott, P.Eng.
Director
Section 39, *Environmental Protection Act*

VP/
c: District Manager, MOE Ottawa
Tyler Peters, SGS Lakefield Research Limited ✓

The applicant(s) hereby applies to the Land Registrar.

yyyy mm dd Page 1 of 2

Properties

PIN 57539 - 0025 LT
Description PT LTS 11 & 12, CON 7, RICHARDS, PT 1, 49R17067 TOWNSHIP OF KILLALOE,
 HAGARTY AND RICHARDS
Address KILLALOE

Party From(s)

Name DIRECTOR APPOINTED UNDER SECTION 5 OF THE ENVIRONMENTAL PROTECTION ACT
Address for Service 2 St. Clair Avenue West
 Floor 12A
 Toronto, Ontario
 M4V 1L5

This document is not authorized under Power of Attorney by this party.

This document is being authorized by a representative of the Crown.

Party To(s)*Capacity**Share*

Name THE CORPORATION OF THE TOWNSHIP OF KILLALOE,
 HAGARTY AND RICHARDS
Address for Service 1 John Street
 Killaloe, Ontario
 K0J 2A0

Statements

Schedule: See Schedules

Signed By

Darlene Okum 203 Nelson Street acting for Signed 2010 12 10
 Pembroke
 K8A 3N1 Party From(s)
 Tel 6137352313
 Fax 6137352013

I have the authority to sign and register the document on behalf of the Party From(s).

Submitted By

ROY C. REICHE, BARRISTER & SOLICITOR 203 Nelson Street 2010 12 10
 Pembroke
 K8A 3N1
 Tel 6137352313
 Fax 6137352013

Fees/Taxes/Payment

Statutory Registration Fee \$60.00
Total Paid \$60.00

SCHEDULE "A"

CERTIFICATE OF REQUIREMENT

s. 197(2) of the *Environmental Protection Act*

This is to certify that pursuant to a Provisional Certificate of Approval No. A412307, issued by the Director, Ontario Ministry of Environment, dated October 22, 2004, as amended on December 5, 2007, with respect to a Waste Disposal Site, on Part of Lots 11 & 12, Concession 7, Richards, Part 1, Plan 49R17067, Township of Killaloe, Hagarty and Richards, being all of PIN 57539-0025(LT).
The following person(s):

**THE CORPORATION OF THE TOWNSHIP OF KILLALOE, HAGARTY AND
RICHARDS**

and any other persons having an interest in Part of Lots 11 & 12, Concession 7, Richards, Part 1, Plan 49R17067, Township of Killaloe, Hagarty and Richards, being all of PIN 57539-0025(LT) are required, before dealing with the land in any way, to give a copy of the Provisional Certificate of Approval, including any amendments that may be made thereto to every person who will acquire an interest in the land as a result of the dealing. Under subsection 197(3) of the *Environmental Protection Act*, this requirement applies to each person who, subsequent to the registration of this certificate, acquires an interest in the land.

SCHEDULE

All of Location CL 15293,
Being part of Lots 11 and 12, Concession 7,
Geographic Township of Richards,
Municipal Township of Killaloe, Hagarty and Richards,
County of Renfrew,
Containing 3.583 hectares, more or less,
Designated as Part 1, on Reference Plan 49R-17067.

Appendix B



Project No: 10781-003

Log of Borehole: BH04-1

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth	Strata Plot	Description	Samples				Well Installation	Remarks
			Number	Type	% Recovery	SPT (n)		
0		Ground Surface						Well equipped with lockable steel casing and lock. Stick-up=0.80 m
1		Sand and Gravel Brown, dry, loose	1	AS	-	-	Concrete	
2			2	SS	90	12		
3		Sand Fine to coarse, stratified, trace stone, grey, damp	3	SS	100	11	Quick Grout	
4			4	SS	100	6		
5			5	SS	100	7		
6			6	SS	100	6		
7		Sand Fine to medium, brown with seams of orange staining, moist to wet	7	SS	100	4	Bentonite Holeplug	
8			8	SS	80	4		
9		Silt Grey, dense	9	SS	50	2	Filter Sand	
10			10	SS	50	3		
11		Sand Fine to medium, brown with seams of orange colouring, moist to wet						
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25		borehole terminated in Sand						MOE Well Tag No. XXXXXX
26								UTM Coord. N 5,081,920 E 303,960
27								
28								
29								

Drill Method: Hollow Stem Auger (CME 75)

Drill Date: August 5, 2004

Input by: D. Bucholtz

Checked by: R. Focht

Sheet: 1 of 1

SGS

Project No: 10781-003

Log of Borehole: BH04-2

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth	Strata Plot	Description	Samples				Well Installation	Remarks
			Number	Type	% Recovery	SPT (n)		
0		Ground Surface						Well equipped with lockable steel casing and lock. Stick-up=0.85 m
0.5		Sand and Gravel Brown, dry, loose	1	AS	-	-	Concrete	
1.5			2	SS	100	6		
2.5			3	SS	50	3		
3.5		Fill Mixed waste (plastic, wood, textile, glass) with sand, damp to moist	4	SS	10	2	Quick Grout	
4.5			5	SS	50	2		
5.5			6	SS	75	13		
6.5		Sand Fine to coarse, stratified, brown to grey, moist to wet	7	SS	50	13	Bentonite Holeplug	
7.5			8	SS	100	13		
8.5		Silty Sand Grey, wet	9	SS	75	8	Filter Sand	
9.5			10	SS	90	6		
10.5		Sand Medium, grey, wet	11	SS	100	4		
11.5		borehole terminated in Sand						MOE Well Tag No. XXXXX
12.5								UTM Coord. N 5,061,925 E 304,025

Drill Method: Hollow Stem Auger (CME 75)

Drill Date: August 5, 2004

Input by: D. Bucholtz

Checked by: R. Focht

Sheet: 1 of 1

SGS

Project No: 10781-003

Log of Borehole: BH04-3

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth ft m	Strata Plot	Description	Samples				Well Installation	Remarks
			Number	Type	% Recovery	SPT (m)		
-3 -2 -1		Ground Surface					Well equipped with lockable steel casing and lock. Stick-up=0.75 m	
0 1 2 3 4 5		Sand and Gravel Brown, dry, loose	1 2	AS SS	- 100	- 7	Concrete	
6 7 8 9 10 11 12		Sand Fine to coarse, stratified, trace stone, grey, damp	3 4 5	SS SS SS	100 100 100	8 5 10	Quick Grout	
13 14 15 16 17 18 19		Sand Fine to medium, brown, moist to wet	6 7 8	SS SS SS	100 100 100	6 7 4	Bentonite Holeplug Filter Sand	
20 21 22 23 24 25 26 27 28 29		borehole terminated in Sand					MOE Well Tag-No. XXXXXX UTM Coord. N 5,061,985 E 304,005	

