2020 ANNUAL SITE MONITORING AND OPERATIONS REPORT WEST ELGIN LANDFILL SITE MUNICIPLAITY OF WEST ELGIN RODNEY, ONTARIO

Submitted to:

The Corporation of the Municipality of West Elgin
22413 Hoskins Line, Box 490
Rodney, ON N0L 2C0

Prepared by:

BluMetric Environmental Inc.
Unit 3B, 209 Frederick Street
Kitchener, ON N2H 2M7

Project Number: 200254
March 17, 2021

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1. Introduction

BluMetric Environmental Inc. (BluMetric ™) was retained by The Corporation of the Municipality of West Elgin (Municipality of West Elgin) to complete the 2020 annual site monitoring and operations report for the West Elgin Landfill site (the site) located near Rodney, Ontario (Figure 1). The monitoring program consisted of semi-annual (spring and fall) monitoring of the site groundwater quality. It should be noted that "the site" is defined as the study area as a whole (as noted in Figure 2 and Figure 3) and incorporates both on-site (property currently owned by the Municipality of West Elgin) and off-site components.

This report has been prepared to comply with the Ministry of the Environment, Conservation, and Parks (MECP's) 2010 Technical Guidance Document entitled "Monitoring and Reporting for Waste Disposal Sites, Groundwater and Surface Water" (MOE, 2010). As such a Competent Environmental Practitioner (CEP) completed the document's checklist which is included as Appendix A of this report.

1.1 Location

The site is located near Rodney, Ontario south of Downie Line as shown in Figure 1.

Coordinates are approximately (using Google Earth© as a reference):

UTM 17T, 439670.29 m E, 4710278.09 m N

Figure 2 is a site plan with all groundwater monitoring stations and the property boundary as shown on an aerial photo (from 2016).

Figure 3 is the site plan without the aerial photo, with the general infrastructure of the site shown (i.e. the waste transfer station bins).

1.2 Ownership and Key Personnel

The Municipality of West Elgin currently operates the West Elgin Landfill site under the MECP Amended Provisional Environmental Compliance Approval (ECA) for Waste Disposal Site No. A051101 dated December 21st, 2005 (MOE, 2005), and amended on April 11, 2012, September 11, 2015 and April 4, 2017, provided in Appendix B of this report.

The contact information is as follows:

Contact:
Mr. Lee Gosnell
Manager of Operations & Community Services Municipality of West Elgin
22413 Hoskins Line
Rodney, ON N0L 2C0
Phone: 519-878-3961

Description and Development of the Waste Disposal Site.

BluMetric (operating as WESA until 2015) was retained by the Municipality of West Elgin in 2006 to prepare a Hydrogeological Investigation and Design and Operations Report (WESA, 2006).In response to recommendations made in that report and to comments from the MECP (MOE, 2007a and b), BluMetric was retained by the Municipality of West Elgin to complete a subsurface investigation and leachate delineation study for the site (WESA, 2007b). The subsurface investigation and leachate delineation study allowed for delineation of leachate impacts down-gradient of the landfill (off-site). The study concluded that impacts to groundwater were identified beyond the property boundaries (off-site) and therefore the site was out of compliance with the Reasonable Use Guideline (RUL) (B-7) (MOEE, 1994).

The need for the establishment of a Contaminant Attenuation Zone (CAZ) was identified and in 2012, the Municipality of West Elgin purchased the recommended CAZ to the south (50 m) of the site. As a result, monitoring wells MW6, MW8, MW9, and MW12 are considered on-site. In 2015, the Municipality purchased additional CAZ to the east of the site. As a result of this purchase, monitoring wells MW11 and MW15 are also considered on-site. In July 2015, a new piezometer (MW19) was installed within the CAZ to the east. Figures 2 and 3 show the site plan and detail the locations of all the monitoring wells.

Historically, background water quality on-site had been evaluated on the conditions at MW1; however due to the potential for a small component of groundwater flow to be directed towards this monitoring well, it was determined that it may not be fully representative of background conditions (WESA, 2009). A new background well (MW14) was installed at the site in May 2010 (Figure 2). RULs have been calculated for the landfill site using historical analytical data collected from MW14 (including data collected since installation in 2010 through to current data).

The landfill site was surveyed in the spring of 2010 and again in the fall of 2016 (to confirm waste input). It should be noted that all reference elevations for the site, including borehole elevations, monitoring well elevations and cross sections have been updated based on the 2016 survey. A revised final Trigger Mechanism and Contingency Plan (BluMetric, 2017) was approved by the MECP in 2017. No communications from the MECP were received in 2020.

Appendix B includes:

- Certificate of Approval Number A051101, Issue Date: December 21, 2005;
- Amendment to Environmental Compliance Approval A051101, Issue Date April 11, 2012;
- Amendment to Environmental Compliance Approval A051101, Issue Date September 11, 2015;
- Amendment to Environmental Compliance Approval A051101, Issue Date April 4, 2017.

1.3 Description and Development of the Waste Disposal Site

The monitoring program meets the requirements of the ECA as provided in Appendix B. This was amended in April 2017 to revise the Final Trigger Mechanism and Contingency Plan (BluMetric, 2015) as the assessment criteria. The trigger level is established based on Reasonable Use Policy B7 (MOEE, 1994) which was established to address the quality of groundwater on properties adjacent to potential sources of contaminants such as landfills. Therefore, the groundwater quality at the site is compared to the calculated Reasonable Use Limit (RUL) based on the background conditions on-site and the Ontario Drinking Water Quality Standards (ODWQS) for the following leachate indicator parameters (LIPs):

- Alkalinity, arsenic, chloride, dissolved organic carbon (DOC), iron, and sodium.

Monitoring well MW14, shown on Figures 2 and 3, is representative of background groundwater conditions and therefore RULs for the site are calculated using the historical background concentrations up to and including the most recent sampling event at this well. As a result the calculated RUL changes each year.

The following demonstrates how the RUL is calculated:

$$Cm = Cb + x * (Cr - Cb)$$

Where,

Cm Reasonable Use Limit

Cb Background concentration of groundwater before it has been affected by human activity (average concentrations since May 2010 at MW14)

Maximum concentration of contaminant that should be present in groundwater (ODWQS)

x Constant that reduces the contaminant (equal to 0.25 for health-related parameters and equal to 0.5 for non-health related parameters)

The amended ECA determines site compliance using the Trigger Mechanism and Contingency Plan that compares the groundwater concentrations to a trigger limit of 75% of the RUL at specific trigger or boundary wells. A Tier 1 alert is initiated once a trigger limit is exceeded over three consecutive sampling events at a trigger well/monitor. Site compliance is ultimately determined using 100% of the RUL.

The RUL calculations for spring and fall 2020 were completed using the current ODWQS concentrations.