Drill Method: Hollow Stem Auger (CME 75)

Drill Date: August 5, 2004

Input by: D.Bucholtz

Checked by: R. Focht

Sheet: 1 of 1



Project No: 10781-003

Log of Borehole: BH04-4

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth	Strata Plot	Description	Samples				Well Installation	Remarks
			Number	Type	% Recovery	SPT (n)		
ft -3 -2 -1 0		Ground Surface						Well equipped with lockable steel casing and lock. Stick-up=0.71 m
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29		<i>Sand</i> Fine to coarse, stratified, trace stone, grey, damp	1	AS	-	-	Concrete	
			2	SS	90	6	Quick Grout	
			3	SS	100	7		
			4	SS	100	5	Bentonite Holeplug	
			5	SS	100	5		
		<i>Sand</i> Fine to medium, brown, stratified, moist to wet	6	SS	100	8	Filter Sand	
			7	SS	100	10		
			8	SS	100	8		
		<i>Sand</i> Fine, grey, wet	9	SS	100	6		
			10	SS	100	2		
		borehole terminated in Sand						
								MOE Well Tag No. A008437
								UTM Coord. N 5,061,960 E 304,090

Drill Method: Hollow Stem Auger (CME 75)

Drill Date: August 6, 2004

Input by: D. Bucholtz

Checked by: R. Focht

Sheet: 1 of 1

SGS

Project No: 10781-003

Log of Borehole: BH04-5

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth	Strata Plot	Description	Samples				Well Installation	Remarks	
			Number	Type	% Recovery	SPT (n)			
0		Ground Surface						Well equipped with lockable steel casing and lock. Stick-up=0.77 m	
1		Sand and Gravel Brown, dry, loose	1	AS	-	-		Concrete	
2			2	SS	100	3			
3		Sand Fine to medium, stratified, grey, damp	3	SS	100	6		Quick Grout	
4			4	SS	100	4			
5			5	SS	100	10			
6			6	SS	100	11			Bentonite Holeplug
7			7	SS	100	2			Filter Sand
8		8	SS	100	5				
6		Silt Grey, wet							
6		Sand Fine, grey, wet							
		borehole terminated in sand							

MOE Well Tag No. XXXXXX

UTM Coord.
N 5,061,905
E 304,070

Drill Method: Hollow Stem Auger (CME 75)

Drill Date: August 6, 2004

Input by: D. Bucholtz

Checked by: R. Focht

Sheet: 1 of 1

Project No: 10781-003

Log of Borehole: BH04-6

Project: Red Rock WTS

Client: Township of Killaloe-Haggarty-Richards

Location: See Site Plan

Logged By: D. Bucholtz

Depth	Strata Plot	Description	Samples				Well Installation	Remarks
			Number	Type	% Recovery	SPT (n)		
0		Ground Surface						Well equipped with lockable steel casing and lock. Stick-up=0.53 m
0.5		Sand and Gravel Brown, dry, loose	1	AS	-	-	Concrete	
1.5			2	SS	100	8		
2.5		Sand Fine to medium, stratified, grey, damp	3	SS	100	11	Quick Grout	
3.5			4	SS	100	8		
4.5			5	SS	100	9		
5.5		Sand Medium to coarse, brown, stratified, damp to wet	6	SS	85	11	Bentonite Holeplug	
6.5			7	SS	100	11		
7.5		Sand Fine, grey, wet	8	SS	100	4	Filter Sand	
8.5		Orange colouring at 6.4 to 6.5 m	9	SS	100	6		
9.5		Silt Grey, wet borehole terminated in silt						

MOE Well Tag No. XXXXXX
UTM Coord.
N 5,061,865
E 304,040

Drill Method: Hollow Stem Auger (CME 75)
Drill Date: August 6, 2004
Input by: D. Bucholtz
Checked by: R. Focht
Sheet: 1 of 1





Greenview

ENVIRONMENTAL MANAGEMENT

Greenview Environmental Management Limited
 88 Cleak Avenue, P.O. Box 100
 Bancroft, Ontario K0L 1C0
 T: (613) 332-0057
 F: (613) 332-1767
 e: solutions@greenview-environmental.ca

Log of Monitoring Well: MW06-7

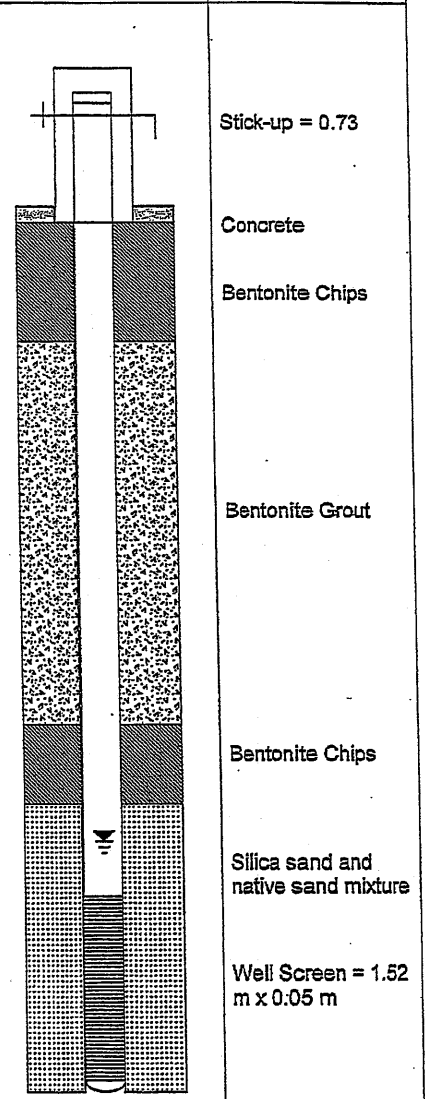
Project No.: 107.06.004

Project: Red Rock Waste Disposal Site

Client: Township of Killaloe Hagarty Richards

Location: See Site Plan

SUBSURFACE STRATA PROFILE			SAMPLE				Well Completion Details	Comments
Depth	Symbol	Description	No.	Type	% R	SPT N-Value		
						0 15 30 45 60		
0		Ground Surface						
0.5		Topsoil Dark brown, organic topsoil, moist, loosely compacted.	1	AS	100			
1.5		Fine to Medium Sand Grey-brown, fine to medium sand, moist, loosely compacted.	2	SS	80			
3.5		Medium Sand Red-brown, medium sand, moist, loosely compacted.	3	SS	75			
5.5		Medium to Coarse Sand Light brown, medium to coarse sand, moist, loosely compacted with sub-angular to sub-rounded granitic gravel.	4	SS	70			
7.5		Fine to Medium Sand Grey-brown to grey, fine to medium sand, moist, loosely compact.	5	SS	70			
9.5			6	SS	85			
11.5		Fine Silty Sand Grey, fine sand with some silt, saturated at 18 feet, loosely compacted. Thin layers of brown, medium sand (< 1 cm) at 23 feet.	7	SS	75			
13.5			8	SS	70			
15.5			9	SS	70			
17.5			10	SS	80			
19.5								
21.5								
23.5								
25.5		End of Borehole						



Drilled By: Lantech Drilling Ltd.

Drill Method: Hollow Stem Augers

Drill Date: April 21, 2006

Logged By: S. Reynolds

Checked By: T. Peters

Sheet: 1 of 1



Greenview

ENVIRONMENTAL MANAGEMENT

Greenview Environmental Management Limited
 69 Cleak Avenue, P.O. Box 100
 Bancroft, Ontario K0L 1C0
 T: (613) 332-0057
 F: (613) 332-1767
 E: solutions@greenview-environmental.ca

Log of Monitoring Well: MW06-8

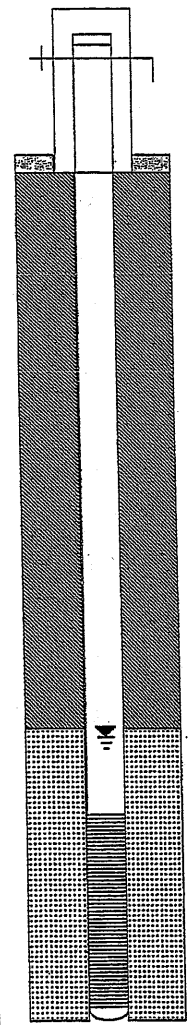
Project No.: 107.06.004

Project: Red Rock Waste Disposal Site

Client: Township of Killaloe Hagarty Richards

Location: See Site Plan

SUBSURFACE STRATA PROFILE			SAMPLE				Well Completion Details	Comments
Depth	Symbol	Description	No.	Type	% R	SPT N-Value		
						0 15 30 45 60		
ft m								
-5								
-3								
-1		Ground Surface						
1		Topsoil Dark brown, organic topsoil, moist, loosely compacted.	1	AS	100			
3	1	Fine to Medium Sand Light brown to brown, fine to medium sand, moist, loosely compacted.	2	SS	80			
5			3	SS	75			
7								
9	3	Fine Silty Sand Grey, fine sand with some silt, moist, loosely compacted.	4	SS	80			
11		Medium Sand Light brown, medium sand, moist, loosely compacted.	5	SS	75			
13		Fine to Medium Sand Grey, fine to medium sand, moist, loosely compacted.	6	SS	75			
15	5	Medium to Coarse Sand Light brown turning to dark brown, medium to coarse sand, moist, loosely compacted.	7	SS	80			
17		Fine to Medium Sand Red-brown, fine to medium sand, moist, loosely compacted.	8	SS	80			
19		Fine to Medium Sand Grey, fine to medium sand, loosely compacted and saturated at 16 feet.	9	SS	90			
21								
23	7	End of Borehole						
25								



Drilled By: Lantech Drilling Ltd.

Drill Method: Hollow Stem Augers

Drill Date: April 21, 2006

Logged By: S. Reynolds

Checked By: T. Peters

Sheet: 1 of 1

Appendix C



Appendix D



C.O.C.: G77513

REPORT No. B19-13427 (i)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100

Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave

Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 15-May-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 30-May-19

P.O. NUMBER: -

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed	Client I.D.	BH04-1	BH04-3	BH04-4	BH04-5
					Sample I.D.	BH04-1	BH04-3	BH04-4	BH04-5
					Date Collected	13-May-19	13-May-19	13-May-19	13-May-19
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	17-May-19/O		10	8	52	264
pH @25°C	pH Units		SM 4500H	17-May-19/O		6.38	6.09	5.99	6.72
Conductivity @25°C	µmho/cm	1	SM 2510B	17-May-19/O		46	29	943	603
Chloride	mg/L	0.5	SM4110C	27-May-19/O		2.0	0.7	21.3	6.6
Nitrate (N)	mg/L	0.05	SM4110C	27-May-19/O		0.28	0.19	0.34	0.18
Sulphate	mg/L	1	SM4110C	27-May-19/O		6	4	383	21
BOD(5 day)	mg/L	3	SM 5210B	15-May-19/K					4
Total Suspended Solids	mg/L	3	SM2540D	23-May-19/K					295000
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-May-19/K		0.08	0.05	0.07	9.60
TDS (Calc. from Cond.)	mg/L	1	Calc.	21-May-19		23	15	501	313
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	23-May-19/O		1.8	2.0	12.4	8.9
COD	mg/L	5	SM 5220D	29-May-19/O		< 5	5	107	124
Arsenic	mg/L	0.0001	EPA 200.8	24-May-19/O		< 0.0001	< 0.0001	0.0013	0.0004
Barium	mg/L	0.001	SM 3120	22-May-19/O		0.005	0.007	0.122	0.230
Boron	mg/L	0.005	SM 3120	22-May-19/O		< 0.005	< 0.005	2.93	0.305
Calcium	mg/L	0.02	SM 3120	22-May-19/O		2.64	2.52	121	75.9
Chromium	mg/L	0.001	EPA 200.8	24-May-19/O		0.001	0.001	0.001	0.002
Copper	mg/L	0.002	SM 3120	22-May-19/O		< 0.002	< 0.002	< 0.002	< 0.002
Iron	mg/L	0.005	SM 3120	22-May-19/O		< 0.005	< 0.005	0.008	40.9
Magnesium	mg/L	0.02	SM 3120	22-May-19/O		0.85	0.77	25.5	12.9
Manganese	mg/L	0.001	SM 3120	22-May-19/O		0.001	0.010	2.82	4.66
Sodium	mg/L	0.2	SM 3120	22-May-19/O		4.2	1.5	51.7	13.7