1.4 Assumptions and Limitations

The conclusions presented in this report represent our professional opinion and are based upon the work described in this report and any limiting conditions in the terms of reference, scope of work, or conditions noted herein.

The findings presented in this report are based on conditions observed at the specified dates and locations, and on the analysis of samples for the specified parameters. Unless otherwise stated, the findings cannot be extended to previous or future site conditions, portions of the site that were not investigated directly, or types of analysis not performed.

BluMetric makes no warranty as to the accuracy or completeness of the information provided by others, or of conclusions and recommendations predicated on the accuracy of that information.

Nothing in this report is intended to constitute or provide a legal opinion. BluMetric makes no representation as to compliance with environmental laws, rules, regulations or policies established by regulatory agencies.

This report has been prepared for the Municipality of West Elgin and the Ontario Ministry of the Environment, Conservation and Parks (MECP). Any use a third party makes of this report, any reliance on the report, or decisions based upon the report, are the responsibility of those third parties unless authorization is received from BluMetric in writing. BluMetric accepts no responsibility for any loss or damages suffered by any unauthorized third party as a result of decisions made or actions taken based on this report.

2. Physical Setting

2.1 Geology and Hydrogeology

2.1.1 Site Geology

The surficial geology in the vicinity of the site is classified into three units. The upper unit is a lacustrine deep water deposit consisting of sand, silt and clay till. These are underlain by lacustrine shallow water deposits consisting of gravel and sand.

The gravel and sand unit in the area overlies a well laminated to massive clayey silt till. Drift thickness of the gravel and sand units are upwards of 10 m in the area (P. Map, 1973).

Observations during drilling programs (excluding the boreholes completed in the landfill material) (WESA, 2006) identified an overlying till unit present across the area. A gravel/sand, gravel or sand unit that was up to 2.5 m thick was beneath the till and overlying a clay unit. In places throughout the landfill, some or all the units overlying the clay had been removed and replaced with landfill material.

Boreholes were not advanced more than 2 m into the clay and therefore the full depth of the clay is not known. Based on MECP wells records for the area the clay extends to the top of bedrock that is approximately 55 to 70 m below ground surface (bgs).

The distribution of units can be seen in two cross sections that were constructed north–south and east–west across the site. The locations of the cross sections are shown on Figure 4, and the cross sections are included as Figures 5 and 6. The additional off-site investigation confirms the geology in the area (WESA, 2007b).

The bedrock geology in the subject area is described as an inter-bedded limestone and shale with fossiliferous zones. Bedrock in the area is part of the Dundee formation and is Middle Devonian in age (P.2544).

2.1.2 Hydrogeology

Historical hydrogeological information for the area suggests that the direction of regional groundwater flow is generally from the northwest to the southeast towards Lake Erie (Chapman and Putnam, 1984).

Shallow groundwater flow has been characterized by wells completed within the landfill material or the native sand and gravel units (with the exception of MW2D). Monitoring well MW2D is completed within the clay layer that underlies the landfill and is therefore not part of the shallow groundwater flow system.

Based on the historical site operations as a former sand and gravel pit, it was determined during the initial hydrogeological investigation on-site where areas of native sand and gravel remained. These areas were identified along the property boundaries as preferential pathways for leachate migration (WESA, 2006). The areas were confirmed in 2007 to continue off-site (WESA, 2007a and b).

The results of the initial hydrogeological investigation (WESA, 2006) concluded that the hydraulic conductivity of the sand and gravel unit (1.0×10^{-3} m/s) is two orders of magnitude higher than that of the landfill material (1.5×10^{-5} m/s) tested and therefore could act as a preferential pathway for leachate impacted groundwater to migrate off-site. The clay that is present around the area has a measured hydraulic conductivity (1.0×10^{-8} m/s) that is two to three orders of magnitude less than the overlaying units and therefore will help to restrict water and leachate movement.

2.2 Surface Water Features

The landfill is positioned adjacent to a series of wetlands (northwest property boundary) and provincially significant wetlands (south and east property boundary). At the request of the MECP, surface water samples were collected from the wetlands to the north, south and southeast of the landfill in 2013. Based on the results of the 2013 surface water analytical results, future sampling was not recommended at these locations (WESA, 2014).

2.3 Monitoring Locations

Monitoring well locations are shown on Figures 2 and 3. All borehole logs / monitoring well construction logs are provided in Appendix C. Note there are no logs for MW15 through MW18 as these were installed by hand as temporary drive-point piezometers. BluMetric conducted a GPS survey in 2010. The elevations and UTM coordinates for all monitoring wells as measured at that time are included in Appendix D (note there are no UTM coordinates for temporary piezometers MW16 through MW18).

2.4 Monitoring Frequency

As per the ECA, samples are collected twice a year to represent the spring and the fall monitoring events.

The groundwater monitoring programs were conducted on May 26, 2020 (spring) and October 8, 2020 (fall).

2.5 Field and Laboratory Parameters and Analysis

Chain of Custody forms accompanied the samples from the field to the laboratory and until chemical results were presented to BluMetric. All groundwater samples were submitted to ALS Laboratories (ALS) of Waterloo, Ontario.

Groundwater samples from each of the monitoring locations were analyzed for the list of chemical parameters as defined in Schedule B of the ECA.

Field temperature, conductivity and pH readings were also collected at each monitoring location.

2.6 Environmental Compliance Approval Requirements

The monitoring program consisted of semi-annual monitoring of site groundwater. The site is operated under, and is in compliance with, ECA No. A051101 (Appendix B). The CAZ to the southeast was purchased in 2015. A final Trigger Mechanism and Contingency Plan was submitted to the MECP and approved by the MECP in 2017.

Groundwater trigger mechanisms were established for five trigger wells. Trigger limits were set at 75% of the calculated RUL, but site compliance will be determined using 100% of the RUL.

2.7 Standard Operating Procedures and Methods

All measurements and samples were collected in accordance with the Standard Operating Procedures described below.

Methane

Methane concentrations were measured using a portable GEM™2000 landfill gas monitor at all groundwater monitoring locations immediately upon opening the well cap, prior to static water level measurements and sampling. Methane readings are measured within the riser pipe at each location and reported in % volume of methane.

Groundwater

Prior to sampling, static water levels were measured using a water level tape at each monitoring well location.

All monitoring wells were developed prior to sampling by purging a minimum of three well volumes or until the well was purged dry three times. The monitoring wells were then sampled using dedicated Waterra™ inertial lift foot valves and polyethylene tubing.

Clean, disposable nitrile gloves were worn when sampling. Samples were collected in laboratory prepared, sealed, bottles with preservative where required for specific parameters. Care was taken in the field to limit cross contamination of preservative and loss of preservative during sampling. Samples collected for dissolved metal analysis were field-filtered using dedicated 0.45 µm in-line Waterra™ filters.