Michelle Dubien
 Lab Manager

R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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C.O.C.: G77513

REPORT No. B19-13427 (i)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100

Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave

Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 15-May-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 30-May-19

P.O. NUMBER: -

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed	Client I.D.	BH04-6	MW06-7	MW06-8	QA/QA GW
					Sample I.D.	B19-13427-5	B19-13427-6	B19-13427-7	B19-13427-8
Date Collected					13-May-19	13-May-19	13-May-19	13-May-19	13-May-19
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	17-May-19/O	18	17	8	9	
pH @25°C	pH Units		SM 4500H	17-May-19/O	6.56	6.59	6.39	6.37	
Conductivity @25°C	µmho/cm	1	SM 2510B	17-May-19/O	83	73	49	44	
Chloride	mg/L	0.5	SM4110C	27-May-19/O	4.4	1.1	2.4	1.9	
Nitrate (N)	mg/L	0.05	SM4110C	27-May-19/O	0.52	0.18	0.19	0.25	
Sulphate	mg/L	1	SM4110C	27-May-19/O	9	12	9	6	
BOD(5 day)	mg/L	3	SM 5210B	15-May-19/K					
Total Suspended Solids	mg/L	3	SM2540D	23-May-19/K					
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	24-May-19/K	0.09	0.06	0.05	0.03	
TDS (Calc. from Cond.)	mg/L	1	Calc.	21-May-19	42	37	25	22	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.1	23-May-19/O	2.1	2.4	2.8	1.7	
COD	mg/L	5	SM 5220D	29-May-19/O	48	35	89	20	
Arsenic	mg/L	0.0001	EPA 200.8	24-May-19/O	< 0.0001	< 0.0001	< 0.0001	< 0.0001	
Barium	mg/L	0.001	SM 3120	22-May-19/O	0.008	0.009	0.002	0.005	
Boron	mg/L	0.005	SM 3120	22-May-19/O	0.019	0.008	0.005	< 0.005	
Calcium	mg/L	0.02	SM 3120	22-May-19/O	5.69	8.05	2.71	2.73	
Chromium	mg/L	0.001	EPA 200.8	24-May-19/O	0.003	0.001	0.001	0.001	
Copper	mg/L	0.002	SM 3120	22-May-19/O	< 0.002	< 0.002	< 0.002	< 0.002	
Iron	mg/L	0.005	SM 3120	22-May-19/O	0.036	0.011	0.006	< 0.005	
Magnesium	mg/L	0.02	SM 3120	22-May-19/O	1.55	1.84	1.01	0.88	
Manganese	mg/L	0.001	SM 3120	22-May-19/O	0.001	0.005	0.001	0.001	
Sodium	mg/L	0.2	SM 3120	22-May-19/O	8.2	2.1	4.9	4.3	

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
 Lab Manager

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C.O.C.: G77513

REPORT No. B19-13427 (ii)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100
 Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave
 Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 15-May-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 30-May-19

P.O. NUMBER: -

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	BH04-5			
			Sample I.D.	B19-13427-4			
			Date Collected	13-May-19			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Acetone	µg/L	30	EPA 8260	20-May-19/R	< 30		
Benzene	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Bromobenzene	µg/L	0.4	EPA 8260	20-May-19/R	< 0.4		
Bromodichloromethane	µg/L	2	EPA 8260	20-May-19/R	< 2		
Bromoform	µg/L	5	EPA 8260	20-May-19/R	< 5		
Bromomethane	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Carbon Tetrachloride	µg/L	0.2	EPA 8260	20-May-19/R	< 0.2		
Chloroethane	µg/L	3	EPA 8260	20-May-19/R	< 3		
Chloroform	µg/L	1	EPA 8260	20-May-19/R	< 1		
Chloromethane	µg/L	2	EPA 8260	20-May-19/R	< 2		
Chlorotoluene,2-	µg/L	0.2	EPA 8260	20-May-19/R	< 0.2		
Chlorotoluene,4-	µg/L	0.2	EPA 8260	20-May-19/R	< 0.2		
Dibromo-3-Chloropropane, 1,2-	µg/L	0.6	EPA 8260	20-May-19/R	< 0.6		
Dibromochloromethane	µg/L	2	EPA 8260	20-May-19/R	< 2		
Dibromoethane,1,2- (Ethylene Dibromide)	µg/L	0.2	EPA 8260	20-May-19/R	< 0.2		
Dibromomethane	µg/L	0.1	EPA 8260	20-May-19/R	< 0.1		
Dichlorobenzene,1,2-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Dichlorobenzene,1,3-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	20-May-19/R	1.2		
Dichlorodifluoromethane	µg/L	2	EPA 8260	20-May-19/R	< 2		
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Dichloroethane,1,2-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	20-May-19/R	2.1		
Dichloroethene, trans-1,2-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Dichloroethylene,1,1-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		



R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien
 Lab Manager

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C.O.C.: G77513

REPORT No. B19-13427 (ii)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100
 Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave
 Kingston Ontario K7K 6Z1
 Tel: 613-544-2001
 Fax: 613-544-2770

DATE RECEIVED: 15-May-19

JOB/PROJECT NO.: Red Rock WDS


DATE REPORTED: 30-May-19

P.O. NUMBER: -

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method		Date/Site Analyzed			
			Method	Date	Site	Result		
Dichloromethane (Methylene Chloride)	µg/L	5	EPA 8260	20-May-19/R		< 5		
Dichloropropane,1,2-	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Dichloropropane,1,3-	µg/L	0.2	EPA 8260	20-May-19/R		< 0.2		
Dichloropropene, cis-1,3-	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Dichloropropene, trans-1,3-	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Dichloropropene,1,1-	µg/L	0.2	EPA 8260	20-May-19/R		< 0.2		
Ethylbenzene	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Hexachlorobutadiene	µg/L	0.6	EPA 8260	20-May-19/R		< 0.6		
Hexane	µg/L	5	EPA 8260	20-May-19/R		< 5		
Isopropylbenzene	µg/L	0.2	EPA 8260	20-May-19/R		< 0.2		
Isopropyltoluene,4-	µg/L	0.2	EPA 8260	20-May-19/R		< 0.2		
Methyl Butyl Ketone	µg/L	5	EPA 8260	20-May-19/R		< 5		
Methyl Ethyl Ketone	µg/L	20	EPA 8260	20-May-19/R		< 20		
Methyl Isobutyl Ketone	µg/L	20	EPA 8260	20-May-19/R		< 20		
Methyl-t-butyl Ether	µg/L	2	EPA 8260	20-May-19/R		< 2		
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Naphthalene	µg/L	0.4	EPA 8260	20-May-19/R		< 0.4		
n-Butylbenzene	µg/L	0.4	EPA 8260	20-May-19/R		< 0.4		
n-Propylbenzene	µg/L	0.1	EPA 8260	20-May-19/R		< 0.1		
sec-Butylbenzene	µg/L	0.1	EPA 8260	20-May-19/R		< 0.1		
Styrene	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
tert-Butylbenzene	µg/L	0.1	EPA 8260	20-May-19/R		< 0.1		
Tetrachloroethane,1,1,1,2-	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Tetrachloroethane,1,1,2,2-	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Tetrachloroethylene	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		
Toluene	µg/L	0.5	EPA 8260	20-May-19/R		< 0.5		



Michelle Dubien
 Lab Manager

R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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C.O.C.: G77513

REPORT No. B19-13427 (ii)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100

Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave

Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 15-May-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 30-May-19

P.O. NUMBER: -

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

			Client I.D.	BH04-5			
			Sample I.D.	B19-13427-4			
			Date Collected	13-May-19			
Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Trichlorobenzene,1,2,3-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trichlorobenzene,1,2,4-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trichloroethane,1,1,1-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trichloroethane,1,1,2-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trichloroethylene	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trichlorofluoromethane	µg/L	5	EPA 8260	20-May-19/R	< 5		
Trichloropropane,1,2,3-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		
Trimethylbenzene,1,2,4-	µg/L	1	EPA 8260	20-May-19/R	< 1		
Trimethylbenzene,1,3,5-	µg/L	0.1	EPA 8260	20-May-19/R	< 0.1		
Vinyl Chloride	µg/L	0.2	EPA 8260	20-May-19/R	< 0.2		
Xylene, m,p-	µg/L	1.0	EPA 8260	20-May-19/R	< 1.0		
Xylene, o-	µg/L	0.5	EPA 8260	20-May-19/R	< 0.5		



Michelle Dubien
 Lab Manager

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

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C.O.C.: G91559

REPORT No. B19-34659 (i)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100

Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave

Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 25-Oct-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 19-Nov-19

P.O. NUMBER:

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Client I.D.		BH04-1	BH04-3	BH04-4	BH04-5
			Reference Method	Date/Site Analyzed	Sample I.D.			
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	31-Oct-19/O	9	7	76	225
pH @25°C	pH Units		SM 4500H	30-Oct-19/O	6.49	6.39	6.75	7.22
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Oct-19/O	48	26	732	522
Chloride	mg/L	0.5	SM4110C	13-Nov-19/O	3.0	1.1	18.4	4.9
Nitrate (N)	mg/L	0.05	SM4110C	13-Nov-19/O	0.08	0.06	0.62	0.17
Sulphate	mg/L	1	SM4110C	13-Nov-19/O	6	3	239	26
BOD(5 day)	mg/L	3	SM 5210B	25-Oct-19/K				4
Total Suspended Solids	mg/L	3	SM2540D	28-Oct-19/K				24400
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	05-Nov-19/K	< 0.01	< 0.01	0.02	9.47
TDS (Calc. from Cond.)	mg/L	1	Calc.	01-Nov-19	24	13	382	270
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	15-Nov-19/O	0.9	0.6	9.1	7.5
COD	mg/L	5	SM 5220D	08-Nov-19/O	14	6	29	175
Arsenic	mg/L	0.0001	EPA 200.8	01-Nov-19/O	< 0.0001	< 0.0001	0.0009	0.0004
Barium	mg/L	0.001	SM 3120	31-Oct-19/O	0.012	0.007	0.042	0.173
Boron	mg/L	0.005	SM 3120	31-Oct-19/O	< 0.005	< 0.005	1.86	0.299
Calcium	mg/L	0.02	SM 3120	31-Oct-19/O	2.34	2.10	73.9	56.0
Chromium	mg/L	0.001	EPA 200.8	01-Nov-19/O	0.001	< 0.001	< 0.001	0.001
Copper	mg/L	0.002	SM 3120	31-Oct-19/O	0.002	< 0.002	< 0.002	< 0.002
Iron	mg/L	0.005	SM 3120	31-Oct-19/O	0.199	< 0.005	< 0.005	30.8
Magnesium	mg/L	0.02	SM 3120	31-Oct-19/O	0.78	0.65	17.8	11.4
Manganese	mg/L	0.001	SM 3120	31-Oct-19/O	0.008	0.006	0.543	3.71
Sodium	mg/L	0.2	SM 3120	31-Oct-19/O	4.5	1.3	46.0	13.8



R.L. = Reporting Limit

Test methods may be modified from specified reference method unless indicated by an *

Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien

Lab Manager

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C.O.C.: G91559

REPORT No. B19-34659 (i)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100

Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave

Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 25-Oct-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 19-Nov-19

P.O. NUMBER:

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed	Client I.D.	BH04-6	MW06-7	MW06-8	GW QA/QC
					Sample I.D.	B19-34659-5	B19-34659-6	B19-34659-7	B19-34659-8
Date Collected					21-Oct-19	21-Oct-19	21-Oct-19	21-Oct-19	21-Oct-19
Alkalinity(CaCO3) to pH4.5	mg/L	5	SM 2320B	31-Oct-19/O	16	18	8	8	
pH @25°C	pH Units		SM 4500H	30-Oct-19/O	6.82	6.76	6.61	6.57	
Conductivity @25°C	µmho/cm	1	SM 2510B	30-Oct-19/O	76	65	43	44	
Chloride	mg/L	0.5	SM4110C	13-Nov-19/O	5.9	1.1	1.3	3.0	
Nitrate (N)	mg/L	0.05	SM4110C	13-Nov-19/O	0.27	0.14	0.08	0.09	
Sulphate	mg/L	1	SM4110C	13-Nov-19/O	7	9	9	6	
BOD(5 day)	mg/L	3	SM 5210B	25-Oct-19/K					
Total Suspended Solids	mg/L	3	SM2540D	28-Oct-19/K					
Ammonia (N)-Total	mg/L	0.01	SM4500-NH3-H	05-Nov-19/K	0.04	0.03	0.02	< 0.01	
TDS (Calc. from Cond.)	mg/L	1	Calc.	01-Nov-19	38	33	22	22	
Dissolved Organic Carbon	mg/L	0.2	EPA 415.2	15-Nov-19/O	0.6	3.6	1.3	0.9	
COD	mg/L	5	SM 5220D	08-Nov-19/O	25	40	58	19	
Arsenic	mg/L	0.0001	EPA 200.8	01-Nov-19/O	< 0.0001	0.0001	< 0.0001	< 0.0001	
Barium	mg/L	0.001	SM 3120	31-Oct-19/O	0.007	0.014	0.004	0.011	
Boron	mg/L	0.005	SM 3120	31-Oct-19/O	0.006	0.009	< 0.005	< 0.005	
Calcium	mg/L	0.02	SM 3120	31-Oct-19/O	4.72	6.76	2.07	2.18	
Chromium	mg/L	0.001	EPA 200.8	01-Nov-19/O	0.001	< 0.001	< 0.001	0.001	
Copper	mg/L	0.002	SM 3120	31-Oct-19/O	< 0.002	< 0.002	0.002	0.002	
Iron	mg/L	0.005	SM 3120	31-Oct-19/O	0.017	1.68	0.011	0.185	
Magnesium	mg/L	0.02	SM 3120	31-Oct-19/O	1.40	1.67	0.80	0.76	
Manganese	mg/L	0.001	SM 3120	31-Oct-19/O	0.001	0.013	0.001	0.008	
Sodium	mg/L	0.2	SM 3120	31-Oct-19/O	7.4	1.9	4.5	4.5	



R.L. = Reporting Limit

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Site Analyzed=K-Kingston,W-Windsor,O-Ottawa,R-Richmond Hill,B-Barrie

Michelle Dubien

Lab Manager

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C.O.C.: G91559

REPORT No. B19-34659 (ii)

Report To:

Greenview Environmental Management

13 Commerce Crt., PO Box 100
 Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave
 Kingston Ontario K7K 6Z1
 Tel: 613-544-2001
 Fax: 613-544-2770

DATE RECEIVED: 25-Oct-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 19-Nov-19

P.O. NUMBER:

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Client I.D.	BH04-5		
Sample I.D.	B19-34659-4		
Date Collected	21-Oct-19		

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Acetone	µg/L	30	EPA 8260	07-Nov-19/R	< 30		
Benzene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Bromobenzene	µg/L	0.4	EPA 8260	07-Nov-19/R	< 0.4		
Bromodichloromethane	µg/L	2	EPA 8260	07-Nov-19/R	< 2		
Bromoform	µg/L	5	EPA 8260	07-Nov-19/R	< 5		
Bromomethane	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Carbon Tetrachloride	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Chloroethane	µg/L	3	EPA 8260	07-Nov-19/R	< 3		
Chloroform	µg/L	1	EPA 8260	07-Nov-19/R	< 1		
Chloromethane	µg/L	2	EPA 8260	07-Nov-19/R	< 2		
Chlorotoluene,2-	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Chlorotoluene,4-	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Dibromo-3-Chloropropane, 1,2-	µg/L	0.6	EPA 8260	07-Nov-19/R	< 0.6		
Dibromochloromethane	µg/L	2	EPA 8260	07-Nov-19/R	< 2		
Dibromoethane,1,2- (Ethylene Dibromide)	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Dibromomethane	µg/L	0.1	EPA 8260	07-Nov-19/R	< 0.1		
Dichlorobenzene,1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichlorobenzene,1,3-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichlorobenzene,1,4-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichlorodifluoromethane	µg/L	2	EPA 8260	07-Nov-19/R	< 2		
Dichloroethane,1,1-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloroethane,1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloroethene, cis-1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloroethene, trans-1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloroethylene,1,1-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		



Michelle Dubien
 Lab Manager

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 Bancroft Ontario K0L1C0

Attention: Tyler Casey

Caduceon Environmental Laboratories

285 Dalton Ave
 Kingston Ontario K7K 6Z1

Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 25-Oct-19

JOB/PROJECT NO.: Red Rock WDS

DATE REPORTED: 19-Nov-19

P.O. NUMBER:

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Client I.D.	BH04-5		
Sample I.D.	B19-34659-4		
Date Collected	21-Oct-19		

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed			
Dichloromethane (Methylene Chloride)	µg/L	5	EPA 8260	07-Nov-19/R	< 5		
Dichloropropane,1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloropropane,1,3-	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Dichloropropene, cis-1,3-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloropropene, trans-1,3-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Dichloropropene,1,1-	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Ethylbenzene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Hexachlorobutadiene	µg/L	0.6	EPA 8260	07-Nov-19/R	< 0.6		
Hexane	µg/L	5	EPA 8260	07-Nov-19/R	< 5		
Isopropylbenzene	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Isopropyltoluene,4-	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2		
Methyl Butyl Ketone	µg/L	5	EPA 8260	07-Nov-19/R	< 5		
Methyl Ethyl Ketone	µg/L	20	EPA 8260	07-Nov-19/R	< 20		
Methyl Isobutyl Ketone	µg/L	20	EPA 8260	07-Nov-19/R	< 20		
Methyl-t-butyl Ether	µg/L	2	EPA 8260	07-Nov-19/R	< 2		
Monochlorobenzene (Chlorobenzene)	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Naphthalene	µg/L	0.4	EPA 8260	07-Nov-19/R	< 0.4		
n-Butylbenzene	µg/L	0.4	EPA 8260	07-Nov-19/R	< 0.4		
n-Propylbenzene	µg/L	0.1	EPA 8260	07-Nov-19/R	< 0.1		
sec-Butylbenzene	µg/L	0.1	EPA 8260	07-Nov-19/R	< 0.1		
Styrene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
tert-Butylbenzene	µg/L	0.1	EPA 8260	07-Nov-19/R	< 0.1		
Tetrachloroethane,1,1,1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Tetrachloroethane,1,1,2,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Tetrachloroethylene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		
Toluene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5		



Michelle Dubien
 Lab Manager

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Tel: 613-544-2001

Fax: 613-544-2770

DATE RECEIVED: 25-Oct-19

JOB/PROJECT NO.: Red Rock WDS


DATE REPORTED: 19-Nov-19

P.O. NUMBER:

SAMPLE MATRIX: Groundwater

WATERWORKS NO.