All samples were stored in a cooler with ice during shipment to the laboratory. Holding times for samples conformed to CCME Standards where applicable (CCME, 1993). Chain of custody forms accompanied the samples from the site to the laboratory and until the chemical results were presented to the client.

2.8 Record Keeping and Field Notes

BluMetric retains all field notes supporting sample collection and analysis and provides the Municipality of West Elgin with electronic copies when requested.

2.9 Quality Assurance for Sampling and Analysis

As per the ECA, one blind duplicate was collected during each of the sample events conducted at the Site in 2020. Sampling precision was determined by calculating the relative percentage difference (RPD) for the duplicate samples as follows:

RPD (%) = [(Dup1 – Dup2)/(average of Dup1+Dup2)] x100

An RPD is calculated for duplicate samples with reported contaminant concentrations greater than 5 times the reportable detection limit (RDL). Concentrations less than 5 times the RDL become increasingly imprecise and, in these cases, the results are not considered sufficiently reliable and an RPD is not calculated. When the analytical result for one or both of a duplicate pair are less than the RDL (i.e. non-detect), an RPD cannot be calculated. BluMetric evaluated the results of the QA/QC analyses using RPD values of 30% for groundwater. An RPD below 30% was considered acceptable and confirmed that the sampling methodology is capable of producing repeatable results.

2.10 Operational Monitoring

Landfill site inspections were completed by BluMetric staff in May and October 2020 as part of the annual environmental monitoring program. Results are discussed below.

3. 2020 Overview – Site Monitoring Results

The results of the 2020 environmental monitoring program are presented below.

3.1 Historical Data

BluMetric was originally retained in 2006 by the Municipality and has collected all the data for the environmental monitoring events from that time through to and including 2020.

All sample locations are illustrated in Figures 2 and 3. Tables 1 through 4 provide all historical and current data.

3.2 Data Quality Evaluation

Appendix E includes all Laboratory Certificates of Analysis for the 2020 monitoring period.

As discussed in Section 2.9, one blind field duplicate was collected during each sampling event and the RPD was calculated to assess the quality of the data collected for parameters analysed by the laboratory. The blind field duplicate was collected from MW5-R during both the spring and fall events. The RPDs indicate that the overall data quality is acceptable.

3.3 Groundwater Level Monitoring

The groundwater monitoring programs were conducted on May 26, 2020 (spring) and October 8, 2020 (fall). Water levels were measured at monitoring well to calculate groundwater elevations and determine groundwater flow directions.

Spring 2020

Static groundwater elevation data collected on May 26, 2020 is summarized in Table 1.

The groundwater within the shallow flow ranged between 217.05 metres above sea level (m asl) (MW19-R) to 218.76 m asl (MW10) in the spring of 2020. Groundwater flow on-site is generally towards the east. Groundwater flow patterns are similar to historic results. Figure 7 shows the groundwater elevation contours and direction of groundwater flow for spring 2020.

In the spring of 2020, a horizontal gradient of 0.004 was present across the landfill towards the southeast using monitors MW1 and MW3. Vertical flow between the landfill material, measured in MW2-R and the underlying clay unit, measured in MW2D, was downward at a gradient of 0.15.

Fall 2020

Static groundwater elevation data collected on October 8, 2020 is summarized in Table 1.

The groundwater within the shallow flow regime ranged between 216.62 m asl (MW19-R) to 218.07 m asl (MW10) in the fall of 2020. Groundwater flow on-site is generally towards the east. In general, an overall decrease in water level from the spring was noted across the site. This aligns with observations made in previous years and groundwater flow patterns are similar to historic results. Figure 8 shows the groundwater elevation contours and direction of groundwater flow for fall 2020.

In the fall of 2020, a horizontal gradient of 0.003 was present across the landfill towards the southeast using monitors MW1 and MW3. Vertical flow between the landfill material, measured in MW2-R and the underlying clay unit, measured in MW2D, was upward at a gradient of 0.02.

3.4 Methane Monitoring

Methane vapour survey results from each monitoring location are presented in Table 2. During both the spring and fall 2020 sampling events, elevated levels of methane were detected in MW2-R (43.6% by volume and 50.4% by volume, respectively). The methane vapour readings in the remaining wells were below detection limits in May 2020 and <0.5% by volume in October 2020.

Historically, the highest methane readings have been noted in wells located within or below landfill material (MW2-R and MW2D) or in close proximity to historical and / or current land filling operations (MW4 and MW5-R). The readings during the monitoring events are similar to historical results.

Presently, there is no concern of gas buildup in confined spaces. There are no permanent structures on or below grade within site limits. A small, elevated trailer is located adjacent to monitoring well MW4. A sea container is located near the transfer station on site between MW3 and MW6 and acts as the on-site worker's office. As shown in Table 2, none of these monitoring wells has current or historical elevated methane levels.

3.5 Groundwater Quality Monitoring

Groundwater quality results are discussed based on background groundwater chemistry and leachate characterization. The inorganic and metals groundwater quality within the shallow flow system and the clay unit are summarized in Table 3 with the RUL, 75% of the RUL and the background groundwater quality established for the site. In Table 3, parameter concentrations that exceed 75% of the RUL are bolded with light shading and concentrations that exceed 100% of the RUL are bolded and italicized with dark shading. The volatile organic compounds (VOCs) groundwater quality data is summarized in Table 4.

Groundwater chemistry results showing leachate indicator parameters that exceeded 75% of the RUL over three consecutive sampling events in 2020 can be seen in Figure 9. As well, Appendix F provides time-series plots of leachate indicator parameters for all monitoring wells (please note that the plots are not all on the same concentration scale).

Figures 10 and 11 present the spring and fall 2020 data, respectively, on a tri-linear, or piper plot. These diagrams identify groundwater monitoring wells with chemical similarities by plotting the relative contribution of major cations and anions on a charge equivalent basis, to the total ion content of the water. Therefore, this figure identifies those wells that have similar chemistry to the leachate well MW2-R.

In general, the monitoring wells plot away for MW2-R with the exception of the results shown on the anion plots. In both the spring and fall cation diagrams, no monitoring wells plot near MW2-R. In the spring and fall anion diagrams, the monitoring well that is in closest proximity to the leachate well is MW15.

Complete analytical results are provided in the original laboratory certificates of analyses in Appendix E.

3.5.1 Background Groundwater Chemistry and Reasonable Use Calculations

The groundwater quality at the site was compared to 75% of the RUL (or the trigger limit) values based on the background conditions on-site, as measured in MW14-R (installed in June 2018 to replace MW14 that had been damaged) and the ODWQS. Calculated trigger limits, RUL values and ODWQS are listed in Table 3. The current RULs have been calculated using historical data from MW14-R. Monitoring well MW14-R exhibits concentrations of alkalinity and iron above 75% and 100% of the RUL, respectively. As discussed in Section 1.4, a tier 1 alert (or early warning alert) is initiated when the trigger limit is exceeded over three consecutive sampling events. This initiates a Tier 2 assessment.