Parameter	Units	R.L.	Reference Method	Date/Site Analyzed				
Trichlorobenzene,1,2,3-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trichlorobenzene,1,2,4-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trichloroethane,1,1,1-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trichloroethane,1,1,2-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trichloroethylene	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trichlorofluoromethane	µg/L	5	EPA 8260	07-Nov-19/R	< 5			
Trichloropropane,1,2,3-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			
Trimethylbenzene,1,2,4-	µg/L	1	EPA 8260	07-Nov-19/R	< 1			
Trimethylbenzene,1,3,5-	µg/L	0.1	EPA 8260	07-Nov-19/R	< 0.1			
Vinyl Chloride	µg/L	0.2	EPA 8260	07-Nov-19/R	< 0.2			
Xylene, m,p-	µg/L	1.0	EPA 8260	07-Nov-19/R	< 1.0			
Xylene, o-	µg/L	0.5	EPA 8260	07-Nov-19/R	< 0.5			



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 Lab Manager

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Appendix E



Appendix D-Monitoring and Screening Checklist General Information and Instructions

General Information: The checklist is to be completed, and submitted with the Monitoring Report.

Instructions: A complete checklist consists of:

- (a) a completed and signed checklist, including any additional pages of information which can be attached as needed to provide further details where indicated.
- (b) completed contact information for the Competent Environmental Practitioner (CEP)
- (c) self-declaration that CEP(s) meet(s) the qualifications as set out below and in Section 1.2 of the Technical Guidance Document.

Definition of Groundwater CEP:

For groundwater, the CEP must have expertise in hydrogeology and meet one of the following:

- (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 practicing member, temporary member or limited member of the Association of Professional Geoscientists of Ontario. O. Reg. 66/08, s. 2..

Definition of Surface water CEP:

A CEP for surface water assessments is a scientist, professional engineer or professional geoscientist as described in (a) and (b) above with demonstrated experience and post-secondary education, either a diploma or degree, in hydrology, aquatic ecology, limnology, aquatic biology, physical geography with specialization in surface water, and/or water resource management.

The type of scientific work that a CEP performs must be consistent with that person's education and experience. If an individual has appropriate training and credentials in both groundwater and surface water and is responsible for both areas of expertise, the CEP may then complete and validate both sections of the checklist.

Monitoring Report and Site Information

Waste Disposal Site Name: Red Rock WDS

Location (e.g. street address, lot, concession): Part Lot 11, Concession 7, geographic Township of Richards, Township of Killaloe, Hagarty and Richards

GPS Location (taken within the property boundary at front gate/front entry):
North American Datum (NAD83) are 303959.0 metres (m) East, 5061895.0 m North, in Zone 18T

Municipality: Township of Killaloe, Hagarty and Richards

Client and/or Site Owner: Township of Killaloe, Hagarty and Richards

Monitoring Period (Year): 2019

This Monitoring Report is being submitted under the following:

- Certificate of Approval No.: A412307
- Director's Order No.: _____
- Provincial Officer's Order No.: _____
- Other: _____

Report Submission Frequency: Annual Other specify : _____

The site is: active inactive closed

If closed, specify C of A, control or authorizing document closure date: _____

Has the nature of the operations at the site changed during this monitoring period? Yes No

If yes, provide details: _____

Groundwater WDS Verification:

Based on all available information about the site and site knowledge, it is my opinion that:

Sampling and Monitoring Program Status:

- 1) The monitoring program continues to effectively characterize site conditions and any groundwater discharges from the site. All monitoring wells are confirmed to be in good condition and are secure:

Yes No

If no, list exceptions:

See report.

- 2) All groundwater, leachate and WDS gas sampling and monitoring for the monitoring period being reported on was successfully completed as required by Certificate(s) of Approval or other relevant authorizing/control document(s):

Yes No Not applicable

If no, list exceptions below or attach information.

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

3) a) Some or all groundwater, leachate and WDS gas sampling and monitoring requirements have been established or defined outside of a ministry C of A, authorizing, or control document.

Yes No Not applicable

b) If yes, the sampling and monitoring identified under 3(a) for the monitoring period being reported on was successfully completed in accordance with established protocols, frequencies, locations, and parameters developed as per the Technical Guidance Document:

Yes No Not applicable

If no, list exceptions or attach additional information.

Groundwater Sampling Location	Description/Explanation for change (change in name or location, additions, deletions)	Date

4) All field work for groundwater investigations was done in accordance with standard operating procedures as established/outlined per the Technical Guidance Document (including internal/external QA/QC requirements) (Note: A SOP can be from a published source, developed internally by the site owner's consultant, or adopted by the consultant from another organization):

Yes No

If no, specify:

Sampling and Monitoring Program Results/WDS Conditions and Assessment:

- 5) The site has an adequate buffer, Contaminant Attenuation Zone (CAZ) and/or contingency plan in place. Design and operational measures, including the size and configuration of any CAZ, are adequate to prevent potential human health impacts and impairment of the environment.

Yes No

If no, the potential design and operational concerns/exceptions are as follows:

See report.

- 6) The site meets compliance and assessment criteria.

Yes No

If no, list and explain exceptions

See report

- 7) The site continues to perform as anticipated. There have been no unusual trends/ changes in measured leachate and groundwater levels or concentrations.

Yes No

If no, list exceptions and explain reason for increase/change.

See report.

8) Is one or more of the following risk reduction practices in place at the site:

- (a) There is minimal reliance on natural attenuation of leachate due to the presence of an effective waste liner and active leachate collection/treatment; or
- (b) There is a predictive monitoring program in-place (modeled indicator concentrations projected over time for key locations); or
- (c) The site meets the following two conditions (typically achieved after 15 years or longer of site operation):
 - i. The site has developed stable leachate mound(s) and stable leachate plume geometry/concentrations; and
 - ii. Seasonal and annual water levels and water quality fluctuations are well understood.

Yes Note which practice(s): (a) b) c)
 No

9) Have trigger values for contingency plans or site remedial actions been exceeded (where they exist):

Yes No Not applicable

If yes, list value(s) that are/have been exceeded and follow-up action taken

See report.

Groundwater CEP Declaration:

I am a licensed professional Engineer or a registered professional geoscientist in Ontario with expertise in hydrogeology, as defined in Appendix D under Instructions. Where additional expertise was needed to evaluate the site monitoring data, I have relied on individuals who I believe to be experts in the relevant discipline, who have co-signed the compliance monitoring report or monitoring program status report, and who have provided evidence to me of their credentials.