3.5.2 Leachate Indicator Parameters

Historically, leachate has been characterized by high concentrations of:

- ammonia, alkalinity, arsenic, chloride, DOC, iron and sodium (WESA, 2006).

In 2007, the additional investigations and the historical analytical results were reviewed, and the list of leachate indicator parameters was re-assessed. The off-site groundwater quality, the natural features located off-site (wetlands) and the surrounding properties' current and historical operations were used in this review. Based on this information, DOC and iron were not believed to be solely representative of leachate impacts originating from the landfill and therefore were removed from the list of definitive leachate indicator parameters and were not used to delineate leachate impacts off-site. However, as requested by the MECP in their letter dated December 3, 2008 (MOE, 2008) based on a review of the 2007 additional investigation, DOC was included on the leachate indicator parameter list.

It was agreed, however, that the landfill is positioned adjacent to a series of wetlands (northwest property boundary) and provincially significant wetlands (east property boundary). As a result of the wetlands in close proximity to the landfill and the groundwater monitoring wells, the DOC reported in the wells could be attributed to secondary sources and not just from leachate. In addition, deforestation activities have occurred on the property adjacent to the southwestern property boundary (MW9). Deforestation could also attribute to elevated DOC within the groundwater (MW9).

Furthermore, with respect to iron, concentrations are variable across the site, but have been noted in background well MW14. Given this, iron concentrations cannot be fully attributed to landfill activities but may be signs of localized impacts due to metal storage on-site. On its own iron is not representative of leachate impacts but in conjunction with other parameters, such as chloride, it can be an indicator for leachate impacts. It continues to be included in the list of leachate indicator parameters but must be considered with respect to other parameters to determine if it is reflective of leachate impact.

Organic N concentrations are often used to assess the impacts of leachate and are sometimes preferred over just using ammonia concentrations for groundwater. The concentration of organic N is based on a calculation using the concentrations of ammonia and TKN reported in a sample. Prior to 2014, organic N was used in conjunction with ammonia to assess leachate impacts. Natural biological processes in wetland environments can contribute organic N to surface water, through the degradation of decaying plant matter. On its own organic N is not representative of leachate impacts but in conjunction with other parameters, such as chloride, it can be an indicator for leachate impacts.

However, in the 2013 Annual Monitoring Report (WESA, 2013c), BluMetric recommended the removal of organic N from the list of indicator parameters as it has been observed to be naturally occurring in the surface waters within the on and off-site wetlands. Both ammonia and organic N are still monitored at the site; however, they are discussed separately from the discussion below regarding indicator parameters and RUL exceedances.

Based on the information presented above, a revised list of leachate indicator parameters has been prepared and approved in the ECA amendment in September 2015

(Appendix B). The revised parameter list is believed to be representative of leachate impacts associated with the site.

- alkalinity, arsenic, chloride, DOC, iron, and sodium

The leachate indicator parameters (LIPs) are used to assess the quality of groundwater and will be used to monitor changes in groundwater chemistry at each sampling location. However, as previously noted, although certain parameters (i.e. iron) are LIPs for the site, they often occur naturally (i.e. at non-impacted wells) at concentrations above RUL and / or ODWQS. Therefore, concentrations of leachate indicator parameters are compared to background concentrations to assess leachate impact.
Upon comparison of the groundwater chemistry at one or more monitoring locations to calculated RULs, ODWQS and background conditions, several parameters exceed the set value. Although exceedances were noted, the parameters are not considered LIPs for this site. These parameters include ammonia, organic N, colour, hardness, total dissolved solids (TDS), turbidity, fluoride, nitrate, aluminium, barium, boron, chromium, manganese and uranium.

As discussed in previous reports (WESA 2006, 2007a and b), the natural occurrence of these parameters provide evidence that they are not necessarily indicative of leachate impact. A discussion with respect to ammonia, organic N, TDS, manganese, sulphate and boron parameters within the groundwater is provided below for completeness, as per MECP request (MOE, 2009).

It is recognized that chloride represents the most mobile of the LIPs and would be expected to be the first to reach a monitoring location if leachate migration were occurring. Concentrations of chloride will be monitored closely to evaluate the migration of leachate impacts off site.

3.5.3 Site Groundwater Quality

The analytical results observed during the monitoring events are, in general, consistent with those historically observed and reported for the site.

The following table summarizes all leachate indicator parameters measured in excess of 75% of the RUL for three (3) consecutive sampling events (including during the spring or fall 2020 event depending on the assessment date). The table also identifies if the well is considered a trigger well as per the Final Groundwater Trigger Mechanism and Contingency Plan and the location of each monitoring well. Only those wells that are considered trigger wells (or boundary wells) would trigger a Tier 1 – Alert.

Results Summary Relative to Tier 1 Trigger Alerts:

Monitoring Well	Well Location	Trigger Well?	Groundwater Flow	Spring 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events	Fall 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events
MW1	Northwest	**YES – North**	Shallow	Alkalinity	Alkalinity
MW2-R	Leachate (Landfill Footprint)	No	Shallow	Alkalinity, Arsenic, Chloride, DOC, Iron, and Sodium	Alkalinity, Arsenic, Chloride, DOC, Iron, and Sodium
MW3	East	No	Shallow	Alkalinity, Arsenic, Chloride, DOC, Iron, and Sodium	Alkalinity, Arsenic, Chloride, DOC, Iron, and Sodium
MW4	Southeast	No	Shallow	Alkalinity, Chloride	Alkalinity, DOC

Monitoring Well	Well Location	Trigger Well?	Groundwater Flow	Spring 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events	Fall 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events
MW5-R	Southwest	No	Shallow	Alkalinity, Arsenic, DOC, and Iron	Alkalinity, Arsenic, DOC, and Iron
MW6	South – CAZ	No	Shallow	Alkalinity, Arsenic, DOC, and Iron	Alkalinity, Arsenic, DOC, and Iron
MW7	East	No	Shallow	Alkalinity, Chloride, DOC, and Sodium	Alkalinity, Chloride, DOC, and Sodium
MW8	South – CAZ	No	Shallow	Alkalinity, Chloride, and DOC	Alkalinity, Chloride, and DOC
MW9	South – CAZ	**YES – South**	Shallow	Alkalinity	Alkalinity, DOC
MW10	Off Site	**YES – West**	Shallow	None	None
MW11	East – CAZ	No	Shallow	Alkalinity, Chloride, DOC, and Sodium	Alkalinity, Chloride, DOC, and Sodium
MW12	South – CAZ	**YES - South**	Shallow	None	None
MW15	East – CAZ	No	Surface/ Shallow	Alkalinity, Chloride, and DOC	Alkalinity, Chloride, DOC and Sodium

Monitoring Well	Well Location	Trigger Well?	Groundwater Flow	Spring 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events	Fall 2020 Leachate Indicator Parameters which exceed 75% of the RUL for three consecutive events
MW2D	Clay	No	Deep	DOC	DOC
MW19-R	East - CAZ	**YES - East**	Surface/ Shallow	DOC, Iron	Iron

[1] Note that for MW2-R, MW5-R and MW19-R, this assessment considers the most recent sample results from this well plus the historic results from MW2, MW5 and MW19, respectively.

Based on the spring and fall 2020 sampling event, trigger wells MW1 and MW9 exceeded 75% of the RUL for trigger parameter alkalinity for three consecutive sampling events. Trigger well MW9 also exceeded 75% of the RUL for trigger parameter DOC for three consecutive sampling events. Trigger well MW19-R exceeded 75% of the RUL for trigger parameter iron for three consecutive sampling events. These early warning Tier 1 Alerts initiate the Tier 2 – Assessment discussion under the separate heading below.

No other trigger wells had concentrations of LIPs which exceeded 75% of RUL for three consecutive sampling events including 2020, and therefore no other Tier 1 Alerts occurred. It is worth noting, prior to the addition of the Eastern CAZ in 2015, MW11 and MW15 were considered trigger wells, and based on 2020 LIP values would have prompted a Tier 1 Alert. The analytical results of MW11 and MW15 are consistent with historical data and are not of concern and do not trigger any alerts.

MW2-R was installed in April 2016 to replace MW2 and further repaired in June 2019. It is screened in the landfill and representative of leachate. All leachate indicator parameters have exceeded 100% of the RUL in each sampling event since installation.

Tier 2 Assessment Discussion – MW1

The results for alkalinity in trigger well MW1 have exceeded 75% of the RUL for over three consecutive monitoring events, resulting in an early warning Tier 1 alert. This initiates the following Tier 2 Assessment.

The alkalinity results at MW1 are still within the range of 100% RUL. Alkalinity is the measure of the water's ability to neutralize acid. It is calculated using carbonate/bicarbonate. pH, on the other hand, is a numeric scale which measures the hydrogen ion concentration of the water.
The pH determines how acidic or basic the water is.

Appendix F includes the time-concentration graphs for MW1 depicting the results of LIP monitoring over time. Alkalinity is depicted in the second graph in Appendix F. The recent results depict a slightly decreasing trend. The most recent results are clearly much lower than historic sampling has indicated. An increasing trend in conservative LIP chloride, as well as in LIP sodium, are noted.

Therefore, it is concluded that Tier 3 monitoring is not required at this time.

Tier 2 Assessment Discussion – MW9

The results for alkalinity and DOC in trigger well MW9 have exceeded 75% of the RUL over three consecutive monitoring events resulting in an early warning Tier 1 alert. This initiates the following Tier 2 Assessment.

Both the alkalinity and DOC results at MW9 are within the range of 100% RUL.

Appendix F includes the time-concentration graphs for MW9 depicting the results of LIP monitoring over time. No definite trend is noted here and therefore it is concluded that Tier 3 monitoring is not required at this time.

Tier 2 Assessment Discussion – MW19-R

A Tier 1 alert is noted with respect to parameter iron at MW19-R. The alert related to iron was first noted in 2019 and resulted in Tier 3 monitoring to confirm the levels.

It is noted that historically iron concentrations have been identified as variable across the site, including in background well MW14 (the predecessor to MW14-R). Given this, iron concentrations cannot be fully attributed to landfill activities but may be a sign of localized impacts due to metal storage on-site. As such, it has been historically documented that on its own, iron is not representative of leachate impacts; however, in conjunction with other parameters, such as chloride, it can be an indicator for leachate impacts. Tier 3 monitoring was conducted in the fall 2019 sampling event.

The Revised Final Trigger Mechanism and Contingency Plan (BluMetric, January 2017) requires a review of historic groundwater quality at MW19-R to determine if an increasing trend in LIP concentrations exists. The following provides a summary of groundwater quality at MW19-R wells (note that the historic review is somewhat hindered by a limited data set), as well as a discussion of upgradient monitoring locations:

1. A review of all LIP data at MW19-R indicates that only iron has demonstrated an increasing trend, with fluctuations noted within that trend. Only DOC and arsenic have had instances in which 75% of the RUL is exceeded at this location. Chloride and sodium seem to fluctuate and be elevated in the fall in comparison to the spring but are below 75% of the RUL. Alkalinity, DOC, and arsenic results are either stable or not increasing. Appendix F includes the time-concentration graphs for MW19-R depicting the results of LIP monitoring over time.
2. Chloride is considered the most conservative LIP and often when there is leachate impact, chloride is flushed through first and then dissolved metals are noted afterwards. Chloride has not been identified above 75% of the RUL at MW19-R.
3. Consideration of other parameters of interest does not identify any further concerns. For example, TDS and organic N do not demonstrate a definite trend, exceeding 75% of the RUL on occasion; manganese occasionally exceeds 75% of the RUL but is relatively stable; and sulphate and boron are stable while remaining below 75% of the RUL.
4. Methane readings at MW19-R have not identified methane gas at this location and VOC analysis results are reported below the method detection limit.
5. A review of upgradient wells identifies the following:

a. Previously it was considered that monitoring wells MW7, MW11, and MW15 may have been demonstrating increasing iron concentrations; the concentration of iron at MW7 exceeded 75% of the RUL during the fall 2019 sampling event but has since returned to previous levels near or below the method detection limit. MW11 and MW15 continue to have either low detections of iron or are below the method detection limit.
b. There has been no iron detected at Monitoring wells MW8 and iron was first detected at MW12 in 2020 with concentrations just barely above the method detection limit.
c. Monitoring wells MW3 and MW6 have iron exceeding 75% of the RUL on a consistent basis.

It is concluded that the increase in just the iron concentration is not consistent with leachate from the landfill which would have elevated concentrations of all LIPs, and as such it is believed that the concentrations of iron at MW19-R may be partially due to localized impacts from the metals storage in the waste transfer station area.
Trends in LIPs in this trigger well will continue to be reviewed in future monitoring events.

Other Leachate Indicator Parameters and Organic N, TDS, Manganese, Sulphate, and Boron Trends

The following general trends with respect to the leachate indictor parameters and additional parameters organic N, TDS, manganese, sulphate and boron were noted:

- Monitoring wells MW3, MW4, MW5-R, MW6, MW7, MW8, MW11, and MW15 have exhibited concentrations of one or more leachate indicator parameter above the RUL (and therefore also the Trigger Limit) in 2020;
- Monitoring wells MW1 and MW6 are showing an increase in chloride in 2020, with MW8 showing a steadily increasing trend in chloride since spring 2017. Other monitoring wells showing a fluctuation in chloride concentrations from low concentrations in spring to elevated concentrations in fall;
- Monitoring wells MW3, MW5R and MW6 have iron concentrations that exceed 100% of the RUL on a consistent basis.