I have examined the applicable Certificate of Approval and any other environmental authorizing or control documents that apply to the site. I have read and followed the Monitoring and Reporting for Waste Disposal Sites Groundwater and Surface Water Technical Guidance Document (MOE, 2010, or as amended), and associated monitoring and sampling guidance documents, as amended from time to time. I have reviewed all of the data collected for the above-referenced site for the monitoring period(s) identified in this checklist. Except as otherwise agreed with the ministry for certain parameters, all of the analytical work has been undertaken by a laboratory which is accredited for the parameters analysed to *ISO/IEC 17025:2005 (E)- General requirements for the competence of testing and calibration laboratories*, or as amended from time to time by the ministry.

If any exceptions or potential concerns have been noted in the questions in the checklist attached to this declaration, it is my opinion that these exceptions and concerns are minor in nature and will be rectified for the next monitoring/reporting period. Where this is not the case, the circumstances concerning the exception or potential concern and my client's proposed action have been documented in writing to the Ministry of the Environment District Manager in a letter from me dated: _____.

Recommendations:

Based on my technical review of the monitoring results for the waste disposal site:

- No changes to the monitoring program are recommended
- The following change(s) to the monitoring program is/are recommended:

- No changes to the site design and operation are recommended
- The following change(s) to the site design and operation is/are recommended:

Recommended to export C&D and bulky waste to an approved waste disposal site in 2020, and preparation of a landfill expansion application for Red Rock WDS to the MECP.

Name: Dan Hagan, P.Geo.

Seal:

Signature: 

Date: Mar26-20



CEP Contact Information:

Company: Greenview Environmental Address:

Telephone No.: 613-332-0057

Fax No. : _____

E-mail Address:

dan.hagan@greenview-environmental.ca

Co-signers for additional expertise provided:

Signature: _____ Date: _____

Signature: _____ Date: _____

Appendix F



Statement of Service Conditions and Limitations

Provision of Services and Payment

Upon documented acceptance of Greenview's proposed services, costs and associated terms by the client, Greenview may commence work on the proposed services directly. Upon retention of Greenview's services related to this project, the client agrees to remit payment for the services rendered for the specified period within (30) days of receipt as invoiced by Greenview on a typical monthly basis, unless otherwise arranged between the client and Greenview. In the event of non-payment by the client, Greenview reserves the right, without external influence or expense, to discontinue services and retain any documentation, data, reports, or other project information until such time as payment is received by Greenview.

Warranty, Limitations, and Reliance

Greenview relies on background and historical information from the client to determine the appropriate scope of services to meet the client's objectives, in accordance with applicable legislation, guidelines, industry practices, and accepted methodologies.

Greenview provides its services under the specific terms and conditions of a specific proposal (and where necessary formal contract), in accordance with the above requirements and the *Limitations Act 2002*, as amended, only.

The hypotheses, results, conclusions, and recommendations presented in documentation authored by Greenview are founded on the information provided by the client to Greenview in preparation for the work. Facts, conditions, and circumstances discovered by Greenview during the performance of the work requested by the client are assumed by Greenview to be part of preparatory information provided by the client as part of the proposal stage of the project. Greenview assumes that, until notified or discovered otherwise, that the information provided by, or obtained by Greenview from, the client is factual, accurate, and represents a true depiction of the circumstances that exist related to the time of the work.

Greenview relies on its clients to inform Greenview if there are changes to any related information to the work. Greenview does not review, analyze or attempt to verify the accuracy or completeness of the information or materials provided, or circumstances encountered, other than in accordance with applicable accepted industry practice. Greenview will not be responsible for matters arising from incomplete, incorrect or misleading information or from facts or circumstances that are not fully disclosed to or that are concealed from Greenview during the period that services, work, or documentation preparation was performed by Greenview.

Facts, conditions, information and circumstances may vary with time and locations and Greenview's work is based on a review of such matters as they existed at the particular time and location indicated in its documentation. No assurance is made by Greenview that the facts, conditions, information, circumstances or any underlying assumptions made by Greenview in connection with the work performed will not change after the work is completed and documentation is submitted. If any such changes occur or additional information is obtained, Greenview should be advised and requested to consider if the changes or additional information affect its findings or results.

When preparing documentation, Greenview considers applicable legislation, regulations, governmental guidelines and policies to the extent they are within its knowledge, but Greenview is not

qualified to advise with respect to legal matters. The presentation of information regarding applicable legislation, regulations, not intended to and should not be interpreted as constituting a legal opinion concerning the work completed or conditions outlined in a report. All legal matters should be reviewed and considered by an appropriately qualified legal practitioner.

Greenview's services, work and reports are provided solely for the exclusive use of the client which has retained the services of Greenview and to which its reports are addressed. Greenview is not responsible for the use of its services, work or reports by any other party, or for the reliance on, or for any decision which is made by any party using the services or work performed by or a report prepared by Greenview without Greenview's express written consent. Any party that uses, relies on, or makes a decision based on services or work performed by Greenview or a report prepared by Greenview without Greenview's express written consent, does so at its own risk. Except as set out herein, Greenview specifically disclaims any liability or responsibility to any third party for any loss, damage, expense, fine, penalty or other such thing which may arise or result from the use of, reliance on or decision based on any information, recommendation or other matter arising from the services, work or reports provided by Greenview.

Site Reviews and Assessments

A site assessment is created using data and information collected during the investigation of a site and based on conditions encountered at the time and particular locations at which fieldwork is conducted. The information, sample results and data collected represent the conditions only at the specific times at which and at those specific locations from which the information, samples and data were obtained and the information, sample results and data may vary at other locations and times. To the extent that Greenview's work or report considers any locations or times other than those from which information, sample results and data were specifically received, the work or report is based on a reasonable extrapolation from such information, sample results and data but the actual conditions encountered may vary from those based on extrapolations.

Only conditions, and substances, at the site and locations chosen for study by the client are evaluated; no adjacent or other properties are evaluated unless specifically requested by the client. Any physical or other aspects of the site that were not chosen for study by the client, or any other matter not specifically addressed in a report prepared by Greenview, are beyond the scope of the work performed by Greenview and such matters have not been investigated or addressed.

Confidentiality

Greenview provides proposals, reports, assessments, designs, and any other work for the sole party identified as the client or potential client in the case of proposals.

For proposals specifically, the information contained therein is confidential, proprietary information, and shall not be reproduced or disclosed to any other party than to that of the addressee of the original proposal submission, without prior written permission of Greenview.