- In 2020, concentrations of organic N exceeded the RUL in monitoring wells MW2-R, MW2D, MW3 (spring only), MW4 (spring only), MW5-R, MW8, MW9, MW10 (fall only), MW11, and MW15;
- Concentrations of TDS were above 75% or 100% of the RUL for all monitoring locations in 2020 (fall only at MW10, MW19R);
- Manganese concentrations exceeded 75% or 100% of the RUL in 2020 in MW1 (spring only), MW2-R, MW3, MW4 (fall only), MW5-R, MW6, MW7, MW8 (fall only), MW9 (fall only), MW10 (fall only), MW11, background well MW14-R, MW15, and MW19-R (fall only).
- The concentration of sulphate exceeded 100% of the RUL in fall 2020 in MW1, and;
- In 2020, boron concentrations were above 75% or 100% of the RUL for monitoring locations MW2-R, MW3, MW4 (fall only), MW7, MW8, MW11 and MW15.

MW2D – Deep (Clay)

Monitoring well MW2D, located within the landfill material, was completed within the clay to see the effects of the landfill activities on the clay layer. The concentration of DOC in MW2D exceeded 75% of the RUL in spring of 2020 and 100% of the RUL in fall of 2020. No other LIPs exceeded the respective RULs in MW2D in 2020. It should be noted however that due to the thickness of the clay unit beneath the landfill (55 to 70 m based on MECP well records) and the tested hydraulic conductivity (see Section 2.1.2), the leachate impact, if identified at this location, would be restricted to the upper clay and it is unlikely it would extend to deeper aquifers.

VOCs

The results of the VOCs analyses are summarized in Table 4. The results indicate that concentrations of all parameters measured in all monitoring wells were below the laboratory method detection limit in 2020, with the exception leachate monitoring well MW2-R and MW5-R. Monitoring well MW2-R had concentrations of benzene and ethylbenzene above the ODWQS limits with benzene concentrations of 1.02 µg/L in spring and 1.1 µg/L in fall of 2020 and ethylbenzene concentrations of 4.24 µg/L in spring and 4.87 µg/L in fall of 2020. Chlorobenzene was detected above the method detection limit in MW5-R in the spring and fall of 2020 (2.22 and 2.44 µg/L, respectively), however concentrations were below the ODWQS (30.0 µg/L). This parameter has been noted in MW5/MW5-R since May 2006.

4. Assessment, Interpretation and Discussion

Historical water levels in MW15 through MW18 within the wetland in the eastern portion of the property were within range of those seen in the groundwater monitoring wells currently on-site and therefore considered representative of groundwater discharging conditions within the wetland at the time monitoring was completed. Monitors MW16, MW17, and MW18 were only temporary and removed at the request of the previous property owner. Following purchase of the property, the Municipality installed MW19-R (re-installed in May 2017 to replace MW19), which has been considered representative of groundwater discharging from the landfill. MW19-R was installed by hand and the water level is very shallow or at ground surface; on occasion water has been noted to be frozen during the winter freezing temperatures.

As discussed in previous annual reports, within the wetland, high levels of DOC and organic N can be attributed to rotting plant matter and may not be a direct result of leachate. High ammonia concentrations are indicative of anaerobic activity within the wetland that is further supported by low sulphate, low nitrate and high iron concentrations. The water chemistry in the wetland (MW15) is indicative of an anaerobic reducing system with enhanced de-nitrification potential/conditions and therefore acts to provide natural treatment of leachate.

Based on the concentration trends of the leachate indicator parameters (as seen in the concentration versus time graphs provided in Appendix F) trends can be noted and conclusions made with respect to the leachate characterization for the site. The data for background monitoring well MW14-R indicates that indicator parameter concentrations are relatively stable and low in comparison to the other monitors.

To the south and west, it is noted that concentration levels in MW9 (down-gradient to the south) and MW10 (down-gradient to the west) have similar trends to that seen in the background well with concentrations of chloride below the RUL.

The wells located down-gradient and to the east (MW7, MW8, MW11, and MW12) all show similar concentration trends over time to each other. It was noted previously that MW8 was exhibiting an increasing trend in the concentration of chloride and this was seen again in 2020. Chloride was also noted to have seasonally fluctuating levels in MW7, MW9, MW11 and MW15 in 2018 through 2020.

Trends cannot be noted in MW16 through MW18 (to the east and off-site) as they were only sampled twice and have since been decommissioned.

Monitoring well MW19-R was installed in May 2017 to replace the damaged MW19. As discussed above, iron concentrations have increased at this location and a Tier 3 monitoring program was completed in the fall of 2019 and winter of 2020. The Tier 3 monitoring concluded that the increase in just the iron concentration is not consistent with leachate from the landfill. It is noted that historically iron concentrations have been identified as variable across the site, including in background well MW14 (the predecessor to MW14-R). Given this, iron concentrations cannot be fully attributed to landfill activities. As such, it has been historically documented that on its own, iron is not representative of leachate impacts; however, in conjunction with other parameters, such as chloride, it can be an indicator for leachate impacts. As discussed above, there is no clear trend in other indicator parameters and as such the site is considered to still be in compliance.

Concentration trends in the remaining wells, MW3 and MW6 do not follow the groups of trends at other locations but show leachate impacts.

5. Annual Operations Report

5.1 Historical Site Operations

The West Elgin Landfill site has been in operation since 1971. An ECA (A051101) was first issued in 1971 and reissued in 1972, 1973, 1974, and 1976. On July 16th, 1980 the MECP reissued an ECA to the Village of Rodney.

The MECP issued an amendment to the ECA on December 21, 2005 and amended it on April 11, 2012, September 11, 2015, and April 4, 2017 (Appendix B).

5.2 Existing Conditions

The West Elgin Landfill site is owned by the Municipality of West Elgin. The site is located on Lot B, Concession 7 former Township of Aldborough, West Elgin Municipality, County of Elgin (Figure 1). For this reporting period, the Municipality is the operator of the site.

The landfill services the entire Municipality of West Elgin. The population served is approximately 5,500 which is estimated to increase to approximately 6,000 during the summer months.

Land uses adjacent to the site include a low lying wood lot, wetlands and agricultural fields to the northwest, an aggregate (sand and gravel pit) to the northeast, a wood lot and low lying wetlands to the southeast, and land consisting of grasses, shrubs and trees to the southwest. General topography, surface water drainage, and the hydrogeological assessment of the site are included in Section 2 of this report.

There is one gravel surfaced, temporary access road entering the site from the northwest at Downie Line. The gate across the access road is locked whenever the landfill is closed or the attendant is not present. The site is bounded at each property boundary by natural forest and marshlands that deter illegal access to the site. The temporary access road is maintained to access the active landfill area. This road will be modified accordingly as waste disposal proceeds.

There are no permanent structures on or below grade within site limits. A small, elevated trailer and a sea container are present and act as the on-site worker's office. There are no utilities (electricity, gas, water, sanitary sewers, or phone) to the site. The site operator has a cell phone in case of emergencies.

Existing signs include an entrance sign and signs denoting bins for recyclable material. As per the ECA, the entrance sign states the owner's name and hours of operation, the operator's name, the ECA No., the type of waste accepted, and a contact telephone number to call with complaints or in the event of an emergency.

Landfill operating hours are from 9am to 4pm on Wednesday, Friday, and Saturday.

Waste disposal records are kept at the local municipal offices. The Municipality of West Elgin maintains a record of daily site operations, complaints, site inspections, and unacceptable waste as per the ECA.

During the environmental monitoring events, BluMetric completes a landfill inspection and maintenance record to determine if any adjustments are required for the operation of the site. The completed inspection records for spring and fall 2020 are included in Appendix G.

During the spring 2020 landfill inspection it was noted that the active face operations were wider than the ECA-prescribed limit. Also, there was some concrete noted in a pile outside of the landfill footprint. A note was also made regarding lack of daily cover in the spring inspection but it was subsequently confirmed that the ECA requires cover be placed weekly, not daily, and the inspection checklist was updated to reflect this.
The fall 2020 landfill inspection confirmed that the width of the active face and the concrete remained outside the prescribed limits. BluMetric confirmed with the Municipality following the fall inspection that barrels have been installed to direct residents to the active face, allowing staff to minimize the width of the active face. It was also confirmed that the concrete is not to be placed in the landfill; it is collected and removed off site and will remain outside of the footprint.

In addition, during the fall inspection it was noted that there was smoke emitting from the burn pit. The Municipality has confirmed that burning takes place on Mondays and it is protocol to not leave with an open flame unattended.

5.3 Waste Disposal

The West Elgin Landfill site is currently licensed for the disposal of domestic and commercial waste.

Surveys conducted in 2007 and 2008 identified the source of the waste and recyclable materials, and the number of bags disposed each day. In May 2007, BluMetric conducted a one-day waste audit to provide an approximate average weight per bag of waste, as well as per car, truck, and van load accepted at the site. In addition, the number of bags of waste collected from residential versus commercial sources was counted during the survey.

Based on the May 2007 waste survey, the assumed average weight per bag was 5 kg and the assumed number of bags per car, truck, and van was 3.4, 3.2, and 3.4, respectively. The results of the 2008 waste survey were similar to those from the 2007 waste survey. The measured weight for municipal curbside pick-up runs from the residential areas was also used to calculate the total amount of waste coming into the landfill.

A waste audit was conducted in 2012 as part of the Municipality’s 2011 Waste Recycling Plan (WESA, 2011). The work plan was developed based on recommendations provided in the 2011 Waste Recycling Plan and the purpose of the waste audit was to confirm the recyclable diversion rate for the Landfill and identify the amount of recyclable material not being diverted.

The 2012 waste audit further confirmed the type of waste accepted and the average weight per bag of 5 kg (5.7 kg per bag during the summer event and 4.8 kg per bag during the winter event) (WESA, 2013). The waste audit concluded that there was a potential to divert a further 23-24% of recyclable material from the landfill.

As part of the daily records, the Municipality tracks the number of cars, trucks, and vans entering the facility to drop off waste. In addition, they also track the municipal curbside pick-ups from local residential communities and trailer parks. In the latter half of 2015, the Municipality switched to accepting all waste from West Lorne and Rodney (previously some waste was diverted to other approved landfills). In September 2019, the Municipality began diverted waste from the Village of Rodney and the Village of West Lorne to Green Lane Landfill in London, Ontario. Municipal-wide curbside collection of all waste started in West Elgin on August 1, 2020 with all waste collected diverted to Green Land Landfill in London, Ontario.

The following breakdown of waste generated within the landfill in 2020 is provided:

Municipal-wide curbside collection:
843.76 metric tonnes

Landfill/Transfer Station (tracked acceptance with assumed weights):
430.17 metric tonnes

Special Collection/Large Item Pick Up (cancelled due to COVID-19):
0 metric tonnes

The total waste generated in the Municipality in 2020 is therefore estimated to be 1,274 metric tonnes. A total of 843.76 metric tonnes was diverted to Green Lane Landfill and the total accepted at the West Elgin Landfill is 430.17 metric tonnes.

Domestic waste is estimated to represent greater than 95% of the waste entering the landfill. The domestic waste was delivered by commercial hauler or individual drop-off and is comprised of mixed household garbage. Large items such as discarded appliances, furniture, and mattresses are collected by the haulers or delivered to the waste disposal site for recycling, re-use or deposition at the landfill. Clean wood and brush are collected in a pile to the south of the approved waste limits and burned.

Commercial waste represents approximately 5% of the total waste accepted at the West Elgin Landfill. Commercial waste is delivered by commercial hauler and typically consists of construction material.

The landfill does not allow for large quantities of recyclable material to accumulate as the bins are transferred to the London Material Recovery Facility (MRF) on a regular basis. Municipal-wide curbside collection of recyclable material started in West Elgin on August 1, 2020. The following represents the total diversion to the London MRF or other approved recycling contractors in 2020:

Municipal-wide curbside collection:
182.7 metric tonnes

Landfill/Transfer Station (tracked acceptance with assumed weights):
70.6 metric tonnes

Waste Transfer Station (Steel/ Electronics):
114.2 metric tonnes

In total, the Municipality diverted 367.5 metric tonnes of recyclable materials to the London MRF or other approved recycling contractors.

Additionally, the Municipality diverts organics from the landfill (including spring and fall leaf and yard pick-ups).

5.4 Final Contours and Site Capacity

On September 13, 2016, an Unmanned Aerial Vehicle (UAV) survey was completed on site by BluMetric personnel. The results of the 2010 manual GPS survey and 2016 UAV survey are presented in Figures 12 to 15.

Figure 12 presents the site layout and contours resulting from the 2016 UAV survey with the updated aerial photo. The proposed final design contours are presented in Figure 13. The final contours are based on the local topography of the site and the estimated footprint area of 1.59 hectares. All side slopes will be constructed to a maximum 25% grade. The crown of the landfill will be constructed to a minimum 5% grade to promote surface water runoff. Figure 14 provides a direct elevation comparison of the current 2016 survey and the proposed final design. The purple, blue, and green colours in Figure 14 represent areas where material can still be placed or filled (i.e. areas with capacity) and the red, orange, and yellow colours identify areas where material must be removed or cut to comply with the final contour plan (i.e. areas where the proposed final contour is exceeded).

In 1984, MECP staff estimated the site capacity to be 100,600 m^3 (MOE 2003). Prior to this time, the site did not have an approved capacity. The GPS survey data from 2010 estimated a new total site capacity of 106,109.5 m^3 as the landfill footprint had increased. Based on the final contours plan and the updated 2016 UAV survey data, the remaining site capacity was calculated to be 31,190 m^3 at the end of September 2016.

Note that the areas depicted in red and yellow in Figure 14 are slightly above the final design capacity (approximately 3,450 m^3); however, during the time of the survey, these locations were used for storage of concrete debris and metal material which have since been removed. The areas in blue and purple still have capacity remaining for waste disposal. Figure 15 shows cross sections C-C’ and D-D’, which are shown in plan-view on Figure 14. The red cross section lines are from the 2010 GPS survey, the blue lines are from the 2016 UAV survey and the green lines are the proposed final design. Any locations where the current survey extent exceeds the final design contour will be addressed prior to landfill closure and confirmed by a new survey.

Based on the 2020 annual waste input rate of 430.2 metric tonnes (obtained from the Municipality), a compaction density of 0.5 tonne/m^3 and a waste to cover ratio of 4:1, the annual air space utilization rate for the site is calculated to be 1,075.25 m^3/annum. Using the estimated quantity of in-place waste, calculated utilization rates, and a projected annual population (i.e. waste) growth rate of 0.5% over the next 25 years, the estimated life of the landfill is 20 years (that is, until December 2039). The remaining site capacity as of December 2020 is estimated to be 21,753 m^3.

Note that the estimated life is calculated based on the remaining site capacity as determined by the UAV survey at the end of September 2016 and then calculated until the end of 2020 based on measured scale ticket weights from collection, as well as the tracked material accepted through the waste transfer station (based on assumed weights as discussed above). It is noted that any estimate of remaining site life is highly sensitive to variations in waste characteristics, waste generation rates, cover material utilization, waste compaction and recycling efforts. It is recommended that surveys be completed every 5 years to reassess and update the remaining site capacity.

5.5 2020 Site Operations

The Hydrogeological Investigation and Design and Operations Report prepared by WESA (WESA, 2006) provides a detailed phased development plan for landfill operations over the site life.

In 2010, clay was placed on the edge of the laneway as final cover, however no other final cover has been placed on the landfill footprint. Interim cover is placed over the active face on a weekly basis. All locations that are not part of the active face should be covered with 300 mm of intermediate cover material as discussed in the WESA 2006 report. The Municipality has surveyed and staked the landfill extents.

As per Condition 18 of the Amended ECA, cover or suitable alternative must be placed over the entire active face at the end of every operating week. In 2020, soil cover was placed on the active face on a weekly basis.

The Hydrogeological Investigation and Design and Operations Report prepared by WESA (WESA, 2006) outlines the requirement for active face operations at the landfill. The active face should be kept to a maximum width of 10 m wide. The height of the active face should be the shorter of 1.5 m or the distance to the final waste contour. Site inspections in 2020 indicate that the active face was greater than the 10 m width requirement. Site inspection forms are provided in Appendix G.
The natural surface water drainage at the site is controlled by the low topographic relief. There are no on-site drains and little evidence of surface water ponding or channels identified during BluMetric's site visits. The Municipality of West Elgin purchased CAZ both south and east of the landfill in which portions of the property comprise a Provincially Significant Wetland (PSW). The landfill is situated on a local topographic high and therefore surface water run-off has not been a problem.

The site currently maintains a record of complaints received about the site or any environmental emergency situations that occur at the site at the local municipal offices. There were no complaints in the log for 2020.

5.6 Changes to Operational Procedures and Infrastructure

The Municipality took over operations of the West Elgin Landfill in 2015. In 2019, all waste from the Village of West Lorne and Rodney began to be diverted in an effort to increase the life expectancy of the landfill. Furthermore, in August 2020, curb-side pick up was expanded to the entire municipality in addition to the villages of West Lorne and Rodney.

The site layout was also modified in 2015 in such a manner that the requirements of the recyclable receiver are met (see Figures 2 and 3). All recyclables and waste brought to site are placed in the appropriate bins located on the transfer station.

The recyclable handling areas were moved in an effort to:

- Allow better promotion of separating Recyclable and Waste (including better signage and bin storage); and
- Provide better access control to the landfill at the entrance and limit the access to the face of the landfill.

The Municipality is currently a member in the London MRF, and only requires two separated recyclables streams: fibres and mixed recyclables, including glass, plastic and metals. The Municipality maintains the right to decide where recyclables are taken following collection. Should the London MRF cease to offer a viable solution, temporary storage will be maintained onsite until an alternate is established.

The location for collection of waste tires and electronic waste is adjacent to MW6. These materials are also recycled.

6. Recommendations

The recommendations derived from 2020 annual site monitoring and operations for the West Elgin Landfill site are outlined below. In general, the recommendations for the Annual Site Monitoring and Reporting and Site Operations are consistent with those from the previous annual reports.

6.1 Annual Site Monitoring and Reporting

1. Background water quality analyses should continue to be conducted at MW14-R for the purpose of updating the RULs for the site.
2. The site groundwater monitoring network should be sampled in the spring and fall each year for a full set of parameters, as listed in Tables 3 and 4 of this report, to establish site conditions.
3. As required by the ECA, by no later than April 30th of every year a site operation and environmental monitoring report will be prepared and submitted to the Ministry of the Environment, Conservation and Parks. This recommendation is outlined in the provisional Certificate of Approval for this site.
4. A UAV survey should be completed at a minimum of every 5 years (next survey in 2021) in order to reassess the estimated landfill capacity.

6.2 Annual Operations Report

The design and operations recommendations made by BluMetric as part of the Hydrogeological Investigation and Design and Operations Report (WESA, 2006) should be implemented to minimize any leachate impacts. Recommendations are as follows:

1. The landfill site should continue to maintain a record of daily site operations, monthly site inspections conducted by a trained person, all occurrences of receipt of unacceptable waste, and complaints received about the site or any environmental emergency situations that occur at the local municipal offices. In order for the landfill site to be in compliance with the Amended ECA, these records containing the information specified in in the ECA must be maintained.
2. The site operator should continue to use the delineated landfill footprint to ensure operations adhere to the detailed phased development plan and active face operations as provided in the Hydrogeological Investigation and Design and Operations Report (WESA, 2006).
3. Bins used to collect recyclables must be kept in good condition without leaks. It is recommended that the metals storage area either be tarped to prevent precipitation and potential runoff, or have some means to contain the potential water runoff resulting from precipitation.

4. As per Condition 18 of the Amended ECA, daily cover must be placed over the entire active face with a minimum thickness of 150 mm of soil cover at the end of every operating week. As stated, a tarp can be used as an alternative. Final cover should be placed over the areas where the waste footprint is within the 30 m buffer area.

Respectfully submitted,
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